P. Transit and Pedestrians

100. Definitions

The objective of the transit and pedestrian analyses is to determine whether a proposed action can be expected to have a significant impact on public transportation facilities and services and on pedestrian flows. In particular, these analyses can address the following major technical areas:

- *Rail and subway facilities and services*, including the capacity of subway lines (known as "line haul" capacity), station platforms, stairwells, corridors, and passageways, token booths/control areas, turnstiles, and other critical station elements to accommodate projected volumes of passengers in the future with the proposed action 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. Franchise bus routes should be included in these analyses.

- *Pedestrian flow and conditions*, including the capacity of sidewalks, crosswalks, and intersection corners to process or store the volume of pedestrians expected to be generated at specific locations by the proposed action.

Specific methodologies, databases, and procedures that can be used to analyze these technical areas have been developed and are presented in this section of the Manual. As cited in the previous section on traffic and parking, there are some interrelationships between all of these transportation systems—traffic, parking, transit, and pedestrians—that may need to be reflected in the analyses.

200. Determining Whether Transit and Pedestrian Analyses are Appropriate

It is possible that detailed transit and pedestrian analyses may not be needed for low- or low- to moderate-density proposed actions in particular sections of the City. Before undertaking any analyses, refer to Table 3O-1 in Chapter 3O Traffic and Parking to determine whether *any* numerical analyses would be appropriate. If the proposed action would result in development less than the levels shown in Table 3O-1, further analysis will likely not be needed for transit and pedestrian analyses, either, except in unusual circumstances.

However, if development expected under the proposed action exceeds the minimum thresholds indicated in Table 3O-1, a preliminary trip generation analysis typically should be conducted to determine the volume of transit and pedestrian trips expected to be generated during the peak hour. The methodologies available for use in determining transit and pedestrian trip generation are presented later in this chapter. In general, it will be necessary to either: a) utilize available trip generation rates for the type of use proposed and available modal split characteristics for the site of the proposed action; or b) obtain these data via new surveys at a comparable facility in the same (or comparable) part of the City.

According to general thresholds used by MTA New York City Transit (NYCT), if the proposed action is projected to result in fewer than 200 peak hour rail or bus transit riders, further transit analyses are not typically required as the proposed action is considered unlikely to create a significant transit impact. For programmatic actions that affect more than one neighborhood, the 200-rider threshold would be applied on a per-neighborhood basis. It is also possible that higher transit trip projections would not be expected to impact transit services, especially for stations or bus 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 action might have a significant impact, further analysis may be appropriate. Consultation with NYCT may be necessary if potentially significant impacts could occur.

For pedestrian analyses, quantitative studies have sometimes been performed for proposed actions that would result in residential or office projects that are 50 percent greater than the levels identified in Table 3O-1 of Chapter 3O. This is typical for proposed actions located near already congested intersections, sidewalks with a sizable amount of street furniture, narrow sidewalks, long traffic lights, or active subway entrances. However, in some cases, it is possible that actions resulting in developments substantially above the Table 3O-1 thresholds would still not significantly impact pedestrian facilities and therefore not require further analysis.

It is also suggested that pedestrian analyses consider one additional criterion based on general experience, namely that projected pedestrian volume increases of less than 200 pedestrians per hour at any pedestrian element analyzed would not typically be considered a significant impact, since that level of increase would not generally be noticeable and therefore would not require further analysis.

Pedestrian analyses for new or expanded schools are typically required and these analyses would concentrate on safety at intersections on principal access paths to/from the school. As an example, the path between a new high school and the nearest subway station(s) would be assessed. This analysis should be coordinated with the traffic analysis as described in Section 346 of Chapter 3O.

For both transit and pedestrian analyses of a proposed action, the preliminary trip generation analyses—including relevant assumptions and findings vis-a-vis significant impact potential—should typically be documented, including the rationale used in determining whether impacts would or would not be expected to occur.

300. Assessment Methods

This part of the transit and pedestrian chapter provides background information on each of the key components of the analyses to be conducted, the reasons why the analyses would be appropriate and guidance regarding the extent of the analyses needed, and specific methodologies available for use. Discussions of factors to be considered in determining significant impacts, the approach to identifying and evaluating appropriate mitigation measures, and approaches to developing alternatives that reduce or avoid impacts follow. For proposed actions requiring the preparation of an EIS or EAS, it is important that facilities to be analyzed, assessment methodologies, and technical assumptions all be outlined and documented as much as possible.

310. STUDY AREA DEFINITION

The first step in preparing for and conducting the transit and pedestrian impact analyses is the definition of the specific physical locations and facilities to be studied. Guidelines are presented below.

311. Rail Transit Study Area

For the analysis of subway and rail facilities, the study area relates more to specific lines and stations proximate to the site than to a physical area or to intersections. For the subway system, the closest station to the proposed project site would be studied for each line serving the site, provided that station is within ½ mile of the project site. That is, for example, for a 42nd Street site along Ninth Avenue in Manhattan that is served (within ½ mile) by the 42nd Street stations of the A/C/E lines, the 1/2/3 and N/R lines, and the D/F lines, each of these stations would be included in the rail transit study area. Should a proposed project site be served equally well by two different stations along the same line, both stations may need to be studied. The extent to which subway riders would travel to the site should be determined, by direction, to identify which of the two stations could potentially be significantly affected.

The rail transit study area encompasses the key elements within each station (e.g., its key stairwells, escalators, elevators, token booth/control areas, turnstile banks, platforms, and corridors and passageways), where applicable. Elevators should be analyzed if they provide primary access to the subway (for example, the 181 Street – St. Nicholas Avenue station (1/9 lines)). 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. For programmatic actions that affect several neighborhoods, it may be necessary to analyze the cumulative impacts of the action at key locations within the line-haul analyses or at major passenger transfer locations.

Commuter rail lines, such as the Long Island Rail Road or Metro-North, could also be the subjects of such analyses, depending on a proposed action's modal split and origin/destination characteristics. For example, should the LIRR station in Flushing be situated within ½ mile of a proposed project site, its key station elements and line-haul capacity might need to be addressed.

312. 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 generally coming within ½ mile of the project site may need to be addressed and the maximum load point along each potentially affected bus route would be studied.

313. Pedestrian Study Area

The pedestrian studies consider several elements, such as the sidewalks, crosswalks, corner reservoirs at intersections where pedestrians wait for a green traffic light enabling them to cross the street, and other potentially key pedestrian paths.

To determine the appropriate study area, the key question is: what are the routes pedestrians would use going to and from the proposed project from subway stations, bus stops, and parking facilities being studied? The analysis would first trace through these routes to note which are likely to be the most heavily used. Those routes and related sidewalks, crosswalks, and corner reservoirs become the focus of the pedestrian studies.

Since the area that could potentially be subject to evaluation may be large, the initial study area is typically defined as being, at a minimum, the sidewalks, crosswalks, and corner reservoirs approaching the four corners of a single-block project site, and the same pedestrian elements along the most critical route to the site from the major transit systems and parking facilities serving the site (but not all pedestrian routes to the site). For example, the pedestrian analysis for a proposed office building in Lower Manhattan would consider the four corners of the office site as well as the major elements en route to the site from the closest subway stations reasonably expected to be used, but not necessarily all subway stations and bus stops serving the project site.

Defining the pedestrian study area will call for considerable judgment in defining the paths and elements most potentially subject to significant impact. As a very general guideline, it is likely that the pedestrian analyses will encompass at least the four corners of the site, and generally those heavily traveled paths between the site and the principal subway station. For a school site, the study area would include all pedestrian facilities (sidewalks, corners, etc.) that are expected to have 200 or more new trips in the peak hour.

If the proposed action encompasses a multiblock site, it may be appropriate to study not only the four corners of the site, but also any internal corners and elements along which pedestrian activity is expected to be most intense and along which significant impacts could occur. These elements may include the internal routes from proposed parking facilities or subway station entrances to major building entrances, routes to project open space expected to attract significant pedestrian activity, or other pedestrian elements.

320. ANALYSIS OF EXISTING CONDITIONS

Once the study areas have been defined, the analysis of existing conditions becomes the building block on which all impact analyses are based. The objective of the existing conditions analysis is to determine existing volumes, pedestrian and passenger flow patterns, and levels of service (a measure of congestion) to provide a baseline from which future conditions can be predicted. 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 conditions analyses are discussed separately below for rail transit, bus transit, and pedestrians. In some cases, surveys and analyses may overlap in two or more of these technical areas or the traffic analyses, so coordination and understanding of the nature and extent of surveys to be conducted and technical assumptions to be made may be necessary between the various analyses. Potential sources of trip generation and modal split information needed for all technical transportation analyses are described in the previous section on traffic and parking.

321. 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, these will include lines and stations within a convenient walking distance. 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.

321.1. 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 actions, the peak analysis hours will be the same as the peak travel hours already occurring on affected subway lines—i.e., specific 1-hour periods within the AM and PM rush hours. For proposed actions different than the most typical residential or commercial actions, it is possible that analysis at other times of the day and/or on weekends could be called for. A proposed sports arena or concert hall may require an analysis for a weeknight event, a Friday night or Saturday night event, and a weekend afternoon event if it is expected to significantly use nearby transit facilities and/or produce high volumes of pedestrians at critical street locations.

321.2. Assembly and Collection of Passenger and Pedestrian Volumes Within Stations

Available data can be used if there have been no major changes in nearby land uses or transit services that would have significantly affected transit usage since the data were collected. However, most of the data needed to conduct the rail transit analyses will 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. Data that do not need to be newly collected include turnstile registration counts that provide the number of riders entering the subway system by turnstile location for each station, although this number can also be observed by surveyors from the turnstiles themselves at the various stations; and the line-haul volume of riders per line at various checkpoints along each route. These data can be obtained by contacting NYCT.

The NYCT *Station Planning and Design Guidelines* identify analysis methodologies and count data. New counts may include any or all of the following, depending on whether these elements are part of the transit study area:

- Up and down stairway, 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.

- The number of persons passing through the turnstiles at stations, where queues and delays are an existing or anticipated problem and where significant impacts may occur. Observations of two-way flow are made since this information is needed to conduct the subsequent capacity analysis of the turnstile.

- The nature of queuing and walk movements on station platforms when platform congestion is a current problem or is identified as a potential problem in the future.

- The number of persons waiting at token booths and MetroCard vending machines only if token 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 are conducted over the course of the full peak hour in 15-minute increments (or in 5-minute increments for locations experiencing very short duration/high peaking characteristics, e.g., major rail terminal stairways).

Many of the guidelines for appropriate survey days defined for new traffic data collection (see Chapter 3O) are applicable here as well. 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. 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 to this 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.

321.3. Analysis of Station Element Level of Service

The analysis of conditions at stations entails a determination of the capacities of the stairwells, corridors, turnstiles, and other elements to be analyzed, coupled with a comparison of these capacities with the volume of passengers/pedestrians using them, to produce the station element's level of service (LOS).

Methodologies regarding the analysis of station element capacities are detailed within NYCT's *Station Planning and Design Guidelines*. Note that these guidelines are subject to revision. Please consult with NYCT for the most current version of this publication (see Section 731).

The NYCT *Station Planning and Design Guidelines* provide the following maximum theoretical capacities for selected station elements:

- Regular turnstiles:
  30 persons per minute for entry
  40 persons per minute for exit
  32 persons per minute for combined entering and exiting flows
  (assuming 20 percent reduction for cross-traffic)

- High entrance turnstiles:
  20 persons per minute

- Exit gates:
  50 persons per minute for 3-foot wide gates
  75 persons per minute for 4-foot wide gates

- High revolving exit gate:
  30 persons per minute

- Stairs:
  17 persons per foot of width per minute

- Passageways/Ramps:
  25 persons per foot of width per minute.

- Escalators:
  For a speed of 90 feet per minute, 70 persons per minute for a double, or 4-foot wide, escalator, and 35 persons per minute for a 2-foot wide escalator.

- Elevators:
  Capacity based on the characteristics of the elevator being evaluated, such as its physical capacity, travel time, and number of elevators available.

These capacities represent maximum observed values, which do not reflect preferred pedestrian flow conditions. In computing the capacity of some station elements, some adjustments may be needed. For example, it is necessary to consider the *effective* width (and not the full width) of a station element, which is the clear space between two points—i.e., the actual width less the clearance space allowed for obstructions, such as handrails, pipes, signs, etc. The effective width of a walkway is based on the narrowest point minus 2 feet to account for pedestrian behavior, where people leave a buffer between themselves and a wall or obstruction. Effective widths of stairwells are assumed to be 1 foot less than the actual width to account for handrails and similar obstructions.

An additional adjustment needs to be made to reflect the reduced capacity available on a facility when pedestrians are moving in opposite directions. Counterflow traffic results in pedestrian "friction" that reduces the effective width of a facility for passenger flows. When pedestrian flow is fully one-way, there is no need for an adjustment. When one-half to two-thirds of the pedestrian flow is in one direction, capacity is reduced by 10 percent. When more than two-thirds of the pedestrian flow is in one direction, a 20 percent reduction to capacity is incorporated.

Stairways, Corridors, and Passageways. In evaluating these facilities, the methodology of determining level of service consists of identifying the peak 15-minute volume and dividing it by the service capacity considered desirable by NYCT (based on 10 pedestrians per foot of width per minute, PFM, for stairs or 15 PFM for corridors and passageways that are then adjusted for effective width and counterflow traffic, as described below). The peak 15-minute volume may be obtained from actual counts, or by taking 1.25 times the peak hourly volume. The resulting volume-to-capacity, o or v/c, ratio is then compared with a scale that identifies level of service within a range of v/c ratios.

Levels of service for stairways, corridors, and passageways used in the methodology presented below, are based on guidelines developed by John J. Fruin in *Pedestrian Planning and Design* (1971) that reflect the pedestrian movements and the amount of area available for those movements. Overall, there are six levels of service, which reflect the amount of area occupied by pedestrians. The difference between each level is based on the freedom to choose walking speed, the ability to bypass slower moving pedestrians, and ease of contraflow movements at pedestrian traffic concentrations.

- At LOS A and B, there is sufficient area to allow pedestrians to freely select walking speed and bypass slower-moving pedestrians. When cross flow and reverse flow movement exists, minor conflicts may occur. There are no severe peak concentrations. V/C ratios for LOS A range from 0.00 to 0.45, while for LOS B they range from 0.45 to 0.70.

- At LOS C, pedestrian movement is fluid although somewhat restricted. It provides sufficient room for standing without personal contact. Circulation through queuing areas, however, will require adjustment to walking speed. V/C ratios range from 0.70 to 1.00.

- At LOS D, walking speed is restricted and reduced. Reverse flow and cross flow movement is severely restricted due to congestion and difficulty in bypassing slower-moving pedestrians. These conditions are common in many Manhattan locations during peak periods and represent somewhat congested conditions, with v/c ratios ranging from 1.00 to 1.33.

- LOS E and F represent severe congestion, with LOS E v/c ratios ranging from 1.33 to 1.67. Walking speed is restricted and there is insufficient area to bypass others and contraflow movement is difficult. LOS F is "bumper-to-bumper" pedestrian flow, with forward progress achievable only through shuffling, with queues forming.

It is very important to emphasize here that although both traffic analyses and transit and pedestrian analyses use the term "level of service" to portray flow or circulation conditions, the definition and meaning of level of service for one is not equivalent to the same level of service for the other. That is, LOS D for traffic flow, for example, does not have the same meaning nor connotation vis-a-vis acceptability as does LOS D for pedestrian flow or spatial needs.

The Transit Authority's minimum standard for pedestrian conditions has traditionally been established as the breakpoint between LOS C and LOS D, at a v/c ratio of 1.00, also referred to as LOS C/D. Thus, LOS C/D is used to determine the design capacity of critical elements during peak travel hours.

Stairway Level of Service:

LOS A (Unrestricted)	7 PFM or less
LOS B (Slightly restricted)	7-10 PFM
LOS C (Restricted, but fluid)	10-15 PFM
LOS D (Restricted, necessary to continually alter walking)	15-20 PFM
LOS E (Severely restricted)	20-25 PFM
LOS F (Forward progress only by shuffling, no reverse movement possible)	25 PFM or more

Corridor/Ramp Level of Service:

LOS A (Unrestricted)	5 PFM or less
LOS B (Slightly restricted, no impact on speed)	5-7 PFM
LOS C (Speeds reduced, difficult to pass)	7-10 PFM
LOS D (Restricted, reverse flow conflicts)	10-13 PFM
LOS E (Severely restricted)	13-17 PFM
LOS F (Many stoppages, no discernible flow)	17 PFM or more

Examples are provided for illustrative purposes. For a stairway that is 6 feet wide and experiences one-third of its total flow in the opposite direction (i.e., a friction factor of 0.90), the hourly processing capacity of the stairway would be determined by multiplying the LOS C/D stair processing rate of 10 PFM times 60 minutes per hour, or 600 pedestrians per foot per hour. This would then be reduced by multiplying this number (600) by the stairway's effective width of 5 feet (6 feet less 1 foot to account for handrails) and 0.90 for contraflow friction. This would yield an hourly stair processing capacity of 2,700 pedestrians per hour.

Fifteen-minute processing rates would simply be obtained by taking one-quarter of this hourly rate, or 675 pedestrians per 15 minutes. If the recorded volume of pedestrians at this stairway is 540 persons per 15 minutes, the resultant flow rate of 8 PFM, and a v/c of 0.80 which would indicate that the stairway is currently operating within acceptable LOS C. If the recorded volume was 940 pedestrians, its flow rate of 14 PFM, and its v/c of 1.40 would indicate unacceptable LOS E.

For the analysis of a 10-foot station corridor, the same procedure would be used, with the single substitution being the LOS C/D processing rate of 15 PFM. Therefore, the following formulas can be used.

For stairways:

$$v / c = \frac{V}{150 We FF}$$

where V = 15-minute pedestrian volume
We = effective width of stairs
FF = friction factor

For corridors:

$$v / c = \frac{V}{225 We FF}$$

where V = 15-minute pedestrian volume
We = effective width of the corridor
FF = friction factor

Platforms. The time-space methodology can be used to determine level of service for platform conditions. This methodology recognizes that people require varying amounts of space and time for walking or standing. The amount of space available affects people's comfort level and, more important, their ability to circulate and move about the platform. These pedestrian activities are also classified through a range of levels of service, LOS A through LOS F, as shown in the *NYCT Station Planning and Design Guidelines*.

The time-space methodology considers pedestrian facilities as dynamic zones for moving through and waiting in. Pedestrians can either walk through a certain zone on the platform or wait within it; both types of activities require time and space. The boundary between levels of service C and D (i.e., LOS C/D) is considered acceptable; it is associated with a volume-to-capacity ratio of 1.00.

The definition 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 platforms have sections that are very active and others that are seldom used or used with no apparent congestion problem. This is critical to the overall analyses since the creation of zones that are too large could understate potential problems. On the other hand, the definition of zones that are too small—e.g., generally less than one subway car length—could depict conditions that are worse than actually exist. Considerable judgment is needed.

In determining platform LOS, available time-space is compared to required time-space. The *available* time-space in each zone is determined by multiplying the area in each zone (in square feet) by the 15-minute analysis period. This total area is then reduced to account for space unused by pedestrians, such as the back edge of the platform wall and the area surrounding refuse containers, etc. The resulting area is the platform's effective area. The *required* time-space is a function of the volume of pedestrians walking through the zone within the 15-minute analysis period, plus the number of persons waiting in that zone during this period.

Initially, acceptable level-of-service C/D standards are used to calculate walk and queue space requirements of platforms. These are 7 square feet per person for standing pedestrians and 16 square feet per person for walking. In the event that available time-space does not meet the required amount, lower level-of-service standards (e.g., mid-LOS D, D/E, etc.) are used to recompute walk and space requirements. In this iterative fashion, the use of time-space procedures are used to determine the level of service for each zone under existing conditions.

For certain platform and stairwell conditions, it may also be appropriate to analyze the queuing of passengers at the foot or the top of problem stairwells. The analysis begins with observations when trains have unloaded their passengers and queuing begins to occur. The volume of passengers in the queue, and the length of time it takes for the queue to dissipate, are field-recorded.

Turnstiles, Escalators, Elevators and High-Wheel Exits. Levels of service for turnstiles, escalators, elevators and high-wheel exits are also described in terms of volume-to-capacity ratios, with LOS A being less than 0.2, LOS B from 0.2 to 0.4, LOS C from 0.4 to 0.6, LOS D from 0.6 to 0.8, LOS E from 0.8 to 1.0 and LOS F over 1.0. As an example, for a regular turnstile with a one-way flow and a maximum theoretical capacity of 40 persons per minute, the volume of passengers processed through the turnstile is compared with this capacity to determine the v/c ratio and level of service; any volume-to-capacity ratio greater than 1.00 signifies volumes beyond capacity and extended queues.

321.4. 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.

Line-haul capacity analyses are based on per-car practical capacity guidelines used by NYCT. The practical capacities of subway cars are as follows:

Car Length	Number of Seats	Practical Capacity per Car	Number of Cars per Train
51 feet	44	120	10*
60 feet	50	180	10
75 feet	75	220	8

* Generally 10 cars per train. The IRT No. 7 operates with 11-car trains, and the No. 3 line operates with 9-car trains.

The line-haul capacity of a given subway line is determined by multiplying the number of scheduled trains per hour by the number of cars per train and times the practical capacity per car. The volume of riders passing a given point can then be compared with the line haul capacity of the subway line. 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 passenger load per car. The resulting per-car passenger load can then be compared with practical capacity standards to determine the acceptability of conditions.

322. 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 action 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 will 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 busload levels vs. their physical capacities. The bus transit analyses may also include an analysis of queuing and loading conditions at bus stops at the project site if they are currently characterized by lengthy lines of passengers waiting to board, which could be significantly affected in the future.

322.1. Assembly and Collection of Bus Ridership Data

Data may be obtained from NYCT regarding the number of persons per bus at the peak load point on each route. In addition, field counts can 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 would be conducted on a typical day, as described earlier for the other traffic and transit analyses. These counts can be taken either by: a) getting on the bus and conducting a quick count of the number of riders; b) asking a dispatcher, if one is present at the bus stop (providing approval has been obtained from NYCT); or c) 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"). If the windshield estimate method is used, care needs to be exercised that bus windows are not tinted, which would preclude the surveyor from getting an accurate reading from off the bus. 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.

322.2. *Analysis of Bus Load Levels*

NYCT generally operates two types of buses: standard (RTS-04 & 06 and Orion 5) and articulated. During rush hours, standard buses operate up to a maximum of 70 passengers per bus at the maximum load point, and articulated buses operate up to 145 persons per bus at the maximum load point.

Typically, the number of persons per bus at the maximum load point and at the bus stop closest to the project site are quantified and then compared with NYCT standards so as to identify the extent to which bus capacity is utilized, overutilized, or underutilized under existing conditions. On/off activity are also quantified and presented for general informational purposes.

323. Existing Pedestrian Conditions

The analysis of existing pedestrian conditions determines whether key pedestrian routes and corner reservoir areas expected to be traversed by pedestrians under the proposed action are currently operating at acceptable levels of service, and provides an overview of general pedestrian conditions within the study area.

323.1. Assembly and Collection of Pedestrian Counts

In general, the only source of available pedestrian count data and level of service analyses is previously completed, recent environmental assessments, since independent pedestrian studies are generally not prevalent. There are some exceptions to this in areas of the City with heavy pedestrian activity, and the Department of City Planning (DCP) and NYC Department of Transportation (DOT) should be contacted regarding the availability of any pedestrian study reports.

As is the case for the other technical areas addressed previously, new pedestrian counts would also be conducted on a typical day and during representative peak hours, which generally also include the noontime hours. These counts can be taken on a single, typical day. Counts are taken over the course of the full peak hour and are recorded in 15-minute increments, since the level of service analyses to be conducted utilize a 15-minute analysis framework for their evaluations.

The pedestrian counts to be conducted depend on the pedestrian elements identified as constituting the pedestrian study area. They may include, along sidewalks, counts at intersection crosswalks, corner reservoirs at intersections where pedestrians queue up while waiting to cross the street, midblock sidewalk locations, and other important routes if such are applicable. Two-directional counts are needed to conduct the subsequent level of service analyses.

323.2. Analysis of Pedestrian Levels of Service

The *Highway Capacity Manual* is the basic analytical tool used to analyze pedestrian conditions and should be referred to for detailed information on analytical procedures. For midblock sidewalk locations or other midblock walkways, the most important parameters in the analyses are the volume of pedestrians passing a given point during the peak 15 minutes, total sidewalk width, and obstacles in the sidewalk. Pedestrian level of service standards—measured as the pedestrian flow rate per foot of width per minute (PFM)—are indicators of the quality of pedestrian movement and comfort, and are defined in a density-comfort relationship reported as follows:

LOS A	(Unrestricted)	5 PFM or less
LOS B	(Slightly restricted)	5 to 7 PFM
LOS C	(Restricted, but fluid)	7 to 10 PFM
LOS D	(Restricted, necessary to continuously alter walking stride and direction)	10 to 15 PFM
LOS E	(Severely restricted)	15 to 23 PFM
LOS F	(Forward progress only by shuffling; no reverse movement possible)	greater than 23 PFM

The midblock analyses determine both the average flow rate's level of service, as well as the "platoon" level of service, which usually occurs when transit vehicles release a large group of pedestrians in a short period of time, when applicable.

Street corners and crosswalks are also analyzed via the *HCM* procedures, with pedestrian flow rate, effective street corner/crosswalk areas, and pedestrian signal timings comprising the most important analysis parameters. Level of service standards is measured in terms of square feet of space per pedestrian, as defined below, with the same definitions for LOS A through F as indicated for sidewalks and other walkways.

LOS A	60 or more square feet per pedestrian
LOS B	40- 60 square feet
LOS C	24-40 square feet
LOS D	15-24 square feet
LOS E	8-15 square feet
LOS F	less than 8 square feet

Crosswalk analyses are conducted for average pedestrian flow conditions over the 15-minute analysis period as well as for "maximum surge" conditions, i.e., the point at which the maximum number of pedestrians are in the crosswalk. This maximum surge condition usually occurs shortly after pedestrian signals change to green, when the lead pedestrians in opposing crossing platoons reach the opposite corner.

In addition to the operational analyses discussed above, the evaluation of school sites requires the analysis of existing pedestrian safety at nearby intersections expected to be used as main access routes. This analysis should be coordinated with NYCDOT.

330. 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 action's build year. Background growth rates typically used in conducting the technical analyses are presented in Section 331, as are the methodologies used to account for trips from expected development projects. In general, the procedures and approach used are similar to those reviewed previously for traffic analyses.

331. Background Growth Rates

For rail and bus transit analysis purposes, NYCT can be consulted for modeled projections that may be available on a per line, or possibly per station, basis. In the absence of such information for a given transit study area, the following annual compounded growth percentages suggested for use in the traffic and parking analyses may be used or an independent estimate of a reasonable growth rate may be developed.

- Manhattan 0.50%
- Bronx 0.50%
- Downtown Brooklyn 0.50%
- Other Brooklyn 1.00%
- Long Island City 0.50%
- Other Queens 1.00%
- St. George (Staten Island) 1.00%
- Other Staten Island 1.50%

Future no action pedestrian analyses use either the traffic or the transit growth rates, depending on the nature of travel within the study area. For example, Midtown Manhattan pedestrian growth would be more closely linked to transit tripmaking and use its growth rate, while in an area like eastern Queens the traffic growth rate would be more appropriate.

332. No Build Development Project Tripmaking

In addition to the 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 build project is considered part of the general background or superimposed on top of the general background growth will call for considerable judgment, with the following guideline suggested:

- A no action project that generates less than about 100 peak hour transit trips should be considered as 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 as part of the background. For pedestrian analyses, this determination should follow the lead of the traffic and transit analyses.

There are several ways to determine the amount of tripmaking associated with a no action project. The best way is to use the trip projections cited in that project's EIS or transit analysis, if such exists. An alternative is to use the same methodologies described in the next section of the Manual on trip generation and trip assignment for build analyses.

333. *Preparation of Future No Action Volumes and Levels of Service*

Pedestrian flow maps and transit and pedestrian level of service analyses are 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 in the future no action scenario.

This assessment should also account for any programmed transit or pedestrian network changes that could affect passenger/pedestrian flows or levels of service. For example, for subways, 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 analyses. 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 will be made such that future no action conditions would not exceed capacity on any given route.

340. *ANALYSIS OF FUTURE ACTION CONDITION*

The objective of these analyses is to determine projected future conditions with the proposed action in place and fully operational. These future action conditions are then compared with the future no action scenario to determine whether or not the proposed action would likely significantly affect the study area's transit and pedestrian facilities and require mitigation.

The assessment of projected future action conditions consists of a series of analytical steps, namely:

- *Trip generation*. The determination of the volume of trips generated by a project on a daily basis and during peak travel hours. The hourly distribution of a project's generated trips is referred to as its "temporal distribution."

- *Modal split*. The determination of the percentage of generated trips that would occur by auto, taxi, subway, bus, walking, bicycle or other modes.

- *Trip assignment*. The routing, or "assignment," of trips by each travel mode to specific streets and highways, parking facilities, subway lines and stations, bus routes, and sidewalks en route from their origin to their destination.

- *Capacity and level of service analysis*. 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 build condition.

Once these steps have been completed, a determination of significant impacts—based on a comparison of future action conditions with no action conditions and with thresholds of acceptability—can be made.

The technical guidelines used to make each of these analyses and determinations are described in Chapter 3O on traffic and parking. Key definitions and elements of that description pertaining to transit and pedestrian analyses are repeated in this section, although it is advisable to refer to Chapter 3O for a full review. Generally, the analyses of transit and pedestrians are performed in coordination with those of traffic.

341. *Trip Generation*

The trip generation analysis provides the estimated volume of *person* trips expected to be generated by the proposed action over the course of the entire day as well as during peak analysis hours. There has been considerable trip generation analysis work done in the City to date as part of EISs and other studies, so rates for certain land use types in specific parts of the City have been developed for use on previous projects. Table 3O-2 in Chapter 3O presents a partial list of previously researched rates that may be used, as appropriate. Potential modifications to these rates are discussed in the chapter on traffic and parking.

For land uses with no documented trip generation rates, two courses of action are available. One would be to review similar land uses in the ITE *Trip Generation Manual* and modify those rates for the local New York City setting and modal split of the proposed action. The second would be to conduct trip generation surveys of the same land use in a comparable setting of the City. Additional guidelines are provided in Chapter 3O.

342. Modal Split

Modal split analyses provide information on those travel modes likely to be used by persons going to and from the proposed action, including autos, taxis and car services, subways, buses, ferries, commuter rail, walking, bicycling and other modes. 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 be via each mode. The modal split percentages are then applied to the hourly trip generation estimates to determine the volume of persons traveling to and from the site for each of the analysis hours by mode. It is then advantageous to summarize in a table the volume of trips by mode for each of the analysis hours, both as a tool to document the volume of trips generated and to facilitate the subsequent trip assignment task. It should be noted that the bus trip generation should also consider subway-to-bus transfers for sites substantially distant from the nearest subway station.

It is important to remember that "walking" as the travel mode refers to people who walked all the way from their starting point to the project site. People arriving at the project site by subway, bus, auto, and other modes must also walk to the specific building after getting off the subway or bus or after parking their car. Thus, the volume of pedestrian trips to be included in the pedestrian analyses must include all of these walkers as well.

Similar to the discussion on trip generation above, there is a substantial body of modal split data available within previous EISs and other databases, including the U.S. Census. For many combinations of land use types and geographical locations within the City, there are previously researched modal splits available for use (a partial list is presented in Table 3O-3 in Chapter 3O). For other combinations, there may be other sources of information that can be investigated, or the conduct of original surveys will be needed.

343. Trip Assignment for Rail and Bus Transit

This element of the build analysis entails the routing of transit trips to the various lines and stations being analyzed. The first step is to determine the extent to which trips to the project site will be made from various parts of the metropolitan region. The best source of this information, if available, is origin-and-destination (O&D or O/D) data, or data about the beginning and end points of a trip. For certain parts of the City that have been studied or surveyed before, such data may be readily available. An example of this is Midtown Manhattan and Lower Manhattan office space, for which there exists a body of information on the percentages of Manhattan employees who typically come from each of the boroughs, New Jersey, Long Island, etc. This information has been derived either from the most recent U.S. Census or from 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 home-to-work trips, and which can be used.

As noted in the detailed guidelines for traffic assignments within Chapter 3O, it is also possible to survey O&D patterns of a comparable type of site, similar to the types of surveys outlined regarding trip generation and modal split. Yet, it is also important to note that the O&Ds—or regional distribution—of transit trips can 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 since Manhattan residents are unlikely to drive to work in the same borough.

Once the regional distribution of transit trips is determined, the assignment of rail trips to specific subway lines (or subway and commuter rail lines) is conducted. This can generally be accomplished by reviewing the subway lines that are available in each borough to serve these travelers and then assigning the rail trips to the most logical routes. In cases where more than one subway line is available in a given area, appropriate percentages can be assigned to each of the lines.

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 covers the various platforms, stairwells, passageways or corridors, turnstile banks, and token booth/control areas extending between the subway car and the street level. The presence of congestion on a given stairwell or through a given bank of turnstiles is less likely to affect a subway rider's movement through the station than a traffic "choke" point is likely to affect a motorist's decision on driving routes to their destination. Therefore, in general, 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* sections of the platform while awaiting the arrival of incoming trains, nor to *all* cars, but only to those platform zones and subway cars that can 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 to the platforms, and possibly even the destination of riders at the end of their trip.

A similar approach is used for bus trips. The analysis considers the particular routes stopping near the project site and assign bus riders to these routes in accordance with their general destinations. This analysis need not be as detailed as the traffic or rail transit analysis, and is generally less time-consuming. It is usually possible to review the general service areas of the various bus routes serving a project site (which are themselves often a very limited number) 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.

344. Trip Assignment for Pedestrians

The trip assignment for pedestrians basically picks up where the traffic and transit assignments leave off. For the AM and PM peak hour arrivals and departures of persons to the project site by auto, taxi, and transit, 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 will be 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 same guidelines that preceded this section also apply to pedestrians—the most logical walking paths are used.

For midday trips, it is more likely that pedestrian trips will 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 will be far less pronounced. Therefore, a broader-brushed assignment of these off-peak pedestrian patterns can be made as part of the midday analysis.

345. Preparation of Future Action Volumes and Levels of Service

The build analysis continues with the preparation of pedestrian flow maps within subway stations and at the street level. Capacity and level of service analyses are completed, using the same guidelines described previously. Should the proposed action include design changes to subway stations or the alteration of pedestrian paths, their effect on flow patterns and capacities would be incorporated within the build analyses.

Findings of the future action analyses are presented in a clear tabular format that facilitates the subsequent comparison of no action and action conditions as part of the determination of significant impacts.

346. Assessment of Construction Phase Impacts

In addition to the assessment of impacts when the project is fully operational in its build year, the transportation analyses may also address projected impacts during a proposed action's construction phase. Because construction phase impacts are temporary in nature, they are typically analyzed in a primarily qualitative fashion. Therefore, the determination of construction phase impacts entails an abbreviated version of the impact assessment framework described above. It focuses on depicting the key locations that are likely to be impacted and the general magnitude and duration of the impacts expected, rather than on all potential impact locations analyzed within the regular Build analyses.

For pedestrian analyses, the extent to which any sidewalks will be closed or narrowed to allow for construction-related activity would be identified, along with a definition of how pedestrian access to adjacent land uses and through the area would be maintained. Such plans would also need to be approved by NYCDOT Office of Construction Mitigation and Coordination (OCMC), located at 40 Worth Street in Manhattan. Should any bus stops or bus routes need to be relocated or subway station access be affected, such impacts are to be identified and also reviewed with NYCT and NYCDOT.

400. Determining Impact Significance

The comparison of expected conditions in the future with and without the proposed action in place determines whether any significant impacts, or changes in prevailing future conditions, are to be expected. In general, the determination of significant transit and pedestrian impacts must respond to several important questions:

- 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 NYCT's adding more service?
- Could the volume of pedestrian trips generated by the proposed action be accommodated on study area sidewalks and safely within its crosswalks and corners at key intersections?

The sections that follow summarize current suggested guidelines for making this determination. Detailed guidelines from NYCT's *Station Planning and Design Guidelines* should be referred to for all subway station analyses.

410. SIGNIFICANT RAIL TRANSIT IMPACTS

The determination of significant impacts differs for stairways, passageways/corridors, turnstiles, and platform conditions. NYCT is the agency in New York responsible for implementing or overseeing the implementation of transit mitigation measures, should they be needed. The guidelines presented below summarize those followed by NYCT at the current time. There may be cases where alternative assessments may be warranted to cover either unique conditions or alternative build analysis methodologies.

411. Stairways

NYCT has defined significant stairway impacts in terms of the width increment threshold (WIT) needed to restore future no action conditions based on the location of the stair in the station. Stairways that are substantially degraded in level of service or which result in the formation of extensive queues are classified as significantly impacted. Significant stairway impacts are typically considered to occur once the following thresholds are reached: for a build LOS D condition, a WIT of 6 inches or more is considered significant; for a build LOS E condition, 3 inches is considered significant; and, for build LOS F, a WIT of 1 inch is considered significant. If the build analyses show that a WIT of less than 1 inch is needed, this impact is not considered significant.

To determine the WIT, the following formula should be used:

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

where WIT= width increment threshold
We = effective width in the no action
Vp = 15-minute project-induced pedestrian volume
Vna = no action pedestrian volume

412. Station Passageways and Corridors

The formation of queues is less prevalent at corridors and therefore level of service criteria governing the determination of impacts are different from those defined above for stairways since the width of corridors is considered less critical than the width of stairways that extend up to the train platform level (where safety considerations occur if backups become significant). For corridors and passageways at build LOS D, a WIT of 12 inches or more is considered significant; at LOS E, 6 inches is considered significant; and at LOS F, a WIT of 3 inches is considered significant. A WIT of less than 3 inches is not considered significant.

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

Since a volume-to-capacity ratio of 1.00 —at the threshold of levels of service C and D— is considered the theoretical capacity of a turnstile, escalator, elevator or high-wheel exit by NYCT, any measurable increase in v/c ratio above that would begin to cause queuing and potentially constitute a significant impact.

Proposed actions 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.

414. Platforms

NYCT guidelines define the objective of maintaining LOS C/D occupancy conditions along platforms. For platforms (and for station mezzanine or concourse levels, as well), 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.

At this time, there are no definitive NYCT guidelines regarding acceptable/unacceptable conditions along platforms, mezzanines, etc. Level of service C/D conditions or better are sought and deterioration of future no action conditions from better than C/D to worse than C/D, or deterioration from no action conditions already expected to be worse than C/D may be considered potential significant impacts.

Significant impacts are disclosed to public sector decision-makers assessing the overall merits and concerns regarding the proposed action, along with a full description of what deterioration between or within given levels of service mean to passengers and train operations.

415. Line-Haul Capacity

In the area of line-haul capacity, there are also constraints on what service improvements are potentially available to NYCT. The comparison of future build load levels per car with future no action levels would indicate the extent that ridership per car would increase.

First, any increases in per car load levels that remain within practical capacity limits are generally not considered significant impacts. However, projected increases from a no action condition within practical capacity to a build condition that exceeds practical capacity may be considered a significant impact, if the proposed action is generating five more transit riders per car. This is based on a general assumption that at practical capacity, the addition of even five more riders is perceptible.

420. SIGNIFICANT BUS TRANSIT IMPACTS

The build evaluations provide an analysis of projected load levels per bus at the route's maximum load point, and determine whether this future load level would be within a typical bus's total capacity or above total capacity. As previously noted, buses are scheduled to operate at a maximum load of 70 (standard) or 145 (articulated) passengers per bus—their maximum seated-plus-standee load—at the bus's maximum load point. According to current NYCT guidelines, increases in bus load levels to above their maximum capacity at any load point is defined as a significant impact since it necessitates the NYCT's adding more bus service along that route.

430. SIGNIFICANT PEDESTRIAN IMPACTS

The guidelines described below may be helpful in determining significant pedestrian impacts. The determination of a significant pedestrian impact is generally based on both comfort/convenience characteristics of pedestrian flow and safety considerations. As defined previously, pedestrian level of service D refers to restricted flow conditions for sidewalks and crosswalks and to "no touch" zones for corner reservoir areas, LOS E refers to severely restricted conditions for sidewalks and crosswalks and to "touch zones" for corner reservoir areas, and LOS F refers to conditions where movement is extremely difficult if not impossible. LOS D through F all, therefore, have implications regarding comfort and convenience; only LOS F would appear to have potential safety implications under normal conditions.

When evaluating pedestrian impacts, the location of the area being assessed is an important consideration. For example, sections of Midtown and Lower Manhattan have historically had 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. The guidelines that follow offer some sensitivity to local areas' current pedestrian usage levels.

431. Corners and Crosswalks

For corners and crosswalks within the Manhattan central business district (CBD) and downtown Brooklyn, significant impacts may be considered for decreases in pedestrian area occupancies of 1 square foot per person under the build projection when the no action condition has average occupancies under 15 square feet per pedestrian (the threshold of LOS D and E). For crosswalks, maximum surge conditions should be used for assessing significant impacts. Increments of 1 square foot or more applied to no action conditions within LOS D may be perceptible, but not necessarily be considered significant impacts.

Elsewhere in the City, significant impacts may be considered for decreases of one square foot per person when the no action condition has average occupancies under 20 square feet per pedestrian (mid-LOS D). Increments of one square foot or more applied to no action conditions within LOS D or any deterioration from LOS C or better to LOS D may be perceptible, but not necessarily significant impacts.

While the large majority of proposed actions will not require a detailed analysis of pedestrian safety impacts, for some actions they may need to be addressed. Such actions may include the presence of sensitive land uses in the vicinity of the proposed project, such as hospitals, schools, parks, nursing homes, or elderly housing that could be affected by traffic volumes generated by the proposed project.

Increased pedestrian crossings at already-documented high-accident locations would result in increasingly unsafe conditions. In addition, generating measurable pedestrian crossings at non-controlled locations, midblock or intersection, especially for sites generating young pedestrians, such as schools, parks or other similar locations, also leads to unsafe conditions. See Section 346 of Chapter 3O.

432. Sidewalks and Midblock Locations

For sidewalks and other midblock locations within the Manhattan CBD and downtown Brooklyn, a significant impact may occur with an increase in the pedestrian flow rate of 2 pedestrians per foot per minute (PFM) over no action conditions characterized by flow rates over 15 PFM (the threshold of LOS D and E). Platoon conditions are used for assessing significant impacts. Increases of one to two PFM under this no action scenario may be perceptible, but not necessarily considered significant impacts. Also, increases of at least 1 PFM within mid-LOS D (a no action condition with 13 to 15 PFM) may also be considered perceptible, but not necessarily be considered significant impacts, since it would be "pushing" future build conditions closer to LOS D's threshold with LOS E.

Elsewhere in the City, a significant impact may be defined as an increase in the pedestrian flow rate of 2 PFM for no action conditions with flow rates of 13 PFM or more (mid-LOS D). Increments of one PFM may be perceptible, but not necessarily significant impacts.

It is also suggested that pedestrian analyses consider that projected pedestrian volume increases of less than 200 pedestrians per hour would not typically be considered a significant impact, since that level of increase would not generally be noticeable.

500. Developing Mitigation

The identification of significant impacts leads to the need to identify and evaluate feasible and practicable mitigation measures, i.e., measures that mitigate the impact or return projected future conditions to what they would be if the proposed action were not in place. In general, the analysis begins by identifying those measures that would be effective in mitigating the impact and then proceeds to measures that may be less easily implemented only if the first set of measures is deemed insufficient. In doing so, care should be exercised that the implementation of a given measure not mitigate impacts in one area—either geographic or technical—only to create new significant impacts or aggravate significant impacts already projected elsewhere.

For example, for a significantly impacted stairwell from a subway station, stairwell widening could be appropriate mitigation, but such widening should not narrow the adjacent street-level sidewalk to where it does not have sufficient capacity to process pedestrians passing along it. Creation of a bus "lay-by"—where the sidewalk is cut into to provide an exclusive berth for buses stopping to pick up and drop off passengers outside of the main traffic stream—should also not reduce sidewalk width or corner reservoir area by an amount that creates significant impacts there.

Each of the separate transportation services and facilities need to be considered as part of a system, wherein changes in one could affect activity patterns and/or levels of service in another. This is a very important point that needs to be viewed comprehensively. 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 benefit would also have secondary impacts that need to be evaluated as to whether they are significant and themselves require mitigation.

Would pedestrian flows to and from the ferry landing have impacts? If buses are rerouted to connect with the ferry, would intersection capacity be affected? Would there be sufficient parking for ferry users? This does not mean that broader, more effective, or desirable mitigation measures should not be considered, but rather that a comprehensive look and evaluation is needed.

The appropriate agency should be contacted to review possible mitigation measures (NYCT-Operations Planning for transit mitigation and NYCDOT for pedestrian mitigation).

510. 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 action. These measures are primarily related to the station elements that are analyzed and could be affected by a proposed action. Significant line-haul impacts, on the other hand, can be extremely difficult to mitigate. For some mitigation measures for significant adverse impacts on rail transit, NYCT may choose improvements that result in conditions beyond the measures necessary to mitigate a given action's significant impacts. For example, an action may need to widen a stairway at the entrance/exit of a subway station by 2 inches to mitigate significant adverse impacts. As discussed below, however, MTA generally will not disrupt service on the stairway to complete a 2-inch widening; instead, it may choose to have the stair widened by 2 feet to achieve an acceptable level of service.

511. Stairways

Stairway widenings are the most common form of mitigation for projected significant impacts, providing 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 an escalator, opening a closed stairway elsewhere to/from the station or, providing new stairways. As stated earlier, NYCT approval will be needed. (As described in Chapter 1, this approval can be granted conceptually for inclusion in the FEIS or Findings.) Stairway widening or new stairways must conform to the NYCT *Station Planning and Design Guidelines*.

512. Station Passageways and Corridors

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.

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 levels of service there. Mitigation analyses for all these elements need to be conducted simultaneously.

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

The most logical and readily available measure to mitigate projected turnstile or high-wheel exit shortages is to add more turnstiles or high-wheel exits, providing there is sufficient space within the station, to accommodate them. A measure to mitigate projected escalator or elevator shortages is to add 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.

514. Token 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.

515. Platforms

Mitigation of platform impacts is a difficult exercise since the lengths and widths of existing platforms are generally fixed. There are relatively minor measures that can 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 location.

516. 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.

520. BUS TRANSIT MITIGATION

Significant bus impacts generally can 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. (As described in Chapter 1, this approval can be granted conceptually for inclusion in the FEIS or Findings.)

530. PEDESTRIAN MITIGATION

Available measures to mitigate significant pedestrian impacts may include:

- New traffic signal or other intersection control measures.
- Removing or relocating street furniture, newsstands, or other obstacles that reduce pedestrian capacity at either midblock sidewalk locations or at corner reservoirs.
- Widening the sidewalk or other pedestrian path that has been determined to be significantly impacted.
- Widening intersection crosswalks to provide additional pedestrian crossing capacity. Such widening should not significantly reduce the amount of street space available for vehicles queuing at the next traffic light.
- Providing additional green signal time or new signal phases for pedestrians crossing at signalized intersections. Signal timing changes should still leave vehicular traffic with sufficient green time without causing a significant traffic impact.
- Providing direct connections from adjacent transit stations to major proposed projects that reduce the need for transit patrons to traverse overtaxed pedestrian street elements.
- Creating a pedestrian mall by closing streets to vehicular traffic.
- Constructing a pedestrian bridge to separate pedestrian and vehicular flows.

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

600. Developing Alternatives

The alternatives analysis of the EIS is intended to depict and analyze alternatives to the proposed action that are likely to eliminate or reduce expected significant impacts. Since transit or pedestrian impacts may be among those determined to be significant, there are attributes of a proposed action that, if changed, can result in a reduction of expected impacts. This section provides an overview of developing and evaluating such alternatives, although a more comprehensive review is included in Chapter 3O on traffic and parking.

610. DEVELOPMENT OF ALTERNATIVES

Alternatives to the proposed action can include the following:

- Reducing the size of the proposed action to reduce its overall trip generation. This will generally lead to a proportional reduction in the amount of trips generated, but not necessarily in the magnitude of its impacts.
- Replacement of a high trip-generating land use component of the proposed action with a lesser trip generator. Also note that different types of land uses may tend to have different modal splits, and a land use that has a lower overall trip-generation rate may not necessarily generate fewer trips by all modes.
- Redesign of the site plan to improve access and circulation patterns and effectively move vehicular or pedestrian traffic to locations or routes that would not be significantly affected. For example, relocation of a project's main entrance can alter pedestrian patterns or

increase utilization of a particular subway station or station entrance over another one.

There may be other alternatives that are tailored to a specific proposed action at a specific site that could be developed. In general, to be effective, they would either reduce the overall level of tripmaking, shift tripmaking to non-critical hours or to non-critical modes, or alter the physical design of a project to relocate trips away from identified significant impact locations.

620. EVALUATION OF ALTERNATIVES

In evaluating the impacts of the alternatives versus those of the proposed action, it is generally not necessary to conduct a full analysis of transit and pedestrian conditions. Other approaches exist.

For alternatives that reduce the size but not the land use mix of the proposed action, it may be possible to scale down the proposed action's trip-generation projection and then pro-rate the findings of the transit and pedestrian analyses accordingly. It is generally possible to reanalyze just the locations where significant impacts were projected and report these findings along with the overall trip reduction that would occur.

For alternatives that alter the mix of land uses or replace a more intensive trip generator with a less intensive generator, it would generally be necessary first to quantify the changes in the 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 action. Afterwards, the technical analysis 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 and where these changes would affect transportation conditions. If this review indicates that transit or pedestrian increases would occur along routes and at locations that are likely not to be significantly impacted, this evaluation would be documented. If it encompasses locations that have not been analyzed before and it is readily apparent that conditions there are not problematic, that evaluation would suffice and be reported. If this evaluation cannot be made with a reasonable degree of certainty, other available sources of data should be sought to make a preliminary evaluation. If the evaluation indicates that adverse 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.

700. Regulations and Coordination

710. REGULATIONS AND STANDARDS

There are no specific City, state, or federal statutory regulations or standards governing the conduct of transit and pedestrian 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 transit and pedestrian impact analyses.

720. APPLICABLE COORDINATION

It is necessary to seek approval for mitigation measures from agencies that would be responsible for implementing those measures, namely NYCT for rail, subway, and bus analyses and NYCDOT for pedestrian analyses. NYCDOT is also responsible for the designation of bus stops in the City. NYC Parks and Recreation approval would be required for mitigation measures involving park-edge sidewalks and pedestrian/bicycle greenway systems. Coordination with these agencies is often advisable for the analyses as well. (See Chapter 1 for more information on the timing of required approvals for mitigation.)

730. LOCATION OF INFORMATION

Much, but certainly not all, of the information needed to conduct the transit analyses may be obtained from NYCT; pedestrian data availability, however, is very limited. Although it is likely that a significant amount of data will need to be collected via field surveys and passenger or pedestrian counts, Office of Environmental Coordination (OEC), NYCDOT, MTA, NYCT, DCP, and other agencies that may possess information that would be helpful should be contacted to determine whether relevant data are available. 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 recent similar study has been completed in the same or neighboring area, and it is considered important for the data and findings of that study and the analysis of the proposed action to be consistent.

An initial listing of the location of primary sources of available transit and pedestrian data is presented below, followed by an indication of those technical areas in which original research or surveys are often required.

731. Sources of Available Rail Transit Data

- EISs 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: OEC, 100 Gold Street, Manhattan, NY 10038; NYCDCP, Environmental Assessment and Review Division, 22 Reade Street, Manhattan, NY 10007 (website: www.nyc.gov/planning); NYC Department of Environmental Protection (DEP), Office of Environmental Planning, 59-17 Junction Boulevard, Elmhurst, Queens, NY 11373 (website: www.nyc.gov/dep); and NYCDOT, 40 Worth Street, Manhattan, NY 10013 (website: www.nyc.gov/calldot).

- Transit studies with volumes or analyses that are relatively recent.

  Source: MTA, 347 Madison Avenue, Manhattan, NY 10017 (website: www.mta.nyc.ny.us).

- 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, 130 Livingston Street, Brooklyn, NY 11201 (website: www.mta.nyc.ny.us/nyct).

- Biannual survey of system riders indicating the number of subway riders entering the central business district by line.

  Source: MTA, 347 Madison Avenue, Manhattan, NY 10017 (website: www.mta.nyc.ny.us).

732. Sources of Available Bus Transit Data

- EISs 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: OEC, DCP, or DEP, as cited above.

- Bus studies that are recent enough to be valid. Source: NYCT Operations Planning, 130 Livingston Street, Brooklyn, NY 11201 (website: www.mta.nyc.ny.us/nyct).

- NYCT Bus Guide for bus routes, hours of operation, and frequency of service.

  Source: NYCT, 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, as cited above. Also, private bus operators who provide service, generally not in Manhattan or between Manhattan and the other boroughs.

733. Sources of Pedestrian Data

- EISs that contain pedestrian volume information and/or pedestrian level of service findings for a particular study area, providing such information is reasonably recent.

  Source: OEC, NYCDCP, or NYCDOT, 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.