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Chapter 23: Construction Impacts

A. INTRODUCTION

1. Issues

This chapter describes likely construction methods, sequencing, and impacts associated with the Proposed Action. The Proposed Action, as described in Chapter 2, "Description of the Proposed Action," involves elements that require major construction activity, including tunneling for subway construction, major building construction, and construction and development of open space. Elements of the Proposed Action include rezoning and related land use actions (including development of new open space and streets), the No. 7 Subway Extension (including related improvements at Corona Yard), expansion of the Convention Center, the deconstruction and relocation of the Quill Bus Depot, construction of the Multi-Use Facility on a platform above the western portion of Caemmerer Yard, and the potential accommodations for facilities operated by the New York City Department of Sanitation (DSNY) and New York City Police Department (NYPD).

Because the Proposed Action has the potential to result in significant construction-related impacts, this FGEIS provides an assessment of the existing and future conditions with and without the Proposed Action. Construction-related issues include potential impacts generated by construction of the elements of the Proposed Action, including temporary street or lane closures, noise and vibration, restricted access to community facilities, the volume and types of waste products (including reuse or disposal options), exposure to contaminated or hazardous materials, and traffic and air quality impacts.

As described in Chapter 2, "Description of the Proposed Action," the Proposed Action involves development in the Project Area and improvements to Corona Yard. Due to the geographical separation between the Project Area and Corona Yard, activities, conditions, and potential construction-related impacts associated with improvements to the Corona Yard facility are discussed separately at the end of this chapter.

The analysis of construction related emissions, and resulting air quality levels predicted at the largest cluster of construction sites, has been updated and refined since publication of the DGEIS. The most significant refinements include the following:

- Updates to the construction schedule for the different projects components;
- Refinement of the number of pieces of construction equipment according to the specific type and schedule of construction phases;
- Estimation of emissions from construction activities for all sites expected to be under construction during the relevant period (including emissions from construction trucks traveling within NYC limits);
- Refinement of PM_{10} quarterly emissions based on activity-specific emission factors (i.e., demolition, excavation, truck loading, and re-entrained dust); and
- Refinement in the on-site modeling impact analysis to reflect the difference in elevations at the various construction areas and to account for the fact that construction areas will be enclosed with solid barriers.

2. Principal Conclusions

a) Air Quality

The results of the updated cumulative air quality analysis for on-site activities (i.e., the effects of deconstruction, excavation activities, spoil and rock removal, and construction equipment) and off-site activities (e.g., the effects of traffic, including project-related truck trips and lane closures) indicated that the effect of these activities during the peak (reasonable worst case) construction period would not cause exceedances of the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO_2) and particulate matter smaller than 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$) if Ultra-Low Sulfur Diesel (ULSD) fuel is used for all construction equipment and would not result in significant adverse impacts with respect to these pollutants. The results also show that, absent the mitigation measures described below, construction-phase impacts on $PM_{2.5}$ levels would exceed the Significant Threshold Values (STVs) established by the New York City Department of Environmental Protection (DEP) and would therefore be significant. Because of this potential for significant adverse impacts of emissions from diesel-powered construction equipment on $PM_{2.5}$ levels, the project sponsors are committed to the implementation of mitigation measures to reduce emissions from diesel engines and dust-generating activities. The emission reduction measures selected include requirements for contractors to use construction equipment that will comply with EPA's Tier 2 emission standards (post model year 2001/2003), retrofitting the equipment with diesel particulate filters (or, where that is not feasible, diesel oxidation catalysts or equivalent technology), and electrification of compressors, pumps, and welders. A description of the effects of these emission control measures is presented in the Emission Reduction Measures Section. With implementation of these mitigation measures, the construction-phase impacts would not exceed the $PM_{2.5}$ STVs established by the New York City DEP and, therefore, would not have a significant adverse impact on air quality.

b) Noise and Vibration

Construction activities associated with the Proposed Action are expected, at times, to cause noticeable and significant increases in noise and vibration levels. Residences located in the following areas are expected to experience significant adverse impacts due to construction of elements of the Proposed Action: along Tenth Avenue north of West 42nd Street (as a result of construction of the Intermediate Station and private residential development on Projected Development Site 14); on West 40th Street between Eighth and Ninth Avenues (as a result of construction of the fan plant at Site N); at the corner of Dyer Avenue and West 41st Street (as a result of construction of the Intermediate Station and private residential development on Projected Development Site 14); between West 41st and West 42nd Streets east of Twelfth Avenue (as a result of construction of the Convention Center Hotel); and on West 35th Street between Tenth and Eleventh Avenues (as a result of construction of the Midblock Park and Boulevard System, the platform over Caemmerer Yard, and the Convention Center expansion).

Contractors for projects included in the Proposed Action would be required to strictly adhere to the applicable provisions of the New York City Noise Control Code and good engineering practices (e.g., proper maintenance and operation with muffling devices, shutting off idling machinery when not in use, etc.). Three categories of noise control approaches would also be explored and implemented: design considerations and project layout; sequence of operations; and alternative construction methods. New York City Transit (NYCT), through its Construction Environmental Protection Program (CEPP), would also develop mitigation measures that would reduce and, where practicable, eliminate significant construction noise impacts due to construction of the No. 7 Subway Extension. While these measures would minimize noise levels as a result of the Proposed Action, there would likely still be significant noise impacts at one or more sensitive receptors during the construction period at times throughout construction.

With the exception of pile driving, caisson drilling, and bulldozing, all of the vibration values for the types of equipment likely to be used during construction at distances greater than 20 feet are below the vibration damage threshold criteria for fragile buildings and for extremely fragile historic buildings. For construction at sites where there are fragile structures or vibration-sensitive uses within the threshold distances, mitigation measures including blasting regulations and contract specification, site- and structure-specific vibration monitoring, programs responding to community feedback and concerns, and other site-specific control measures would be implemented.

c) Traffic

For the AM peak period, Eleventh Avenue at West 34th Street is the only intersection expected to have significant adverse impacts from construction-related traffic. For the Midday peak period, the intersections of West 34th Street with both Tenth and Eleventh Avenues are projected to have significant adverse impacts. For the PM peak period, Twelfth Avenue at West 34th Street is the only intersection expected to have significant adverse impacts from construction-related traffic. These impacts would result from (1) reduced roadway capacity due to lane closures adjacent to construction sites associated with the No. 7 Subway Extension development, as well as development of the Multi-Use Facility and the expansion of the Convention Center, and (2) as a result of increased truck traffic associated with construction of all elements of the Proposed Action. All such impacts could be mitigated through standard mitigation measures.

d) Land Use and Neighborhood Character

Construction activities occurring prior to 2010 would affect land use and neighborhood character in the vicinity of construction activities. The effects on land use and neighborhood character would be temporary – limited to the duration of the construction period – and would not constitute significant adverse impacts. Barriers and fencing surrounding construction sites, and MPT plans would reduce or eliminate these effects.

e) Socioeconomic Conditions

Construction activities related to the subway extension would, at some construction sites, temporarily affect socioeconomic conditions in the vicinity of above-ground construction. Some businesses could be affected where construction activities require temporary closing of lanes or portions of the sidewalk in front of businesses relying on pedestrian traffic. This situation would be temporary prior to 2010, and would be limited to two areas: (1) the south side of West 40th Street from the corner of Eighth Avenue extending west to a point approximately midway between Eighth and Ninth Avenues, which is anticipated to be closed from early 2005 to late 2009; and (2) along the north side of West 41st Street extending west from Tenth Avenue for approximately 200 feet. This stretch is anticipated to be closed for approximately four months starting in early 2006. Businesses located on the south side of West 40th Street, both those situated at street level and those on upper floors, rely on their visibility and accessibility to pedestrians to attract customers and generate sales. Both visibility and accessibility would be restricted due to sidewalk closures required for construction of ventilation components of the proposed subway extension. Along West 41st Street near Tenth Avenue, access to a parking garage would be restricted, and traffic congestion due to cut-and-cover construction for the Intermediate Station would deter some motorists from using the facility. At this location, construction would be scheduled such that the parking garage entrance would be disrupted for as brief a time as practicable. In instances where lane and sidewalk closures would be required, access to business would be maintained.

f) Historic and Archaeological Resources

For construction prior to 2010, there would be no significant adverse physical impacts to properties on State and National Registers of Historic Places (S/NR) or New York City Landmark (NYCL) properties within 90 feet of proposed construction activities, because they would be protected by

compliance with *TPPN #10/88* and other New York City Building Code regulations. There would be no adverse physical impacts to architectural resources from construction of the Midblock Park and Boulevard System and the No. 7 Subway Extension, because the City and NYCT would take protection measures (e.g., underpinning, limiting blast intensity, chemical rock splitting techniques, etc.) against inadvertent construction damage that could result from construction activities under the control of a public agency. However, development could have adverse physical impacts on six architectural resources that are anticipated to remain on projected development sites or are located close enough (within 90 feet of proposed construction activities) to projected development sites to potentially experience adverse construction-related impacts from ground-borne construction-period vibrations. In addition, construction of the Multi-Use Facility, and development on the eastern portion of Caemmerer Yard, would result in the demolition of the High Line north of West 30th Street. The High Line has been identified by the State Historic Preservation Office (SHPO) as an historic resource, and Letters of Resolution have been entered into with SHPO with respect to mitigating this significant adverse impact. A portion of this structure could be rebuilt and integrated into the southern entrance to the Multi-Use Facility, partially mitigating this significant adverse impact (see Chapter 9, "Historical Resources").

g) Transit and Pedestrians

Construction of the No. 7 Subway would require connecting the existing tracks in Times Square to the new tracks for the proposed alignment. During the period when this connection is made, service on the No. 7 Subway could be affected: either the frequency of service on the No. 7 Subway line would be reduced, or it is possible that No. 7 Subway would terminate at Queensboro Plaza in Queens. In order to minimize passenger inconvenience, this construction would occur during the weekends. In the event that service would be terminated at Queensboro Plaza, shuttle bus service would be provided to those stations in Queens where service would be precluded (i.e., 45th Road/Court House Square, Hunters Point Avenue and Vernon Boulevard/Jackson Avenue).

The subway mitigation at the Times Square station would require periodic outages on the Nos. 2 and 3 express tracks on selected nights and weekends for a period of approximately two years in order to complete the extended mezzanines and new stairways included in that mitigation.

Additionally, service to the Eighth Avenue Subway line could be affected by construction in the abandoned lower level of the Eighth Avenue Subway. During several weekends the number of available tracks would be reduced from two uptown and two downtown tracks to one set of tracks in each direction. Significant adverse impacts to subway operations are not expected.

Pedestrian traffic would be altered in the vicinity of construction sites where sidewalks would be closed or reduced in width. The locations of closed lanes and sidewalks are identified later in this chapter. In all cases, pedestrian access to businesses, residences, and community facilities would be maintained, with provisions for pedestrian safety (such as barriers, signage, sidewalk sheds, etc.) implemented as required by City building codes and the NYCDOT. No significant adverse impacts are anticipated.

h) Natural Resources

Construction activity would be located east of Route 9A, with the exception of two pedestrian bridges connecting the waterfront and the upland, and would not cause significant adverse impacts to the Hudson River or natural resources within the Project Area. Construction at Corona Yard would affect wetlands in the vicinity of Flushing Creek. Any loss of wetlands would be compensated by appropriate wetland creation/restoration/enhancement, and the use of best management practices would ensure the site's water quality functions (see Chapter 13, "Natural Resources").

Long Island, including Queens and portions of Brooklyn, is located above an EPA-designated sole source aquifer that supplies drinking water for southeastern Queens and Long Island, though Corona

Yard is not located above the aquifer. Geotechnical and hazardous materials investigations, would be conducted prior to construction activity at Corona Yard in order to avoid any significant impacts on the environment.

i) Hazardous Materials

No significant adverse hazardous materials impacts are anticipated through construction of elements of the Proposed Action, because appropriate measures would be taken to limit worker and public exposure to hazardous materials through implementation of the CEPP and other measures (see Chapter 14, "Hazardous Materials").

B. METHODOLOGY

The *CEQR Technical Manual* provides guidance on the methods to be used to assess impacts associated with construction activities that occur as a component of a proposed action or induced as a result of a proposed action. The Manual also provides guidance in determining the area within which analyses should be conducted. The analysis of construction-related impacts focuses on 13 impact categories:

- Land use and neighborhood character
- Socioeconomic conditions
- Community facilities
- Open space
- Historic and archaeological resources
- Traffic
- Transit and pedestrians
- Air quality
- Noise
- Natural resources
- Infrastructure
- Hazardous materials
- Public health

This FGEIS assesses the range of construction methods and activities that could be required for the various elements of the Proposed Action. A reasonable worst-case approach is used to evaluate potential impacts, i.e., where a variety of construction techniques could reasonably be used to build a particular element, the method that would result in the worst potential impacts is the one selected for analysis. Following guidelines established in the *CEQR Technical Manual*, an initial screening analysis was conducted to determine whether resources in each of the impact categories were located within the area likely to be affected by various construction activities. If the screening analysis identified resources, further analysis followed. The analysis examines the construction impacts of elements of the Proposed Action anticipated to be under construction in each of two analysis years (discussed below).

1. Study Area

Most of the construction required for elements of the Proposed Action would occur west of Tenth Avenue between West 26th and West 42nd Streets (Figure 23-1). The areas that would be most affected by construction generally comprise the area immediately bordering the construction activity. However, in some cases impacts from construction activities extend beyond the immediate area surrounding construction sites. For these reasons, the study area for construction impact analyses may vary for each construction-related activity. For example, when considering environmental impacts due to construction-related trucking and ambient noise, impacts from trucking would affect

air quality and traffic near the construction site, as well as along the trucking route, while construction noise could dissipate within a few hundred feet of the activity.

2. Analysis Approach

The analysis years selected for the environmental assessments in this FGEIS are the years 2010 and 2025. However, analysis of construction activities during these analysis years would not accurately reflect reasonable worst-case construction impacts, because much of the construction associated with the Proposed Action is expected to be completed prior to these years. To capture a reasonable worst-case condition, analyses of construction impacts are conducted assuming that by 2010 the No. 7 Subway Extension would be operational, construction of the Multi-Use Facility would be complete, the Midblock Park and Boulevard System would be constructed between West 33rd and West 34th Street, the DSNY Garage and NYPD Tow Pound facility would be relocated into the Project Area, and the Convention Center Expansion would be complete.

(As discussed in Chapter 3, "Analytical Framework", the initial phase of the Convention Center Expansion is expected to be complete and operational by 2010. Although the second phase of the Convention Center Expansion – from West 40th Street to West 41st Street, including relocation of the Quill Bus Depot – might not be completed until after 2010, this FGEIS conservatively assumes, for analysis purposes, full completion of the Convention Center Expansion by 2010, since such an assumption is generally a more conservative, worst-case scenario for construction, traffic, air quality, noise, and other impact areas.)

It is also anticipated that the rezoning would be in place by 2005, and as a result, some development permitted under the rezoning would be completed by 2010. Since these elements of the Proposed Action would be completed on or about the same time, it is anticipated that construction of these elements would occur at roughly the same time. For reasons discussed below, analysis years of 2006 and 2017 were selected to represent the reasonable worst-case peak construction period.

a) 2006 Construction Analysis Year

As discussed below, construction at a given site in Manhattan routinely involves deconstruction of existing structures, excavation of earth for basements and foundations, and delivery of building materials, and each stage requires the transport of deconstruction debris, excavated soil and/or rock, and building materials. The number of truck trips generated by transporting these materials is reasonably indicative of construction activity. As such, data regarding the number of vehicle trips generated by construction (of those elements of the Proposed Action to be completed prior to 2010) were analyzed to determine the period during which vehicular activity would be greatest. These vehicle trips comprise: 1) removal of excavation spoils and deconstruction debris, 2) delivery of construction material, and 3) workforce transportation requirements. The data indicate a yearly peak occurring from mid-2005 through mid-2006 (Figure 23-2). The number and type of diesel-powered construction equipment that would be used on construction sites has been estimated for the period from mid-2005 through 2010. These data indicate a period of maximum usage in 2006 (see Appendix V). The period of maximum vehicular activity, coupled with the period of maximum diesel-powered construction equipment usage, indicate that 2006 would be the period of maximum pre-2010 construction activity, and construction impacts analyses are conducted for conditions projected to occur during this period.

Throughout this FGEIS, the 2006 Construction Analysis Year is used as the reasonable worst-case peak construction year. In 2006, construction activities for the proposed No. 7 Subway Extension and other large-scale elements of the Proposed Action, including the Convention Center Expansion and the Multi-Use Facility, would be under way (see Chapter 3, "Analytical Framework," Section F.4(c)).

It is important to recognize that even though activities would peak in 2006, some construction would occur prior to that time. Examples of such construction that would be expected to occur as early as 2005 include:

- Starting caisson installation and construction of the large platform to be built over Caemmerer Yard, and beginning construction of the replacement Quill Bus Depot;
- Building launch and retrieval shaft sites for the tunnel boring machine (TBM) that would be used to bore through the rock along the proposed tunnel alignment for the No. 7 Subway Extension;
- Beginning off-site removal of excavated soil and rock spoils generated by operation of the TBM; and
- Establishing staging sites where activities related to the tunneling process and cavern and station construction could occur.

Details on these activities and the current construction schedule are provided later in this chapter.

b) 2017 Construction Analysis Year

As discussed in Chapter 2, "Project Description," Projected and Potential Development Sites have been identified, and it is expected that development of these sites would occur at some point between 2010 and 2025. Unlike anticipated development prior to 2010, where most of the construction sites are known and construction plans have been developed, construction after 2010 is expected to be driven by market forces and, with the exception of the Midblock Park and Boulevard System, specific projects and project sites are not known. At any given time, projects under construction after 2010 could occur at any one (or more) of the identified development sites. As a result of the longer timeframe and the reduced scale of individual projects, construction activity after 2010 would be less concentrated in both time and space than that which would occur prior to 2010.

Construction of most of the private development allowed under the proposed rezoning of the area is expected to occur throughout an approximately 15-year period between 2010 and 2025. This would include new commercial and residential development. It is anticipated that, by the midpoint between 2010 and 2025, 15 million square feet of commercial office space and 6,400 residential units would be constructed and occupied. Although the locations of completed buildings and those that would be under construction are unknown, reasonable worst-case assumptions have been applied. For instance, development sites selected for analysis are those that would be proximate to other construction projects, sensitive populations, and/or land use, and where potential traffic impacts could occur.

In addition to private development as a result of the proposed rezoning, public projects are proposed for sites within the Project Area. These include development of the Midblock Park and Boulevard System and a new Port Authority bus garage that would consolidate 13 existing bus parking facilities and locations into a single facility within the Project Area.

It is expected that development of the Midblock Park and Boulevard System would progress from south to north, and that the segment between West 34th and West 36th Street would be complete by 2012, while the segments north of West 36th Street would be completed between 2012 and 2025. With this development sequencing, the construction period for development of each block of the park system could be several years. However, in order to assess a reasonable worst case, this construction impact analysis considers a scenario in which one block is developed in one year. Additionally, to complete full anticipated build-out by 2025, private commercial development in the Project Area is expected to progress at a rate of approximately 1.2 million square feet per year, while residential development is expected to progress at a rate of approximately 0.7 million square feet per year. Because of the anticipated rate of commercial development, and because the new zoning would allow large office towers with well over one million square feet of office space, it is anticipated that one

office tower per year would accommodate commercial growth in the Project Area. Similarly, development of one residential tower (approximately 600 units) per year is expected to accommodate the residential demand in the Project Area.

A second construction analysis year, 2017, has been selected because it represents a typical year in the post-2010 development of the Project Area. For the analysis of construction impacts, it is assumed that during 2017, construction related to the Proposed Action would include one block of the Midblock Park and Boulevard System, one major commercial office tower, and one approximately 700-unit residential tower.

It is anticipated that prior to 2025, a portion of the development allowed under the rezoning would be under construction. Construction of these site-specific developments was considered in relation to the Proposed Action elements analyzed in the 2006 Construction Analysis Year, which would be operational at that time.

The approach used to assess potential construction impacts involved comparing anticipated conditions during the construction analysis years (2006 and 2017) with base-line conditions without the Proposed Action in the same years. In order to establish base-line conditions expected in the construction analysis years, current conditions in the Project Area were first identified. Then, using established and accepted methods (e.g., air dispersion analysis, noise modeling, etc.) and information regarding proposed development unrelated to the Proposed Action, future conditions were developed to reflect conditions in the two construction analysis years. The outcome of this process represents the Future Without the Proposed Action.

To determine the construction analysis condition for the Proposed Action, all Proposed Action elements are identified. A construction scenario is then developed which includes a schedule of construction activities, a description of construction activities, and the locations of these activities. The construction scenario is compared with the Future Without the Proposed Action to identify impacts due to construction activity that are greater than those for the Future Without the Proposed Action alone.

Construction activities have the potential to affect components of the natural or built environment, depending on the nature of the activity (e.g., pile driving, sub-surface tunneling, or interior renovations), the distance that separates the environmental component, or "resource," from the activity, and the particular sensitivities of the resource. An environmental resource affected by construction activity, referred to here as an "affected resource," can be unique to a particular construction activity. A public school, for example, could be affected by construction-related noise, but not by construction-related traffic congestion. In order to determine whether impacts due to construction activity are likely to affect a given resource, locations of environmental resources for each impact category listed above (e.g., land use, air quality, noise, etc.) were identified. Parameters indicated in the *CEQR Technical Manual* were used to determine whether a particular resource is located within the range of impact for a given construction activity.

C. 2006 FUTURE WITHOUT THE PROPOSED ACTION

As detailed in Chapter 4, "Land Use, Zoning, and Public Policy," development without the Proposed Action is expected to occur primarily along the West 42nd Street corridor (between West 41st and West 43rd Streets) and along portions of Ninth Avenue. Projects currently under construction or proposed for the Project Area or immediate vicinity would comprise approximately 2.8 million square feet of office space, approximately 362,000 square feet of retail space, and approximately 1,360 residential units. Development planned or under construction would include television studios, parks, public open space and recreation facilities, ferry and rail transportation terminals, and residential units. Table 3-3 (see Chapter 3, "Analytical Framework,") provides information regarding the projects considered for analysis under the Future Without the Proposed Action.

Projects listed in Table 3-3 could have impacts in the Project Area. Several Future Without the Proposed Action projects would be developed within the proposed Project Area: the Moynihan Station Redevelopment project (Farley Building), involving development of office and retail space, and a railroad station; Projected Development Site 19, involving development of residential units; River Place II, comprising residential units; residential units and retail space between West 42nd and West 43rd Streets west of Eleventh Avenue (Projected Development Site 18); and residential units and retail space along the west side of Ninth Avenue between West 37th and West 39th Streets (Projected Development Sites 24 and 22, respectively).

It is anticipated that construction of these projects would take place essentially from within the footprint of each facility. However, temporary lane closures for removal of excavation spoils and deconstruction debris and delivery of construction materials would likely be required, as well as partial or full closure of adjacent sidewalks. Potential lane and sidewalk closures for these projects could include the lanes adjacent to the Farley Building along West 31st Street and West 33rd Street between Seventh and Eighth Avenues, along West 41st Street between Dyer and Tenth Avenues and between Eleventh and Twelfth Avenues, and portions of the streets west of Ninth Avenue between West 37th and West 39th Streets, as well as the western lane of Ninth Avenue in this area. In addition to lane closures resulting from the construction of these projects, construction-related truck traffic from these projects, as well as from truck traffic generated by development at 306 West 44th Street, New York Times Headquarters, 11 Times Square, 435 Seventh Avenue, and Friars Tower (located outside the Project Area), would likely traverse the Project Area. The crosstown streets most likely to be utilized by these vehicles would be West 31st, West 33rd, West 34th, West 42nd, and West 44th Streets. Northbound traffic would likely utilize Eleventh and Twelfth Avenues, while southbound traffic would likely utilize Ninth and Twelfth Avenues. As a consequence of lane closures and increased truck traffic, impacts to traffic, air quality, and noise receptors could occur, particularly proximate to construction activities and along truck routes.

Depending on construction techniques used for these projects, other construction-related impacts could affect the area in addition to impacts due to truck traffic and lane closures. Equipment and machinery for construction of these projects would likely include graders and excavators, cranes and cherry pickers, backhoes and front end loaders, pile drivers and caisson rigs, and compressors, as well as other heavy construction equipment. The use of this equipment could affect noise receptors and air quality in the vicinity of construction activity. Other potential impacts would include fugitive dust emissions and hazardous materials exposure from building deconstruction, land clearing and excavation, potential noise and vibration impacts from pile driving and other construction activities, temporary disruptions to utility provision, and reduced access to public transportation, community facilities, and residential and business entrances.

It is anticipated that projects under construction in the Future Without the Proposed Action would be constructed in accordance with current building code requirements and State and local environmental regulations. In instances where impacts result from construction, mitigation efforts would be implemented. Such efforts could include, but are not limited to, noise barriers, maintenance and protection of traffic plans, the use of ULSD fuel and pollution control devices on construction equipment, schedule restrictions on construction activities, and dust suppression techniques.

D. 2006 FUTURE WITH THE PROPOSED ACTION

During the 2006 analysis year, most of the construction activities would be concentrated in the western portion of the Hudson Yards area and would comprise installing the public infrastructure components of the Proposed Action, such as the platform or deck spanning Caemmerer Yard, construction of the Multi-Use Facility atop the western portion of the platform and the proposed public plaza on the eastern portion, the DSNY Garage and NYPD Tow Pound facility with a rooftop park, a segment of the new Midblock Park and Boulevard System located between West 33rd and

West 34th Streets, and the No. 7 Subway Extension. A subsurface 950-space public parking garage is proposed to be located under the Midblock Park and Boulevard System between West 34th and West 36th Streets. It is expected that the garage would be in operation by 2011 or 2012, and construction of the garage would begin in 2009 or 2010. Although construction would occur after the peak construction activity (2006), discussion of the garage is included in the first construction analysis year to capture a reasonable worst-case scenario.

Additionally, the Convention Center Expansion is assumed to be under construction in 2006. Although construction of the second phase of the Convention Center Expansion (from West 40th Street to West 41st Street, including relocation of the Quill Bus Depot) might not begin until after 2010, this FGEIS conservatively assumes the construction of the full Convention Center expansion prior to 2010, when the Multi-Use Facility, Projected Development Sites 33 and 14, and the southern segment of the Midblock Park and Boulevard System would also be under construction. Such an assumption is the conservative, worst-case scenario for all construction-related impact areas for analytical purposes.

As outlined in Chapter 2, "Description of the Proposed Action," this FGEIS considers the relocation of Madison Square Garden (MSG) to Projected Development Sites 33 and 32 as a possible development scenario. However, such relocation, if it were to occur, is not anticipated until after 2012. Therefore, a scenario in which MSG does not relocate, and other development goes forward on Projected Development Site 33 (northwest corner of West 31st Street and Ninth Avenue), represents the greatest potential for construction impacts in 2006 and is analyzed in this section.

Generally, construction follows established techniques, and with some modification, these techniques are used in many different building applications. As these different techniques (such as those involving deconstruction, slurry walls, tunnel mining, etc.), are introduced in the following discussion of construction activity, a general description of the technique is provided, as well as a description of how that technique applies to the construction of the Proposed Action element.

This section describes construction activity for elements of the Proposed Action. Table 23-1 provides a matrix linking construction sites associated with the Proposed Action with the major activities that can generate construction-related impacts. Figure 23-3 illustrates the construction sequence of elements in the Proposed Action.

Construction of elements of the Proposed Action would occur over an expansive area of the Project Area and would comprise different types of activities. These activities would often be sequential and of limited duration, with one activity following the previous. For example, several months of deconstruction and removal of unwanted structures would be followed by a period of excavation for foundation work, which would be followed by the installation of steel reinforcing bars and the pouring of concrete. Each stage of construction could use a different combination of construction equipment and could affect environmental conditions in a different way.

For construction of relatively small-scale developments on a single lot – a residential tower, for instance – each stage would occur over the entire site. For large-scale developments on a superblock, each activity would occur over a portion of the site and would migrate across the site such that each activity occurs for a limited time at a particular area of the site. Often different stages of construction on large lots would overlap. While site preparation on a portion of the site could be complete, excavation could be starting on another portion of the site.

TABLE 23-1
CONSTRUCTION ACTIVITY AND ACTIVITY LOCATION

Area/ Activity	Excavation and Backfill	Pile Install	TBM	Cut-and-Cover	Deconstruction	Caisson Installation	Superstructure	Spoils Removal	Drilling and Blasting	Paving
No. 7 Subway Extension										
Launch Site A – 25th & 26th Street at 11th Ave.	●	●	●					●	●	
Launch Site A to Terminal Station			●							
Terminal Station	●	●	●		●			●	●	
Terminal Station to Intermediate Station			●							
Intermediate Station	●	●	●	●	●			●	●	
Retrieval Site L – 41st Street and 10th Ave.	●	●	●		●			●	●	
Intermediate Station to Times Square Connection		●	●	●	●			●	●	
Convention Center Expansion	●	●			●	●	●	●		●
Existing Quill Bus Depot	●				●			●		
New Quill	●	●			●	●	●	●	●	●
Multi-Use Facility		●			●	●	●	●		
Western portion of Caemmerer Yard	●					●	●	●		●
Eastern portion of Caemmerer Yard	●					●	●	●		●
Midblock Park and Boulevard System	●				●			●		●
Midblock Parking Garage	●				●		●	●	●	●
Anticipated Private Development	●	●			●	●	●			
DSNY Garage/NYPD Tow Pound Facility	●	●			●	●	●	●	●	

In general terms, site preparation and excavation are the first, and perhaps the most disagreeable, activity in the development of a site. Depending on site characteristics, these activities, which would typically take several months to complete, would be characterized by a large amount of truck activity and large pieces of equipment (cherry pickers, loaders, graders, excavators, etc.). Impacts could include noise from trucks and equipment, including back-up alarms on trucks and construction vehicles, the visual presence of the construction site and associated equipment, fugitive dust and engine emissions, and traffic congestion from increased trucking activity and restrictions to travel lanes. Mitigation could include plywood construction fences around the site perimeter, dust suppression measures, and emission reduction technology for construction equipment, etc. (Impacts and mitigation measures specific to each element of the Proposed Action are discussed later in this chapter.)

As construction activities change, the types and intensity of impacts also change. Typically site preparation and excavation are followed by construction for piles, caissons and foundations, retaining walls, and installation of structural steel and other structural components. Typical impacts with construction in this stage would include noise from cement trucks, cranes, and other machinery, equipment emissions, noise and vibration from pile driving, etc. Mitigation efforts could include staging of concrete and other material delivery trucks and restrictions on the time of day certain activities would occur.

The following sections describe the construction of each element of the Proposed Action, including the areas within Hudson Yards where the activity would occur, the kinds of activities anticipated, and the approximate duration of these activities. Impacts anticipated as a result of construction activity, if any, and appropriate mitigation measures are discussed later in the chapter.

1. No. 7 Subway Extension Construction

The proposed alignment for the No. 7 Subway Extension would require tunneling through bedrock and soils that underlie the Project Area. The subway extension would comprise: two tunnels to accommodate trains traveling in opposite directions; two subway stations with mid-level mezzanines and interlocking chambers; electrical substations; tracks and switches; ancillary space; access and ventilation components; event layup/storage tracks in Manhattan (within the segment of tunnel between West 25th and West 34th Streets); and storage tracks at Corona Yard. In addition, two subsurface chambers would be constructed to serve as assembly and disassembly areas for the TBMs. After construction of the subway tunnels and chambers, the assembly and disassembly chambers would be used for permanent elements of the subway (stations, vent shafts, etc).

This section discusses the spoils materials generated by excavation and the machinery and workforce required for excavation. Following the discussion of excavation techniques, this section explores the process by which rock and soil debris, or spoils, would be removed from the tunnel and transported elsewhere, and discusses the potential reuse options for spoils materials and transportation options. After excavation, finishing work in the tunnels, stations, and other subway elements would begin. The construction methods, location, and sequencing of this work are discussed as part of this section.

Finally, a discussion of subway construction sequencing is presented in order to determine impacts. This discussion provides a temporal and spatial framework of construction activities and describes amounts of materials transported to construction sites and amounts of spoils to be removed from construction sites.

a) Excavation

Subway construction would begin with preparing a site to accommodate excavation equipment and follow with excavating subsurface cavities to house various components of the system. Bedrock and soil excavation would be accomplished using one or more of the following methods: cut-and-cover construction; drill-and-blast techniques; and excavation using a TBM (see below). Figure 23-4 depicts the proposed subway alignment and identifies segments that would be excavated by these three mining techniques. TBM boring would proceed north under Eleventh Avenue from West 25th Street to West 41st Street and Tenth Avenue, incorporating a curve eastward initiated at approximately West 39th Street.

A general description of these excavation techniques is provided in the following paragraphs. A discussion of the manner in which these techniques would apply to the No. 7 Subway Extension, the segments of the proposed alignment where each technique would be used, and the expected sequencing of excavation work is presented later in the section.

Tunnel Boring Machine Excavation – Running Tunnels

Tunnel boring machines are used to bore through rock or soil or a combination of both, and TBM designs vary depending on the subsurface material. For the No. 7 Subway Extension, a TBM would be used only for that portion of the tunnel located entirely in bedrock. The following discussion focuses on the so-called “hard rock” TBMs designed for that purpose.

In basic terms, TBMs are large-diameter drills that excavate a cylindrical cavity in the subsurface. Components of the machine include the cutter head at the leading end of the machine, followed by several hundred feet of component machinery supported by steel rails. The trailing machinery includes the engine, grippers, spoil conveyor, and machine propulsion.

The cutter head, which is fitted with a series of steel roller bits, rotates around the machine’s longitudinal axis, breaking the rock surface. The rock debris, termed spoils, are conveyed through an opening in the cutter head and out through the back of the machine to either a conveyor belt or a rail mucking car. Hydraulic jacks, known as grippers, are located behind the cutter head. The grippers

extend from the side of the TBM and provide purchase for the forward propulsion of the cutter head. The machine moves forward in short increments, approximately six feet per cycle. At the end of the drilling cycle, the grippers are retracted, the body of the machine is moved forward, and the grippers are then extended to the new position, and drilling resumes.

Figure 23-5 illustrates urban tunnel boring using a hard rock TBM. In this illustration, mucking (discussed later) is accomplished by a horizontal conveyor system. Typically, these machines arrive at the surface unassembled. The parts are lowered by crane through a vertical shaft leading to a chamber excavated at the depth of the future tunnel. The machines are then assembled under the surface in the chamber. When tunneling is complete, the machines are disassembled and removed, typically from a chamber and shaft at the end of the TBM segment of the tunnel.

Drill-and-Blast Excavation

Drill-and-blast mining involves drilling holes in the rock face and detonating explosives that have been inserted in the holes. The explosion fractures and loosens the rock, which is then collected and transported to the spoils removal location by belt conveyor or muck car. Inherent with drill-and-blast operation are noise and vibration caused by detonating explosive charges. These impacts can be mitigated by altering the matrix of holes in which explosives are placed and by changing the strength of the explosive charges. By increasing the number of holes per unit area, the explosive strength of each charge can be reduced. Also, explosives can be detonated sequentially, which releases the energy over a longer period and thereby reduces effects experienced at the surface. All blasting activity would be conducted in accordance with appropriate building code requirements and with approval of FDNY.

Cut-and-Cover Excavation

Cut-and-cover mining involves excavation of soil and/or rock from the surface, extending to the depth of the finished cavern. Urban cut-and-cover excavation typically uses excavators to cut a trench in the surface on one side of the street. As the trench increases in depth, retaining walls are typically constructed to prevent the sides from collapsing. Several techniques are employed for construction of retaining walls, depending on site conditions and the specific requirements of the wall. These techniques, described later in this section, include secant walls, soldier piles, and slurry walls. When sufficient depth is reached to allow excavation to proceed below the surface, the trench is decked, typically with simple steel plates, and traffic on the affected lanes resumes. To support the deck, caissons could be installed along the length of the excavation in the center of the street, spaced approximately 10 feet apart. In a typical urban setting, one side of the street is excavated to a sufficient depth to allow for the trench to be decked, then excavation begins on the other side of the street. When excavation and construction of subsurface elements are completed, the remaining cavity is filled and the original surface restored. Figure 23-6 depicts a typical cut-and-cover operation along an urban street.

Mucking

Mucking is the term applied to the process of removing spoils (excavated soil or rock) from below the surface, where they are generated, to the surface. The movement of spoils is generally accomplished either by a system of horizontal and vertical conveyors or by rail-mounted mucking cars and cranes. At this time it is not known which method would be used, so both systems are described.

(a) Horizontal and Vertical Conveyors

Under this method, horizontal conveyor belts transport spoils from the point of excavation to the bottom of the exit shaft, where they are transferred to the vertical conveyor assembly. This assembly consists of a belt with small buckets attached to form a continuous loop extending from the bottom of

the shaft to the surface. Spoils are then lifted in the buckets to the surface, where they are transferred to hoppers and trucks awaiting the loading process, or to temporary on-site storage.

(b) Mucking Cars

Under this method, spoils are loaded onto mucking cars near the point of excavation. Mucking cars are rail-mounted hoppers, each with a capacity of roughly 10 cubic yards (cy). The cars are moved between the excavation face and the access shaft on rails. From the bottom of the shaft, loaded cars would be lifted to the surface by crane, and the contents transferred to waiting trucks or to temporary on-site storage.

Dewatering

Excavation and construction that occurs below the water table has the potential to encounter groundwater. During excavation and before tunnels and caverns are sealed, groundwater could seep into the work area. In such instances the groundwater would be removed in a process known as dewatering. The water table varies from 10 to 12 feet below the surface in the northeast portion of the Project Area to approximately 25 feet below the surface in the southwest portion. During the construction of shafts for the No. 7 Subway Extension and excavation for building basements and foundations, dewatering would likely be required.

A groundwater management plan, a component of the CEPP, would address procedures for handling groundwater encountered during construction of elements of the Proposed Action. The groundwater management plan would provide a description of the methods used to collect, store, and dispose of contaminated water generated during dewatering activities. Additionally, the groundwater management plan would identify the permits required from the DEP and/or the NYSDEC to discharge the water into either the City's sewers or surface waters, respectively. Prior to obtaining DEP or NYSDEC discharge permits, groundwater would be sampled and analyzed to characterize its physical and chemical properties. Depending on the results of the analyses, the type of treatment prior to discharge, if required, would be determined. The type of treatment selected is determined by the contaminants present in the groundwater. Both NYSDEC and DEP permits require that contaminated sediments suspended in groundwater be removed prior to discharge. This would be achieved, for example, through the use of settling tanks and the injection of a flocculant, causing suspended sediments to settle out of the water. (A flocculant is a chemical or physical agent added to a volume of fluid to induce suspended particles to coalesce and settle to the bottom.) The sediments would be analyzed to determine whether contaminants are present and, depending on the type and concentrations of contaminants, the disposal option that would be selected, as described in the soil management section.

If the groundwater contains VOCs, additional treatment would be performed on-site after the settling process and prior to discharge. The treatment could include air stripping or the use of carbon filtration. Air stripping extracts VOCs from the water by inducing them to partition into air, and is generally accomplished by forcing air through the water column in the other direction. Once the air passes through the water column, it is collected and filtered with carbon. The VOCs then adsorb to the carbon and when the filters are spent, they are disposed in a permitted facility. If this method is utilized, an air discharge permit would be obtained and discharges performed in accordance with the permit requirements (see Chapter 21, "Air Quality"). Alternatively, groundwater subject to VOC or PCB contamination could be filtered through carbon for treatment. This treatment utilizes a sealed container containing carbon, and VOCs and PCBs are removed as the water passes through the carbon.

Prior to implementing any treatment system or discharge of groundwater, samples would be collected and analyzed, a treatment system would be designed, and the information would be included in the NYSDEC or DEP permit applications. Approval from the responsible regulatory agency, in the form

of a permit, would be obtained prior to construction activities. Depending on the quantity of water to be discharged, the permits require sampling on a regular basis to confirm that the treatment is effective. Discharging activities would be performed in accordance with the terms and conditions specified by the permit, including the discharge rate, the sampling frequency, and duration. (For more information regarding contaminated groundwater encountered during construction, see Chapter 14, "Hazardous Materials.")

b) No. 7 Subway Excavation and Construction

Assembly and Disassembly Chamber Construction

(a) Description of Construction and Techniques

For the No. 7 Subway Extension, the southern end of the subway tunnel and the TBM assembly chamber are projected to be approximately 120 feet below the surface of Eleventh Avenue at West 25th Street. A vertical shaft would be advanced to this depth using drill-and-blast mining techniques on a site located between West 25th and West 26th Streets east of and adjacent to Eleventh Avenue (Launch Site A). A short horizontal shaft, called an adit, would lead from the bottom of the shaft to the assembly chamber located directly under Eleventh Avenue. The shaft and adit would be approximately 30 feet in diameter. Depending on the design of the machine, the assembly chamber would be approximately 200 feet long, 60 feet wide (in order to accommodate two TBMs – one for each tunnel), and 28 feet in height. The TBMs would be assembled in this chamber.

The top of rock in this area is approximately 50 feet below the surface. Prior to rock excavation for the vertical shaft, the soil above would be removed. Because soil is relatively unstable, as the soil excavation advances the sides could tend to collapse. To prevent the collapse of the side walls, one of several types of retaining walls would first be constructed. For the assembly chamber access shaft, secant piles would be used.

In this process, vertical holes are bored to the depth of rock and spaced such that the centers of the holes would be separated by a distance measuring slightly less than twice the diameter of the bore. The holes would be filled with un-reinforced or slow-curing concrete to form the initial piles. Another set of holes would then be bored between the initial piles such that their circumferences intersect the initial piles. The secondary bore holes would be filled with reinforced concrete, forming a continuous waterproof retaining wall. After a perimeter of secant walls is constructed, soil would be removed from inside the perimeter using equipment appropriate for the site-specific conditions, including backhoes, front end loaders, and cranes with clam shell attachments.

Once soil excavation has proceeded to the top of rock, drill-and-blast mining techniques would advance the shaft floor to the desired depth. The shaft walls would be reinforced with shotcrete and rock bolts, and the shaft lined with reinforced concrete. (Shotcrete is concrete with properties that allow it to be sprayed on the surface.) Rock bolts would be inserted into predrilled holes in the walls, and ceiling and steel plates bolted to the portion that extends out of the rock surface. By tightening the bolt, the end deepest into the rock would expand and thus hold the steel plate securely against the rock face. Because the secant pile wall and finished shaft are waterproof, lowering of the water table, and the effects of a lowered water table (e.g., reduced ability to support structures above, treatment of contaminated groundwater, etc.), would be minimal.

Subsequent to construction of the cavern for Launch Site A, and assembly of the TBM, the site would serve other functions in the construction and operation of the subway extension. The TBM would proceed north under Eleventh Avenue from this site. Spoils (see below) would be removed from the tunnels at Launch Site A, and materials for reinforcing, lining, and finishing the running tunnels would enter at this site. After the running tunnels are complete, the surface portion of this site would be used to house mechanical systems required for operation of the subway (ventilation, emergency

egress, etc.). The mechanical system space would extend three floors below grade and would incorporate foundations sufficient to support future overbuild structures.

Construction of the mechanical system space at Launch Site A would involve removal of the secant pile walls and construction of slurry walls. In this process a trench is excavated in the shape of the final wall. As soil is removed, bentonite slurry is added. This would exert hydraulic pressure on the sides of the trench and keep the sides from collapsing. When excavation reaches the desired depth – in this case the wall would "key" two or three feet into bedrock – a lattice of steel reinforcing bars (rebar) would be lowered into the slurry-filled trench. The rebar lattice would consist of lengths of rebar placed side-by-side and spaced according to desired reinforcing strength requirements. Another set of rebar lengths would be placed perpendicular to the initial set, and the intersections of the lattice would be secured by lashing with heavy-gauge wire. After the lattice, or rebar cage, is lowered into the trench, concrete would be injected into the slurry, and being heaver than the slurry, would displace it. The slurry would be collected and reused. The resulting concrete walls would form the subsurface walls of the system space and the foundations of any future overbuild.

The TBM disassembly chamber would be located directly under West 41st Street between Tenth and Dyer Avenues. At this location, referred to as Retrieval Site L, which is also the location of the Intermediate Station, the subway tunnel is projected to be approximately 40 feet below the surface and completely in bedrock. The top of bedrock in this area is approximately 10 feet below the surface. An adit would extend between the disassembly chamber and a shaft located at the western end of the block bounded by West 41st and West 42nd Street, and Tenth and Dyer Avenues (Retrieval Site L). The shaft at Retrieval Site L would be used for station access after tunnel construction, and the disassembly chamber would be used either for mechanical systems space or as part of the Intermediate Station. With the exception of the retaining walls, techniques similar to those employed for construction of the assembly chamber, adit, and access shaft at West 25th Street would be used for construction here. Soldier piles would be used for the retaining walls for the disassembly chamber shaft.

Typically, soldier pile retaining walls are constructed by driving steel H-beams vertically into the ground spaced approximately 6 to 10 feet apart. As excavation proceeds, wooden timbers (lagging) are placed such that they extend horizontally between the H-beams and fit into the open portion of the H at either end.

Prior to excavation at both Launch Site A and Retrieval Site L, the sites would be prepared for this activity. Preparation would involve clearing any structures and leveling the surface. Launch Site A is currently used as an open parking lot, consisting of an asphalt surface and a small parking attendant station. Preparation of this site would require removal of the asphalt. However, preparation of Retrieval Site L would be more extensive. In addition to an open parking lot, several buildings occupy Retrieval Site L. These would be demolished and removed from the site.

(b) General Deconstruction Activities

The general procedures associated with the deconstruction activities related to the Proposed Action consist of the following:

- Development of a deconstruction strategy for each structure with consideration for proximity to other structures and property, size and type of structure, history of uses, original design and construction aspects;
- Preliminary survey of structure including examination of as-built drawings (if available), visual inspection of structure and surrounding area, and examination and testing (if necessary) for hazardous materials;

- Development of detailed deconstruction drawings, specifications, procedures, and sequencing of work consistent with the level of complexity;
- Design of temporary protective structures or other control measures to maintain structural integrity of the structure during deconstruction and protection of adjacent structures and property.

Implementation of the deconstruction plan would include: identification and disconnection of utilities (water, sewer, gas, electric and telephone), hazardous materials removal (asbestos-containing materials, lead paint and petroleum storage tanks) and removal of non-structural bearing members and other miscellaneous mechanical, plumbing, heating, ventilation, and air conditioning (HVAC), and electrical components. Depending on the nature of the structure, deconstruction techniques could include piecemeal methods using hand-held tools, machines such as electric or pneumatic breakers, or hydraulic chain/tackle. The use of machines such as bulldozers or hydraulic pushers could be appropriate for short structures, while the use of a demolition ball may be appropriate for taller structures. For at- or below-grade deconstruction, the use of impact hammers, graders, backhoes, and bulldozers could be appropriate. Deconstruction activity would include collection and removal of debris from the site by truck.

(c) Deconstruction and Removal of Buildings on Retrieval Site L

Buildings located on Retrieval Site L would be vacated and stripped of all internal furnishings. Pre-deconstruction activities would include the identification of utilities, building condition surveys, and hazardous materials assessment. The process would include a determination of the level of potential airborne particulates from deconstruction activities, and an assessment of the nature of construction debris for disposal. These assessments could be completed before the building tenants are vacated. Hazardous materials present in any buildings or structures proposed for deconstruction would be identified and removed prior to deconstruction. A discussion of potential impacts associated with the presence of contaminated materials, together with a discussion of relevant removal and transportation techniques, is provided in Chapter 14, "Hazardous Materials."

Following the removal of any internal contaminants, building shell deconstruction would proceed. The buildings on Retrieval Site L range from one to three stories and represent no obvious deconstruction difficulties. In the case of high buildings, deconstruction would require the staged deconstruction of each floor. Rubble and debris would then be systematically lowered to the cleared adjacent sites below. The material could be sorted on site, and then removed, or mixed debris could be removed and sorted in a remote location. Several of the buildings proposed for deconstruction have basement levels. These sub-grade structures would also be removed. Due to the proximity of other buildings, deconstruction activities would be performed using construction equipment with the lowest feasible vibration levels. Blasting techniques would be used only as necessary and as permitted by FDNY.

Deconstruction activities required for Retrieval Site L – buildings on the western end of Block 1051 (Lot 1) – would require removal of a five-story masonry building with two basement levels and exterior dimensions of approximately 300 by 200 feet. Material would be removed by dump trucks and/or dumpsters that would be staged along West 41st Street or Tenth Avenue, pending approval from NYCDOT.

(d) Sequencing, Materials, Equipment, and Transportation – Launch Site A

For the TBM Launch Site A, approximately 30,000 square feet of asphalt paving would be removed. Assuming the paving is 4 inches thick, approximately 370 cy of material would be trucked away. Soil excavation for the shaft is expected to amount to approximately 3,300 cy, and rock excavated for

the shaft, adit, and assembly chamber is estimated to amount to approximately 29,300 cy (swelled).[1] Trucks would be used to transport materials into the site and spoils away from the site.

In addition to the transport of spoils generated by construction of the shaft, adit, and chamber construction, TBM spoils would be transported from Launch Site A and tunnel construction materials would enter through this site. As discussed earlier, this site would also be used for subway systems, and the infrastructure required for this element would enter this site. Table 23-2 lists the amount of spoils exiting Launch Site A, the amounts of construction materials entering the site and the estimated number of truck trips required, and the approximate period during which specified activities would occur.

TABLE 23-2
MATERIALS ENTERING AND SPOILS EXITING LAUNCH SITE A AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Soil and Asphalt (exiting)	28,000 cy	5/05 – 7/05	1,870[1]
Two TBMs (entering)	1,200 tons	7/05 – 1/07	40
Rock Spoils (exiting)	220,000 cy	7/05 – 5/07	14,670[1]
Shotcrete/Concrete (entering)	53,000 cy	2/06 – 4/06	5,300[2]
Steel[3] (entering)	300 tons	7/05 – 12/09	12[4]
Masonry (entering)	3,300 tons	1/07 – 12/09	140[4]
Miscellaneous[5]	20,000 tons	1/07 – 12/09	800[4]
		Total Truck Trips	**22,832**

1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete and shotcrete would be transported in 10 cy capacity trucks.
3 Could include rock bolts, concrete reinforcement, soldier piles, structural steel, etc.
4 Assuming 25 tons per truck load.
5 Includes the railwork and mucking cars.

Construction activity at Launch Site A would require temporary closure of portions of the roadways and sidewalks in the vicinity of the site (Figure 23-7). (Construction activity at this site, and any other sites associated with construction of elements of the Proposed Action, could require the closure of proximate sidewalks. Except where noted below, protected pedestrian passageways would be provided along the adjacent street to maintain circulation.) The following closures would be necessary:

- One travel lane, one parking lane, and the entire sidewalk along the east side of Eleventh Avenue between West 25th and West 26th Streets, from 2005 through 2009. Four southbound travel lanes would remain in service on the avenue.
- The parking lane and the entire sidewalk along the south side of West 26th Street extending east from Tenth Avenue for approximately 200 feet, and the parking lane and sidewalk along the north side of West 25th Street extending east from Tenth Avenue for approximately 100 feet, from 2005 through 2009. Two travel lanes would remain in service on both cross streets.

Properties that comprise Launch Site A would be acquired by the City, and lane and sidewalk closings would extend only along the boundaries of the acquired lots. Lane and sidewalk closings would not directly affect accessibility of buildings located adjacent to the site. For this, and all lane and sidewalk closures associated with construction of the Proposed Action, measures would be taken to maintain pedestrian access to building entrances and to provide a safe vehicular and pedestrian

[1] The bank volume of bedrock is the volume of the rock as it exists in the ground. Mining processes introduce space between rock particles and thus increase the volume. The increased volume is referred to as the swelled volume. Geotechnical analysis of rock underlying the project area indicates a swell co-efficient of 1.65. This and all subsequent discussion of bedrock spoils in the Construction Impacts chapter refer to swelled volumes.

environment in the vicinity of construction sites. The construction site would be enclosed by a temporary concrete barrier with an 8-foot-tall chain link fence. This barrier/fence combination on West 25th and West 26th Streets would be located on the street bed approximately five feet from the curb. A five-foot-wide pedestrian walkway would be provided in the street bed, separated from traffic by a six-foot-tall timber barricade. Along the east side of Eleventh Avenue, the sidewalk would be closed, and no pedestrian walkway would be provided. Signage would indicate to pedestrians to cross on the other side of the avenue.

Truck access to the site for spoils removal and materials delivery would be provided at the north and south ends of the closed lanes on Eleventh Avenue, and near the eastern end of the site on West 26th Street. It is anticipated that trucks would enter from West 26th Street and exit to Eleventh Avenue.

Major machinery needed for construction at this site is estimated to include front-end loaders, scrapers, backhoes, cherry pickers, jackhammers, compressors, dump trucks, and one crane with clamshell attachments. During the majority of the construction period at Launch Site A, this equipment would be located within the boundaries of the construction site. For the purposes of assessing impacts, it is assumed that equipment would be located near the periphery of the site such that the distance to any potentially affected resource would be minimized.

(e) Sequencing, Materials, Equipment and Transport – Retrieval Site L

In addition to the use of Retrieval Site L for removing the TBMs after running tunnel construction, the site would also be used for removal of spoils from excavation of caverns for the Intermediate subway station and the Times Square connector, and as an entrance for construction materials for the station and the connector. While station finishes would not be completed by 2010, a major portion of the station construction (station caverns, ventilation, trackwork and switching, etc.) would be complete by that date. Station finishing would be complete some time before 2025. It is anticipated that the surface area of this site would be used for subway construction from early 2005 until December 2009. Table 23-3 lists the amount of spoils and deconstruction debris exiting the site, the materials to be transported to the site, the approximate period during which specific activities would occur, and the estimated number of truck trips involved with these activities at Retrieval Site L.

Construction activity at Retrieval Site L would require temporary closure of portions of the roadways and sidewalks in the vicinity of the site (see Figure 23-8). It is anticipated that closures would include the following:

- Approximately one-half the width of the sidewalk along the south side of West 42nd Street between Tenth Avenue and a point approximately 200 feet east of Tenth Avenue, from 2005 through 2009. Approximately one-half the width of the sidewalk would remain open along this stretch. All travel lanes on West 42nd would remain open.
- One travel lane and the entire sidewalk along the east side of Tenth Avenue between West 41st and West 42nd Streets, from 2005 through 2009. Five lanes on the avenue would remain open for traffic.
- The parking lane and the entire sidewalk along the north side of West 41st Street between Tenth Avenue and Dyer Avenue, from 2005 through 2009. Four lanes on the street would remain open for traffic.
- The entire sidewalk along the west side of Dyer Avenue between West 41st Street and a point approximately 100 feet south of West 42nd Street, from 2005 through 2009. All five lanes on Dyer Avenue would remain open for traffic.

TABLE 23-3
MATERIALS ENTERING AND SPOILS EXITING RETRIEVAL SITE L AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Soil and Asphalt (exiting)	20,000 cy	10/05 – 1/06	1,330[1]
Building Deconstruction Debris (exiting)	28,200 cy	10/05 – 1/06	1,570[4]
Remove Old Trackwork (exiting)	120 tons	1/08 – 3/08	5[5]
Rock Spoils (exiting)	131,000 cy	6/06 – 1/08	8,730[1]
Two TBMs (exiting)	1,200 tons	9/06 – 12/06	40
Shotcrete/Concrete (entering)	40,000 cy	6/05 – 9/08	4,000[2]
Steel[3] (entering)	1,100 tons	12/07 – 12/09	45[5]
Wood Lagging (entering)	60 tons	6/05 – 1/06	3
Gravel (entering)	2,300 cy	9/08 – 12/09	155
		Total Truck Trips	15,878

1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete and shotcrete would be transported in 10 cy capacity trucks.
3 Could include rock bolts, concrete reinforcement, soldier piles, structural steel, steel rings, etc.
4 Assuming 30 cy dumpsters at 60 percent full.
5 Assuming 25 tons of steel per truck.

Properties that comprise Retrieval Site L would be acquired by the City and all buildings on the site would be removed. Lane and sidewalk closings would extend only along the boundaries of the acquired lots. Lane and sidewalk closings would not directly affect accessibility of buildings located adjacent to the site. Similar to Launch Site A, Retrieval Site L would be enclosed by a temporary concrete barrier, on top of which would be an eight-foot-tall chain link fence. Signage would indicate that sidewalks are closed. Truck access to the site is from West 41st Street midway between Dyer and Tenth Avenues, and from West 42nd Street near the western end of the block.

An estimate of major equipment needed for construction at this site includes front-end loaders, scrapers, backhoes, cherry pickers, jackhammers and compressors, dump trucks, and one crane with clamshell attachments. During most of the construction period at Retrieval Site L, this equipment would be located within the boundaries of the site. For the purposes of assessing impacts it is assumed that equipment would be located near the periphery of the site such that the distance to any potentially affected resource would be minimized.

Running Tunnel Excavation and Construction

(a) Description of Construction and Techniques

After excavation of the chamber, adit, and shaft, and any remaining mining required for southerly extension of the tail tracks, and after the rock walls and ceiling are stabilized, rail tracks would be installed on the chamber floor. The TBM would then be lowered in pieces by crane to the shaft floor, moved through the adit to the chamber, and assembled on the rail tracks. Mucking, electrical service, dewatering, lighting, and communication systems would then be installed. TBM operation would then begin, starting at the southern extent of the running tunnels and proceeding north. Running tunnels mined by TBM are proposed to be approximately 4,300 feet in length and 21.5 feet in diameter.

Once a segment of tunnel has been bored, a waterproof barrier would be installed against the rock surface, and either pre-cast or cast-in-place tunnel liners would be installed. (Because cast-in-place tunnel liners require more workers, equipment, and material on-site, for this analysis, construction using cast-in-place tunnel liners is considered for the worst-case scenario.) Cement grout would then be injected under high pressure into any voids between the tunnel liners and the tunnel walls.

(b) Sequencing, Materials, Equipment and Transportation

Construction of the running tunnels is expected to begin in late 2005 and continue through 2006. It is anticipated that boring operations would be conducted 24 hours per day, six days per week (comprising 2 shifts for boring activity and one shift for equipment maintenance), and tunnel boring would progress at a rate ranging from approximately 55 to 80 linear feet per day in each tunnel. With simultaneous excavation of both tunnels, TBM construction activity would be expected to generate between 2,450 and 3,600 cy of bedrock spoils per day, with a peak generation of approximately 3,600 cy per day.

Total spoils volume generated from running tunnel construction is estimated to be approximately 191,000 cy. Bedrock spoils generated from TBM operation would be removed from the tunnel through the Launch Site A access shaft. As with removal of drill-and-blast spoils generated by construction of Launch Site A, truck movement within the site would be supervised by the tunneling contractor. One likely scenario is that trucks would approach the site from the west and enter the site from West 26th Street just east of Eleventh Avenue. Trucks would exit the site at West 25th Street and travel west to Twelfth Avenue. In this case, parking lane closures are likely along West 25th and West 26th Streets.

Because greater volumes of spoils generated in a given period would require a greater number of trucks for transportation, a scenario in which the TBM progresses at a rate of 80 linear feet per day is considered the worst-case for analyzing impacts to traffic, air quality, and ambient levels of sound. In this scenario, TBM spoils would be generated at approximately 3,600 cy per day for the period starting in 2005. At a rate of 80 linear feet per day, TBM excavation would take 54 working days, or approximately nine weeks. Because little space is available in the vicinity of Launch Site A for spoils stockpiling, and spoils removal must keep pace with generation, it is expected that trucking of TBM-generated spoils would occur six days per week, from 7:00 AM until 10:00 PM (15 hours). This equates to removal of one day's spoils (3,600 cy) in 15 hours, or approximately 240 cy per hour. Assuming the use of 15 cy capacity trucks, this quantity of material would generate approximately 32 round-trip (one empty truck arriving and one loaded truck departing) truck trips to the site every hour, or approximately one trip every two minutes. Information regarding spoils removal and the number of truck trips generated by spoils removal is included in Table 23-2.

Terminal Station Caverns and System Space

(a) Description of Construction and Techniques

Construction of the Terminal Station would begin with construction of vertical circulation elements of the station entrance, including escalators, elevators, and emergency stairs, as well as ventilation shafts and emergency egress shafts. Similar to construction of the shafts at Launch Site A and Retrieval Site L, this excavation would begin with site preparation and removal of existing structures (discussed later in this section). Soldier piles would be used for the construction of retaining walls, and slurry walls would form subsurface walls and foundations for future overbuild. System space is proposed to be located east of and adjacent to Eleventh Avenue between West 33rd and West 34th Streets (Block 705, Lots 1, 5, 54, and 68) and between West 34th and West 35th Streets (Block 706 Lot 1). Subway elements located on Block 706 Lot 1 and Block 705 Lots 1, 5, and 68 would be designed such that they could support future commercial development, and subway elements on Block 705 Lot 54 would support development of the Midblock Park and Boulevard System.

Construction of the caverns required for the Terminal Station would begin after the tunnel boring is complete. Cavern construction would entail enlarging the tunnel to the desired dimensions using drill-and-blast mining techniques and securing the rock face in the same manner as that for the assembly and disassembly chambers – with rock bolts, waterproofing, and shotcrete. In addition to

the caverns needed for the station, caverns would also be excavated for crossover tracks, system space, and other required space.

A laydown area for construction of the Terminal Station is proposed for the western end of Block 707, between West 35th and West 36th Streets adjacent to Eleventh Avenue. This site, approximately 50,000 square feet in size, is currently an open space maintained by the Convention Center. After construction activity at this site is finished, this open space would be eliminated and developed as allowed by the rezoning action (Projected Development Site 6).

(b) Deconstruction and Removal of Buildings near West 34th Street (Blocks 705, 706, and 707)

Similar to Retrieval Site L, deconstruction activities would be required to prepare the site for construction of the Terminal Station and proximate system space. The station headhouse and vertical circulation elements associated with the station, and system space required for subway operation, are proposed for Block 706 Lot 1 and Block 705 Lots 1, 5, 54, and 68. Structures located on these blocks include one two-story building with basement dimensions of approximately 100 by 200 feet, and one one-story building with basement dimensions of approximately 200 by 200 feet. Deconstruction of the open space between West 35th and West 36th Streets would involve removal of cast concrete benches, concrete paving, and a small concrete pagoda.

(c) Sequencing, Materials, Equipment, and Transportation

Construction of the Terminal Station is scheduled to begin in October 2006 and continue through December 2009. Materials required for the station, cavern, and system space construction and spoils from excavation that would enter and exit through the site are listed in Table 23-4.

TABLE 23-4
MATERIALS ENTERING AND SPOILS EXITING THE TERMINAL STATION SITE AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Soil and Asphalt (exiting)	85,000 cy	10/06 – 3/07	5,670[1]
Building Deconstruction Debris (exiting)	9,100 cy	1/07 – 6/07	500[1]
Rock Spoils (exiting)	310,000 cy	1/07 – 2/07	20,670[1]
Shotcrete/Concrete (entering)	46,000 cy	4/07 – 10/08	4,600[2]
Gravel (entering)	3,200 cy	6/07 - 12/08	213[1]
Steel3 (entering)	1,000 tons	11/07 – 10/08	40[4]
Wood Lagging (entering)	80 tons	3/07 – 10/08	4
Ceramic and Stone Tile (entering)	630 tons	10/08 – 12/09	25
Miscellaneous5	500 tons		100[6]
		Total Truck Trips	**31,822**

1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete and shotcrete would be transported in 10 cy capacity trucks.
3 Could include rock bolts, concrete reinforcement, soldier piles, structural steel, steel rings, etc.
4 Assuming 25 tons of steel per truck.
5 Including: ductwork, paint, escalators, hand railing, token booths, fare machines, architectural features, HVAC, plumbing, electrical, etc.
6 Assuming 5 tons per truck due to bulk of material.

Major construction equipment and machinery estimated to be needed for construction at this site includes two or three front-end loaders, one scraper, two backhoes, one cherry picker, jackhammers, six compressors, dump trucks, and one crane with clamshell attachments. During most of the construction period at the 34th Street Station site, this equipment would be located within the bounds of the site. For the purposes of assessing impacts, it is assumed that equipment would be located around the periphery of the site such that the distance to any potentially affected resource would be minimized.

Construction activity at the Terminal Station would require temporary closure of portions of the roadways and sidewalks in the vicinity of the site (Figure 23-9). It is anticipated that closures would include the following:

- The parking lanes and sidewalks along the east side of Eleventh Avenue between West 33rd and West 34th Streets, West 34th and West 35th Streets and between West 35th and West 36th Streets.
- The parking lane and sidewalk along the south side of West 35th Street and along the south side of West 36th Street from Eleventh Avenue to a point approximately 200 feet east. A temporary pedestrian walkway, similar to that proposed for Launch Site A, would occupy a portion of the parking lanes along these segments of West 35th and West 36th Streets.
- Half the width of the sidewalk along the north side of West 35th Street and along the north side of West 34th Street from Eleventh Avenue to a point approximately 200 feet east. A concrete barrier with an 8-foot-high chain link fence would separate the construction sites from pedestrians on the sidewalk.
- Half the width of the sidewalk on the south side of West 34th Street from Eleventh Avenue to a point approximately 400 feet east. A concrete barrier with an 8-foot high chain link fence would separate the construction sites from pedestrians on the sidewalk. Both the east-bound and west-bound NYCT bus lanes along West 34th Street would remain open at all times.
- The sidewalk and the curb lane along the north side of West 33rd Street from Eleventh Avenue to a point approximately 440 feet east.
- A portion of the sidewalk along the north side of West 34th Street from Eleventh Avenue to a point approximately 200 feet east.

Truck access to these sites would be provided by entry points from Eleventh Avenue at the midpoint between each cross street, and from the cross street at approximately the midpoint of each site's northern and southern boundary. The land and sidewalk closures would not interfere with public access to any buildings, because the buildings on these sites would be vacated prior to any construction activity. Durations of these closures are described in Figure 23-9.

Intermediate Station Caverns and System Space

(a) Description of Construction and Techniques

Construction of the Intermediate Station would include construction of the vertical circulation elements associated with the station entrance, ventilation shafts, and emergency egress shafts. This construction would occur on the lot bounded by West 41st Street between Dyer and Tenth Avenues on the south, by Tenth Avenue between West 41st and West 42nd Streets on the west (Block 1051 Lot 1). An additional shaft(s) for this station would be located on the lots adjacent to Tenth Avenue between West 40th and West 41st Streets (Block 1069 Lots 34 and 29). Similar to construction of the shafts at Launch Site A and Retrieval Site L, this excavation would begin with site preparation, including removal of existing structures (discussed later in this section). Soldier piles would be used for the construction of retaining walls, and slurry wall would form subsurface walls and foundations for any future overbuild.

A historic church is located directly west of Block 1069, Lots 34 and 29. In order to prevent potential structural damage to St. Raphael's RC Church, characterization of the subsurface conditions near the structure would be conducted and, if it is determined that construction activity would destabilize the structure, necessary underpinning or other appropriate stabilizing measures would be performed.

Construction of the caverns required for the Intermediate Station would begin after the TBM tunneling is complete. Cavern construction would entail enlarging the tunnel to the desired dimensions using cut-and-cover mining techniques and securing the rock face in the same manner as that for the assembly and disassembly chambers – with rock bolts, waterproofing, and shotcrete. In addition to the caverns needed for the station, caverns would also be excavated for crossover tracks, system space, and other required space.

The segment of West 41st Street to be excavated using cut-and-cover techniques extends from Dyer Avenue to a point approximately 200 feet west of Tenth Avenue. It is anticipated that the northern half of the street along this segment would be excavated first. Excavation along West 41st Street would progress sequentially from one end to the other (it is unknown at this time at which end excavation would begin), in segments approximately 80 feet in length. When excavation has advanced to the point were decking can be installed, decking would be secured over the cut and the excavation of the next segment would begin. It is expected that the northern half of the roadway would be closed for approximately 4.5 months, during which traffic would be diverted to the southern lanes of the street. After excavation is complete and decking has been installed, excavation would begin along the southern half. The southern half would also be excavated sequentially. Approximately 4.5 months after work begins on the southern half, the street would be completely decked and normal traffic patterns would resume. After the station has been constructed, clean backfill would be placed over the station, any utility transmission lines would be replaced to the center of the street, and the street surface would be replaced.

In order to minimize disruption to traffic, cut-and-cover mining would not occur across Tenth Avenue. The intersection (West 41st Street and Tenth Avenue) would be supported from underneath using underpinning techniques discussed earlier. After underpinning the avenue, this segment would be mined using drill-and-blast techniques. All blasting activity would be conducted in accordance with appropriate building code requirements and with approval of FDNY.

Construction of the Intermediate Station would require the temporary relocation of Con Edison transformer vaults located under the southern edge of the building at West 41st Street and Tenth Avenue. There are three vaults containing transformers and one containing a double-bus compartment. All four structures must be relocated to allow the placement of excavation piles along the edge of the residential building located north of West 41st Street and west of Tenth Avenue. The vaults, and transformers and switching within, would be temporarily relocated and returned to their current location after construction is complete.

At this time three possible relocation scenarios are under consideration: 1) temporarily relocate transformers to the sidewalk approximately 70 feet west of their current location. The transformers would be placed inside pre-cast concrete boxes supported on top of the temporary roadway decking system in place for cut-and-cover excavation; 2) temporary relocation as per number 1 above, except that the vaults would be located under the decking; and 3) temporary relocation as per number 1 and number 2 above, except that the vaults would be located in the street bed instead of under the sidewalk. Because number 1 could affect traffic and/or pedestrian movements, this scenario is considered the reasonable worst case, and is evaluated in this FGEIS.

Under scenario number 1 above, the temporary replacement vaults would occupy a portion of the sidewalk adjacent to West 41st Street. At least 5 feet of sidewalk would remain between the building at this location and the vaults. The vaults would be isolated from pedestrian by suitable safety barriers. MPT plans regarding the diversion of pedestrian traffic would be submitted to the NYCDOT for approval prior to construction.

Once the replacement transformers are ready to come on-line, power to each of the three transformers would be transferred sequentially. This process would likely require between 4 and 8 hours to complete; however, it could require up to 24 hours. During this time, the service area of the

transformers would be without power. Disruption of electrical power would not occur during the summer months – from approximately June through August. The service area comprises the residential building located directly north of West 41st Street and west of Tenth Avenue.

(b) Deconstruction and Removal of Buildings near 41st Street (Block 1069 Lots 34 and 29)

Similar to deconstruction activities required for Retrieval Site L, development on the eastern end of Block 1069 would require site preparation, including the removal of a small parking attendant structure and an asphalt parking surface. Deconstruction debris removal and construction material deliveries are presented in Table 23-3. It is anticipated that construction on these lots would be staged within the lot boundaries and would not require sidewalk or lane closures.

(c) Sequencing, Materials, Equipment, and Transportation

The relocation of the Con Edison transformers would occur beginning approximately one year prior to excavation for the Intermediate Station. During the initial stages of cut-and-cover excavation, before decking is installed on the road bed, excavation spoils would be removed to the street surface from the cut, and some construction materials could enter through the cut. It is anticipated that after the deck is in place, all equipment and materials needed for construction of the Intermediate Station, as well as additional mining spoils to be removed, would be transported through the shafts at Retrieval Site L (see Table 23-3). Major equipment needed for cut-and-cover construction includes front-end loaders, excavators, backhoes, cherry pickers, pile driving rigs, compressors, jackhammers, dump trucks, and a crane with clamshell attachments.

Cut-and-cover mining for the Intermediate Station would require temporary closure of portions of the roadways and sidewalks in the vicinity of the site (Figure 23-10). As with the sequential nature of the cut-and-cover construction, sidewalk and lane closures would also occur sequentially. It is anticipated that closures would include the following:

- The sidewalk and two lanes along the north side of West 41st Street between Dyer and Tenth Avenues, and the sidewalk and two lanes along the north side of West 41st Street between Tenth Avenue and a point located approximately 200 feet west. Access to the garage and apartment building located at the northwest corner of West 41st Street and Tenth Avenue would be maintained. It is anticipated that these closures would begin in March 2006 and move sequentially along the length of excavation until the middle of July 2006.
- The sidewalk and two lanes along the south side of West 41st Street between Dyer and Tenth Avenues, and the sidewalk and two lanes along the south side of West 41st Street between Tenth Avenue and a point located approximately 200 feet west. Access to the buildings located adjacent to this construction would be maintained. It is anticipated that these closures would begin in the middle of July 2006 and move sequentially along the length of excavation until approximately November 2006.

Times Square Connector

(a) Description of Construction and Techniques

The segment of the subway tunnel along West 41st Street approximately between Tenth Avenue and Times Square would not be mined using TBMs. The design depth of the tunnel along this segment is too close to the top of rock for safe operation of the TBM, and sensitive structures in the area could be affected by vibrations inherent in TBM operation. This segment of the tunnel would be mined by traditional methods – cut-and-cover and drill-and-blast.

Cut-and-cover techniques would be used for the tunnel segment extending from approximately 200 feet west of Tenth Avenue to Dyer Avenue. One side of the street would be closed for the beginning of this operation. Soldier piles and wood lagging would form the retaining walls as excavation

proceeds to the top of rock – approximately 10 feet below the surface. Drill-and-blast mining techniques would be used to advance the excavation to the desired depth – approximately 40 feet below the surface. Where sufficient headroom exists within the excavated area to allow movement of equipment, the surface would be decked with a temporary steel plate, and traffic on affected lanes would resume. At this time, the other lanes would be closed to traffic, and excavation would begin. After the temporary decking is in place, all excavated materials would exit the tunnel through the shaft at Retrieval Site L.

Between Dyer Avenue and Times Square, drill-and-blast techniques would be used to advance the tunnel. Mining would begin at Dyer Avenue and proceed east. Much of this excavation would occur under the Port Authority Bus Terminal (PABT) subsurface access ramp. Prior to excavation, the PABT access ramp would be supported by underpinning or ground improvement techniques (e.g., freezing or injection of cement). Geotechnical and structural tests would be conducted to determine whether other proximate structures would require stabilization, and if necessary, stabilization plans would be implemented.

Underpinning and shoring are structural techniques utilized to support existing structures that may be affected by tunneling below or by excavation along their foundations. Simple methods, such as the use of screw jacks supported on steel plates or concrete piers, through more complex solutions such as installation of steel beams and trusses supported on caissons or steel columns, are typical approaches to protecting existing structures. Lateral shoring techniques, including tie-back systems and wood or steel bracing systems supported by sheetpile or concrete curtain walls, are also commonly utilized. The actual design of the underpinning and shoring systems would be defined during the preliminary design phase of the project.

Underpinning and shoring would be required at various locations for the construction of the subway. Such locations could include the construction of the Times Square Connector, areas adjacent to some of the cut-and-cover tunneling, and areas adjacent to deconstruction activities.

(b) Sequencing, Materials, Equipment, and Transportation

With the exception of that portion of the Times Square Connector to be excavated by cut-and-cover mining techniques prior to temporary decking, all equipment, materials, and mining spoils would be transported through the shafts at Retrieval Site L (see Table 23-3). Equipment and materials required for cut-and-cover excavation would be trucked to and from the site of excavation from West 41st Street.

Major machinery expected to be needed for construction at this site would include front-end loaders, scrapers, backhoes, cherry pickers, jackhammers, compressors, dump trucks, and a crane with clamshell attachments.

Fan Plant at Site N

(a) Description of Construction and Techniques

Ventilation infrastructure required for the northern portion of the subway extension would be housed in a facility located between Eighth and Ninth Avenues on West 40th Street (identified as Site N, Block 763 Lot 47). The ventilation equipment would be housed in new construction at the site and would comprise one level below the surface as well as five levels above, for a total height of approximately 100 feet above the street surface. A tunnel would be mined from this site extending below West 40th Street to Eighth Avenue, at which point it would be integrated with an existing tunnel located under Eighth Avenue. The adit tunnel would be approximately 10 feet in diameter and would be constructed and finished using techniques similar to those of other portions of the project where drill-and-blast techniques are used for mining.

This site is currently used as an outdoor parking lot. Site preparation would involve removal of approximately 6 inches of asphalt and 6 inches of soil. Following site preparation, soil excavation to bedrock (approximately 10 feet) would begin. After installation of soldier piles, which would be used for retaining walls, drill-and-blast excavation of bedrock (for the basement portion of the structure and the shaft and adit) would begin. The shaft, adit, and tunnel would then be reinforced and lined, and mechanical systems installed.

(b) Sequencing, Materials, Equipment, and Transportation

Construction at Site N is expected to begin in 2007 and end in 2009. Construction activity at Site N would require temporary closure of two lanes and the sidewalk along the south side of West 40th Street between Eighth Avenue and a point approximately mid-block between Eighth and Ninth Avenues (Figure 23-8). A pedestrian walkway would be provided in the street, separated from traffic with a 6-foot wood barrier. Vehicular access to the site would be provided from West 40th Street. Access to buildings adjacent to closed sidewalks would be maintained. These closures would be in effect from 2006 through 2009.

Volumes of soil and asphalt debris to be removed, construction materials needed for the construction at Site N, the approximate time period for specific activities, and the number of truck trips required to transport this material are provided in Table 23-5.

TABLE 23-5
MATERIALS ENTERING AND SPOILS EXITING SITE N AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Soil and Asphalt (exiting)	1,860 cy	6/07 -9/07	124[1]
Rock Spoils (exiting)	3,070 cy	9/07 – 3/08	205[1]
Shotcrete/Concrete (entering)	2,270 cy	12/07 – 6/09	227[2]
Steel[3] (entering)	220 tons	1/09 – 12/09	9
Miscellaneous[5]	20,000 tons	1/09 – 12/09	40[5]
		Total Truck Trips	**605**

1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete and shotcrete would be transported in 10 cy capacity trucks.
3 Could include rock bolts, concrete reinforcement, soldier piles, structural steel, steel rings, etc.
4 Includes architectural features.
5 Assuming 5 tons per truck.

Major equipment expected to be needed for construction at this site includes a front-end loader, one scraper, backhoes, cherry pickers, jackhammers, compressors, dump trucks, and a crane with clamshell attachments.

c) Spoils Management

Introduction

New York State and New York City regulations promote sound waste management procedures. One component of State and City regulations is the reduction of waste materials at the source. Title 6 New York Codes, Rules and Regulations (NYCRR) Part 360 regulations establish standards and criteria for solid waste management and contain provisions that enable particular materials to exit the solid waste stream when beneficially utilized. The Beneficial Use Determination (BUD) regulations identify certain solid wastes that are no longer subject to regulation under Part 360 when used in a specified manner. Solid waste not specifically named in Subdivision 360-1.15(b) procedures and criteria are included to enable the NYSDEC to grant case-specific BUDs. Once the NYSDEC grants a BUD, the waste material ceases to be considered a solid waste. If granted a BUD, materials excavated for the subway extension would not be considered solid waste. If a BUD is not granted, the rock spoils would be considered a solid waste under Part 360. According to representatives of the

DEC's Solid Waste Division, clean bedrock generated by construction of the subway could be eligible to be granted a BUD.

International Organization for Standardization

On March 17, 1999, NYCT Capital Program Management became the first Design and Construction Management entity to be registered to the International Organization for Standardization (ISO) 14001 Environmental Management System. This registration indicates NYCT's commitment to incorporate ISO 14001 standards in its future designs and construction projects, including the No. 7 Subway Extension. The ISO standards are designed to encourage the provision of products and services in accordance with internationally agreed environmental management criteria. In terms of subway construction and operation, this commitment involves employing methods that maximize energy efficiency, the use of cleaner fuels, source reduction by use of recycled and reusable materials, and other efforts to prevent and reduce environmental degradation.

Factors Determinant to Beneficial Reuse for Spoils

A number of factors are important in determining the suitability of rock spoils material for reuse. The most critical are the physical characteristics of the spoils, and chief among these is the particle size and range of particle sizes, followed by the geology, which encompasses soundness, hardness, and chemical constituents.

The size of rock particles from TBM operations is determined by the size and spacing of the steel roller bits on the machine's cutterhead, and the characteristics of the rock – foliation patterns, hardness, and geologic rock type, among others. Preliminary indications suggest that TBM spoils generated by tunneling for the No. 7 Subway Extension would range in size from silt-sized particles, so called "rock flour," to particles with a maximum dimension of approximately six inches. The distribution of expected particle size is unknown at this time.

The size of particle generated by drill-and-blast mining is a function of the explosive strength and explosive placement array, and physical characteristics of the rock. The explosive strength and array are tailored according to the desired final shape of the excavated cavern, and with regard for the potential percussive impact to sensitive structures above. Drill-and-blast mining is expected to generate a wide range of particles, the largest of which would measure up to three to four feet on the longest face.

According to published sources, the subsurface geology of the Hudson Yards area of Midtown Manhattan is comprised of Manhattan schist and pegmatite. Rock samples retrieved from test borings along the alignment reveal bedrock composition consisting predominantly of schist and pegmatite, with lesser amounts of quartzite, granite, and granofels. Serpentinite rocks have been identified in preliminary alignment borings taken from an approximately 200-linear-foot section of the proposed subway tunnel in the vicinity of West 26th Street and Eleventh Avenue. Naturally occurring asbestos is found in serpentinite. When rocks with potential for naturally occurring asbestos are disturbed, the asbestos fibers can be released into the air and inhaled into the respiratory system of workers, or released to the environment. Because asbestos fibers can be hazardous when airborne, the reuse options for rock mined from this segment of the alignment may be restricted. Reuse of this rock would not be suitable in situations where the asbestos fibers may become airborne. However, in situations where the fibers would not become airborne, for example, quarry restoration or marine uses (discussed later in this section), reuse of the material is viable.

The volumetric proportion of one rock type with respect to others is not known at this time, and because the different geologic types that comprise the rock along the tunnel alignment are situated in tight folds, it is unlikely that spoils can be segregated according to geologic rock type. However, spoils material from different segments of the tunnel can be segregated and reused where suitable.

Serpentinite, asbestos-containing materials, and the implications of mining serpentinite rock are discussed in Chapter 14, "Hazardous Materials."

Potential Reuse Options

Preliminary geotechnical characteristics of the spoils indicate the material is potentially suitable for highway construction, landfill capping, fill material for abandoned quarries, railroad bed construction material, shore protection, jetty construction, and construction of artificial reef habitat. Table 23-6 lists various reuse options, gradation criteria, and transportation information for excavation spoils.

TABLE 23-6
EXCAVATION SPOILS REUSE OPTIONS, CRITERIA, AND TRANSPORT

Use	Gradation	Location	Likely Route	Approximate Distance
Highway Construction	Up to 6 in.	Various	Land	Variable
Quarry Fill	Potentially all Sizes	Various	Land/Sea	Variable
Concrete Aggregate	Not Suitable due to Insufficient Structural Strength			
Railroad Ballast	Not Suitable due to Insufficient Structural Strength			
Landfill Cover Subbase Base	 Up to 6 in. Up to 0.25 in.	Various	Land	Variable
Shore Protection	Up to 6 in.	Bayonne Military Ocean Terminal	Sea/Land	10 mi.
Artificial Reef	6 in. and Larger	S. of Long Island E. of New Jersey	Sea Sea	60 – 160 mi. 30 – 100 mi.
Near-Shore Fill	Up to 6 in.	Jamaica Bay	Sea	40 mi.

Sources: NYSDOT, NYSDEC, NJDEP, City of Bayonne, 2003.

(a) Highway Construction

Generally, roadway construction involves using materials that satisfy certain criteria depending on the part of the road that is being constructed. For example, one set of criteria relates to materials used in the construction of that portion of the road upon which vehicles travel (the road surface) and the portion directly below that (the subbase). A second set of criteria relates to materials used in the construction of the subgrade (existing below the subbase course) and roadway embankments. Materials used in the subbase course must satisfy more stringent criteria than those used for subgrade and embankment construction. As it appears that the bedrock in the Project Area could have a large component of Manhattan schist, it is likely this material is more suitable for the construction of subgrade and embankment portions of highways.

(b) Fill for Quarry Closure

Potentially all bedrock spoils generated are suitable fill for quarries. Particle size and physical characteristics are not highly critical. The remediation of abandoned quarries involves the deposition of fill materials to raise the surface to the desired levels. Many different materials have been used for this purpose, including deconstruction debris and automobile tires.

(c) Concrete Aggregate

Criteria for determining the suitability of aggregate used in concrete manufacture include particle size and dimension, soundness, fracture angles, geologic type, mineral size, and mineral classification. Sources contacted regarding use of spoils material as aggregate in concrete indicate that due to the likely high percentage of schist in the spoils, it is probably unfit for such use.

(d) Railroad Ballast

Criteria for determining the suitability of rock to be used as railroad ballast include soundness, which is a measure of fracture strength. As it appears that the bedrock in the Project Area may have a large component of Manhattan schist, which does not exhibit high degrees of soundness. It would not, therefore, be suitable for railroad ballast.

(e) Landfill Capping Material

Rock spoils from both TBM and drill-and-blast excavation are potentially suitable for landfill capping. Landfill caps are designed to fulfill the unique requirements of individual facilities, depending on the nature of the landfill contents, climatic conditions, topography, etc. Generally, many designs involve strata of different materials to serve separate functions. Directly above the solid waste is a layer of fill intended to bring low spots up to grade and establish the final shape of the cap. Such fill material consists of soil, stones, and fines, with stones graded to less than five or six inches along the maximum dimension. Atop this fill layer is a layer of crushed stone comprised of material with a maximum dimension of 0.25 inches. Above this are several layers to complete the cap, including a plastic liner, a geo-synthetic mesh, sand and organic material, and topsoil. Preliminary investigations indicate that the rock spoils could be suitable for the first two layers above the solid waste. In addition to gradation, suitability of prospective landfill capping material is determined by chemical analysis and geotechnical analysis, such as compaction tests.

(f) Shore Protection

Rock spoils and dredged materials are currently used to reduce shore erosion by the construction of artificial reefs, wave-attenuating devices, groins and jetties, revetments, seawalls, and breakwaters.

The City of Bayonne is currently considering a shore stabilization project and may need material. Depending on characteristics such as gradation and soundness, rock spoils generated by boring and mining for the No. 7 Subway Extension could be suitable. Preliminary discussions indicate that the spoils material of approximately 2 to 6 inches maximum dimension could be suitable for the project. Additionally, Bayonne and the Bayonne Local Reuse Authority, which now controls the former Bayonne Military Ocean Terminal, possibly have space to stockpile the material at this facility.

(g) Marine Ecological Restoration

Clean bedrock spoils are suitable for the restoration of ecological systems in marine environments. Projects currently under way or under consideration include the construction of artificial reefs in the New York/New Jersey Harbor and the restoration of salt marshes in Jamaica Bay. These projects could potentially utilize the complete spectrum of rock sizes generated by mining for the subway extension. Sand and fines are used to restore eroded salt marshes to past elevations. Rocks ranging in size from approximately one inch to eight inches in diameter are suitable for juvenile lobster beds, while rocks from eight inches to four feet in diameter are suitable for adult lobster habitat. Cobble-size rock is used as a foundation for the construction of oyster beds.

Application of bedrock spoils to habitat restoration and construction sites involves barging the material to the site and discharging the contents. For sites designed for benthic habitat and located in deeper waters, split hull barges are typically used. These barges, which have a draft of approximately 20 feet, cannot operate in shallow water. Shallow-draft barges are used to transport material for salt marsh restoration.

According to representatives of the NYSDEC and New Jersey Department of Environmental Protection (NJDEP), Division of Fish, Game and Wildlife, spoils from the project are potentially suitable for benthic wildlife habitat. Both agencies have artificial reef programs to develop offshore habitat at various locations. Spoils from drill-and-blast mining are preferable to those from TBM

mining because of the larger particle size; however, depending on size gradation of TBM spoils, these may also be suitable.

Processing

Depending on the physical characteristics of the bedrock spoils mined for the No. 7 Subway Extension and end-use of the material, processing of spoils could be necessary before reuse. As discussed earlier, reuse of the spoils could require segregation with respect to particle size. For other reuse options, other spoils processing could be necessary, including dewatering and crushing. The urban setting of the Project Area would likely preclude spoils processing within the vicinity of the shafts from which the spoils exit the ground, and thus if necessary, processing would most likely occur elsewhere.

Transportation Options

One or more modes of transportation would be required to remove the TBM spoils from Launch Site A. Three modes of long-distance transport are considered: trucking, railroad, and barge. Short-distance transportation involving conveyor systems are also considered. Such conveyor systems yield the potential to transport spoils from Launch Site A to potential marine transfer stations along the Hudson River.

(a) Staging

As discussed earlier, tunnel and subway cavern excavation spoils would be removed from several locations along the proposed alignment. The staging area associated with running tunnel construction would be located at West 26th Street and Eleventh Avenue. Staging areas associated with cavern excavation would be located near the two proposed stations.

(b) Trucking

Trucking regulations in the City (as regulated by the NYCDOT) permit a maximum gross vehicle weight of approximately 73,000 pounds for 10-wheel dump trucks and approximately 120,000 pounds for an 18-wheel tractor-trailer rig. Subtracting the vehicle weight from the gross weight results in a payload weight of approximately 47,000 pounds for a dump truck and approximately 80,000 pounds for a tractor-trailer rig (with a NYCDOT-issued Annual Divisible Overweight permit). Considering a bank weight (the weight of the rock before mining) of 170 pounds per cubic foot and a spoils expansion factor of 1.65, the swelled weight (the weight of the rock after expansion due to mining activity) of spoils is approximately 100 pounds per cubic foot or 2,700 pounds per cubic yard. However, spoils would likely be wet when removed from the tunnel, and due to the limited amount of staging area at any of the removal sites, dewatering of spoils would be incomplete. Thus, a reasonable worst-case estimate of spoils weight of 3,500 pounds per cubic yard has been selected for this analysis.

Using these figures, a 10-wheel dump truck's maximum capacity is approximately 13.4 cubic yards and the capacity of an 18-wheel tractor-trailer rig is approximately 22.9 cubic yards. A conservative estimate of truck capacity, 15 cubic yard, is used to provide a reasonable worst-case scenario of impacts due to trucking spoils material. The number of truck trips required to remove excavation spoils has been incorporated into material deliveries occurring at each construction site discussed earlier in this chapter. Trucking contractors are assumed to have all required permits and to follow NYCDOT-sanctioned truck routes.

(c) Rail Transport

Use of the Amtrak Empire line was considered for transport of spoils material. This rail line extends north from Penn Station, and within the Project Area, occupies a subgrade easement located between Tenth and Eleventh Avenues. Portions of the Amtrak right-of-way are open between West 36th Street and West 39th Street. The use of the rail line, including the possibility of loading spoils onto

train cars at the open portions of the cut, was investigated as a possible conveyance for removing spoils from the area.

According to Amtrak officials, freight service on this line is possible between the hours of 11:00 PM and 5:00 AM. Therefore, freight cars would be loaded during the day and leave during the night. The train would need the capacity to accommodate the volume of spoils generated during one day, or approximately 3,600 cubic yards during the peak period of mining activity.

Freight cars that typically carry rock spoil-type material, known as gondolas, exhibit a wide range of capacity and length. Drop bottom gondolas, the most likely carrier of rock spoils, range in capacity from approximately 65 cubic yards to over 135 cubic yards, and from approximately 38 to 44 feet in length. Conservatively assuming the use of 135 cubic yard capacity gondolas with a length of 43 feet (large capacity and short length), approximately 27 gondolas would be required to accommodate spoils generated in a peak day (approximately 3,600 cubic yards). The length of a 27-gondola train, excluding locomotive, would be approximately 1,160 feet in length.

This train would be stored and loaded during the day on a siding adjacent to the existing Amtrak line. Due to the configuration of the rail infrastructure in the Amtrak right-of-way, the only feasible location for a siding would be west of the existing track. The segment of the right-of-way where loading spoils is feasible (from West 36th to West 39th Streets) is approximately 600 feet in length – insufficient to accommodate a train with the length and capacity to transport 3,600 cubic yards of spoils. Additionally, the width of the right-of-way between West 36th to West 39th Streets would not be adequate to provide space for both siding track and loading of the gondolas.

(d) Barging

Since the issuance of the DGEIS, it has been determined that barging would not be feasible for the removal of construction spoils in connection with the Proposed Action in light of (1) the high cost of establishing a marine transfer facility, (2) the necessity that trucks be required for spoils removal in any case, and (3) the added fiscal and environmental cost of double-handling spoils material, spoils transport by barge is no longer considered a viable option for this project. Moreover, further investigation into the use of west side piers revealed that those cited as potential marine transfer points in the DGEIS were either unavailable until after the majority of spoils were generated (Pier 76, the current NYPD tow pound), currently at or near operating capacity and physically unsuitable for rock spoils transfer (Pier 99, the DSNY facility), or in need of substantial renovation and reconfiguration for spoils transfer (the Gansevoort DSNY facility).

(e) Conclusion

The rock spoils generated in tunnel and cavern mining for the No. 7 Subway Extension would be removed from the subsurface in at least four different locations (West 34th Street and Eleventh Avenue, West 26th Street and Eleventh Avenue, West 41st Street and Tenth Avenue and West 40th Street near Eighth Avenue). Transport of rock spoils via overland conveyor would require four systems, one of which would extend over one-half mile to the Hudson River. Therefore, the use of overland conveyor was not considered feasible for the removal of mining spoils, leaving trucking as the only reasonable means of conveyance.

2. Multi-Use Facility; Caemmerer Yard Platform; Quill Bus Depot; Convention Center Marshalling Yards

a) Description of Construction and Techniques

The Multi-Use Facility would be located on a platform built over the western portion of Caemmerer Yard and the adjacent block immediately south of the yards, collectively bounded by West 30th Street on the south, West 33rd Street on the north, and Eleventh and Twelfth Avenues on the east and west, respectively. The Multi-Use Facility, supported by the platform, would rise directly over the rail

yards and the adjacent block south of the yards. The platform would also serve as cover and provide protection for the LIRR trains and rail operations in Caemmerer Yard. Additionally, the space under the southern one-third of the platform would house the bus storage portion of the replacement Quill Bus Depot. (The other half of a replacement depot would occupy the block bounded by Tenth and Eleventh Avenues and West 30th and West 31st Streets and would be connected by a passageway under Eleventh Avenue. Construction of this half of the replacement Quill Bus Depot is discussed under construction over the eastern portion of Caemmerer Yard later in this section.)

While Block 679 (between Eleventh and Twelfth Avenues and West 33rd and West 34th Streets) is not part of the Multi-Use Facility, it is anticipated that a single or a contiguous platform would be built on this block in coordination with the platform for the Multi-Use Facility. Convention Center truck marshalling activities would be located below the platform. The platform over this block would provide public open space and serve convention functions. The Multi-Use Facility's northern entry would front on the open space.

West 33rd Street between Eleventh and Twelfth Avenues would be closed for development of the platform on Block 679. Utility transmission infrastructure located under the surface of the street would be abandoned and rerouted to existing transmission lines along Eleventh Avenue and/or Twelfth Avenue. Existing transmission lines along the avenues may need upgrades to accommodate the increased load, and this work, if necessary, would occur prior to closing West 33rd Street (see Chapter 16, "Infrastructure").

It is expected that staging for construction of the Multi-Use Facility would be almost entirely confined to the footprint of the platform – between Eleventh and Twelfth Avenues and West 30th and West 34th Streets; however, some lane closures would occur along Eleventh and Twelfth Avenues and along West 30th Street (discussed later in this section). Construction in this area would involve four separate components: (1) the Convention Center truck marshalling yard, from West 33rd to West 34th Streets; (2) the replacement Quill Bus Depot, beneath the platform between West 30th and West 31st Streets; (3) the platform from West 30th Street to West 34th Street; and (4) the Multi-Use Facility. Construction of components (1), (2), and (3) may occur simultaneously, with some overlap with element (4). Construction of the platform and the truck marshalling yard would be coordinated among the parties responsible for designing and building the Multi-Use Facility and the expanded Convention Center. At this time the designs of these components are in a preliminary stage and the details of construction sequencing are not fully developed. However, site preparation, foundation work, and other basic construction would be consistent with accepted practices within the industry. Site preparation in this case would involve removing existing facilities – parking lots, some small structures – and a portion of the High Line. Deconstruction of buildings would be accomplished by procedures similar to those described above for Retrieval Site L of the No. 7 Subway Extension. After site preparation, caisson installation would begin.

Caisson installation involves drilling steel cylinders into the ground, which are socketed into the bedrock and reinforced with steel rebar. Ultimately, the reinforced cylinders are filled with concrete. While exact construction sequencing has not been finalized at this time and could change, within the rail yard, caisson installation is expected to proceed from east to west on a grid line-to-grid line basis, and may include working in both a south-to-north and north-to-south direction. Sequenced track outages would be minimized by coordinating with the LIRR and taking full advantage of off-peak rail yard schedules to the extent practicable.

It is anticipated that caisson installation within the rail yard would occur concurrently with caisson installation for the replacement bus depot to the south, and could occur simultaneously with caisson activities associated with the marshalling yards to the north.

Caisson work for the platform and the replacement Quill Bus Depot between West 30th and West 33rd Streets would rely on access from both Eleventh and Twelfth Avenues at West 30th and West

33rd Streets. Caisson work between West 33rd and West 34th Streets would rely on access from both Eleventh and Twelfth Avenues at West 33rd and 34th Streets. By using multiple site entries, the contractor would be able to maintain greater flexibility to coordinate access and egress to the site with existing traffic patterns, while at the same time maximizing the use of internal staging areas within the site.

It is anticipated that retaining walls would be constructed in coordination with the caisson work required for construction of the Quill Bus Depot and Convention Center marshalling yard. Retaining wall construction type and methodology would be consistent with conventional practice, given the different geotechnical and design conditions at each perimeter location, and would likely include secant walls for that portion of the perimeter common to the yard, and slurry walls or sheeting on the remaining six sides of the structure perimeter – three each for the bus depot and the marshalling facility. (Sheeting refers to retaining walls consisting of sheets of metal driven or vibrated into the ground.)

Once caisson installation is sufficiently advanced, erection of the steel superstructure for the truck marshalling yard, the Quill Bus Depot, and the platform would begin. This would be followed by infilling of the platform deck to create a working surface for eventual construction of the Multi-Use Facility above. The platform superstructure is anticipated to consist of substantially prefabricated structural components which would be hoisted into place over the rail yard so as to minimize disruption to rail yard activities.

Once the platform is complete, it would be available for use for staging areas internal to the site, thereby minimizing disruptions to rail yard activities and the surrounding streets as construction of the Multi-Use Facility proceeds.

After the retaining walls have been installed, and concurrent with construction of the deck over these two blocks, excavation of earthen materials would proceed to a depth necessary to accommodate the western portion of the relocated Quill Bus Depot facility and the Convention Center truck marshalling yard. After excavation for the Quill Bus Depot, a concrete slab would be poured – the floor of the first level. Foundation walls, integrated with the retainment sheeting and secant walls discussed earlier, would then be constructed. Then a supported slab – the floor of the second level – would be installed. Structural steel for the walls that extend above the ground surface to the bottom surface of the platform would be attached to the foundation walls and concrete walls to complete the shell of the bus depot. Concurrent with this work would be similar work at the Convention Center truck marshalling yard.

Dewatering of the site would not be necessary, due to the installation of the retaining walls as described above. Localized pumping for rainwater runoff would be necessary as part of the general construction activities.

The Multi-Use Facility would be built on top of the platform, from West 30th Street to West 33rd Street between Eleventh and Twelfth Avenues. An elevated walkway is expected to be constructed along the southerly perimeter of the Multi-Use Facility, providing entry to the south lobby of the Multi-Use Facility, and a potential connection to the High Line to the east. An entry portal would be built over West 33rd Street to the north. Construction of the facility, which would be composed largely of steel, concrete, and glass, would start with the erection of the structural steel components and would be expected to begin as soon as the platform working deck has been sufficiently advanced. While details of the construction phasing are not finalized and may change, it is anticipated that the structure would be erected simultaneously on both the north and south sides, then infilled on the east and west ends of the facility. Roof framing trusses would then be erected, completing the structural frame. The bowl precast and mechanical and electrical rough-in work would begin as soon as the structural frame has been sufficiently advanced to permit these activities. Exterior walls would then be constructed, following the sequencing of the north and south structural elements, followed by the

east and west walls. Roofing work would begin as soon as the roof structural frame is sufficiently advanced. Interior finishing work would follow and include HVAC, plumbing, electrical, and communications.

b) Equipment, Materials, and Transportation

Construction of those portions of the platform over Caemmerer Yard and western half of the Quill Bus Depot site is expected to start in the second quarter of 2005 with site preparation and caisson installation, with preordering of long lead delivery items including structural steel commencing in early 2005. Equipment necessary for site preparation would include earth moving machinery, compressors, jackhammers, and trucks. Equipment required for caisson installation would include mobile rigs for drilling 36 to 48 inch holes and for installing cylinders into the holes, as well as backhoes, front-end loaders and cranes for rebar installation, concrete delivery trucks, and trucks for removal of spoils. Barges could be used for excavation and spoils removals, and an onsite concrete batching plant would be considered, based on economics. Steel erection for the platform and stadium would be accomplished using as many as eight fixed cranes placed strategically around and within the site to provide efficient hoisting of construction materials. Table 23-7 illustrates the amount of materials estimated to be needed for the construction of the platform and the Multi-Use Facility.

TABLE 23-7
MATERIALS ENTERING AND SPOILS EXITING MULTI-USE FACILITY SITE AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Backfill (exiting/entering)	45,000 cy	4/05 – 8/05	3,000[1]
Building Deconstruction Debris (exiting)	900 cy	4/05 – 8/05	60[1]
Building Deconstruction Debris (exiting)	475 tons	4/05 – 8/05	40
Concrete (entering)	80,000 cy	7/05 – 7/07	8,000[2]
Structural Steel (entering)	116,400 tons	7/05 – 4/08	4,656[3]
Precast Concrete (entering)	3,000 pieces	9/05 – 4/06	1,500
Miscellaneous (entering)		11/05 – 6/09	4,000[4]
		Total Truck Trips	**21,256**

Sources: Turner Construction Company, 2003; NY Jets, 2003.
1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons per truck.
4 Includes HVAC, lighting, seating, MEP, plumbing, electrical, etc.

Construction activity at the Multi-Use Facility site and Block 679 would require temporary closure of portions of the roadways and sidewalks in the vicinity of the site. It is anticipated that the sidewalk and one parking lane would be closed along the north side of West 30th Street between Eleventh and Twelfth Avenues, as well as the sidewalks and parking lanes along the south side of West 34th Street between Eleventh and Twelfth Avenues. These closures would occur from 2005 through 2009 (Figure 23-11).

3. Convention Center Expansion

a) Description of Construction and Techniques

Expansion of the Convention Center, including the Convention Center Hotel, to West 42nd Street would occur in two phases. The first phase includes construction of the truck marshalling facility on Block 679, new construction and renovation on the existing Convention Center site (Block 680), construction on the block north of the existing Convention Center site (Block 685), and construction of the Convention Center Hotel on the eastern portion of Block 1089. A description of construction of the marshalling facility, including materials and debris entering and exiting the site, has been discussed in the previous section. A discussion of the proposed Convention Center Hotel is provided

later in this section. The second phase would include construction on Block 1088 after the replacement Quill Bus Depot is operational.

The first phase of Convention Center Expansion would involve closing West 39th Street between Eleventh and Twelfth Avenues. Utility transmission infrastructure located under the surface of the street would be abandoned and rerouted to existing transmission lines along Eleventh Avenue and/or Twelfth Avenue. Existing transmission lines along the avenues could need upgrades to accommodate the increased load; this work, if necessary, would occur prior to closing West 39th Street (see Chapter 16, "Infrastructure").

The second phase of Convention Center expansion would involve closing West 40th Street between Eleventh and Twelfth Avenues and a segment of West 41st Street extending from Eleventh Avenue to a point approximately 200 feet west of the avenue. Utility transmission infrastructure located under the surface of the street would be abandoned and rerouted to existing transmission lines along Eleventh Avenue and/or Twelfth Avenue. Existing transmission lines along the avenues could need upgrades to accommodate the increased load; this work, if necessary, would occur prior to closing these streets.

The first phase of the Convention Center Expansion would include construction of a pedestrian bridge over the Quill Bus Depot. Although the design for the bridge has not been fully developed, it is assumed that construction of the bridge would not affect the operations at the Quill Bus Depot. Construction would involve building the bridge's structural elements off-site, assembling the component parts, and installing the assembled bridge structure with cranes.

As discussed earlier, the initial phase of the Convention Center Expansion is expected to be complete and operational by 2010. Although the second phase of the Convention Center Expansion – from West 40th Street to West 41st Street, including relocation of the Quill Bus Depot – would not be completed until after 2010, this chapter of the FGEIS conservatively assumes, for analysis purposes, full completion of the Convention Center Expansion by 2010, since such an assumption is generally a more conservative, worst-case scenario for construction-related impacts such as traffic, air quality, and noise.

Associated with the Convention Center Expansion are improvements to the truck marshalling operation. In addition to the new truck marshalling facility that would be located under the platform between West 33rd and West 34th Streets, an off-street truck route extending from the truck marshalling facility to the expanded Convention Center would utilize a below-grade rail right-of-way. This right-of-way begins at the northeast corner of Block 679, crosses under both West 34th Street and Eleventh Avenue, and extends north, adjacent to the Amtrak right-of-way between Tenth and Eleventh Avenues. At approximately West 38th Street, the right-of-way veers off from the Amtrak cut to the west and ends at the eastern foundation wall of the existing Quill Bus Depot.

Design plans for the marshalling route have not been developed at this time. However, construction required to utilize the rail right-of-way would involve excavation, installation of floor slabs, foundation walls and roof structures, and ventilation systems, and could involve underpinning of roadway infrastructure and structures.

Convention Center Expansion – Phase 1

Phase 1 of the Convention Center expansion would include new construction from the current north end of the existing structure (at West 38th Street) to West 40th Street between Eleventh and Twelfth Avenues, development of the truck marshalling facility beneath the platform between West 33rd and West 34th Streets on Block 679 (as discussed earlier), and renovation of the existing Convention Center structure. Site preparation for northerly expansion comprising this phase would include the deconstruction of a large structure, detached from the main Convention Center facility, at the northern end of Block 680. Masonry structures on Block 685 would also be deconstructed. Deconstruction of

these structures would be accomplished by procedures similar to those described earlier in this chapter – including an assessment of any environmental contaminants in the structures. Construction of the new facility would be similar to the current Convention Center, including its overall appearance and structural design.

The structure housing ventilation equipment for the Lincoln Tunnel is a potential architectural resource. The structure is located directly southwest of the intersection of West 39th Street and Eleventh Avenue. Prior to construction, geotechnical and structural tests would be conducted to determine the level of underpinning or other stabilizing measures required to avoid damage to this structure.

Construction is estimated to take 36 to 40 months from start of foundation excavation to occupancy. The building would be supported by spread footings supported on rock with a steel superstructure and glass curtain wall. Various lane and sidewalk closures are anticipated during this construction period, depending on the phase of construction. Specific closures for each phase are discussed below.

Based on this type of structure, excavation, and deconstruction debris volumes, building materials and truck trips required for removal and delivery for construction of this phase of the Convention Center expansion are presented in Table 23-8. A list of expected activities and equipment follows the table.

TABLE 23-8
MATERIALS ENTERING AND SPOILS EXITING CONVENTION CENTER EXPANSION – PHASE 1

Description	Amount	Approximate Activity Period	Truck Trips
Excavation and Deconstruction Debris (exiting)	105,300 cy	4/05 – 9/05	7,020[1]
Concrete (entering)	44,000 cy	9/05 – 12/06	4,400[2]
Structural Steel (entering)	20,000 tons	12/05 – 3/07	800[3]
Glass Curtain Wall (entering)	108,000 sf	1/07 – 3/08	108
Misc[4] Mech/Elec/HVAC/PLMBG/Arch Items (entering)		12/05 – 12/09	1,460
		Total Truck Trips	**13,788**

1 Soil, deconstruction debris, and asphalt would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 20 tons per truck.
4 Includes HVAC, lighting, seating, MEP, plumbing, electrical, etc.

The activities and equipment for Phase 1 are expected to include:

- Excavation and Deconstruction Debris (exiting):
  - Activity: Deconstruction and excavation.
  - Equipment: crane; cherry pickers; compressors; excavators; backhoes; front end loaders.

- Concrete (entering), Structural Steel (entering), Glass Curtain Wall (entering):
  - Activity: General construction.
  - Equipment: cranes; cherry pickers; compressors; excavators; backhoes; front end loaders; scrapers; compactors/pavers; pile drivers/caisson drill rigs.

- Mechanical, Electrical, Heating, Ventilation and Air Conditioning, Plumbing and Architectural Items (entering):
  - Activity: Miscellaneous construction.
  - Equipment: cranes; cherry pickers; compressors; backhoes.

Convention Center Expansion – Phase 2

Phase 2 of the Convention Center expansion would involve construction from West 40th Street to West 41st Street between Eleventh and Twelfth Avenues (Block 1088). Site preparation would entail

the deconstruction of the Quill Bus Depot and excavation. Deconstruction of the bus depot would be accomplished by procedures similar to those described earlier in this chapter – including an assessment of any environmental contaminants in the structures. Construction of the new facility in this area would be similar to the current Convention Center, including its overall appearance and structural design.

Construction is estimated to take 36 to 40 months from start of foundation excavation to occupancy. The building would be supported by spread footings supported on rock with a steel superstructure and glass curtain wall. Various lane and sidewalk closures are anticipated during this construction period, depending on the phase of construction. Specific closures for each phase are discussed below.

Based on this type of structure, excavation, and deconstruction debris volumes, building materials and truck trips required for removal and delivery for construction of this phase of the Convention Center expansion are presented in Table 23-9. A list of expected activities and equipment follows the table.

TABLE 23-9
MATERIALS ENTERING AND SPOILS EXITING CONVENTION CENTER EXPANSION – PHASE 2

Description	Amount	Approximate Activity Period	Truck Trips
Excavation and Deconstruction Debris (exiting)	57,200 cy	1/07 – 6/07	3,815[1]
Concrete (entering)	22,000 cy	3/07 – 12/07	2,200[2]
Structural Steel (entering)	10,000 tons	6/07 – 6/08	400[3]
Glass Curtain Wall (entering)	162,000 sf	3/08 – 3/09	162
Misc[4] Mech/Elec/HVAC/PLMBG/Arch Items (entering)		12/07 – 12/09	230
		Total Truck Trips	**6,807**

1 Soil, deconstruction debris, and asphalt would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 20 tons per truck.
4 Includes HVAC, lighting, seating, MEP, plumbing, electrical, etc.

The activities and equipment for Phase 2 are expected to include:

- Excavation and Deconstruction Debris (exiting):
  - Activity: Excavation, deconstruction, and debris removal.
  - Equipment: cranes; cherry pickers; compressors; excavator; backhoes; front end loaders.

- Concrete (entering), Structural Steel (entering):
  - Activity: General construction.
  - Equipment: cranes; cherry pickers; compressors; excavators; backhoes; front end loaders; scrapers; compactors/pavers; pile drivers/caisson drill rigs.

- Glass Curtain Wall (entering):
  - Activity: Miscellaneous construction.
  - Equipment: cranes; cherry pickers; compressors.

Construction activities involving the Convention Center expansion would require temporary closures of portions of roadways and/or sidewalks in the vicinity of the activity (Figure 23-12). Closures during the first phase of the expansion are expected to begin in 2005 and be in place until 2008. These anticipated closures include:

- The sidewalk and curb lane along the west side of Eleventh Avenue from West 36th to West 40th Streets, and the sidewalk, curb lane, and one travel lane along the east side of Twelfth Avenue from West 39th to West 40th Streets.

- All lanes and both sidewalks of West 39th Street between Eleventh and Twelfth Avenues.

- The sidewalk and curb lane along the west side of Eleventh Avenue from West 34th to West 35th Streets, and the sidewalk, curb lane, and one travel lane along the east side of Twelfth Avenue from West 38th to West 39th Streets.

Closures during the second phase of the expansion are expected to begin in December 2008 and be in place until December 2009. These anticipated closures include:

- The sidewalk and curb lane along the west side of Eleventh Avenue from West 40th to West 41st Streets.
- All lanes and both sidewalks of West 40th Street between Eleventh and Twelfth Avenues.

Convention Center Hotel

The Convention Center Hotel proposed to be erected on Eleventh Avenue between West 41st and West 42nd Streets would be typical of current New York City construction for that type of facility.

Construction is estimated to take 34 to 36 months from start of foundation excavation to certificate of occupancy. The building would be supported by spread footings supported on rock with a steel superstructure and glass curtain wall. It is assumed that, in addition to other lane and sidewalk closing mentioned above, the sidewalk and the curb lane along the west side of Eleventh Avenue would be closed between West 41st and West 42nd Streets for the duration of hotel construction. Based on this type of structure, gross bulk commodities and associated truck trips are presented in Table 23-10.

TABLE 23-10
MATERIALS ENTERING AND SPOILS EXITING CONVENTION CENTER HOTEL CONSTRUCTION AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Spoil Removal (exiting)	50,000 cy	1/07 – 6/07	3,330[1]
Substructure Concrete (entering)	3,500 cy	6/07 – 12/07	350[2]
Superstructure Concrete (entering)	21,000 cy	12/07 – 6/08	2,100[2]
Structural Steel (entering)	21,000 tons	12/07 – 8/08	850[3]
Glass Curtain Wall (entering)	650,000 sf	4/08 – 2/09	650[4]
Dry Wall (entering)	4,800,000 sf	8/08 – 5/09	1,200[5]
Misc Mech/Elec/HVAC/Plmbg/Arch Items (entering)	15,000 tons	12/07 – 12/09	1,500
		Total Truck Trips	**9,980**

Source: Turner Construction Company, 2003.
1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.
4 Assuming 1,000 sf per truck.
5 Assuming 4,000 sf per truck.

4. Midblock Park and Boulevard System

a) Description of Construction and Techniques

Construction of the Midblock Park and Boulevard System is expected to begin in late-2008 and progress north sequentially, with completion assumed before 2025. However, prior to 2010 only one block is projected to be under construction – the central portion of Block 705, bounded by West 33rd and West 34th Streets and Tenth and Eleventh Avenues.

This section of the Midblock Park and Boulevard System is located east of the proposed terminal subway station at West 34th Street, approximately 200 feet east of Eleventh Avenue. It would encompass an overall area of approximately 47,000 square feet.

Portions of the park on this block would be located over the subsurface pedestrian circulation space for the Terminal Station. As such, construction of the park would be coordinated with construction of

the station. Except for the portions over the subway circulation space, construction would be relatively simple, as this section of the park would be constructed at street level over earthen fill. Major activities would consist of grading and the placement of a sand/gravel base topped by concrete/asphalt. After structural completion, addition of architectural/landscaping features, such as benches and planters, would be added. Bulk commodities and truck trips associated with the construction of this section of the Midblock Park and Boulevard System are provided in Table 23-11.

TABLE 23-11
MATERIALS ENTERING AND SPOILS EXITING MIDBLOCK PARK AND BOULEVARD SYSTEM CONSTRUCTION AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Deconstruction Debris (exiting)	5,200 cy	12/08 – 3/09	347[1]
Grading and Spoil Removal (exiting)	1200 cy	2/09 – 4/09	80[1]
Sand/Gravel Subbase (entering)	600 cy	4/09 – 6/09	40[1]
Concrete/Asphalt Base (entering)	600 cy	6/09 – 9/09	60[2]
Misc. Arch/Landscaping Features	10 tons	9/09 – 12/09	10
		Total Truck Trips	**537**

1 Soil, gravel, deconstruction debris, and asphalt would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.

b) Sequencing, Equipment, Materials, and Transportation

The first activity associated with the construction of this portion of the Midblock Park and Boulevard System would be the deconstruction of an existing three-story masonry structure and the removal by truck of the spoils and waste. Equipment anticipated to be needed for this work would include front-end loaders, excavators, backhoes, cherry pickers, compressors, compactors, dump trucks, and jackhammers. Following completion of the deconstruction, the area would be graded using a bulldozer and/or scraper, and the area would be compacted using a truck-mounted roller and hand-operated compactor.

With the completion of the grading operation, a sub-base of soil and gravel would be laid, followed by a base of concrete or asphalt. Equipment utilized would include dump trucks, spreaders, and rollers. Compaction of the sub-base and the laying of the concrete or asphalt base using delivery trucks and spreaders would then follow. Following this construction, the architectural and landscaping features would be installed using delivery trucks and hand equipment.

Construction activity for this portion of the Midblock Park and Boulevard System would require temporary closure of the parking lane and relocation of portions of the sidewalks along the south side of West 34th Street and the north side of West 33rd Street at the central portions of the block. It is anticipated that these closures would be in effect from late 2008 to late 2009.

5. Midblock Parking Garage

a) Introduction

To meet anticipated parking demand, the City proposes a public parking garage located below a section of the proposed Midblock Park and Boulevard System between West 34th Street and West 36th Street. The garage would be built before, or concurrent with the Midblock Park and Boulevard System proposed to be located atop the garage, and therefore would likely be constructed before 2017. However, to capture a reasonable worst-case construction condition, construction of the garage is included in this assessment.

The garage would be designed to accommodate approximately 950 spaces comprising an area of approximately 380,000 square feet. Vehicular ingress and egress would be provided via ramps located west of the proposed boulevard, accessed from West 35th Street and West 36th Street. The

underground parking spaces in the southern half of the garage (between West 34th and West 35th Street) would use this access point as well, and cars would travel under West 35th Street to reach these spaces.

b) Description of Construction and Techniques

No construction plans for the parking facility have been developed at this time. It is assumed that this facility would be constructed consistent with known building practices for similar construction in Manhattan. The probable design would incorporate 1) a basement slab constructed of reinforced concrete and supported on spread footings that extend to bedrock; 2) retaining walls would be used during excavation; and 3) wall and floors would be constructed with reinforced concrete. These assumptions are used to assess reasonable worst-case impacts during the construction of the facility.

c) Sequencing, Equipment, Materials, and Transportation

Approximately eight masonry structures that presently occupy the property would be demolished and the spoils and debris removed from the site. The property would then be excavated to a depth of approximately 50 feet below the surface, and would likely involve removal of bedrock by blasting. The parking structure would likely utilize spread footings, the installation of which would be followed by pouring of the structural concrete slab, which would form the lower level of the facility. Sidewalls and upper level slabs would follow, with the roof level being installed and forming the base of a new public park and boulevard at grade. Volumes of deconstruction debris and construction material required for development of the garage and truck trips associated with the conveyance of this material are provided in Table 23-12.

TABLE 23-12
MATERIALS ENTERING AND SPOILS EXITING MIDBLOCK PARKING GARAGE
REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Deconstruction Debris (exiting)	15,000 cy	1/09 – 4/09	1,000[1]
Excavated Soil and Rock (exiting)	175,000 cy	2/09 – 8/09	11,670[1]
Concrete (entering)	18,000 cy	6/09 – 8/10	1,800[2]
Reinforcing Steel (entering)	8,000 tons	6/09 – 8/10	320[3]
Misc Mech/Elec/HVAC/Plumbing/Arch Items (entering)		6/10 – 6/11	100
		Total Truck Trips	**14,890**

1 Deconstruction debris, rock spoils, and soil would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.

Interior mechanical, electrical, plumbing, HVAC, security, and other building systems would be installed, and offices, storage, and parking areas constructed on the various levels of the new facility. Construction activity for the midblock public parking garage would require temporary closure of the curb lanes and portions of the sidewalks along the south and north sides of West 35th Street near the center of the block, leaving one travel lane and a temporary protected pedestrian passageway remaining. For a limited time during construction the entire street may be closed.

6. Eastern Portion of Caemmerer Yard

a) Description of Construction and Techniques

Construction at the eastern portion of Caemmerer Yard (Blocks 702 and 704) would create a public open space on a deck over the rail yard and house the eastern half of the proposed replacement Quill Bus Depot. The deck would extend south from West 33rd Street to West 30th Street between Tenth and Eleventh Avenues. The depot would be located under the southern extent of the deck.

Construction would begin with site preparation, including dismantling the segment of the High Line between Tenth and Twelfth Avenues, deconstruction of the masonry structure that extends along the length of the block, and relocation of the temporary support facilities associated with construction of the DEP No. 3 Water Tunnel, all located between West 30th Street and the rail yard. The DEP currently uses this area for an access shaft to the water tunnel, space for an electrical substation, and as a laydown area for construction materials. The details relating to the relocation of the DEP facilities have not been finalized; however, it is anticipated that these facilities would be relocated across West 30th Street to the eastern end of Block 701.

Construction on Block 702 (bounded by West 30th Street, the rail yards, Tenth Avenue, and Eleventh Avenue) would require excavation and construction of foundation walls for the replacement Quill Bus Depot. Retaining walls for excavation would comprise a secant wall along the north side and sheeting around the remainder of the perimeter.

After the retaining walls have been installed, excavation of earthen materials would occur to a depth necessary to accommodate the eastern portion of the Quill Bus Depot. After excavation of earthen and bedrock materials, a concrete slab would be poured – the floor of the first level. Foundation walls, integrated with the retainment sheeting and secant walls, would then be constructed. A supported slab – the floor of the second level – would then be installed. Structural steel for the walls that extend above the ground surface to the bottom surface of the platform would be attached to the foundation walls, and concrete walls would complete the shell of the depot.

Retaining walls would be grouted to limit groundwater infiltration. Dewatering would be necessary during construction, and if necessary, would consist of an on-site pre-treatment system of granular activated carbon for treatment of hydrocarbon contaminants and after-treatment discharge to City sewers or, with an appropriate discharge permit, to the Hudson River.

Caissons would support the Quill Depot foundation walls and would provide foundations for the platform support columns.

b) Sequencing, Equipment, Materials, and Transportation

Design for the eastern portion of Caemmerer Yard would begin in 2006, and construction would begin in April 2008 and last until 2011. (As is the case with other elements of the Proposed Action, in order to capture the reasonable worst-case condition for construction-related impacts, it is assumed for the purposes of this analysis that construction at the eastern portion of Caemmerer Yard would be complete prior to 2010.) Techniques and equipment for construction here would be similar to that used for construction at the western portion of Caemmerer Yard, including the platform and accommodations for the replacement Quill Bus Depot. It is assumed that the curb lane and sidewalk along the north side of West 30th Street would be closed for the duration of construction at this site, from mid-2008 through 2009. Table 23-13 provides information regarding spoils and debris exiting the site, building materials entering the site, and the number of truck trips required to transport this material.

TABLE 23-13
MATERIALS ENTERING AND SPOILS EXITING THE EASTERN PORTION OF CAEMMERER YARD AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Asphalt (exiting)	5,560 cy	4/05 – 8/05	370[1]
Building Deconstruction Debris (exiting)	5,310 cy	4/05 – 8/05	295[2]
Structure Deconstruction Debris (exiting)	170 tons	4/05 – 8/05	15[4]
Rock Spoils (exiting)	87,750 cy	6/05 – 3/06	5,850[1]
Soil Removal (exiting)	216,700 cy	6/05 – 3/06	14,447[1]
Backfill (entering)	12,100 cy	1/06 – 4/06	810[1]
Shotcrete/Concrete (entering)	70,000 cy	2/06 – 12/08	7,000[3]
Steel (entering)	23,000 tons	2/06 – 12/08	1,000[4]
Miscellaneous	25,000 tons	6/05 – 12/09	2,500
		Total Truck Trips	**32,287**

Source: Turner Construction Company, 2003.
1 Soil, asphalt and rock spoils would be transported in 15 cy capacity trucks.
2 Assuming 30 cy dumpsters, 60 percent full.
3 Concrete and shotcrete would be transported in 10 cy capacity trucks.
4 Assuming 25 tons of steel per truck.

7. Construction Activities Associated with Projected Development

a) Description of Construction and Techniques

Development prior to 2010 anticipated under the reasonable worst-case development scenario is expected to total approximately 5.6 million square feet—2.7 million square feet of office use, 142,500 square feet of retail, and 2,673 housing units. For the purposes of the first Construction Analysis Year, 2006, it is assumed that development of one typical 60-story office tower and one typical 500-unit residential tower would occur within the Project Area. As discussed in Chapter 2, "Description of the Proposed Project," of this document, commercial and residential development prior to 2010 is expected to occur at up to seven specified sites. These specific locations were examined and, in order to project the reasonable worst-case in terms of construction impacts, locations for development analysis were selected.

The commercial development selected for analysis is Projected Development Site 33, located at the northwest corner of West 31st Street and Ninth Avenue. This site, which is relatively close to construction at Penn Station (Farley Building) and the eastern portion of Caemmerer Yard, is projected for location of a 2.2 million-square-foot office building with retail use at the base. The residential development selected for analysis would be located on West 41st Street (south side) west of Tenth Avenue (Projected Development Site 14). For this analysis, this site is projected to contain approximately 500 residential units plus ground-floor retail use.

Construction of the commercial building is estimated to take 34 to 36 months from start of foundation excavation to occupancy. It is assumed that the building would be supported by spread footings supported on rock, with a steel superstructure and glass curtain wall. An estimate of construction material amounts and excavation volumes, and associated truck trips required for transportation of this material, is provided in Table 23-14. Construction of the residential building is estimated to take 34 to 36 months from start of foundation excavation to occupancy by tenants. This structure is assumed to be sized for 500 units, with an average unit size of 1,000 square feet, and consist of one 25-story structure with two below-grade levels for accommodating off-street parking, concierge service, and laundry facilities. It is assumed that the structure would be supported on piles driven down to bedrock and include a structural steel frame with glass curtain wall-type design. Construction material amounts and excavation volumes, and associated truck trips required for transportation of these materials, are provided in Table 23-15.

TABLE 23-14
MATERIALS ENTERING AND SPOILS EXITING COMMERCIAL DEVELOPMENT AT THE BROOKFIELD SITE AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Spoil Removal (exiting)	60,000 cy	7/06 – 12/06	4,000[1]
Substructure Concrete (entering)	6,000 cy	5/06 – 12/06	600[2]
Superstructure Concrete (entering)	37,500 cy	12/06 – 6/07	3,750[2]
Structural Steel (entering)	37,500 tons	6/07 – 12/07	1,500[3]
Glass Curtain Wall (entering)	1,200,000 sf	12/07 – 6/08	1,200
Dry Wall (entering)	1,800,000 sf	6/08 – 12/08	450
Misc Mech/Elec/HVAC/Plumbing/Arch Items	11,250 tons	6/08 – 12/08	1,125
		Total Truck Trips	**12,625**

1 Soil, asphalt, and rock spoils would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.

TABLE 23-15
MATERIALS ENTERING AND SPOILS EXITING RESIDENTIAL DEVELOPMENT AT WEST 41ST STREET AND TENTH AVENUE AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Spoil Removal (exiting)	32,500 cy	7/06 – 12/06	2,167[1]
Concrete (entering)	30,000 cy	5/06 – 12/06	3,000[2]
Piles and Structural Steel (entering)	8,000 tons	12/06 – 6/07	320[3]
Glass Curtain Wall (entering)	216,000 sf	6/07 – 12/07	220
Dry Wall (entering)	520,000 sf	12/07 – 6/08	130
Misc Mech/Elec/HVAC/Plumbing/Arch Items	5,000 tons	6/08 – 12/08	500
		Total Truck Trips	**6,337**

1 Soil and asphalt would be transported in 15 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.

b) Sequencing, Equipment, Materials, and Transportation

The sequencing of construction at the Brookfield Site and at West 41 Street and Tenth Avenue is unknown at this time. However, for this impact assessment, a reasonable worst-case scenario involves construction at these sites concurrent with construction of proximate elements of the Proposed Action, i.e., ready for tenants prior to 2010. As such, the following sequencing does not reflect the actual dates of construction activity at these sites. It is expected that some lane and sidewalk closures would be necessary in the vicinity of construction. If such closings are necessary, the developer would identify lanes and/or sidewalks proposed to be closed in a Maintenance and Protection of Traffic plan, which would require approval from the NYCDOT prior to implementation. For this analysis it is assumed that the curb lane and sidewalk along the north side of West 31st Street would be closed between Ninth Avenue and the Lincoln Tunnel approach road for the commercial construction. For the residential construction it is assumed that no lanes would be closed.

8. Combined Facility for DSNY and NYPD Tow Pound

a) Introduction

A combined facility for the DSNY and NYPD Tow Pound could be provided on the full block between West 29th and West 30th Streets, Eleventh and Twelfth Avenues (Block 675). As described in Chapter 3, "Analytical Framework," this FGEIS conservatively considers the impacts of potential relocation of these facilities to the Project Area, but they are not part of the Proposed Action. As such, the reasonable worst case would occur if construction of this facility were concurrent with other

construction in the vicinity; i.e., the Multi-Use Facility, the Convention Center Expansion, the new Quill Bus Depot, etc. Therefore, construction of this facility is analyzed for the 2006 construction analysis year.

As currently contemplated, the combined facility would contain one level for each use and one level that would be shared by both uses. The lowest level would be below grade at elevation -12 feet and the two above-grade levels would be at approximate elevations of +8 feet and +30 feet. Grade rises along West 30th Street and Eleventh Avenue, so that from the street it would appear to be a one-story, 20-foot-high building.

b) Description of Construction and Techniques

No construction plans for the facility have been developed at this time. However, an evaluation can be pursued by assuming that this facility would be constructed consistent with known building practices for similar construction in Manhattan. It is therefore assumed that (1) the probable design would incorporate a basement slab supported on piles that extend to bedrock; (2) no retaining walls would be used during excavation; and (3) wall and floors would be constructed with reinforced concrete. These assumptions are used to assess reasonable worst-case impacts in the development of the facility.

Several masonry- and metal-sided structures and parking lots that presently occupy the property would be deconstructed and the spoils and waste removed from the site. The property would then be excavated, graded, and compacted to an approximate elevation of -14 feet, which would form the bottom of the basement level slab for the new facility. Piles and pile caps would be installed, followed by pouring of the structural concrete slab. Sidewalls and upper level slabs would follow, with the roof level being installed and forming the base of a new public park at an elevation of approximately +48 feet.

Interior mechanical, electrical, plumbing, HVAC, security, and other building systems would be installed, and offices, storage, and parking areas constructed on the various levels of the new facility.

c) Sequencing, Equipment, Materials, and Transportation

For this analysis, it is assumed that because of the amount of time required to acquire the properties, construction activity would begin in mid-2005. The first activity associated with the construction of the facility would be the deconstruction of on-site structures and the removal by truck of the spoils and waste. Equipment needed for this work would include front-end loaders, a bulldozer, a backhoe, a cherry picker, dump trucks, and jackhammers. Following completion of the deconstruction, the area would be graded using a bulldozer and/or scraper/grader, and the area would be excavated. Dewatering and the use of dewatering pumps could be necessary during this stage.

With the completion of excavation, piles would be installed to bedrock, followed by installation of the reinforced, structural concrete slab. Equipment utilized would include construction material delivery trucks, pile drivers, and smaller hand-operated equipment. Installation of walls and the intermediate and roof levels would follow, utilizing similar equipment. Installation of HVAC, mechanical, electrical and plumbing, and other building systems and interior furnishings would follow. Finally, architectural and landscaping features would be installed for the rooftop open space, using delivery trucks and hand equipment. It is assumed that for construction on Block 675 the curb lane and sidewalk would be closed along the north side of West 29th Street between Eleventh and Twelfth Avenues, and the curb lane and sidewalk would be closed along the west side of Eleventh Avenue between West 29th and West 30th Streets. Construction material amounts and excavation volumes and associated truck trips required for transportation of these materials are provided in Table 23-16.

TABLE 23-16
MATERIALS ENTERING AND SPOILS EXITING BLOCK 675 AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Deconstruction Debris (exiting)	10,000 cy	7/05 – 10/05	500[1]
Excavated Soil (exiting)	113,000 cy	8/05 – 12/05	5,650[1]
Piles and Caps (entering)	1,000 tons	10/05 – 3/06	40[2]
Concrete (entering)	34,500 cy	12/05 – 6/06	3,450[3]
Reinforcing Steel (entering)	5,000 tons	12/05 – 6/06	200[2]
Misc Mech/Elec/HVAC/Plumbing/Arch Items	-	9/05 – 12/06	500
		Total Truck Trips	**10,340**

1 Due to the proximity of the site to Eleventh Avenue, deconstruction debris and soil would be transported in 20 cy capacity trucks.
2 Assuming 25 tons of steel per truck.
3 Concrete would be transported in 10 cy capacity trucks.

9. Impacts and Mitigation

a) Land Use

Impact Assessment

Construction activities would temporarily and unavoidably affect land use in the vicinity of construction by changing the current land use to a land use comprising construction activity. However, all construction staging and laydown areas for the Proposed Action would occur either within the footprint of the various construction sites or within portions of sidewalks and curb and travel lanes of public streets adjacent to the construction sites. Additionally, adherence to provisions of the NYC Building Code, such as the erection of construction fencing, would reduce potentially undesirable views of construction sites and buffer noise emitted from the sites. No significant adverse impacts to land use are anticipated.

In addition to on-site and adjacent lane and sidewalk areas, a laydown area located between West 35th and West 36th Streets adjacent to and east of Eleventh Avenue would be used for subway construction. The use of these areas would be temporary and limited to the construction period, which ranges from approximately one to five years.

A large portion of the construction activity associated with the Proposed Action prior to 2010 would occur between Eleventh and Twelfth Avenues. Land use in this area includes transportation infrastructure, bus parking, and truck marshalling. Construction of the DSNY Garage and NYPD Tow Pound facility (Block 675), the platform over Caemmerer Yard (Block 676) and the Convention Center truck marshalling yard (Block 769) is not expected to adversely affect land use in the area. Construction of the Multi-Use Facility would occur entirely within Caemmerer Yard and would be coordinated with ongoing train operations in the yard. No significant adverse impacts to land use are anticipated.

Expansion of the Convention Center would occur such that no exhibition space is lost during the construction period, and in a manner that would not significantly affect ongoing Convention Center operations. Construction of the Convention Center Hotel would affect residents of the tower located on the western half of the block between Eleventh and Twelfth Avenues and West 41st and West 42nd Streets (Block 1089) by temporarily changing the land use on the eastern portion of the block from that of a parking lot to that of a construction site.

Construction activities that would occur east of Eleventh Avenue are more likely to affect land use. The cut-and-cover excavation and other excavation and construction associated with the subway station at West 41st and Tenth Avenue would be proximate to residential buildings and businesses, and construction for the fan plant on West 40th Street between Eighth and Ninth Avenues would be adjacent to residential and commercial/retail land uses. However, disruptive construction activities

such as cut-and-cover excavation and blasting are expected to be of short duration, and impacts would be temporary.

Construction of an office tower on Projected Development Site 33 would be across West 31st Street from a residential apartment building and commercial/office space. However, this development site is currently a parking lot located adjacent to rail yards and across the Lincoln Tunnel approach road from a large commercial building. Significant adverse impacts to land use are not anticipated.

b) Neighborhood Character

Impact Assessment

Construction of elements of the Proposed Action would change the character of neighborhoods in the vicinity of construction activity. Depending on the specific construction site, the change would be more or less pronounced. Construction on sites west of Eleventh Avenue and south of West 34th Street, such as the Multi-Use Facility, would temporarily change the character of the neighborhood from one of transportation and industrial uses to one of construction activity. Construction of the Terminal Station, the Midblock Park and Boulevard System, and the midblock parking garage would occur in an area characterized by transportation and industrial uses. The existing uses do not contribute to a vibrant neighborhood character, and their replacement with construction activities would not result in significant adverse impacts to neighborhood character.

Construction associated with the expansion of the Convention Center would be temporary and isolated from the functioning portion of the facility as much as possible. It is anticipated that no loss of usable convention space would occur as a result of construction activity.

Construction of the Intermediate Station, the Retrieval Site L, and the residential tower at Development Site 14 would occur in an area with more residential characteristics than that found near construction sites to the west. A residential tower with ground floor retail stores is located between West 41st and West 42nd Streets west of Tenth Avenue, and a church is located across West 41st Street from the residential tower. On the south side of West 41st Street between Tenth and Dyer Avenues is a campus of Hunter College and Covenant House. Temporary changes to the character of this area are anticipated due to the construction of the subway and the private residential development in this area. The presence of heavy equipment such as cranes, excavators, trucks and loaders, and other construction site requirements (field offices, portable sanitary facilities, etc.) would temporarily change the character of this neighborhood.

Construction of facilities at Launch Site A would occur in a commercial neighborhood with art galleries adjacent and nearby. The presence of cranes, earth moving and loading equipment, and other heavy equipment would temporarily affect the character of this neighborhood. Spoils from TBM operation would be removed from this site. Removal of this material would involve trucks queuing, loading, and departing the site from 7:00 AM until 11:00 PM for six days a week. If a vertical conveyor is used to remove spoils from the shaft, the conveyor would be visible and audible in the area surrounding the site.

Construction at Retrieval Site L and Launch Site A would continue for approximately five years. Measures to minimize noise emanating from these sites and views of the construction sites from off-site would include noise/visual barriers located along the perimeter of the site. The noise barriers would be 20 to 30 feet tall and constructed of timber, steel, or concrete. While such enclosures would block noise from and limit views into the construction sites where they are employed, they would themselves be visually intrusive. Such barriers would block views near buildings and could limit views from windows on the lower floors. Also, because of their proximity to building façades and windows, enclosures would block some light for those windows. The use of tall barriers or enclosures would affect views from proximate lower floor windows. The movement of dust to off-

site location would be controlled by spraying, with water or other dust suppression agents, appropriate portions of the sites.

Cut-and-cover construction along West 41st Street would occur for approximately nine months. After construction, the street and sidewalk would be rebuilt.

Measures used to reduce the effects on character of the neighborhood caused by construction of the residential development on Projected Development Site 14 would likely consist of construction fencing and dust suppression measures similar to those described above. In addition, particularly noisy construction operations would not occur during periods when services or other functions are being conducted in the church located directly west of the site. Therefore, no significant adverse impacts to neighborhood character would result from the construction of the Proposed Action.

c) Socioeconomic Conditions

Impact Assessment

Construction activities related to the Proposed Action would, in some instances, temporarily affect socioeconomic conditions in the vicinity of above-ground construction. This would occur where construction activities require closing lanes or portions of the sidewalk in front of businesses that rely on pedestrian traffic or curbside deliveries. These effects would also be expected because construction fencing and sidewalk sheds would reduce visibility of business signage. Lane and sidewalk closures and reduced signage visibility would be limited to two areas. The first area would be located along the south side of West 40th Street from the corner of Eighth Avenue extending west to a point approximately midway between Eighth and Ninth Avenues, on either side of Site N. Businesses located at street level to the east of Site N on West 40th Street include a fast food restaurant, a tobacco/Lotto shop, a liquor store, and several video stores. A gym and residences are located above the street level in this area. West of Site N is a Department of Parole facility. The second area of potential impacts is located along the north side of West 41st Street extending west from Tenth Avenue for approximately 200 feet, and along the south side of West 41st Street extending east from Tenth Avenue to Dyer Avenue. An apartment building with ground floor retail and the entrance to a below-grade parking garage are located to the west of Tenth Avenue. The Covenant House and a campus of Hunter College are nearby. Delivery of merchandise and access to business and facilities would be disrupted in these areas. In instances where lane and sidewalk closures would be required, access to business would be maintained. Signage would be relocated to the street side of sidewalk sheds to maximize visibility. If necessary, NYCT will coordinate with businesses to address access/delivery issues and provide special loading and unloading areas on nearby side streets to locations where access would be curtailed in front of buildings during construction. No significant adverse impacts in these areas are anticipated.

Construction related to the subway extension, private development on Projected Development Sites 33 and 14, and the multi-agency municipal facility for the DSNY and NYPD Tow Pound operations would predominantly occur on acquired parcels that would be cleared of existing land uses. Because no businesses would remain on these parcels, adjacent lane and sidewalk closures would have no negative impact on these parcels (a discussion of the potential Socioeconomic effects of dislocating existing land uses is discussed in Chapter 5, "Socioeconomic Conditions"). For Launch Site A, the Terminal Station sites (the western end of the blocks between West 33rd and West 35th Streets and the laydown area between West 35th and West 36th Streets), and Retrieval Site L, all lane and sidewalk closures would apply only adjacent to the acquired parcels, and would not directly affect nearby business.

Because no businesses exist in the vicinity, effects to socioeconomic conditions are not expected as a result of construction activity associated with the Convention Center expansion and development of the Multi-Use Facility, including decking over Caemmerer Yard.

Economic benefits can be expected as a result of construction activity, particularly in the immediate vicinity of the construction sites. A large number of construction workers can be expected to patronize local eating and drinking establishments, convenience stores, neighborhood services and other local business.

d) Community Facilities

Impact Assessment

Construction activities are not expected to significantly impact community facilities in the Project Area. There are no public schools or public libraries within the Project Area.

Covenant House and a Hunter College campus are located on West 41st Street between Dyer and Tenth Avenues. Cut-and-cover excavation for construction of the Intermediate Station in this area would disrupt, but not prevent, access to these facilities for the period beginning approximately in the middle of June and ending in November 2006. A church is located on the south side of West 41st Street west of Tenth Avenue. Access to this facility would also be disrupted, though not prevented, due to cut-and-cover excavation during the same period. Access to all buildings by personnel from the NYPD, the FDNY, and emergency medical service personnel would be maintained at all times.

e) Open Space

Impact Assessment

The only open space expected to be affected by construction activity is located adjacent to and east of Eleventh Avenue between West 35th and West 36th Streets. This open space is controlled by the Convention Center and would be used for a laydown area for subway construction. The use of this property would extend through 2009. After this time it is anticipated that the property would be developed as allowed under the rezoning action (Projected Development Site 6). No other open space would be significantly affected by construction for the Proposed Action. Due to the nature of the surrounding neighborhood (i.e., lack of pedestrian activity, few residential developments, low population density), this open space is not heavily utilized, and its elimination would not constitute a significant adverse impact. Construction activity related to the Proposed Action would not result in impacts to any other public open space.

f) Historic and Archaeological Resources

Historical Resources Impact Assessment

There would be no adverse physical impacts to the NYCL and S/NR properties within 90 feet of proposed construction activities, because they would be protected by *TPPN #10/88* and other New York City Building Code regulations. Adherence to *TPPN #10/88* would protect the NYCL-designated and S/NR-listed resources adjacent to project-related construction, and no mitigation measures would be required. As described in Chapter 9, "Architectural Historic Resources", there would be no adverse physical impacts to architectural resources from construction of the Midblock Park and Boulevard System and the No. 7 Subway Extension, because the City would take protective measures against inadvertent construction damage that could result from construction activities under the control of a public agency. These protection measures would include consultation with the LPC and the OPRHP and the development and implementation of construction protection plans.

These plans would follow Department of Buildings (DOB) *TPPN #10/88,* and the guidelines described in Section 523 of Chapter 3F of the *CEQR Technical Manual* regarding procedures for the avoidance of damage to historic structures from adjacent construction, and they would be approved by the LPC and the OPRHP before any work commences. To establish and implement the plans, an engineering firm licensed to practice in the State of New York would develop the construction protection plans that would describe in detail deconstruction and construction procedures. The engineers would perform the following:

- Inspect adjacent architectural resources to ascertain pre-existing damage, existing structural distresses, and potential weakness in the structure;
- Establish protection procedures for architectural resources during project construction;
- Establish methods and materials to be used to repair or replace any elements of the architectural resources that could be damaged in spite of the precautions of the construction protection plan;
- Establish a monitoring program to measure vertical and lateral movement and vibration of the architectural resources within 90 feet of the project site; and
- Establish and monitor construction methods to limit vibrations to levels that would not cause structural damage to the nearby architectural resources.

The engineers in charge of monitoring would be empowered to issue "stop work" orders as required to prevent damage to adjacent architectural resources. Construction would not recommence until the appropriate City or State agency approves the steps taken to stabilize or prevent further damage to the structures.

Development could have adverse physical impacts on six architectural resources that are anticipated to remain on projected development sites or are located close enough (within 90 feet of proposed construction activities) to projected development sites to potentially be subject to adverse construction-related impacts from ground-borne construction-period vibrations, falling debris, and collapse. Development on these sites would occur as-of-right, and there would be no special protection—through construction protection plans and monitoring programs—for the S/NR-eligible and the NYCL-eligible resources against accidental damage resulting from adjacent construction activities. There would, however, be some limited protection afforded by existing DOB regulations regarding the protection of all structures adjacent to construction activities. These measures are limited in that they do not provide for construction protection measures that are specific to the conditions and potential weaknesses of adjacent resources or for the implementation of monitoring procedures.

In addition, it is possible that some of the S/NR-eligible and NYCL-eligible properties in the Project Area and 400-foot study area may become listed S/NR properties or designated NYCLs. If that were to occur, regulations applying to construction of the project components and any future development would afford some additional protection to the future listed or designated resources through implementation of DOB *TPPN #10/88*.

In addition, construction of the Multi-Use Facility, and development on the eastern portion of Caemmerer Yard, would result in the demolition of the High Line north of West 30th Street. The High Line has been identified by the State Historic Preservation Office (SHPO) as an historic resource, and Letters of Resolution have been entered into with SHPO with respect to mitigating this significant adverse impact (see Chapter 9, "Historical Resources").

Archaeological Resources Impact Assessment

No impacts to archaeological resources are anticipated due to construction activity prior to 2010.

g) Traffic

The 2006 analysis year construction traffic study area is bounded by West 43rd Street to the north, West 24th Street to the south, Eighth Avenue to the east and Twelfth Avenue to the west. Intersections within the study area were analyzed to assess the impacts of construction-related activity and traffic conditions projected in 2006. The selection of these intersections was based upon three key factors: the location of construction activity during the peak construction period; the number of trucks and anticipated truck routes to and from each construction site; and roadway restrictions due to

construction-related lane closures. Other factors also considered included the projected path of construction vehicles traveling to the various construction sites, their relationship to air quality and noise receptor locations, proximity to the proposed roadway lane closures, and roadway traffic volumes.

Twenty-one intersections within the study area were selected and used to analyze the potential for impacts related to construction activity on local avenues and streets. The locations of the intersections studied for construction conditions are presented in Table 23-17 and Figure 23-13.

TABLE 23-17
PROPOSED ACTION CONSTRUCTION ANALYSIS LOCATIONS

No.	North-South Street	East-West Street
1	Eighth Avenue	West 40th Street
2	Dyer Avenue	West 34th Street
3	Tenth Avenue	West 43rd Street
4	Tenth Avenue	West 42nd Street
5	Tenth Avenue	West 34th Street
6	Tenth Avenue	West 30th Street
7	Eleventh Avenue	West 40th Street
8	Eleventh Avenue	West 39th Street
9	Eleventh Avenue	West 38th Street
10	Eleventh Avenue	West 37th Street
11	Eleventh Avenue	West 36th Street
12	Eleventh Avenue	West 35th Street
13	Eleventh Avenue	West 34th Street
14	Eleventh Avenue	West 33rd Street
15	Eleventh Avenue	West 30th Street
16	Eleventh Avenue	West 29th Street
17	Eleventh Avenue	West 26th Street
18	Eleventh Avenue	West 25th Street
19	Twelfth Avenue	West 34th Street
20	Twelfth Avenue	West 30th Street
21	Twelfth Avenue	West 29th Street

Similar to the operational traffic analyses, the 2006 construction traffic analyses were conducted using the methodologies presented in the *CEQR Technical Manual*. Quantitative analyses were performed for signalized intersections using the analytical procedures described in the *Highway Capacity Manual (HCM), 2000*. The criteria presented in the *CEQR Technical Manual* were used to determine whether any significant traffic impacts are projected in the study area in 2006 as a result of construction of elements of the Proposed Action.

A total of 12 construction sites related to the Proposed Action were considered in the construction traffic analysis. The sites are listed in Table 23-18. Two analysis scenarios were developed for the 2006 conditions. For the Future Without the Proposed Action, it was assumed that construction of the various Proposed Action elements would not take place and no construction vehicles or lane closures would be included in the 2006 traffic network. For the Future With the Proposed Action, it was assumed that construction vehicles and lane closures due to construction of the various Proposed Action elements would be considered in the traffic analysis.

TABLE 23-18
PROJECTS INCLUDED IN THE PROPOSED ACTION TRAFFIC ANALYSIS

Site	Location	Construction Time Frame	Notes
Launch Site A	Eleventh Ave. at W. 25th St.	5/05 – 12/09	Part of No. 7 Line Subway Extension
Retrieval Site L	Tenth Ave. to Dyer Ave., W. 41st St. to W. 42nd St.	10/05 – 12/09	Part of No. 7 Line Subway Extension
Convention Center Expansion (Phases 1 & 2)	Eleventh Ave. to Twelfth Ave., W. 34th St. to W. 41st St.	4/05 – 12/09	Including Marshalling Yard
Convention Center Hotel	Eleventh Ave. at W. 41st St.	1/07 – 12/09	Part of Convention Center Expansion
Multi-Use Facility Site	Eleventh Ave. to Twelfth Ave., W. 30th St. to W. 33rd St.	4/05 – 9/09	
Eastern Portion of Caemmerer Yard	Tenth Ave. to Eleventh Ave., W. 30th St. to W. 33rd St.	4/05 – 12/09	Replacement Quill Depot & Midblock Park & Blvd.
Block 675	Eleventh Ave. at W. 30th St.	7/05 – 12/06	
Residential: Projected Development Site # 14	Tenth Ave. at W. 41st St.	1/06 – 12/08	Private Development
Brookfield Site: Projected Development Site # 33	Ninth Ave. at W. 31st St.	1/06 – 12/08	Private Development
W. 34th St. Station	Eleventh Ave. at W. 34th St.	10/06 – 12/09	Part of No. 7 Line Subway Extension
Site N	W. 40th St., between Tenth & Eleventh Aves.	6/07 – 9/09	Part of No. 7 Line Subway Extension
Midblock Park and Boulevard Construction	Between Tenth & Eleventh Aves.	12/08 – 12/09	
Midblock Parking Garage	Between Tenth & Eleventh Aves.	1/09 – 6/11	

Traffic Volume Development: 2006 Without the Proposed Action

The projected 2010 Future Without the Proposed Action traffic volumes include all planned and committed developments through 2010 as part of the background growth for the West Side of Manhattan. Since most of the background projects would be constructed and operational by 2006, it was determined that the 2010 Future Without the Proposed Action traffic volumes would be used as a base for the 2006 Future Without the Proposed Action traffic volumes. The 2006 Future Without the Proposed Action traffic volumes within the study area were developed by scaling back the 2010 Future Without the Proposed Action traffic volumes at the 21 intersections identified previously for the AM, midday, and PM peak hours using the 0.5 percent per year growth rate identified in the *CEQR Technical Manual* for this west-Midtown section of Manhattan. As a result, the 2006 Future Without the Proposed Action traffic volumes were 2 percent lower than the 2010 Future Without the Proposed Action traffic volumes for each corresponding location. The 2006 Future Without the Proposed Action AM, Midday, and PM peak hour volumes were compared with the Base Condition (2003) and the 2010 Future Without the Proposed Action volumes during the corresponding peak hours to confirm that they were within an acceptable range. The 2006 Future Without the Proposed Action traffic flow volumes developed for the weekday AM, Midday, and PM peak hours are presented in Appendix V, "Construction."

Traffic Volume Development: 2006 With the Proposed Action

The 2006 Future With the Proposed Action traffic volumes was developed by adding the Proposed Action construction vehicles from all project elements (see Table 23-18) to the 2006 Future Without the Proposed Action traffic volumes. The 2006 Future With the Proposed Action construction vehicle traffic flow volumes developed for the weekday AM, Midday, and PM peak hours are presented in Tables 23-23 and Table 23-24. The assumptions used to develop the 2006 Future With the Proposed Action construction conditions for elements of the Proposed Action are described in the following sections.

(a) Peak Construction Activity Determination

The vehicle trips generated by the proposed projects were assumed to be the result of the several construction activities, including the removal of excavation spoils and deconstruction debris, delivery of construction material, and workforce transportation requirements. The overlapping schedules for construction of elements of the Proposed Action, coupled with the period of maximum diesel-powered construction equipment usage, indicate that 2006 would be the period of maximum pre-2010 construction activity and maximum project-related construction vehicle traffic. As a result, the construction impact analyses were conducted for conditions projected to occur during this period.

(b) Construction Activity Assumptions

(i) Rock Spoils Removal

Trucking required for the removal of rock spoils would occur Monday through Saturday from 7:00 AM to 11:00 PM. It is assumed that the truck trips would be evenly spaced throughout the day. (This scenario would require some stockpiling of spoils at Launch Site A.) It is assumed that all spoils removal trips would use the Lincoln Tunnel to access points to the west.

(ii) Subway-Related Construction

Work shifts for subway construction would occur Monday through Saturday as follows:

- TBM operations (Launch Site A only) would comprise three spoils-generating shifts. These shifts are assumed to be:
  - Shift A – 7:00 AM to 3:00 PM
  - Shift B – 3:00 PM to 11:00 PM
  - Shift C – 11:00 PM to 7:00 AM

- All other subway-related construction (drill-and-blast and cut-and-cover mining, station finishes, etc.) would occur during two shifts. These shifts are assumed to be:
  - Shift 1 – 7:00 AM to 3:00 PM
  - Shift 2 – 3:00 PM to 11:00 PM

(iii) Non-Subway-Related Construction

In order to be conservative, it was assumed that construction work for all non-subway-related construction would be performed Monday through Saturday from 7:00 AM to 5:30 PM. Thus workers leaving in the evening would coincide with the PM peak period (5:00 PM – 6:00 PM).

(iv) Construction Material Deliveries

It is anticipated that material delivery trips for all construction activity would occur Monday through Saturday from 7:00 AM to 5:30 PM. These truck trips were assigned to the traffic network based upon the following assumptions:

- All concrete delivery trucks would originate from east of the Hudson River: one-third from the Bronx; one-third from Queens; and one-third from Brooklyn.

- All steel deliveries would originate from west of the Hudson River and would use the Lincoln Tunnel and the George Washington Bridge (GWB).

- All other construction material deliveries would originate as follows: one-half from west of the Hudson (Lincoln Tunnel and GWB); one-sixth each from, or through, the Bronx, Queens, and Brooklyn.

(v) Employees

It is assumed that workers would arrive within the hour prior to the start of their shift and leave within the hour after their shift ends. The automobile share (with taxis) of the modal split for construction workers traveling into the Project Area is assumed to be 21.8 percent. This was derived from 1990 U.S. Census Journey-to-Work data for the census tracts within the Project Area both east and west of Eleventh Avenue.

(vi) Projected Lane and Roadway Closures

The construction activities at Proposed Action element sites are expected to cause certain streets to be closed or certain traffic lanes and/or sidewalks to be closed. For example, West 39th, West 40th, and West 41st Streets between Eleventh and Twelfth Avenues would be closed in the 2006 Future With the Proposed Action to accommodate construction of the Convention Center Expansion and the new hotel. Table 23-19 lists the roads in the Project Area that would be subject to impacts by construction activities.

TABLE 23-19
2006 FUTURE WITH THE PROPOSED ACTION: ROAD AND LANE CLOSURES

Location	Related Project(s)	Traffic Impact
W. 41st St. (Between Eleventh & Twelfth Aves.)	Convention Center Expansion	Road partially closed
W. 40th St. (Between Eleventh & Twelfth Aves.)	Convention Center Expansion	Road entirely closed
W. 39th St. (Between Eleventh & Twelfth Aves.)	Convention Center Expansion	Road entirely closed
Eleventh Ave. (Between W. 36th & W. 39th Sts.)	Convention Center Expansion	West curb lane and sidewalk closed
W. 33rd St. (Between Eleventh & Twelfth Aves.)	Convention Center/Multi-Use Facility Platform	Road entirely closed
Eleventh Ave. (Between W. 33rd & W. 36th Sts.)	Terminal Station and Staging Areas	East curb lane and sidewalk closed
W. 36th St. (Between Tenth & Eleventh Aves.)	Terminal Station and Staging Areas	South curb lane and sidewalk closed for 1/3 of a block going east from Eleventh Ave.
W. 35th St. (Between Tenth & Eleventh Aves.)	Terminal Station and Staging Areas	North and South curb lanes and sidewalks closed for 1/3 of a block going east from Eleventh Ave.
W. 33rd St. (Between Tenth & Eleventh Aves.)	Terminal Station and Staging Areas	North curb lane and sidewalk closed for 1/3 of a block going east from Eleventh Ave.
Eleventh Ave. (Between W. 30th & W. 34th Sts.)	Multi-Use Facility	West curb lane and sidewalk closed
Twelfth Ave. (Between W. 30th & W. 34th Sts.)	Multi-Use Facility	East curb lane and sidewalk closed
W. 34th St. (Between Eleventh & Twelfth Aves.)	Multi-Use Facility	South curb lane and sidewalk closed
W. 30th St. (Between Eleventh & Twelfth Aves.)	Multi-Use Facility	North curb lane and sidewalk closed
W. 30th St. (Between Tenth & Eleventh Aves.)	Eastern portion of Caemmerer Yard	North curb lane and sidewalk closed
Eleventh Ave. (Between W. 29th & W. 30th Sts.)	Block 675	West curb lane and sidewalk closed
W. 29th St. (Between Eleventh & Twelfth Aves.)	Block 675	North curb lane and sidewalk closed
W. 26th St. (Between Tenth & Eleventh Aves.)	Launch Site A	South curb lane and sidewalk closed
Eleventh Ave. (Between W. 25th & W. 26th Sts.)	Launch Site A	East two curb lanes and sidewalk closed
W. 25th St. (Between Tenth & Eleventh Aves.)	Launch Site A	North curb lane and sidewalk closed
Tenth Ave. (Between W. 41st & W. 42nd Sts.)	Tunnel and Station Construction	East curb lane and sidewalk closed
W. 41st St. (Between Ninth & Tenth Aves.)	Tunnel and Station Construction	North curb lane and sidewalk closed for 1/3 of a block going east from Tenth Ave.
W. 40th St. (Between Eighth & Ninth Aves.)	Site N	South curb lane and sidewalk closed for 1/3 of a block going west from Eighth Ave.

(vii) Construction Trip Generation

The generation of construction traffic for the 13 project sites projected within the study area was developed based on individual construction information provided for each of these projects. The construction information was developed based on input from NYCDOT and from NYCT and the City. Construction vehicles projected to be used for the various elements would be comprised of light vehicles, such as contractor vans and pick-up trucks, and heavy vehicles, such as concrete mixers, dump trucks, trailers, etc. The construction activities projected to occur in the peak analysis year were based on the percentages of construction vehicles shown in Table 23-20.

TABLE 23-20
PROJECTED CONSTRUCTION VEHICLE PERCENTAGES

Vehicle Type	Percentage
Rock Spoil (Heavy Vehicles)	31.3%
Concrete (Heavy Vehicles)	9.0%
Steel (Heavy Vehicles)	1.5%
Other Construction Materials (Heavy Vehicles)	9.0 %
Labor/Employees (Light Vehicles)	49.2%

For analysis purposes, it is assumed that all dump trucks, concrete mixers, and trailers carrying structural steel are heavy vehicles, while labor/employee vehicles were assumed to be light vehicles. The totals of daily peak construction period vehicles projected for each of the various elements under construction in 2006, as percentages of heavy and light vehicles, are summarized in Table 23-21.

TABLE 23-21
2006 DAILY CONSTRUCTION VEHICLES

Proposed Action Project Sites	Heavy Vehicles		Light Vehicles		Total Vehicles
	No.	Percentage	No.	Percentage	
Launch Site A	233	51.1%	0	0.0%	233
Retrieval Site L	4	0.9%	0	0.0%	4
Convention Center	4	0.9%	5	15.2%	9
Convention Center Hotel	Included in CC Expansion		Included in CC Expansion		-
Multi-Use Facility	20	4.4%	16	48.5%	36
Eastern Portion of Caemmerer Yard	9	2.0%	3	9.1%	12
Block 675	21	4.6%	5	15.2%	26
West 41st St. Residential Dev.	31	6.8%	2	6.1%	33
Brookfield Site	34	7.5%	2	6.1%	36
West 34th Street Station	100	21.9%	0	0.0%	100
Site N	0	0.0%	0	0.0%	0
Midblock Park & Blvd. System	0	500.0%	0	500.0%	2445
Total Vehicles	**2736**	**100%**	**198**	**100%**	**10269**

(viii) Construction Trip Distribution

The assignment of construction vehicles to the Manhattan traffic network was based on optimizing the use of existing NYCDOT truck routes and by designating that certain roadways be used for particular truck trips. For example, northbound truck trips to the Bronx and the GWB were routed along Tenth Avenue; eastbound truck trips to Queens via the Queens-Midtown Tunnel were routed along West 34th Street; and southbound truck trips to Brooklyn via the Brooklyn-Battery Tunnel were routed along Twelfth Avenue/Route 9A. The distribution of construction vehicles to the traffic network is summarized in Table 23-22.

TABLE 23-22
TYPICAL DAILY CONSTRUCTION VEHICLE DISTRIBUTION

Vehicle Type	Percentage
Rock Spoil (Heavy Vehicles)	100% West of Hudson via Lincoln Tunnel
Concrete (Heavy Vehicles)	100% Outer Boroughs • 33% The Bronx (via Harlem River Crossings) • 33% Queens (via Queens Midtown Tunnel) • 33% Brooklyn (via Brooklyn-Battery Tunnel)
Steel (Heavy Vehicles)	100% West of Hudson Via GWB
Other Construction Materials (Heavy Vehicles)	50% West of Hudson • 67% via Lincoln Tunnel • 33% via GWB 50% Outer Boroughs • 33% The Bronx (via Harlem River Crossings) • 33% Queens (via Queens Midtown Tunnel) • 33% Brooklyn (via Brooklyn-Battery Tunnel)
Labor/Employees (Light Vehicles)	48% West of Hudson • 35% via Lincoln Tunnel • 35% via Holland Tunnel • 30% via GWB 52% Outer Boroughs • 33% The Bronx (via Harlem River Crossings) • 33% Queens (via Queens Midtown Tunnel) • 33% Brooklyn (via Brooklyn-Battery Tunnel)

(ix) Construction Trip Assignment

(a) Construction Vehicles

A 16-hour work day (7:00 AM to 11:00 PM) was assumed for all work projects pertaining to subway construction (e.g., Launch Site A, Retrieval Site L, Terminal Station). The primary travel routes to be used by subway-related construction vehicles is Tenth Avenue (northbound), Eleventh Avenue (southbound), and West 34th Street (eastbound/westbound), because the majority of truck trips to/from these sites would be rock spoil trucks which would go west of the Hudson River via the Lincoln Tunnel.

A 10.5-hour (7:00 AM to 5:30 PM) was assumed for all non-subway-related projects. Since these construction sites are scattered throughout the Project Area and truck trips to/from these sites would go in all directions, there are no set travel routes. However, as previously mentioned, particular routes have been designated as key north-south and east-west travel routes for trucks. The hourly number of construction vehicles projected to be generated by these elements in 2006 was added to the 2006 background traffic network. The total number of construction vehicles assigned to individual intersections in the study area by the construction of these projects is presented in Table 23-23.

TABLE 23-23
2006 FUTURE WITH THE PROPOSED ACTION: OUTBOUND CONSTRUCTION HEAVY VEHICLE TRIPS AT ANALYSIS INTERSECTIONS – AM, MIDDAY AND PM PEAK PERIODS

No.	Intersection	Approach				Total
		Eastbound	Westbound	Northbound	Southbound	
1	Eighth Ave. at West 40th St.	0	-	0	-	0
2	Dyer Ave. at West 34th St.	3	3	-	23	29
3	Tenth Ave. at West 43rd St.	-	0	4	-	4
4	Tenth Ave. at West 42nd St.	0	0	22	-	22
5	Tenth Ave. at West 34th St.	12	24	18	-	54
6	Tenth Ave. at West 30th St.	0	-	17	-	17
7	Eleventh Ave. at West 40th St.	-	-	0	28	28
8	Eleventh Ave. at West 39th St.	-	0	0	5	5
9	Eleventh Ave. at West 38th St.	-	-	-	5	5
10	Eleventh Ave. at West 37th St.	0	0	0	5	5
11	Eleventh Ave. at West 36th St.	-	-	0	5	5
12	Eleventh Ave. at West 35th St.	-	0	0	5	5
13	Eleventh Ave. at West 34th St.	6	19	-	5	30
14	Eleventh Ave. at West 33rd St.	-	0	-	18	18
15	Eleventh Ave. at West 30th St.	0	-	-	19	19
16	Eleventh Ave. at West 29th St.	-	0	-	17	17
17	Eleventh Ave. at West 26th St.	0	-	-	17	17
18	Eleventh Ave. at West 25th St.	-	0	-	17	17
19	Twelfth Ave. at West 34th St.	-	1	4	1	6
20	Twelfth Ave. at West 30th St.	0	0	4	2	6
21	Twelfth Ave. at West 29th St.	0	0	2	2	4

Sources: Source: Louis Berger Group, Inc.

(b) Employee Vehicles

According to the working hours and shifts assumed for non-subway-related construction sites, AM inbound workers and midday shift change workers are not expected to travel during the AM peak hour (8:00 AM – 9:00 AM) and midday peak hour (12:00 PM – 1:00 PM). However, construction employees that are projected to leave work at the end of the working day (5:30 PM) are expected to coincide with the PM peak period (5:00 PM – 6:00 PM). Therefore, outbound employee light vehicle trips have been added to the analysis of the PM peak period. Employee vehicles are assumed to use the following travel routes:

- The Bronx & Westchester – Twelfth Avenue/Route9A North to Henry Hudson Parkway
- Brooklyn & Staten Island – Twelfth Avenue/Route 9A South to Brooklyn-Battery Tunnel
- Queens & Long Island – West 34th Street East to Queens Midtown Tunnel
- New Jersey via GWB - Twelfth Avenue/Route9A North to Henry Hudson Parkway
- New Jersey via Holland Tunnel – Twelfth Avenue/Route 9A South
- New Jersey via Lincoln Tunnel – Eleventh Avenue (at West 40th Street) Entrance

A summary of the outbound employee light vehicles assigned to the traffic network is presented in Table 23-24.

TABLE 23-24
2006 FUTURE WITH THE PROPOSED ACTION: OUTBOUND EMPLOYEE LIGHT VEHICLE TRIPS AT ANALYSIS INTERSECTIONS – PM PEAK PERIOD

No.	Intersection	Approach				Total
		Eastbound	Westbound	Northbound	Southbound	
1	Eighth Ave. at West 40th St.	0	NA	0	NA	0
2	Dyer Ave. at West 34th St.	6	0	NA	0	6
3	Tenth Ave. at West 43rd St.	NA	0	0	NA	0
4	Tenth Ave. at West 42nd St.	0	0	10	NA	10
5	Tenth Ave. at West 34th St.	5	0	5	NA	10
6	Tenth Ave. at West 30th St.	0	NA	0	NA	0
7	Eleventh Ave. at West 40th St.	NA	NA	0	0	0
8	Eleventh Ave. at West 39th St.	NA	0	0	5	5
9	Eleventh Ave. at West 38th St.	NA	NA	NA	0	0
10	Eleventh Ave. at West 37th St.	0	0	0	0	0
11	Eleventh Ave. at West 36th St.	NA	NA	0	0	0
12	Eleventh Ave. at West 35th St.	NA	0	0	0	0
13	Eleventh Ave. at West 34th St.	13	2	NA	0	15
14	Eleventh Ave. at West 33rd St.	NA	0	NA	0	0
15	Eleventh Ave. at West 30th St.	0	NA	NA	1	1
16	Eleventh Ave. at West 29th St.	NA	0	NA	0	0
17	Eleventh Ave. at West 26th St.	0	NA	NA	0	0
18	Eleventh Ave. at West 25th St.	NA	0	NA	0	0
19	Twelfth Ave. at West 34th St.	NA	7	5	2	14
20	Twelfth Ave. at West 30th St.	0	0	5	9	14
21	Twelfth Ave. at West 29th St.	0	NA	0	9	9

Source: Louis Berger Group, Inc.
NA indicates that no such approach exists

(c) Impact Assessment

The 2006 Future Without the Proposed Action analysis results for the AM, Midday, and PM peak hours were compared to the 2006 Future With the Proposed Action results to determine the impact of the Proposed Action construction activities on traffic in the study area. A total of 21 signalized intersections were analyzed in the study area for construction traffic impacts. The comparison of the analysis results between the two conditions is summarized in Table 23-25.

TABLE 23-25
2006 FUTURE WITH THE PROPOSED ACTION COMPARED TO 2006 FUTURE WITHOUT THE PROPOSED ACTION: TRAFFIC LEVEL OF SERVICE (LOS) SUMMARY COMPARISON

Intersection Approach LOS	Without Proposed Action			With Proposed Action		
	AM	MD	PM	AM	MD	PM
Overall LOS A/B	31	33	31	31	33	32
Overall LOS C	10	9	13	10	9	9
Overall LOS D	9	8	11	7	5	11
Overall LOS E/F	5	5	0	5	6	1
Total	551	551	551	531	531	531

Source: Louis Berger Group, Inc.
1 Several streets would be closed as part of the Proposed Action – West 39th and West 40th Streets between Eleventh and Twelfth Avenues, West 33rd Street between Eleventh and Twelfth Avenues, and the eastern portion of West 41st Street between Eleventh and Twelfth Avenues – and approaches to these streets from Eleventh Avenue were excluded from analysis for the Future With the Proposed Action.

During the AM peak hour (8:00 AM - 9:00 AM), the number of analyzed intersections projected to operate at an overall LOS E or F in the 2006 Future Without Proposed Action is five. This is projected to remain at five under the 2006 Future With the Proposed Action. Another nine

intersections are projected to operate at overall LOS D in the 2006 Future With the Proposed Action during this period.

During the Midday peak hour (12:00 PM - 1:00 PM), the number of analyzed intersections projected to operate at an overall LOS E or F in the 2006 Future Without the Proposed Action is five. This is projected to increase to six in the 2006 Future With the Proposed Action. Another eight intersections are projected to operate at overall LOS D in the 2006 Future With the Proposed Action during this period.

During the PM peak hour (5:00 PM - 6:00 PM), there are no intersections projected to operate at an overall LOS E or F in the 2006 Future Without the Proposed Action. This is projected to increase to one under the Future With the Proposed Action (2006). Another 11 intersections are projected to operate at overall LOS D in the 2006 Future With the Proposed Action during this period.

Projected Impacts

The 2006 Future With the Proposed Action was compared to the 2006 Future Without the Proposed Action to determine the impact of the Proposed Action construction traffic on the study area during the AM, Midday, and PM peak periods. Table 23-26 summarizes the locations and time periods projected to be affected by traffic impacts during the 2006 Future With the Proposed Action as a result of the Proposed Action construction activity.

TABLE 23-26
2006 FUTURE WITH THE PROPOSED ACTION COMPARED TO 2006 FUTURE WITHOUT THE PROPOSED ACTION: TRAFFIC IMPACT ASSESSMENT

No.	Intersection	Potential Impacts During Analysis Periods		
		AM	MD	PM
1	Eighth Avenue at West 40th Street	-	-	-
2	Dyer Avenue at West 34th Street	-	-	-
3	Tenth Avenue at West 43rd Street	-	-	-
4	Tenth Avenue at West 42nd Street	-	-	-
5	Tenth Avenue at West 34th Street	-	●	-
6	Tenth Avenue at West 30th Street	-	-	-
7	Eleventh Avenue at West 40th Street	-	-	-
8	Eleventh Avenue at West 39th Street	-	-	-
9	Eleventh Avenue at West 38th Street	-	-	-
10	Eleventh Avenue at West 37th Street	-	-	-
11	Eleventh Avenue at West 36th Street	-	-	-
12	Eleventh Avenue at West 35th Street	-	-	-
13	Eleventh Avenue at West 34th Street	●	●	-
14	Eleventh Avenue at West 33rd Street	-	-	-
15	Eleventh Avenue at West 30th Street	-	-	-
16	Eleventh Avenue at West 29th Street	-	-	-
17	Eleventh Avenue at West 26th Street	-	-	-
18	Eleventh Avenue at West 25th Street	-	-	-
19	Twelfth Avenue at West 34th Street	-	-	●
20	Twelfth Avenue at West 30th Street	-	-	-
21	Twelfth Avenue at West 29th Street	-	-	-

● Represents Significant Adverse Impacts

During the AM peak period, Eleventh Avenue at West 34th Street is the only intersection projected to be significantly impacted by construction-related traffic. The same intersection is also projected to be significantly impacted during the Midday period, as well as Tenth Avenue at West 34th Street. In the PM peak period, Eleventh Avenue at West 34th Street is the only intersection projected to be significantly impacted by construction-related traffic.

Mitigation

Mitigation measures would be applied to intersections projected to be significantly impacted by construction traffic in the 2006 Future With the Proposed Action AM, Midday and PM periods. Some common mitigation measures that would be applied would include:

- Shifting green signal time from one approach to another;
- Daylighting an existing parking lane for use as a travel lane; and
- Lane configuration/utilization adjustments.

With the application of these measures all of the significant adverse traffic impacts would be mitigated.

TABLE 23-27
LEVEL OF SERVICE AT INTERSECTIONS SUBJECT TO IMPACTS

	2006 Future Without the Proposed Action	2006 Future With the Proposed Action	2006 Future With the Proposed Action With Mitigation
Eleventh Avenue at West 34th Street (AM) Westbound Approach			
Delay (Seconds)	47.4	60.9	44.4
LOS (LOS)	D	E	D
Tenth Avenue at West 34th Street (Midday) Eastbound Approach			
Delay (Seconds)	86.1	92.0	62.4
LOS (LOS)	F	F	E
Westbound Approach			
Delay (Seconds)	52.4	59.0	41.7
LOS (LOS)	D	E	D
Eleventh Avenue at West 34th Street (Midday) Westbound Approach			
Delay (Seconds)	68.6	89.2	59.1
LOS (LOS)	E	F	E
Twelfth Avenue at West 34th Street (PM) Northbound Approach			
Delay (Seconds)	21.4	55.5	43.5
LOS (LOS)	C	E	D

(a) Eleventh Avenue and West 34th Street (AM)

For the 2006 Future With the Proposed Action, a significant impact is projected for the westbound approach, as the delay is projected to increase from 47.4 seconds to 60.9 seconds and the LOS is projected to change from D to E. To mitigate this, two seconds of green time would be shifted from the southbound movement (58.0 seconds down to 56.0 seconds of green time) to the eastbound/westbound movement (22.0 seconds up to 24.0 seconds of green time). The westbound delay is projected to be reduced from 60.9 seconds to 44.4 seconds, and the LOS is projected to change from E to D.

The shifting of green time to mitigate the westbound approach would not significantly impact the eastbound or the southbound approaches. (Refer to Appendix V, "Construction" for the changes in v/c ratio, delay, and LOS at each intersection approach due to this mitigation measure.) Since this mitigation measure would be specific to the PM peak period, it would not need to be applied to the AM or Midday peak periods.

(b) Tenth Avenue and West 34th Street (Midday)

For the 2006 Future With the Proposed Action, a significant impact is projected for both the eastbound and westbound approaches, as the delay is projected to increase from 86.2 seconds to 92.0 seconds and from 52.4 seconds to 59.0 seconds, respectively. The LOS is projected to remain at F for the eastbound approach and projected to change from D to E for the westbound approach. To mitigate this, one eastbound parking lane and one westbound parking lane would be removed during the Midday peak period. The eastbound delay is projected to be reduced from 92.0 seconds to 62.4 seconds, and the LOS is projected to change from F to E. The westbound delay is projected to be reduced from 59.0 seconds to 41.7 seconds, and the LOS is projected to change from E to D.

The daylighting of two parking lanes and the shifting of green time to mitigate the eastbound and westbound approaches would not affect the northbound approach. Refer to Appendix V, "Construction," for the changes in v/c ratio, delay, and LOS at each intersection approach due to these mitigation measures. Since these mitigation measures are specific to the Midday peak period, they would not need to be applied to the AM or PM peak periods.

(c) Eleventh Avenue and West 34th Street (Midday)

For the 2006 Future With the Proposed Action, a significant impact is projected for the westbound approach, as the delay is projected to increase from 68.6 seconds to 89.2 seconds and the LOS is projected to change from E to F. To mitigate this, two seconds of green time would be shifted from the southbound movement (53.0 seconds down to 51.0 seconds of green time) to the eastbound/westbound movement (27.0 seconds up to 29.0 seconds of green time). The westbound delay is projected to decline from 89.2 seconds to 59.1 seconds, and the LOS is projected to change from F to E.

The shifting of green time to mitigate the westbound approach would not impact the eastbound or the southbound approaches. Refer to Appendix V, "Construction," for the changes in v/c ratio, delay, and LOS at each intersection approach due to this mitigation measure. Since this mitigation measure would be specific to the Midday peak period, it would not need to be applied to the AM or PM peak periods.

(d) Twelfth Avenue and West 34th Street (PM)

For the 2006 Future With the Proposed Action, a significant impact is projected for the northbound approach, as the delay is projected to increase from 21.4 seconds to 55.5 seconds and the LOS is projected to change from C to E. To mitigate this, one exclusive westbound left-turn lane would be reconfigured to an exclusive right-turn lane. In addition, five seconds of green time would be shifted from the westbound movement (29.0 seconds down to 24.0 seconds of green time) to the northbound/southbound movement (77.0 seconds up to 82.0 seconds of green time). The westbound delay is projected to be reduced from 55.5 seconds to 43.5 seconds, and LOS is projected to change from E to D.

The reconfiguration of one exclusive westbound left-turn lane to an exclusive right-turn lane would also be applied to the AM and Midday peak periods. For the AM peak period, this would create a significant impact for the westbound approach. This would be mitigated by shifting two seconds of green time from the northbound/southbound movement (80.0 seconds down to 78.0 seconds of green time) to the westbound movement (30.0 seconds up to 32.0 seconds of green time). For the Midday peak period, there would be no significant impact caused by the reconfiguration of the westbound approach. (Refer to Appendix V, "Construction," for the changes in v/c ratio, delay, and LOS at each intersection approach due to these mitigation measures.)

h) Transit and Pedestrians

Impact Assessment

Extending the No. 7 Subway line will involve connecting the existing tracks that lead into Times Square Station with new tracks installed along the proposed alignment. Although design and phasing plans have not progressed to the point where the date of this connection has been identified, when the connection does occur, disruptions in No. 7 Subway service can be expected. It is anticipated that this work would occur during the weekends and would likely be coordinated with other maintenance work and/or subway system improvements. During the connection work the frequency of No. 7 Subway service to and from Times Square station would be reduced. In extreme circumstances, possibly for several weekends, No. 7 Subway service to Times Square station would cease, with trains terminating at Queensboro Plaza. No significant adverse impacts to No. 7 Subway service are anticipated.

The subway mitigation at the Times Square station would require periodic outages on the Nos. 2 and 3 express tracks on selected nights and weekends for a period of approximately two years in order to complete the extended mezzanines and new stairways included in that mitigation.

Extending the No. 7 Subway line would also involve crossing and occupying a portion of the abandoned lower level of the Eighth Avenue Subway line (the A, C and E Trains) at Times Square. Minor alterations to Eighth Avenue service would be expected as construction occurs below the four tracks that occupy the upper level (two uptown tracks and two downtown tracks). Initially, construction work would occur under one uptown track and one downtown track. During this time the tracks directly above would close. After this stage of construction is complete, the tracks above would re-open and construction under the other two tracks would begin. Again, service would cease on the tracks under which construction would occur. Eighth Avenue subway service would not cease at any time, and these limited service alterations would occur only during nights and weekends. No significant adverse impacts to Eighth Avenue Subway service are anticipated.

Two NYCT bus stops are located along the south side of West 42nd Street between Dyer and Tenth Avenues. At the western end of that block, approximately one-half of the sidewalk width would be closed, and the bus stop located in this area would be relocated to the eastern end of the block. Additionally, bus routes and bus stops currently serving the Convention Center would need relocation during the period when construction in this area would interfere with bus transit operations.

Access to the subway entrance on West 40th Street west of Eighth Avenue would be maintained.

Pedestrian traffic would be altered in the vicinity of construction sites where sidewalks would be closed or reduced in width. The locations where this situation would exist have been described in other sections of this chapter. In all cases, pedestrian access throughout the area would be maintained, with provisions for pedestrian safety (such as barriers, signage, sidewalk sheds, etc.) implemented as required by City building codes and NYCDOT. Because access to all businesses, residences and other facilities would be maintained, and pedestrian passage would be provided at all locations where sidewalks have been closed, no significant adverse impacts to pedestrian movement are anticipated.

i) Air Quality

Air quality impacts related to construction operations occur primarily as a result of the following activities:

- Earth excavation, grading, and deconstruction activities;
- The handling and transport of excavated material and debris;
- Operations of heavy-duty diesel and gasoline-powered construction equipment; and
- Heavy-duty diesel trucks operating within construction areas and traveling to the sites to deliver construction materials and from sites transporting excavated spoils and deconstruction material.

The effects of these types of activities on ambient air quality levels are mostly localized (within 200-300 feet) and temporary (during the duration of the activity). However, due to the size and duration of some of these construction activities, a quantitative assessment of the emissions generated by these activities, and the air quality effects of the largest construction areas during the peak construction period on ambient air quality levels is presented in this section. This analysis provides a reasonable worst-case construction-phase air quality impact assessment; the construction-related effects on air quality during other phases and from other sites are anticipated to be less than those estimated in this analysis.

The evaluation performed in this section includes an estimation the pollutant emissions generated by construction activities for all construction sites, and truck trips on a quarterly basis from the beginning of 2005 to the end of 2009 (a five-year period); and the potential air quality impacts of the largest construction area during the peak construction period. The results presented below assume the use of ULSD fuel in all diesel-powered construction equipment at all construction sites under the jurisdiction of public agencies. ULSD is available in the City today with a small cost premium, and NYCT has an agency policy directing that contracts for capital construction projects use ULSD on construction equipment. For the construction activities associated with private development sites, it was assumed that high sulfur diesel (HSD) will be used in off construction equipment.

The results of the updated cumulative air quality analysis for on-site activities (i.e., the effects of deconstruction, excavation activities, spoil and rock removal, and construction equipment) and off-site activities (e.g., the effects of traffic, including project-related truck trips and lane closures) indicated that the effect of these activities during the peak (reasonable worst case) construction period would not cause exceedances of the NAAQS for CO, NO_2 and particulate matter smaller than PM_{10} and $PM_{2.5}$ if ULSD fuel is used for all construction equipment. The results also show that absent the mitigation measures described below, construction-phase emissions would exceed the STVs established by the New York City Department of Environmental Protection (DEP) for $PM_{2.5}$ and would therefore be significant. Because of this potential for significant impacts of emissions from diesel-powered construction equipment on $PM_{2.5}$ levels, the project sponsors are committed to the implementation of mitigation measures to reduce emissions from diesel engines and dust-generating activities. The emission reduction measures selected include requirements to contractors that encompass the use of construction equipment that will comply with EPA's Tier 2 emission standards (post model year 2001/2003), retrofitting the equipment with diesel particulate filters (or equivalent technology), and electrification of compressors, pumps, and welders. A description of the effects of these emission control measures is presented in the Emission Reduction Measures section. With implementation of these mitigation measures, the construction-phase impacts would not exceed the $PM_{2.5}$ STVs established by the New York City DEP.

Methodology

The analysis performed for estimating the potential air quality impacts caused by the on-site (i.e., deconstruction, excavation activities, spoil and rock removal, construction equipment, and truck movement) and the off-site (mobile source traffic effects due to truck trips and lane closures) construction phase activities included the following:

- Estimation of emissions generated by the construction activities (deconstruction, excavation, spoil and rock removal, concrete and steel construction) including fugitive dust emissions and emissions released from diesel-powered equipment and trucks, at all construction sites expected to be under construction between 2005 and 2009.
- Determination of areas with the greatest potential for construction-phase air quality impacts based on emissions generation potential.

- Identification of the most heavily traveled truck routes where levels of service could be significantly affected.
- A comparison of the combined (on-site and off-site) modeling results to the applicable NAAQS and STVs.

This section also provides a description of mitigation measures that would be required to minimize construction phase impacts.

Pollutants of Concern

The most significant pollutant associated with dust-generating construction activities and exhaust from construction equipment is particulate matter. PM_{10} emissions are primarily related to grading, excavation, construction and deconstruction, land clearing, blasting and drilling, material loading operations, and movement of heavy-duty vehicles and equipment. $PM_{2.5}$ emissions are mostly related to the exhaust of diesel-powered construction equipment and trucks.

The other significant pollutant of concern associated with construction activities is NO_2 from diesel-fueled engines of construction equipment and trucking activities within and near construction sites. Diesel engines emit primarily nitrogen oxides as nitrogen oxide (NO), which is then slowly converted to NO_2 in the presence of sunlight. Diesel engines emit relatively small quantities of CO, but this pollutant was considered to assess the combined effect of on-site and off-site emission sources.

In summary, the on-site analysis evaluated the effects of construction activities on PM_{10}, $PM_{2.5}$, CO, and NO_2 ambient concentrations. The emissions associated with truck traffic on public roads (off-site analysis) used for the transportation of spoil, rock, debris removal, construction materials, and cement, and their effect on the traffic flow at the most affected intersections, were analyzed for their effects on CO, NO_2, PM_{10} and $PM_{2.5}$ concentrations.

Emission Sources

Emissions from on-site construction activities that could potentially affect air quality levels at surrounding land uses include:

- Deconstruction and demolition;
- Land clearing, removal of debris, and loading onto the trucks;
- Soil excavation and spoil removal;
- Dust entrained into the atmosphere (re-entrained dust) as a result of trucks and equipment traveling on paved or unpaved roads within the site; and
- Diesel engines of operational equipment and moving and queuing trucks and delivery vehicles.

The data utilized to estimate emissions generated from construction activities included:

- The schedule of construction activities for each one of the 13 sites under construction;
- The duration of each type of construction activity;
- The number and type of construction equipment to be used;
- Equipment horsepower and usage rates (hours per day);
- The number of hours and duration of demolition/deconstruction activities;
- The quantities of material produced and removed from each site from excavation, deconstruction, and tunneling activities;
- The number of trucks trips needed to remove the excavation material, and to bring the supply materials to each site;
- The average speed of construction equipment and delivery vehicles; and
- The vehicle miles traveled on and off-site by delivery trucks.

The emissions from off-site trucks and general traffic affected by construction truck routes followed the same assumptions used to estimate the operational effects of the Proposed Action as described in Chapter 21, "Air Quality."

Operating Scenarios

Emission rates of each pollutant from all sources were estimated for each type of construction activity. Given the fact that the different construction activities could range from a few weeks to several years, separate analyses were conducted to estimate short-term (24-hours or less) and long-term (annual average) pollutant levels. Short-term emission estimates were based on peak period activity levels at each site (defined as emissions per quarter). These emission estimates were used to compare the modeling results to short-term exposure standards (i.e., 8-hours, 24-hours). Annual average activity levels were used to compare modeling results to annual exposure standards.

Determination of Emission Estimates

Project-specific information was utilized to identify site-specific emission source parameters for use in the emission estimates and dispersion analysis. Emission benefits of implementing emission control technologies for diesel equipment are discussed in the Emission Reduction Measures section of this chapter.

The following assumptions were applied:

- Estimated hourly emission rates of each pollutant from all of the construction equipment and trucks operating within the site were used to compute the total quarterly emissions by pollutant, reflecting the contribution of all types of emission sources within the site.
- Each construction-related truck was considered a heavy-duty diesel vehicle with a gross vehicle weight of 40,000 pounds when loaded and a vehicle weight of 20,000 pounds when empty.
- NO_x, PM_{10} and $PM_{2.5}$, and CO emission factors for moving vehicles (i.e., exhaust, brakes, and tires) and queuing vehicles were estimated using the EPA MOBILE 6.2 vehicular emission factor model as described in Chapter 21, "Air Quality."
- Total on-site vehicular emission rates of NO_x, CO, PM_{10}, and $PM_{2.5}$ were estimated by multiplying emission factors for moving vehicles (g/veh-mile) by the distance that an average vehicle would travel within the site and by the number of on-site operating vehicles during the activity period.
- Total off-site vehicular emission rates of NO_x, CO, PM_{10}, and $PM_{2.5}$ were estimated by multiplying emission factors for moving vehicles (g/veh-mile) by the average vehicles mile traveled (VMT) within NYC limits for each truck trip during the activity period.
- Re-entrained dust from moving delivery vehicles was estimated using the current EPA equation for fugitive dust on paved roads for PM_{10} and $PM_{2.5}$ emissions. Because of low vehicular speeds within the construction areas (i.e., less than 5 mph), a speed reduction factor was applied, as appropriate.
- Emission rates of NO_x, CO, PM_{10} and $PM_{2.5}$ from diesel engines of construction equipment were estimated using the EPA NONROAD Emission Model (Report No. NR-009A, November 2002, EPA 420-P-02-016).
- Based on the equipment age distribution recommended in the EPA NONROAD model, it was conservatively assumed that 80 percent of diesel-powered construction equipment would comply with Tier II emission standards (post-model year 2001 for 300-600 horsepower (HP) engines, and post-2003 for 100-300 HP engines) and 20 percent would be Tier I compliance (post-1996 model year).

- $PM_{2.5}$ emission factors for construction equipment were assumed to be 92 percent of the estimated PM_{10} emission factors for each type of equipment. This is the recommended percentage used in both the EPA's NONROAD Emission Model and the Mobile 6.2 Emission Model.
- Engine HP rating and load utilization factors (peak usage during the working hours) for the different types of equipment were estimated, to produce an average HP usage per hour of the day.
- The total number of working hours per week was estimated based on two eight-hour shifts, six days per week for the NYCT No. 7 Subway Extension construction sites, and one 10½-hour shift, six days a week for all other construction sites.
- Diesel fuel was assumed to be ULSD with a sulfur content of 15 parts per million (PPM) for all public-sector development projects, and off-road diesel fuel with a sulfur content of 3,300 PPM for the equipment at private-sector development sites. ULSD fuel is available in the New York City area today, and the use of this fuel is a requirement for MTA construction contracts.
- Fugitive dust emission factors for demolition, excavation, truck loading, and re-entrained dust were based on the equations recommended in EPA's AP-42 Report "Compilation of Air Pollutant Emission Factors" Sections 13.2.3.1/2/3, Heavy Construction Operations, 11.9.1 Uncontrolled Open Fugitive Dust Sources, 13.2.1 Fugitive Dust from Paved Roads.

Identification of Worst-Case Analysis Site and Worst Year for Analysis

Major construction activities would take place simultaneously at a number of locations throughout the study area. To determine which activities and locations could produce worst-case impacts, emissions from each activity including its duration were calculated for the five-year period starting at the beginning of 2005 and ending in December 2009. The proximity of operations to each other (cluster formation), and truck activity generated by each site was considered in determining which area will have the greatest potential for localized ambient air quality effects.

The EPA Tier II and Tier III emission standards for non-road diesel equipment, which were promulgated in 1998, will take effect between 2004 and 2008. This would significantly reduce NO_x and PM diesel emissions. Since these stricter emission standards for diesel engines and the mandated use of cleaner diesel fuel are being implemented nationwide by the EPA after 2007, it is anticipated that the latter part of the construction process that will take place between 2010 and 2025 would generate much lower emissions for an equivalent amount of construction activity than those generated during the 2006/07 period.

In addition, in May 2004 the President signed the EPA final rule to greatly reduce harmful pollutants from non-road diesel engines. The new Tier 4 emission standards for non-road engines will apply to diesel engines used in most kinds of construction, agricultural, and industrial equipment. The new rule includes a nationally mandated reduction of sulfur content in non-road diesel fuel from approximately 3,000 parts per million (ppm) average today to 500 ppm by 2007, and 15 ppm by 2010, and the implementation of emission control technology on non-road diesel engines by 2008. The EPA anticipates that this new rule would reduce PM and NO_2 emissions by up to 90 percent by 2030.

The emission estimates included all construction activities and on and off-site trucking activities for the following sites:

- Terminal Station (West 34th Street and Eleventh Avenue);
- Retrieval Site L (West 41st Street and Tenth Avenue);
- Launch Site A (West 28th Street and Eleventh Avenue);
- Fan Plant Site N (West 40th Street and Eighth Avenue);

- DSNY Garage/NYPD Tow Pound - Block 675 (between West 29th and West 30th Streets and Eleventh and Twelfth Avenues);
- Projected Development Site 33 (Block 729 Lot 50);
- Eastern portion of Caemmerer Yard;
- Projected Development Site 14 (Block 1069 Lots 29 and 34);
- Multi-Use Facility at the western portion of Caemmerer Yard;
- Convention Center Expansion, Stage 1;
- Convention Center Expansion, Stage 2; and
- Convention Center Hotel.

The total hourly and quarterly emissions for each site, including quantities of soil to be excavated and duration of construction activities, were used to rank these sites. The area with the largest emissions was selected for the detailed air quality impact analysis. Emission rates for each of these construction sites were based on the type and scale of activities, number and type of equipment used, hours of operation, and number of trucks that would be operated at the site.

Emission estimates per quarter for all four pollutants were estimated for each one of these sites for the different stages and types of construction activities. In order to be able to compare times when simultaneous activities would be taking place at each site (and prepare a cumulative analysis of emissions across time and space), daily emissions were estimated on a quarterly basis. Since the most critical pollutants from these activities are NO_x, $PM_{2.5}$ and PM_{10}, the quarterly emissions for these pollutants for each site, and the cumulative total, are presented in Figure 23-14 to Figure 23-16. The results presented in these figures include the emissions from construction equipment, trucking operations, fugitive dust generated by demolition, excavation, truck loading, exhaust and re-suspended dust from trucking activities.

The results, presented in Figures 23-14 to Figure 23-16, indicate that the largest emission generation area would be the cluster of adjacent sites including the Terminal Station, Multi-Use Facility, eastern portion of Caemmerer Yard, DSNY Tow Pound (Block 675), and the Convention Center. As can be observed from these figures, the peak emissions for these five sites would occur during year 2005 for PM_{10} (which has a significant dust component from demolition and excavation activities), and during 2006 for $PM_{2.5}$ and NO_x (which are mostly the product of diesel engine exhaust). This is consistent with the cumulative peak trucking activity presented in this chapter.

These five adjacent sites have the potential to generate between 61 and 81 percent of the total NO_x emissions, between 76 and 81 percent of the total PM_{10} emissions, and between 46 and 79 percent of the total $PM_{2.5}$ emissions. It can also be observed from these figures that each of the private development sites would generate only 6 to 14 percent of the total emissions during their 30-month construction period. The detailed emission estimates for each site are presented in Appendix V, "Construction."

Based on the results of this analysis, it was concluded that the area bounded by West 29th and West 40th Streets and Tenth and Twelfth Avenues represents the location with the largest potential for air quality impacts. Table 23-28 provides the approximate range of types and numbers of construction equipment operating at each one of these four sites during their highest level of activity. (A full description of the numbers of pieces of equipment for the duration of each activity is included in Appendix V, "Construction.")

TABLE 23-28
APPROXIMATE LIST OF CONSTRUCTION EQUIPMENT OPERATING DURING PEAK OF 2006 AT THE LARGEST CONSTRUCTION AREA

Equipment Type	Rated Horsepower	Number of Units per Site During Peak of 2006				
		Convention Center Stage 1	Terminal Station	Multi-Use Facility	Eastern Caemmerer Yard	DSNY Tow Pound Block 675
Front End Loaders	400	4	2	2	1	2
Backhoes	125	12	3	6	6	4
Cranes	240	6	1	8	8	1
Cherry Pickers	200	20	4	10	10	4
Pile Driving Rigs	200	2	1	2	2	4
Excavators	225	0	2	0	2	2
Graders	250	2	0	1	1	2
Compressors	150	15	4	10	10	5
Pavers	150	2	0	2	2	2
Totals	**-**	**63**	**17**	**41**	**42**	**26**

Detailed estimates for each activity are presented in Appendix V.

On-Site (Construction Activities) Analysis for CO, NO_2, PM_{10}, and $PM_{2.5}$

An atmospheric dispersion analysis was conducted to estimate pollutant levels at receptor sites near the selected construction area at points beyond each facilities site fence line. The EPA's Industrial Source Complex Short-Term Air Quality Dispersion Model (ISCST3) was used. All emission sources within the construction site were modeled using the area source algorithm incorporated in the ISCST3 model.

Since each piece of construction equipment could move around the entire site, depending on the nature of the activity performed, and specific locations of cranes or other large pieces of equipments could not be determined at this time, the total emissions from all the diesel-powered equipment assigned to the specific activity during the typical working hour were represented as an area source that covers the entire site (i.e., a uniform distribution of emissions through the construction area was assumed). An initial dispersion of 15 meters (approximately 45 feet) from the lot line was assumed for these sources, to provide a reasonably conservative assumption regarding the location of activity at each site. It was also assumed that all equipment and trucks on-site would be traveling at five miles per hour.

The PM emissions related to fugitive dust from demolition/deconstruction, earth movement, and loading materials into trucks, and re-entrained dust within the site were estimated based on activity-specific emission factors from EPA's "Control of Open Fugitive Dust Sources" Report AP-42 (updates 1998, 2001 and 2003) based on the specific duration of each activity. These fugitive dust emissions were also added to construction equipment emissions, following the same distribution pattern.

The concentrations of each pollutant at each receptor location were estimated by modeling all of the sources of all adjacent sites of each pollutant in one modeling run for each year of meteorological data. The results of this analysis provide the cumulative effects of all emission sources combined at each receptor location.

(a) Receptor Sites

Two sets of receptor locations were considered:

- Sidewalks open to pedestrian traffic during the 2005/2006 construction period;
- Windows at the residential buildings surrounding the construction sites (at elevated heights representing a string of vertical receptors from the second story up); the area along Hudson River Park on the west side of Twelfth Avenue was included in this category.

The UTM coordinate system was used to establish coordinates of sources and receptors for entry into the model. Since some of the sites, such as the eastern portion of Caemmerer Yard and Multi-Use Facility are depressed (below street level), each source was modeled according to its relative elevation with respect to the lowest site.

(b) Meteorological Data

Meteorological data used for this analysis included five years (1998-2002) of LaGuardia Airport surface data and Brookhaven mixing height data.

(c) Background Values

Background pollutant concentrations for CO and PM_{10} were obtained from monitoring data recorded at the closest DEC ambient air quality monitor as described in Chapter 21, "Air Quality." The $PM_{2.5}$ baseline values reported in this chapter represent the 2001 to 2003 average of the 24-hour 98th percentile and annual average levels measured at the NYSDEC monitoring station at Public School 59 (located at 288 East 57th Street). The NO_2 annual value is based on the last three years of measured data at the Mabel Dean High School NYSDEC monitoring station.

(d) $PM_{2.5}$ Impact Assessment

The $PM_{2.5}$ analysis follows the DEP's "Interim Guidelines for $PM_{2.5}$ Analysis," dated September 4, 2003, as follows:

- The highest estimated 24-hour concentrations were calculated using the same approach as for the PM_{10} impacts, but the results were compared to both the 24-hour NAAQS, and DEP's STV of 5 $\mu g/m^3$.
- The annual $PM_{2.5}$ impact was estimated based on a neighborhood average analysis using a 1 km by 1 km (approximately 0.6 mile by 0.6 mile) Cartesian receptor grid, centered on the receptor having the highest estimated annual concentration, with 25-meter (approximately 80 feet) spacing in all directions, excluding all receptors within the site fence line or within 15 meters (approximately 50 feet) of any construction source. The $PM_{2.5}$ concentrations estimated at all receptors within the receptor grid were averaged over the grid and compared to an annual STV of 0.1 $\mu g/m^3$.

Off-Site (Mobile Source) Analysis

An analysis was conducted to estimate potential air quality impacts associated with the operation of construction-phase vehicles (including trucks used for the transportation of spoil, rock, and debris removal, and transport of construction materials and cement) on the roadway network, and changes in street configurations as a result of lane closures during 2006.

The corridor of Eleventh Avenue between West 29th and West 40th Streets (with center at the intersection of West 34th Street) was selected for analysis based on its proximity to the location of the highest related construction impacts, lane closures, and the total combined approach volumes in the Eleventh Avenue corridor. The analysis was performed for CO, PM_{10} and $PM_{2.5}$, using the same

procedures and assumptions described in Chapter 21, "Air Quality" matching the receptor locations evaluated in the on-site construction analysis. CO was analyzed using the same procedures and assumptions as described in Chapter 21, "Air Quality." The conservative Tier I CAL3QHC program rather than the more refined CAL3QHCR program was used. The analysis was performed for the Future With the Proposed Construction Scenario, and the Future Without the Proposed Action in order to obtain the increment due to truck movement and the effect of lane closings.

Results

The potential air quality impacts for the four pollutants analyzed for the largest construction area are presented in Table 23-29. This table includes the cumulative impacts from on-site operations (i.e., diesel-powered construction equipment and fugitive dust emissions) and off-site operations (i.e., traffic effects due to trucking activity and lane closings). In order to evaluate localized effects of these impacts, the maximum concentration levels are reported for the closest open sidewalk locations and the closest residences in the vicinity of the construction areas.

As can be observed in Table 23-29, the largest contributions to these pollutant increments are related to the on-site construction activities. The air quality effects from off-site truck travel are very small when compared to on-site construction activities. Also, the levels estimated at nearby residential buildings are lower than those estimated for adjacent sidewalks.

TABLE 23-29
HIGHEST PREDICTED POLLUTANT INCREMENTS

Pollutant	Average Period	Receptor Type[1]	On-Site Effect (construction activity)	Off-Site Effect[2] (trucking/lane closings)	Cumulative Increment
PM10 ($\mu g/m^3$)	24-Hour	Sidewalk	89.5	0.1	89.6
		Residential	23.0	0.2	23.2
	Annual	Sidewalk	8.6	0.06	8.7
		Residential	2.0	0.05	2.1
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	Sidewalk	15.6	0.2	15.8
		Residential	5.0	0.17	5.2
	Annual	Neighborhood	0.29	Included[3]	0.29
NO_2 ($\mu g/m^3$)	Annual	Sidewalk	25.0	NA	25.0
		Residential	8.0	NA	8.0
CO (PPM)	8-Hour	Sidewalk	0.3	0.2	0.5
		Residential	0.2	0.3	0.5

1 The reported increment is for the highest receptor for all combined construction sites evaluated.
2 The increment is the difference between the Future Without the Proposed Action and construction-phase traffic conditions.
NA = Not Applicable

The highest PM increments at the sidewalk locations are predicted to be 89.6 $\mu g/m^3$ for PM_{10}, and 15.8 $\mu g/m^3$ for $PM_{2.5}$ on a 24-hour basis; and 8.7 $\mu g/m^3$ for PM_{10} on an annual basis. In terms of effects to residences and recreational areas, the highest increments are predicted to be 23.2 $\mu g/m^3$ for PM_{10} and 5.2 $\mu g/m^3$ for $PM_{2.5}$ on a 24-hour basis, and 2.1 $\mu g/m^3$ for PM_{10} on an annual basis, almost one-third of the sidewalk levels. The annual $PM_{2.5}$ increment, based on the DEP neighborhood approach, was estimated at 0.29 $\mu g/m^3$.

As observed in Table 23-30, when these predicted increments are added to the background levels for CO, NO_2 and PM_{10}, the results indicate that the total concentrations are not expected to exceed the NAAQS for these pollutants. However, the estimated $PM_{2.5}$ increments are higher than the DEP 24-hour and annual STVs 5 $\mu g/m^3$ and 0.1 $\mu g/m^3$. In addition, the annual monitored $PM_{2.5}$ baseline values already exceed the NAAQS.

TABLE 23-30
HIGHEST PREDICTED POLLUTANT CONCENTRATIONS

Pollutant	Average Period	NAAQS/ (DEP STV)	Receptor Type[1]	Cumulative Increment	Background/ Baseline Level[1]	Total Predicted Concentration
PM10 ($\mu g/m^3$)	24-Hour	150	Sidewalk	89.6	56.4	146.0
			Residential	23.2	56.4	79.8
	Annual	50	Sidewalk	8.7	26.0	34.7
			Residential	2.1	26.0	28.1
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	65 5 (DEP)	Sidewalk	15.8	40	55.8
			Residential	5.2		45.2
	Annual	15 0.1 (DEP)	Neighborhood	0.29	17.5	17.79
NO_2 ($\mu g/m^3$)	Annual	100	Sidewalk	25.0	71	96.0
			Residential	8.0		79.0
CO (PPM)	8-Hour	9.0	Sidewalk	0.5	4.9	5.4
			Residential	0.5	4.9	5.4

1 Background level estimation for PM_{10} and CO is described in Chapter 21. Baseline includes the Future Without the Proposed Action contribution of baseline traffic emissions for PM10 and CO. $PM_{2.5}$ baseline is based on the 2001-2003 average of the 24-hour 98th percentile and annual average levels measured by the NYSDEC at the PS 59 monitoring station. NO_2 background is based on the levels measured at Mabel Dean H.S. NYSDEC monitoring station. Annual $PM_{2.5}$ monitored levels already exceed the NAAQS.

2 $PM_{2.5}$ levels are compared to the NYC DEP Significant Threshold Values, as annual baseline monitored levels already exceed the NAAQS.

Emission Reduction Measures

The results of the cumulative effects analysis of construction activities during the peak construction period, indicate that the operation of approximately 190 diesel-powered construction-phase pieces of equipment has the potential for significant $PM_{2.5}$ increments. Use of USLD fuel, which is anticipated to reduce PM_{10} and $PM_{2.5}$ diesel emissions by approximately 40 percent when compared to the regular off-road (3,300 ppm sulfur) diesel.

In order to further reduce $PM_{2.5}$, the project sponsors are committed to the implementation of mitigation measures to reduce emissions from diesel engines and dust-generating activities.

(a) Diesel Emission Control

All publicly funded construction sites which will be under construction between 2005 and 2009 will require the following emission reduction measures:

- Use of ULSD fuel with maximum 15 PPM sulfur. ULSD allows the use of advance emission control technologies to reduce CO and PM exhaust on diesel engines.
- All engines for construction equipment with engine horsepower (HP) rating above 50 HP should be in compliance with EPA's Tier II emission standards. Tier II standards are mandatory for all new non-road engines from model year 2003 for the 100 to 300 HP category, and model year 2001 for the 300 to 600 HP category.
- All construction equipment with engines above 50 HP should also be retrofitted with diesel particular filters (DPFs). Today DPFs can reduce CO, hydrocarbons (HC) and PM emissions in the order of 60 to 90 percent. There are several manufacturers certified by the EPA with proven experience of thousands of hours of operation on off-road applications.
- In the cases where some particular type of equipment could not be retrofitted with DPFs, the contractor must provide an equivalent retrofit technology that will reduce CO, HC and PM emissions by over 40 percent. This range of emission reductions can be achieved by a combination of diesel oxidation catalysts (DOCs), diesel particulate reactors and crankcase filters. There are over a dozen products in today's market that are certified by EPA and could achieve this range of emission reductions.

- In addition, compressors, welders, and pumps should be electric-powered.

It is expected that these combination of Tier II compliance engines and retrofit technology could achieve PM_{10} and $PM_{2.5}$ emission reductions in the range of 66 percent from the base construction scenario.

In the case of CO and NO_x, the anticipated emission reductions from Tier II compliance engines and retrofit technology are 44 percent and 7 percent respectively (retrofit technology has no effect on NO_x reductions).

(b) Construction Activities Emission Controls

A comprehensive dust control program should be incorporated into each construction contract to control excessive nuisance dust both on- and off-site, thereby ensuring that PM levels within the affected areas are maintained at levels as low as can be reasonably achieved.

The following dust control measures are expected to be implemented:

- Wet suppression with or without approved binding agents, used on-site on a routine basis with hoses or a sprinkler system during deconstruction and material handling activities aiming at a 10 percent moisture content in the ground;
- Wet spray power vacuum street sweeper used on paved roadways;
- Use of calcium chloride instead of wet suppression when freezing conditions exist;
- Use of solid wood 10-foot barriers around the perimeter of each construction site;
- Use of covered sidewalks when the sidewalk is partially used as part of the construction site;
- Use of crushed stone at construction ingress/egress areas;
- Covering dump trucks during material transport on public roadways;
- Limiting unnecessary idling times on diesel-powered engines to three minutes;
- Limiting truck speed within the site at less than 5 mph.

Implementation of these dust control measures can reduce ambient PM increments in the range of 50-85 percent on large-scale construction projects. For the purpose of determining the emission reductions resulting from this dust control program, a 70 percent reduction for PM_{10} and $PM_{2.5}$ base emissions was assumed. These specific control measures (for diesel engines and fugitive dust) will be translated into construction specifications for the Proposed Action as part of the Construction Environmental Protection Plan (CEPP), to ensure that the goals identified during the environmental review process are met during the construction phase.

For the case of the two private development sites (Projected Development Sites 33 and 14), the only emission reductions assumed included the use of on-road diesel fuel (400 ppm sulfur) instead of off-road diesel (3,300 ppm sulfur) for construction equipment. This is mandated under the EPA Tier 4 Non-Road Diesel Rule from 2007, and translates into a PM emission reduction of 37 percent. Also assumed is the application of a best management practice dust control program, which can easily reduce fugitive dust emissions by 50 percent by watering and controlling track-out dirt from the sites.

Results with Emission Reduction Measures

In order to provide an evaluation of the effects of these emission control measures on ambient PM_{10}, $PM_{2.5}$ and NO_2 levels, a re-estimation of the total emissions from all construction activities with the mitigation plan was performed.

The potential ambient air quality impacts on CO, NO_2, PM_{10} and $PM_{2.5}$ levels at the same cluster of sites during 2005/2006 with these emission reductions are presented in Table 23-31. This table includes the cumulative impacts from on-site operations (i.e., diesel-powered construction equipment

and fugitive dust emissions) and off-site operations (i.e., traffic effects due to trucking activity and lane closings).

TABLE 23-31
HIGHEST PREDICTED POLLUTANT CONCENTRATIONS WITH IMPLEMENTATION OF EMISSION REDUCTIONS MEASURES

Pollutant	Average Period	NAAQS/ (DEP STV)	Receptor Type[1]	Cumulative Increment	Background/ Baseline Level[1]	Total Predicted Concentration
PM_{10} ($\mu g/m^3$)	24-Hour	150	Sidewalk	27.3	56.4	83.7
			Residential	7.1	56.4	63.5
	Annual	50	Sidewalk	2.8	26.0	28.8
			Residential	1.1	26.0	27.10
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	65 5 (DEP)	Sidewalk	4.7	40	44.7
			Residential	1.1		41.1
	Annual	15 0.1 (DEP)	Neighborhood	0.08	17.5	17.6
NO_2 ($\mu g/m^3$)	Annual	100	Sidewalk	19.0	71	90.0
			Residential	6.0		77.0
CO (PPM)	8-Hour	9.0	Sidewalk	0.5	4.9	5.4
			Residential	0.5	4.9	5.4

1 Background level estimation for PM_{10}, and CO is described in Chapter 21. Baseline includes the Future Without the Proposed Action contribution of baseline traffic emissions for PM_{10} and CO. $PM_{2.5}$ baseline is based on the 2001-2003 average of the 24-hour 98th percentile and annual average levels measured by NYSDEC at PS 59 monitoring station. Annual $PM_{2.5}$ monitored levels already exceed the NAAQS

The highest PM increments at the sidewalk locations are predicted to be 27.3 $\mu g/m^3$ for PM_{10}, and 4.7 $\mu g/m^3$ for $PM_{2.5}$ on a 24-hour basis; and 2.8 $\mu g/m^3$ for PM_{10} on an annual basis. In terms of effects to residences and recreational areas, the highest increments are predicted to be 7.1 $\mu g/m^3$ for PM_{10} and 1.1 $\mu g/m^3$ for $PM_{2.5}$ on a 24-hour basis, and 1.1 $\mu g/m^3$ for PM_{10} on an annual basis. The annual $PM_{2.5}$ increment, based on the DEP neighborhood approach, was estimated at 0.08 $\mu g/m^3$.

As observed in Table 23-31, when these predicted increments are added to the background levels for CO, NO_2, PM_{10}, and $PM_{2.5}$ the total concentrations would not cause any exceedance of the NAAQS for any of these pollutants, or the DEP $PM_{2.5}$ STVs.

j) Noise and Vibration

Introduction

(a) Background

For the purposes of this analysis, construction under the Proposed Action is divided into three major categories: (1) construction of the No. 7 Subway Extension, (2) construction of public facilities – the Convention Center expansion, the Multi-Use Facility, and the Midblock Park and Boulevard System (with a mid-block parking garage), and (3) zoning-related private development. Construction activities associated with the Proposed Action are expected, at times, to cause noticeable and significant increases in noise and vibration levels. The times and locations where these increased noise and vibration conditions would occur would vary depending on the location of construction activity within the site, the equipment and construction methods employed, and the distance between the noise source and the receptor. The *CEQR Technical Manual* refers to FTA or FHWA methodology and criteria for the analysis and assessment of construction noise and vibration impacts.

(b) Issues

The construction of the new subway and the public facilities would span over seven years and many construction activities could take place between 15 and 24 hours a day, 6 days per week. Construction activities that occur at night would be limited, where practicable, to those that occur

below ground level (tunnel and cavern construction) and those activities with low noise levels unlikely to affect sensitive receptors. However, significant airborne noise and vibration impacts could occur not only during the day, but also during nighttime and weekend periods. Because construction activities would unavoidably occur within close proximity to sensitive land uses (e.g., residential uses), the project's construction has the potential to result in significant noise and vibration impacts. Noise from additional truck traffic in support of construction could also be a concern.

(c) Principal Results

Maximum 1-hour L_{eq} values (without mitigation) were estimated following the general airborne noise assessment procedures, and the maximum 8-hour average L_{eq} and 30-day L_{dn} values were estimated for each of the 14 construction sites, following the detailed assessment procedures of the FTA guidelines for construction noise at the closest noise-sensitive receptors.

Five residential locations were identified as having potentially significant noise impacts resulting from construction activities for elements of the Proposed Action:

- Residences along Tenth Avenue north of West 42nd Street could experience impacts during the construction of the Intermediate Station (see Figure 23-1).
- Residences on West 40th Street between Eighth and Ninth Avenues could experience impacts during the construction of the fan plant at Site N.
- Residences at the corner of Dyer Avenue and West 41st Street could experience impacts during the construction of the Intermediate Station and during the construction of the private development at Tenth Avenue and West 41st Street (Projected Development Site 14).
- Residences between West 41st and West 42nd Streets east of Twelfth Avenue could experience noise levels exceeding the FTA criteria during the construction of the Convention Center expansion and construction of the Convention Center Hotel.
- Residences on West 35th Street between Tenth and Eleventh Avenues could experience impacts during the construction of the Terminal Station, the eastern portion of Caemmerer Yard, and the Midblock Park and Boulevard System.

In addition to construction site noise impacts, the noise impact potential of truck traffic and construction vehicle traffic in support of construction activities was examined. Under the worst-case scenario for the West 34th Street at Tenth Avenue intersection, a 1 dBA (rounded to the nearest "A"-filter-weighted decibel) increase would be expected due to additional construction traffic. (A 1dBA increase is not perceptible to the human ear.) Similar (or lower) increases would be expected along construction trucking routes.

To mitigate construction noise impacts, construction contractors for projects included in the Proposed Action would be required to strictly adhere to the applicable provisions of the New York City Noise Control Code and good engineering practices (e.g., proper maintenance and operation with muffling devices, shutting off idling machinery when not in use, etc.). Three categories of noise control approaches would also be explored and implemented: design considerations and project layout, sequence of operations, and alternative construction methods. NYCT would also prepare a noise and vibration mitigation plan to reduce, and where practicable, eliminate significant construction noise impacts due to construction of the No. 7 Subway Extension. While these measures would minimize noise levels as a result of the Proposed Action, there would likely still be significant noise impacts at one or more sensitive receptors during the construction period.

With the exception of pile driving, caisson drilling, and bulldozing, all of the vibration values for the types of equipment likely to be used during construction at distances greater than 20 feet are below the vibration damage threshold criteria for fragile buildings and for extremely fragile historic

buildings. Because much of the underground construction of the No. 7 Subway Extension, and tunnel boring with a TBM in particular, would be at depths from 65 to 130 feet, no vibration and ground-borne noise levels exceeding the FTA guideline criteria levels are expected at sensitive receptors at street level or above. Minimum safe distances beyond which structural damage would not be of concern at each of the subway, public facilities, and private development construction sites are presented in Table 23-33.

For construction at sites where there are fragile structures or vibration-sensitive uses within the threshold distances, mitigation measures including blasting regulations (e.g., time of day, scale-distance dynamite weights) and contract specification (e.g., maximum peak particle velocities (PPVs) at boundaries and receptors, use of blast mats, etc.), site- and structure-specific vibration monitoring, response programs to community feedback and concerns, and other site-specific control measures are recommended.

Airborne Noise

(a) Existing Conditions

Existing noise levels throughout the Project Area are very high, with L_{eq} (1 hour) noise levels from 65 to 80 dBA, with lower levels occurring at night and on weekends and at streets with less traffic, and in the high 70s along Avenues and arterial Streets (West 34th and West 42nd) and about 80 dBA along Route 9A. Traffic is the primary source of noise. A detailed description of the existing noise levels is presented in Chapter 22, "Noise and Vibration."

(b) Methodology

As specified in the *CEQR Technical Manual*, detailed analysis is needed for large-scale construction following the FTA, FHWA, or EPA methodology. Accordingly, both the general assessment and the detailed noise assessment procedures detailed in the 1995 FTA manual were employed. The FTA manual accounts for (1) noise emissions of the construction equipment, (2) the amount of time each piece of equipment is in use, and (3) the distance between the equipment and the receptor. The combination of noise from several pieces of equipment operating during the same time period is obtained from addition of the L_{eq} values for each piece of equipment.

For the general airborne noise assessment, it was assumed that the two noisiest pieces of equipment would operate continuously at the same time. For the detailed airborne noise assessment, 8-hour L_{eq} values and 30-day average L_{dn} values were calculated assuming all appropriate usage factors for the specified time periods.

(c) Applicable Standards and Criteria

Noise from construction equipment is regulated by EPA noise emission standards. These federal requirements mandate that certain classifications of construction equipment and motor vehicles meet specified noise emission standards.

The CEQR applies the same 3 dBA standard as an impact threshold for sensitive receptors that would be subjected to high construction noise levels for an extended period of time under the Future Without the Proposed Action noise levels greater than 62 dBA. If significant impacts are predicted to occur, the feasibility and effectiveness of implementing mitigation should be investigated. For long-term construction entailing detailed analysis, it also defers to the modeling techniques and assessment methods of federal agencies such as the FTA.

The FTA guidance manual does not present standardized criteria for assessing airborne noise impacts from construction. However, it does contain criteria for levels that, if exceeded, could result in adverse community reaction; these stated criteria are used as the reference impact criteria for this analysis. These criteria are a function of the land use of the affected areas near a construction site, and day and night 1- and 8-hour L_{eq} noise levels and L_{dn} noise levels. L_{eq} is the constant equivalent

sound level of a fluctuating noise source, usually for one hour, while L_{dn} is a description for the cumulative 24-hour day-night noise level, with a 10 dBA weighting during the nighttime hours to account for greater nighttime sensitivity for noise.

Table 23-32 shows the FTA's construction assessment impact values for both the general noise assessment and the detailed noise assessment conducted in accordance with FTA methodologies. For purposes of impact assessment, an airborne noise impact would occur if noise levels during construction exceed the FTA recommended values in the table.

TABLE 23-32
FTA IMPACT CRITERIA FOR CONSTRUCTION

General Assessment			
Land Use	**Descriptor**	**Day**	**Night**
Residential	L_{eq} (1)	90	80
Commercial	L_{eq} (1)	100	100
Industrial	L_{eq} (1)	100	100
Detailed Assessment			
Land Use	**Descriptor**	**Day**	**Night**
Residential	L_{eq} (8)	80	70
Commercial	L_{eq} (8)	85	85
Industrial	L_{eq} (8)	90	90
Detailed Assessment			
Land Use	**Descriptor**	**30-day Average**	
Residential	L_{dn}	75	
Commercial	L_{eq} (24)	80	
Industrial	L_{eq} (24)	85	

1 In urban areas with very high ambient noise levels (L_{dn} greater than 65 dB), L_{dn} from construction operations should not exceed the existing ambient L_{dn} + 10 dB.

(d) Estimated Construction Noise Levels

Both a general assessment and a detailed assessment were performed to examine the potential for noise impacts during construction. First, for each construction scenario listed in Tables 23-2 through 23-16 (with the exception of Table 23-6), detailed equipment and truck usage for each line of activity and duration were enumerated along a timeline. An example is shown in Appendix V, "Construction" for the Midblock Park and Boulevard System construction in Table 23-11. The example illustrates the construction activities from December 2007 to December 2009 and the equipment for each activity. The lower half of the figure shows a sample computation for the nearest receptor (West 35th Street and Eleventh Avenue) for the month of February 2008. The analyses then computed the $L_{eq\ (1)}$, $L_{eq\ (8)}$, and L_{dn} for each activity at each construction site throughout the entire construction schedule. When activities overlap in time as in the example, their noise contributions were added to arrive at the total noise level.

Table 23-33 shows the maximum 1-hour L_{eq} values (without mitigation) obtained by following the general airborne noise assessment procedures, and the maximum 8-hour average L_{eq} and 30-day L_{dn} values obtained by following the detailed assessment procedures at the closest noise-sensitive receptors to the construction site(s). Project values that exceed FTA criteria values are considered to have adverse impacts.

TABLE 23-33
MAXIMUM NOISE LEVELS DURING CONSTRUCTION (WITHOUT MITIGATION)

Nearest Residential Receptor	Construction Site	Dist (ft) to Receptor	1-Hour Leq			8-Hour Leq			30-day Average Ldn			Exceed FTA Criteria
			FTA Criteria	Min/Max Project Level		FTA Criteria	Min/Max Project Level		FTA Criteria	Min/Max Project Level		
North of 42nd Street between 9th and 10th Aves.	Intermediate Station	200	90/80	92	98	90/70	90	96	80	85	91	Yes
On 31st Street between 9th and 10th Aves.	Projected Development Site 33	300	90/80	86	90	90/70	85	90	89	80	85	Yes
Area east of 10th Ave.	Launch Site A	750	90/80	79	85	90/70	77	84	88	73	79	Yes
Building on 40th St. east of site	Site N	75	90/80	96	102	90/70	94	100	88	90	96	Yes
None within 1,000 Feet	Multi-Use Facility	1,000	90/80	80	86	90/70	78	85	NA	73	80	No
None within 1,000 Feet	Corona Yard	1,000	90/80	65	77	90/70	64	75	NA	75	70	No
None within 1,000 Feet	Block 675 – DSNY & NYPD Tow Pound	1,000	90/80	65	77	90/70	64	76	NA	61	72	No
SW Corner Of Dyer & 41st	Projected Development Site 33	150	90/80	90	96	90/70	88	94	83	84	89	Yes
	10th Ave. Station	275	90/80	89	96	90/70	87	93	86	82	88	Yes
	Overlapped Construction		90/80	93	99	90/70	91	96	86	86	91	Yes
Between 41st and 42nd Street east of SR-9A	Convention Center Expansion	450	90/80	83	93	90/70	82	92	80	77	87	Yes
	Convention Center Hotel	300	90/80	87	95	90/70	85	93	80	81	88	Yes
	Overlapped Construction		90/80	89	97	90/70	87	95	80	82	91	Yes
On 35th Street east of 11th Ave.	Terminal Station	200	90/80	91	99	90/70	89	97	87	84	93	Yes
	East Caemmerer Yard	800	90/80	81	87	90/70	80	85	87	75	80	Yes
	Midblock Park and Boulevard	250	90/80	88	93	90/70	86	92	87	81	87	Yes
	Overlapped Construction		90/80	93	100	90/70	91	99	87	86	94	Yes

From Table 23-32, it can be concluded that residences along Tenth Avenue north of West 42nd Street could experience impacts during the construction of the Intermediate Station. Residences on West 40th Street between Eighth and Ninth Avenues could experience impacts during the construction of the fan plant at Site N. Residences at the corner of Dyer Avenue and West 41st Street could experience impacts during the construction of the Intermediate Station and during the construction of the private development at Tenth Avenue and West 41st Street (Projected Development Site 14). Residences between West 41st and West 42nd Streets east of Route 9A could experience noise levels exceeding the FTA criteria during the construction of the Convention Center Expansion and the construction of the Convention Center Hotel. Residences on West 35th Street between Tenth and Eleventh Avenues could experience adverse impacts during the construction of the Terminal Station, the eastern portion of Caemmerer Yard, and the Midblock Park and Boulevard System.

The noise levels from the construction of the private commercial development at Projected Development Site #33, the subway construction at Launch Site A, the Multi-Use Facility, and at Block 675 for the DSNY and Tow Pound facility are not expected to exceed the FTA criteria levels at the nearest residential receptors.

Subway construction could occur 24 hours each day and seven days a week; however, major noise-generating activities affecting nighttime residential uses, such as pile driving or blasting, would not occur after 10 PM, except for activities related to utility relocation. Because of its special nature, utility relocation necessary for construction associated with the Proposed Action could occur at night; this is consistent with the hours maintained for other utility relocation projects in New York City. Utility relocation generally takes place at night, because fewer people use utilities during nighttime hours and because fewer traffic disruptions would occur from the necessary lane closures. Other facility construction would be limited to daytime, as governed by the City Building Code.

Because of the proximity of construction activities to sensitive uses (including residences), noise levels at receptor locations would exceed one or more of the FTA construction impact criteria at most locations unless effective mitigation is implemented. These significant airborne noise impacts would occur for distances up to approximately 750 feet from where construction operations are taking place. Airborne noise travels both vertically and horizontally; whenever a line-of-sight is available between the noise source and a receptor location within approximately 750 feet, impacts could occur.

The values shown in Table 23-32 do not include noise from pile-driving operations, because these operations would take place only for a relatively short time period at any location. Nevertheless, when it occurs, pile driving would produce 1-hour L_{eq} noise levels ranging from approximately 105 dBA at 20 feet to 95 dBA at 60 feet from where the operations are taking place, assuming the use of impact pile drivers. Similar but slightly lower values would be obtained if sonic pile drivers could be used. In all cases, pile-driving operations, if used, would produce intrusive and annoying noise levels that would exceed the FTA's construction impact criteria.

With regard to airborne noise from tunneling operations conducted using TBMs, airborne noise from this source is not expected to be discernible, since most of the noise would be contained underground and would be masked by the high existing ambient noise levels. However, absent the implementation of special measures, noise from TBMs would be discernible and annoying at times when these operations are taking place at access/extraction points and other locations where noise can emanate out of openings in the ground.

Mining operations would use drilling and controlled blasting, and except for some limited locations where vertical blasting could occur (e.g., at shaft sites and at some mined station caverns), most of the airborne noise would be contained underground and is not expected to be discernible. At locations where vertical blasting would occur, noise from the blasting would be discernible for a very short period of time (i.e., for the several-second duration of the blast). In general, due to the short duration of these events, average hourly noise levels would not be significantly affected by the blast noise. However, the rapid and dynamic change in noise levels that could result from these events would be intrusive at nearby residences and businesses.

Vertical blasting operations would be temporary, and are expected to occur only for a limited period of time at any construction location. All blasting would conform to all applicable State and federal and local regulations, including regulations promulgated by the FDNY. Blasting techniques include the use of timed multiple charges of limited blast intensity, which would reduce potential impacts.

Noise would also be significant at the two station construction areas for varying periods of time. Although NYCT would use below-ground mining techniques as much as possible to help minimize impacts—including airborne noise—cut-and-cover construction would be required at the Intermediate Station.

As described previously, the Intermediate Station would be constructed in several distinct stages, and the amount, type, and timing of noise impacts would vary according to the stage. For example, pile driving to support temporary road decking could be a very noisy activity, but this activity would occur only for a fairly short period (approximately three months), and if noise levels were to exceed

permitted thresholds at nearby receptors, alternative methods would be used. However, once the street is excavated to a depth sufficient to permit activities to occur below-ground, a deck would be installed over the street surface. At such time, noisy activities would be concentrated at the shaft (typically measuring 30 feet by 30 feet) used to remove spoils from the station excavation area, and in the immediate vicinity. Most of the remaining area in the vicinity of the station would be less affected by noise and other construction disturbances, because the activities would occur essentially within an underground enclosure. Under no circumstance would the entire excavation area be open to the air simultaneously.

At each station, most noisy construction activities would not occur late at night (i.e., between 10 PM and 7 AM). However, some spoils removal activities could occur during the overnight period to help minimize traffic and other disturbances that would be worse during daytime hours. At any location where spoils would be removed overnight, NYCT would require mitigation such as an enclosure (described in more detail below) to help reduce noise impacts, unless no sensitive land uses (such as residences) would be affected.

Although a variety of mitigation measures would be implemented to reduce noise levels during construction, impacts in the affected areas could still be experienced by residents. These impacts would occur for a considerable period of time—several years for each station and up to 5 years at Launch Site A and at the fan plant at Site N.

In addition to construction site noise (which accounted for construction trucks on site), traffic noise resulting from construction truck traffic and construction worker traffic in support of the construction activities was examined. Even though the maximum hourly truck volume from any one site would vary from no more than 10 truck trips per hour to 1 truck trip per hour during most of the construction period (except for an approximate two-month period, when TBM mining is at a maximum, when the number of trucks leaving Launch Site A could be up to 16 truck trips per hour), the heaviest hourly volume of construction-related vehicles was projected (see Section D.9(g)) to be 54 trucks and 15 passenger vehicles at Tenth Avenue and West 34th Street during the hours of 7 AM and 5:30 PM. Under this reasonable worst-case scenario at West 34th Street at Eleventh Avenue, the additional construction-related traffic volume represented a 38 percent increase in passenger car equivalent (PCE) of the traffic volume in 2006 Without the Proposed Action. This amounted to a 1 dBA (rounded to the nearest decibel) increase in noise levels due to the additional construction traffic. Similar and less increases are anticipated for locations along construction trucking routes. Thus, no traffic-related noise impacts are anticipated as a result of the Proposed Action.

(e) Construction Noise Mitigation

The airborne noise analysis concluded that construction activities would result in significant adverse impacts at many locations throughout the study area along the proposed alignment. Contractors engaged to construct elements of the Proposed Action would be required to strictly adhere to the applicable provisions of the NYC Noise Control Code regulating construction activities (§1403.3-4.11), construction equipment (§1403.3-5.11 on Air Compressors and §1403.3-5.11 on Paving Breakers), and Tunneling Permits (§1403.3-7). Best engineering practices - such as proper maintenance and operation with muffling devices, shutting off idling machineries not in use, etc., - would be employed at construction sites.

MTA NYCT would develop mitigation measures that would reduce and, where practicable, eliminate significant impacts due to construction, in accordance with FTA criteria. Currently, three categories of noise control approaches, identified in the CEPP, are being explored: design considerations and project layout, sequence of operations, and alternative construction methods:

- Design considerations and project layout approaches include such measures as constructing noise barriers, rerouting traffic, placing construction equipment farther from noise-sensitive receptors,

constructing walled enclosures around especially noisy activities, etc. There are two such measures that have the potential to significantly reduce project impacts: the use of acoustic barriers and walled enclosures around certain construction activities, and the placement of construction equipment in shielded locations, such as underground. Both of these measures are being considered for use.

Perhaps the greatest opportunity for significantly reducing noise impacts due to construction is the construction of walled enclosures around noisy operations, particularly at sites where spoils from tunnel operations or station locations would be removed or where spoils removal would take place for extended periods of time or during overnight periods. At locations where blasting is required within the stations or tunnels, acoustically absorptive blast mats could be used to muffle sound and reduce impacts.

- Other types of mitigation measures involve the sequencing of operations. Measures of this type include changing construction sequencing to reduce noise impacts by either combining noisy operations to occur in the same time period or spreading them out, avoiding noisy nighttime activities, where practicable.
- One general exception to the policy of avoiding overnight activities would involve utility work. Because utility work requires the complete closure of the roadway and shutting off utility service for several hours, utility work is normally undertaken at night. Some cut-and-cover construction would be needed, and noisy equipment, such as jackhammers, would at times be required. Where practicable, noisy work would occur during the day. Then, at night, when demand for utilities is low, transmission lines would be severed, moved, and reconnected.
- Finally, alternative construction methods, including such measures as avoiding impact pile driving in noise-sensitive areas using special low noise emission level equipment, selecting and specifying quieter demolition methods, etc., are also being considered. Alternatives to impact or sonic pile driving include bored or drilled piles. This would eliminate a particularly annoying and disturbing operation. Similarly, project sponsors would consider the use of infrared lighting and/or flagmen, instead of backup horns for trucks. Backup horns, which are designed to attract attention, tend to produce noise that is generally annoying and disturbing to nearby residents, particularly late at night. Other examples of measures that fall into the category of alternative construction methods are specifications to reduce the intrusive nature of blasting. Construction specifications would require the use of modern blasting techniques, including timed multiple charges and blast mats to reduce impacts.

While these measures would minimize noise levels as a result of the Proposed Action, it is likely that one or more sensitive receptors would experience increased noise levels at times during the construction period which could result in significant adverse impacts.

Vibration and Ground-Borne Noise

(a) Existing Conditions

Existing vibration sources in the study area include subways near street level, poor road conditions, and repairs and constructions. Vibration levels varied from 95 VdB to under 60 VdB in the Project Area. Vibrations from the existing subway operations are typically localized to within a hundred feet of the line. While vibration levels are generally not perceptible in most areas, high vibration levels were found adjacent to major roadways with high bus and truck volumes, and next to subway surface appurtenances. Detailed information on existing vibration environment is presented in Chapter 22, "Noise and Vibration."

(b) Methodology

The FTA guidance manual provides some simple screening methodologies for determining where there is a significant potential for impacts from construction activities. Such activities include pile driving, deconstruction, drilling, excavation, or blasting in close proximity to sensitive structure. The procedure includes: (1) selecting the equipment and determining the vibratory levels at a reference distance of 25 feet; (2) determining PPV at a receptor location using a formula that accounts for the PPV of the equipment and the distance from the receptor; and (3) if consideration of annoyance or interference with vibration-sensitive activities is of concern, estimating the vibration level and applying the vibration impact criteria discussed above.

(c) Applicable Standards and Criteria

The *CEQR Technical Manual* has no provision governing the impacts of ground-borne vibration and noise.

The FTA-developed criteria for environmental impacts from ground-borne vibration and noise from transit operations are based on the maximum levels for a single event. The impact criteria, shown in Table 23-34, are used to determine whether the project would result in significant vibration and ground-borne noise impacts. The limits are specified for the three land use categories defined below:

- Vibration Category 1: High Sensitivity—Buildings where low ambient vibration is essential for the operations within the building (e.g., vibration-sensitive research, hospitals, etc.), which can be well below levels associated with human annoyance.
- Vibration Category 2: Residential—This category covers all residential land uses and any buildings where people sleep, such as hotels and hospitals.
- Vibration Category 3: Institutional—This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

In terms of construction activities, the focus of vibration criteria has been the levels that should not be exceeded to prevent architectural and structural damage, particularly to old, fragile buildings of historical significance. The generally accepted criteria for avoidance of construction-related damage, which the FTA has adopted in its guidance manual, are 0.20 inches per second (approximately 100 VdB) for fragile buildings or 0.12 inches per second (approximately 95 VdB) for extremely fragile buildings. Where there is concern regarding the avoidance of levels that would result in perceptible ground-borne noise and vibration, particularly at vibration-sensitive sites, the FTA recommends using the criteria presented in Table 23-34.

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TABLE 23-34
GROUND-BORNE VIBRATION AND NOISE IMPACT CRITERIA

Land Use Vibration Category	Ground-borne Vibration Impact Levels (VdB re 1 micro inch/second)		Ground-borne Noise Impact Levels (dBA re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
1	65 VdB[3]	65 VdB[3]	See note 4	See note 4
2	72 VdB	80 VdB	35 dBA	43 dBA
3	75 VdB	83 VdB	40 dBA	48 dBA

Source: Transit Noise and Vibration Impact Assessment, FTA, April 1995, pages 8-2 through 8-3.

1 "Frequent events" are defined as those with more than 70 vibration events per day. Most rapid transit projects fall into this category.

2 "Infrequent events" are defined as those with fewer than 70 vibration events per day. This category includes most commuter rail systems.

3 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

4 Vibration-sensitive equipment is not sensitive to ground-borne noise. However, historic structures could include residences. Therefore ground-borne noise levels for category 1 land use will match those for Category 2.

(d) Estimated Vibration Levels

Table 23-35 shows typical construction equipment and vibration levels at various distances without mitigation measures. As shown in the table, with the exception of pile driving machines and clam shovel drops (needed for the slurry walls), at distances greater than 20 feet, all of the vibration values for the types of equipment likely to be used during subway construction are below the vibration damage threshold criteria for fragile buildings and for extremely fragile historic buildings. Similarly, at distances greater than 20 feet, vibration levels for the TBM would be below both thresholds.

TABLE 23-35
VIBRATION LEVELS VS. DISTANCES FOR CONSTRUCTION EQUIPMENT

Equipment	Peak Particle Velocity			(inches per second)		
	5 feet	10 feet	20 feet	30 feet	40 feet	50 feet
Impact Pile driver (typical)	7.20	2.55	0.90	0.49	0.32	0.23
Clam shovel drop (slurry wall)	2.26	0.80	0.28	0.15	0.10	0.07
Hydromill slurry wall in soil	0.09	0.03	0.01	0.01	0.00	0.00
Hydromill slurry wall in rock[1]	0.19	0.07	0.02	0.01	0.01	0.01
Large bulldozer	1.00	0.35	0.12	0.07	0.04	0.03
Caisson drilling	1.00	0.35	0.12	0.07	0.04	0.03
Loaded trucks	0.85	0.30	0.11	0.06	0.04	0.03
Jackhammer	0.39	0.14	0.05	0.03	0.02	0.01
Small bulldozer	0.03	0.01	0.00	0.00	0.00	0.00
Tunnel Boring Machine[2]	1.1	0.45	0.18	0.1	0.07	0.05

1 Data based on Boston project with softer rock than exists in New York City, where levels would be higher.

2 Levels based on TBM vibration rates in Buffalo limestone.

Much of the underground construction of the No. 7 Subway Extension, and tunnel boring with TBM in particular, would be at depths from 65 to 130 feet; no vibration or ground-borne noise levels exceeding the FTA guideline criteria are expected at sensitive receptors at street level or above. Although the FTA criteria for vibration and ground-borne noise apply strictly only to subway construction and there are no specific vibration limits applicable to the construction of other facilities, the FTA criteria levels were nonetheless used to identify the potential vibration impact at non-transit construction sites. Table 23-36 presents the distances from the various project construction sites within which the FTA vibration damage threshold levels for fragile buildings and for extremely fragile historic buildings would be exceeded.

TABLE 23-36
DAMAGE THRESHOLD DISTANCES FOR PROJECT CONSTRUCTION SITES

Construction Site	Equipment With Max PPV Potential (Typical)	Ref PPV @ 25 feet in inches per second	Distance (ft) to 0.2 inches per second*	Distance (ft) to 0.12 inches per second**
Transit Construction				
Area A	Caisson Drill	0.089	15	21
Area N	Pile Driver	0.644	55	77
Intermediate Station	Pile Driver	0.644	55	77
Terminal Station	Caisson Drill	0.089	15	21
Corona Yard	Pile Driver	0.644	55	77
Facility Construction				
Multi-Use Facility	Pile Driver	0.644	55	77
Convention Center	Caisson Drill	0.089	15	21
Convention Center Hotel	Caisson Drill/Bulldozer	0.089	15	21
East Caemmerer Yard	Caisson Drill	0.089	15	21
Midblock	None Significant	-	-	-
Block 675	Pile Driver	0.644	55	77
Private Developments				
Brookfield	Pile Driver	0.644	55	77
41st St. and Tenth Ave.	Pile Driver	0.644	55	77

* FTA criterion for fragile buildings
** FTA criterion for extremely fragile historic buildings

(e) Vibration and Ground-Borne Noise Mitigation

As described above, construction activities would result in significant vibration and ground-borne noise. A number of controls would be implemented to mitigate the impacts, particularly for operations involving blasting, pile driving, pavement breaking, and movement of very heavy construction equipment. Preconstruction surveys of fragile and fragile historic structures, or any structures with vibration-sensitive equipment such as laser eye surgery tools, within the radii of the construction sites listed in Table 23-36 would be performed. Prospective contractors would be alerted to survey the structures regarding their special requirements and activities. Construction specifications to safeguard the integrity of the structures and the operations would be included in construction contracts.

A number of controls would be implemented with respect to mitigation of vibration during construction. A preconstruction survey of any structure or use (e.g., operation of vibration-sensitive equipment such as laser eye surgery tools) likely to be adversely affected by construction activities would be performed, and threshold or limiting values would be established that account for the ability of each structure or use to withstand the loads and displacements due to construction vibration. Project sponsors, through their contractors, would also meet with users of especially sensitive equipment prior to construction to survey them regarding their special needs, and schedule activities appropriately. Construction specifications that impose reasonable acceptance criteria would be included in construction contracts.

Vibration monitoring programs at nearby sensitive receptors would also be developed and included as part of the construction contract specifications. A feedback response procedure would be implemented to promptly address community concerns and implement additional control methods where necessary. Additionally, vibration control plans would be developed and best management practices to limit vibration would be employed in sensitive areas, depending on the construction method required.

k) Natural Resources

Introduction

Although construction activity would be located near the Hudson River, construction of elements of the Proposed Action would not cause significant adverse impacts to natural resources within the Project Area. The subway tunnel would not cause significant adverse impacts to natural resources, since construction would occur largely below ground and in bedrock. However, components of the Proposed Action that involve construction activities located near the Hudson River could affect natural resources. Elements of the Proposed Action near the river include the platform over Caemmerer Yard and the western portion of the replacement Quill Bus Depot, the Multi-Use Facility, the DSNY and Tow Pound Facility, and the Convention Center expansion. Most of the Project Area contains primarily developed and paved properties, and, as discussed below, construction of these elements are not expected to result in significant adverse impacts to natural resources.

Biota

Construction activity associated with the Proposed Action would occur in an urban setting, and significant impacts to biota are not anticipated. No State or federal listed Threatened or Endangered Species nor habitat for these species would be affected by construction of the Proposed Action. Most of the construction activity associated with the subway extension would occur underground, and activities that occur at grade would not significantly alter habitat. Other activities associated with construction of elements of the Proposed Action would occur on intensively developed land with little or no plant habitat.

Water Resources

Construction activities that occur below the water table generally incorporate techniques for reducing or stemming infiltration of groundwater. For elements of the Proposed Action that do not incorporate these techniques, and for situations where groundwater infiltrates during construction of retaining walls, dewatering would be necessary. Uncontaminated groundwater would be discharged, with appropriate permits, into the sewer or to the Hudson River (see Chapter 14, "Hazardous Materials" for more information regarding contaminated groundwater).

Portions of the Proposed Action would be constructed within the Federal Emergency Management Agency's 100-year flood hazard zone. New York State requires that in order to locate projects within the 100-year flood hazard zone, no reasonable alternative exists. Elements of the Proposed Action, including the new Multi-Use Facility, the Convention Center expansion, and segments of the subway, could not be constructed outside this zone and continue to meet the goals of the action.

The Hudson River could be affected by sedimentation from runoff from construction sites. However, construction would occur at sites separated from the river by Twelfth Avenue and any runoff would be managed by using a Soil Erosion and Sediment Control Plan and thus contained on-site. Containment techniques would include sediment barriers and on-site catchment basins. No significant adverse impacts to the Hudson River are anticipated as a result of sedimentation.

Where dewatering is necessary, the water would be tested to determine whether contamination is present, and if so, the nature of the contamination. Contaminated groundwater would be disposed of according to City, State and federal regulations. (See Chapter 13, "Natural Resources," for further discussion of mitigation measures.)

l) Infrastructure

Most construction activity associated with the subway extension would avoid disruptions to electricity, water, sewer, gas, steam, telecommunications, and other utility transmission lines. Access to Launch Site A, Retrieval Site L, the fan plant and the Terminal Station would be provided without excavation in the street bed – where utility lines are typically located. Except for construction of the

Intermediate Station, tunneling and station cavern excavation would occur below the level of utility transmission lines in the street bed. Excavation for the Intermediate Station within public rights-of-way, such as under West 41st Street on either side of Tenth Avenue, would require the temporary disruption or relocation of underground utilities during the construction period.

West 33rd, West 39th, and West 40th Streets, and a portion of West 41st Street between Eleventh and Twelfth Avenues would be closed as a result of the Convention Center expansion. (See Chapter 16, "Infrastructure," for a discussion of impacts to infrastructure.)

NYCT is committed to making efforts to maintain the viability and accessibility of local businesses and maintaining the quality of life for residents, businesses, and visitors to the area. As such, any disruptions to infrastructure needs would be kept to a minimum. Public outreach and communication with other agencies is anticipated to result in close coordination of construction activities and minimization of utility disruptions.

Careful coordination between the No. 7 Subway Extension designers and DEP Bureau of Water and Sewer Operations would occur throughout construction in these sensitive areas. Specific construction methods to avoid and minimize impacts to the City infrastructure and private utilities would be designed to meet the site-specific needs. In the areas of cut-and-cover construction, utility lines could be suspended from street decking as work underneath progresses, or could be relocated to the edges of the right-of-way. After the cavern for the station is complete, utility lines would be returned to their original position.

Because of its special nature, utility relocation necessary for construction associated with the Proposed Project would typically occur at night; this is consistent with the hours maintained for other utility relocation projects in New York City. Utility relocation generally takes place at night, because fewer people use utilities during nighttime hours, and because fewer traffic disruptions would occur from the necessary lane closures. All necessary agreements with utility providers and governmental agencies regarding temporary or permanent relocation of utility transmission lines would be implemented. Utility service would be maintained throughout construction, and no significant impacts are anticipated.

m) Hazardous Materials

No significant adverse hazardous materials impacts are anticipated through construction of elements of the Proposed Action, because appropriate measures would be taken to limit exposure to hazardous materials. See Chapter 14 "Hazardous Materials" which provides a detailed examination of these issues. The initial evaluation, provided in detail in Chapter 14, "Hazardous Materials," involved a hazardous materials screening study for the Project Area. This broad screening identified potentially contaminated sites that could affect construction of elements of the Proposed Action. Subsequent to this evaluation, further screening and assessment were performed by project element; therefore the methods to be implemented (e.g., Phase I ESA, (E) Designation) differ depending upon the project element. Hazardous materials within soil, soil gas, groundwater, and building materials resulting from historical manufacturing and industrial operations could be encountered during construction related to the Proposed Action. Hazardous materials in the Project Area could include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, coal tars, and cyanide. Naturally Occurring Asbestos (NOA) could be present in bedrock that would be excavated. Additionally, hazardous building materials, including asbestos-containing material (ACM), lead-based paint (LBP), and PCB-containing equipment are expected to be present in structures that would be deconstructed as a result of the Proposed Action.

Implementation of the Proposed Action would not result in significant adverse impacts, because Project Sponsors would ensure that hazardous materials would be managed, isolated, and/or removed during construction, thus preventing impacts during the operational phase. All private development

on projected and potential development sites would receive an (E) Designation and would therefore require Phase I, and if necessary, Phase II investigations, and approved remediation plans prior to commencement of construction activities. The investigations and any necessary remediation and abatement would be implemented prior to or during construction and would be subject to review and approval by the DEP, NYSDEC and NYS Department of Labor.

A CEPP would be developed and implemented for the construction of each of the major public project elements of the Proposed Action, such as the Multi-Use Facility, the Convention Center Expansion, and the No. 7 Subway Extension. The CEPP would have provisions to prevent hazardous materials exposures to workers and the general public, and would define the handling, storage, transportation, and disposal of hazardous materials during construction. The CEPP would also identify measures to be taken to address contaminated material that would not be removed as part of construction, and would therefore remain in place. Such measures include the implementation of impermeable barriers to achieve isolation from contaminants such as SVOCs. Elements of the CEPP include, but are not limited to Health and Safety Plans (HASPs), Soil, Soil Gas, Spoils and Groundwater Management Plans. The HASPs would be prepared to protect both project workers and the public who could be near the project during the construction phase. The provisions of the HASPs would be mandatory for contractors and subcontractors engaged in on-site construction activities.

The CEPP and its corresponding elements are further discussed in Section H of Chapter 14, "Hazardous Materials."

E. 2017 FUTURE WITHOUT THE PROPOSED ACTION

Development of new residential, commercial, and infrastructure uses is expected to continue between 2010 and 2025, and thereafter. Several projects are scheduled to be under construction during 2017. Two projects that will involve upgrades of infrastructure in the Project Area are the Eleventh Avenue Viaduct and No. 3 Water Tunnel.

The New York City Department of Transportation, as part of a program to assure the seismic stability of structures under its jurisdiction, intends to either renovate or replace the Eleventh Avenue viaduct. The timing is uncertain, but the project would be scheduled for some time after 2011. The viaduct, constructed in the 1930s as part of the West Side Improvement Program, extends southward from West 37th Street to West 28th Street in the Project Area. It is expected that construction necessary for improvements to the viaduct would generate traffic impacts on Eleventh Avenue and streets that cross the avenue from approximately West 39th to West 26th Streets.

The DEP is expected to continue excavation for the No. 3 Water Tunnel. Bedrock spoils from that project would be removed from the ground through a shaft located at the northwest corner of West 30th Street and Tenth Avenue. Excavation and construction associated with the No. 3 Water Tunnel is expected to continue through 2020. Traffic, noise, and air quality would likely be affected in the vicinity of the shaft site, located at the northwest corner of West 30th Street and Tenth Avenue, through which excavation spoils would exit and construction equipment and material would enter.

Additionally, it is anticipated that in the Future Without the Proposed Action some development would have occurred in the vicinity of the viaduct, and with the development, an increase of resources potentially affected by construction activities.

F. 2017 FUTURE WITH THE PROPOSED ACTION

1. Construction Activities Associated with Projected Development

a) Introduction

Construction of certain elements of the Proposed Action, for construction impacts analyses, is expected to be complete by 2010. Development between 2010 and 2025 anticipated under the Future with the Proposed Action is expected to include private commercial and residential development, and is expected to total approximately 28 million square feet of office and retail space and approximately 10,000 residential units (see Chapter 3, "Analytical Framework"). When this amount of development is averaged over a span of 26 years (from 2005 to 2025), an annual development rate of approximately 1.16 million square feet of commercial development and approximately 485 residential units is expected. For this analysis, conservative annual development rates have been assumed: 1.2 million square feet of commercial development, and development of approximately 500 residential units.

Commercial and residential development as a result of the Proposed Action after 2010 is expected to occur throughout the Project Area, but would be much less concentrated than construction activity prior to 2010, and would likely consist of isolated projects. Additionally, development envisioned after 2010 would be smaller in scale and require less time to complete. While construction of the No. 7 Subway, the Multi-Use Facility, and the Convention Center are expected to span up to five years, construction of projects associated with development after 2010 would likely be complete in two years. Many of the potential impacts associated with development prior to 2010 would be absent from development after 2010, because projects would be dispersed throughout the Project Area, and each project would require much less time to complete.

Because new buildings would be erected on any of the Development Sites at the discretion of private developers, it is impossible to predict where or when development would occur. Therefore, for the analysis of construction impacts for the 2017 Construction Analysis Year, it is assumed that development would occur primarily along the proposed Midblock Park and Boulevard System. Since development of the boulevard is expected to progress from south to north, and 2017 is the midpoint between 2010 and 2025, commercial and residential development at sites approximately midway along the boulevard have been selected for analysis. In addition, a reasonable worst-case scenario would include development of the Midblock Park and Boulevard System proximate to and concurrent with residential and commercial development. Sites selected for this analysis are Projected Development Site 20 (commercial development) and Projected Development Site 13 (residential development).

b) Description of Construction and Techniques

This analysis assumes that techniques used for constructing these commercial and residential buildings would be consistent with construction conventions in use today. Construction of the commercial building is estimated to take 34 to 36 months from start of foundation excavation to occupancy by tenants. It is assumed that the building would be supported by spread footings supported on rock, and would have a steel superstructure and glass curtain walls. Construction material amounts and excavation volumes, and associated truck trips required for transportation of this material, are provided in Table 23-37. Construction of the residential building is estimated to take 34 to 36 months from start of foundation excavation to occupancy by tenants. This structure is assumed to be sized for 500 units, with an average unit size of 1,000 square feet, and consist of one 25-story structure with two below-grade levels for accommodating off-street parking, concierge service, and laundry facility. It is assumed that the structure would be supported on piles driven to rock and include a structural steel frame with glass-curtain-wall-type design. Construction material

amounts and excavation volumes required for development of the residential tower, and associated truck trips required for transportation of this material, are provided in Table 23-38.

It is likely that the sidewalk and the curb lane (currently used either for parking or travel) would be closed for a portion or all of the construction period. As per City building code regulations, protected pedestrian passageways would be provided in place of any closed sidewalks, and Management and Protection of Traffic plans approved by the NYCDOT would be implemented. Additionally, construction equipment and machinery is expected to be similar to that required for construction of commercial and residential buildings considered in the Future With the Proposed Action prior to 2010. Construction equipment would include: cranes and cherry pickers, compressors, excavators and backhoes, front end loaders, pile drivers, and jackhammers.

c) Sequencing, Materials, Equipment, and Transportation

TABLE 23-37
MATERIALS ENTERING AND SPOILS EXITING COMMERCIAL DEVELOPMENT AND REQUISITE TRUCK TRIPS: PROJECTED DEVELOPMENT SITE 20

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Spoil Removal (exiting)	60,000 cy	Months 1 – 4	4,000[1]
Substructure Concrete (entering)	6,000 cy	Months 2 – 6	600[2]
Superstructure Concrete (entering)	37,500 cy	Months 4 – 18	3,750[2]
Structural Steel (entering)	37,500 tons	Months 4 – 25	1,500[3]
Glass Curtain Wall (entering)	1,200,000 sf	Months 10 – 34	1,200
Dry Wall (entering)	1,800,000 sf	Months 26 – 34	450
Misc Mech/Elec/HVAC/Plumbing/Arch Items (entering)	11,250 tons	Months 10 – 34	1,125
		Total Truck Trips	**12,625**

1 Soil, asphalt, and rock spoils would be transported in 10 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.

TABLE 23-38
MATERIALS ENTERING AND SPOILS EXITING RESIDENTIAL DEVELOPMENT AND REQUISITE TRUCK TRIPS: PROJECTED DEVELOPMENT SITE 13

Material	Amount	Approximate Activity Period	Truck Trips
Excavation and Spoil Removal (exiting)	42,000 cy	Months 1 – 4	2,800[1]
Concrete (entering)	39,000 cy	Months 1 – 4	3,900[2]
Piles and Structural Steel (entering)	10,400 tons	Months 4 – 18	416[3]
Glass Curtain Wall (entering)	280,800 sf	Months 4 – 25	286
Dry Wall (entering)	676,000 sf	Months 10 – 34	170
Misc Mech/Elec/HVAC/Plumbing/Arch Items (entering)	6,000 tons	Months 10 – 34	600
		Total Truck Trips	**8,172**

1 Soil, asphalt, and rock spoils would be transported in 10 cy capacity trucks.
2 Concrete would be transported in 10 cy capacity trucks.
3 Assuming 25 tons of steel per truck.

2. Midblock Park and Boulevard System

a) Introduction

As discussed earlier in this chapter, development of the Midblock Park and Boulevard System is expected to begin prior to 2010 and progress sequentially northward, with completion sometime around 2025. For the 2017 Construction Analysis Year, it is assumed that development of the open

space would be approximately three-quarters complete, and development would therefore have progressed to approximately West 38th or West 40th Street.

Construction of the Midblock Park and Boulevard System would involve different construction techniques depending on site conditions: between West 33rd and West 36th Streets the system would be constructed at grade; between West 36th and West 39th Streets the system would be located over the Amtrak right-of-way; and between West 39th and West 41st Streets the system would be constructed over Lincoln Tunnel approach infrastructure. North of West 36th Street the park system would be constructed over a platform spanning the transportation infrastructure. Support for the concrete and steel platform would be provided by steel posts and beams atop caissons or piles.

Construction of the platform would be coordinated with the PANYNJ to ascertain that piles or caissons are located where they would not interfere with Lincoln Tunnel ramps or other transportation infrastructure.

b) Description of Construction and Techniques

Development of the Midblock Park and Boulevard System on the block south of West 38th Street between Tenth and Eleventh Avenues would require construction over the Amtrak Empire Line right-of-way. For that portion, a steel and concrete deck would be supported by driven piles or caissons. Coordination with and approval from Amtrak would be required for development over the Amtrak Empire Line right-of-way. Ventilation, emergency egress points, and other design features would be specified in an agreement with Amtrak, and construction of the Midblock Park and Boulevard System in this area would be designed and scheduled to minimize impacts to Amtrak operations.

Construction material amounts and excavation volumes for construction of this segment of the Midblock Park and Boulevard System, and associated truck trips required for transportation of this material, are provided in Table 23-39.

TABLE 23-39
MATERIALS ENTERING AND SPOILS EXITING MIDBLOCK PARK AND BOULEVARD SYSTEM CONSTRUCTION

Material	Amount	Approximate Activity Period	Truck Trips
Grading and Spoil Removal (exiting)	2,000 cy	Months 1 – 4	133[1]
Deconstruction Debris (exiting)	200 cy	Months 1 – 4	13[1]
Steel (entering)	1,010 tons	Months 4 – 18	40[2]
Concrete (entering)	1,180	Months 4 – 25	118[3]
Misc Arch/Landscaping Features (entering)	10 tons	Months 10 – 34	10
Total Truck Trips			**314**

1 Soil, gravel, deconstruction debris, and asphalt would be transported in 15 cy capacity trucks.
2 Assuming 25 tons per truck.
3 Concrete would be transported in 10 cy capacity trucks.

c) Sequencing, Materials, Equipment, and Transportation

Construction activity for this portion of the Midblock Park and Boulevard System would require temporary closure of the parking lane and portions of the sidewalks along the south side of West 38th Street and the north side of West 37th Street at the central portions of the block.

3. Impacts and Mitigation

a) Land Use, Neighborhood Character, Socioeconomic Conditions, and Open Space

No significant adverse impacts to land use, neighborhood character, socioeconomic conditions or open space in the Project Area are anticipated as a result of the Proposed Action between 2010 and 2025. Construction of the Midblock Park and Boulevard System, and the private residential and

commercial developments would temporarily change the land use and the neighborhood character of the areas surrounding the construction sites. In the case of private development, the degree to which this change would be apparent would depend on which site is being developed, as some projected development sites are located in areas of the Project Area where the existing land uses are less compatible with construction activities. Generally, this change would be more apparent in eastern portions of the Project Area, where the neighborhood character is better defined. Construction of the Midblock Park and Boulevard System would occur in the area between Tenth and Eleventh Avenues where transportation-related land use predominates. Changes to land use and neighborhood character would be temporary and would not result in adverse impacts.

Socioeconomic conditions could be affected in the immediate vicinity of construction sites due to reduced access and visibility of businesses, depending on the location of the site under development. The NYCDOT requires permits for use of streets and sidewalks for construction projects, and these permits include mechanisms to ensure access to proximate business and residences. Access by NYPD, FDNY and emergency medical services to any property would, at all times, be maintained. No socioeconomic impacts are anticipated as a result of the Proposed Action between 2010 and 2025. As in the case of the 2006 construction analysis year, positive economic impacts would be generated, as construction workers would make purchases from neighborhood businesses.

No open space would be lost as a result of the Proposed Action, and although open space developed as a result of the Proposed Action could be used for construction laydown areas, this use would be temporary. The Proposed Action is not expected to cause significant adverse impacts to open space.

b) Historic and Archaeological Resources

Historic Resources

Historic and archaeological resources are currently located on (or within the area of potential impact of) Projected Development Sites throughout the Project Area. Removal of resources as a result of development on these sites would constitute impacts and would be mitigated through the same mechanisms discussed in the impacts section for the 2006 analysis year. Those resources proximate to construction activity would be protected from damage by structural reinforcement methods, such as underpinning, or ground strengthening procedures.

By 2025, one eligible architectural resource would have to be removed for construction of the proposed open space corridor; this would constitute an unavoidable adverse impact. Although four architectural resources are adjacent to the open space corridor, close enough to be affected by construction-related activities, the City would implement protection measures to avoid inadvertent damage to them. Likewise, NYCT would implement protection measures to avoid accidental construction damage to two resources located adjacent to the proposed Intermediate Station of the No. 7 Subway Extension, which would not be constructed until after 2010.

By 2025, construction on the projected development sites could remove or significantly alter six eligible architectural resources, potentially causing significant adverse impacts. An additional 18 architectural resources could experience accidental damage from construction on adjacent projected development sites. The effects to historic resources due to construction of elements of the Proposed Action, and potential mitigation measures, are discussed in detail in Chapter 9, “Historic Resources.”

Archaeological Resources

By 2025, construction at two sites, Development Sites 11 and 41, would have the potential to cause significant adverse impacts to archaeological resources. Potential significant adverse impacts to archaeological resources would be unmitigated, because development would take place as-of-right once these sites are rezoned. Chapter 10, “Archaeological Resources,” provides a discussion of construction-related impacts to this resource.

c) Traffic

Introduction

By 2010, it is assumed that the major public components of the Proposed Action would be complete. It is also assumed that in response to public transit improvements, investment in the area would occur between 2010 and 2025. Approximately 28 million square feet of private office and retail development and 10,000 units of residential development are expected to be constructed within this 15-year period. In addition, various other infrastructure projects are also expected to occur within the 2010-2025 time period, including the Midblock Park and Boulevard System, which would be built concurrently with commercial and residential development.

A conservative estimate of one commercial building and one residential building is assumed to be built each year from 2010 to 2025. For the year 2017, the sites selected for the construction impact analysis are Projected Development Site 20 (a commercial development at the northeast corner of Tenth Avenue and West 40th Street) and Projected Development Site 13 (a residential development at the southwest corner of Tenth Avenue and West 39th Street). Vehicles from the construction of the Midblock Park and Boulevard System were also included in this analysis. Since it is assumed that the construction of a commercial or residential development would take approximately 34 months to complete, construction vehicles from buildings already under construction from previous years were also factored into the analysis. In this case, construction vehicles from two development projects (one residential and one commercial) in 2015 and two development projects in 2016 (one residential and one commercial) were also included as a part of the 2017 analysis.

By breaking down the 2017 project construction vehicle requirements into a monthly distribution and assuming construction would start in January, it was determined that April 2017 would be the busiest month out of the 34-month construction period. When construction vehicles from projects originating in 2015 and 2016 are also factored in, this would still be the busiest month for construction vehicles. This is primarily due to excavation spoils and deconstruction debris removal that would occur within the first four months of construction.

2017 Future with the Proposed Action Construction Vehicles

The 2017 Future With the Proposed Action construction vehicle traffic flow volumes developed for the weekday AM, Midday and PM peak hours were developed using the same methods and assumptions as in the 2006 analysis. These assumptions are as follows:

- **Peak Construction Activity Determination:** The vehicle trips generated by the proposed projects were assumed to be the result of several construction activities, including the removal of excavation spoils and deconstruction debris, delivery of construction material, and workforce transportation requirements. The overlapping schedules for all Proposed Action-related projects and construction activities indicate a construction peak occurring in the first and second quarters of 2017. Within these peak quarters of construction activity, a peak is projected to occur in the 4th month (i.e., April 2017). This month of maximum construction activity is assumed to reflect maximum vehicular activity. As a result, the construction impact analyses were conducted for conditions projected to occur during this month.

- **Construction Activity Assumptions:** Trucking required for the transport of excavation, backfill, and deconstruction debris would occur Monday through Saturday from 7:00 AM to 10:00 PM. It is assumed that truck trips would be evenly spaced throughout the day. It is also assumed that all spoils removal trips would use the Lincoln Tunnel to access points to the west.

  It is anticipated that material delivery trips for all construction activity would occur Monday through Saturday from 7:00 AM to 5:30 PM. These truck trips were assigned to the traffic network based upon the following assumptions:

- All concrete delivery trucks would originate from east of the Hudson River: one-third from The Bronx; one-third from Queens; and one-third from Brooklyn.
- All steel deliveries would originate from west of the Hudson River and would use the Lincoln Tunnel or the George Washington Bridge.
- All other construction material deliveries would originate as follows: one-half from west of the Hudson (Lincoln Tunnel and George Washington Bridge); one-sixth each from or through The Bronx, Queens, and Brooklyn.

It is assumed that workers would arrive within the hour prior to the start of their shift and leave within the hour after their shift ends. Workers leaving in the evening would coincide with the PM peak period (5:00 PM – 6:00 PM). Thus, these worker trips (primarily light vehicles) must be factored into the analysis of the PM peak period. The automobile share (with taxis) of the modal split for construction workers traveling into the Project Area is assumed to be 21.8 percent. This was derived from 1990 U.S. Census Journey-to-Work data for the census tracts within the Project Area both east and west of Eleventh Avenue.

The generation of construction traffic for the Midblock Park and Boulevard System, the two 2017 project sites, the two 2016 project sites, and the two 2015 project sites were developed based on general construction information. The construction information was developed based on input from the NYCDOT and from the sponsors of the Proposed Action, including MTA NYCT and DCP. The construction vehicles projected to be used for the various elements would be comprised of light vehicles, such as contractor vans and pick-up trucks, and heavy vehicles, such as concrete mixers, dump trucks, trailers, etc.

For analysis purposes, it was assumed that all dump trucks, concrete mixers, and trailers carrying structural steel would be heavy vehicles, while labor/employee vehicles were assumed to be light vehicles. The daily peak construction vehicles projected for highest activity month in 2017 (April 2017) in terms of total and percentage of heavy and light vehicles are summarized in Table 23-40.

TABLE 23-40
PROJECTED 2017, MONTH 4 DAILY CONSTRUCTION VEHICLES

Proposed Action Project Sites	Heavy Vehicles		Light Vehicles		Total Vehicles
	No.	Percentage	No.	Percentage	
2017 Commercial (Site 20)	111	5.3%	5	4.0%	**116**
2017 Residential (Site 13)	132	6.3%	5	4.0%	**137**
Midblock Park and Blvd. System	3	0.1%	4	3.2%	**7**
2016 Commercial	32	1.5%	1	0.8%	**33**
2016 Residential	6	0.3%	1	0.8%	**7**
2015 Commercial	11	0.5%	1	0.8%	**12**
2015 Residential	2	0.1%	1	0.8%	**3**
Total Vehicles	**2376**	**100.0%**	**144**	**100.0%**	**2520**

Conclusion

Based on this conservative construction scenario, the 2017 Future With the Proposed Action is projected to generate just under 300 daily heavy construction vehicles and 18 daily light construction vehicles during the peak month of construction. These projected 2017 volumes are significantly less than the construction vehicles projected for the 2006 Future With the Proposed Action, which would comprise 454 daily heavy construction vehicles and 34 daily light construction vehicles during peak construction.

While some short-term traffic impacts are anticipated, particularly along Tenth Avenue at West 39th Street and West 40th Street, where Development Sites 13 and 20 are located, truck traffic would drop

off significantly by May 2017, as rock spoil and deconstruction debris removal is completed. Short-term mitigation could be needed for problematic intersections. As noted previously for the 2006 Future With the Proposed Action construction impact analysis, such mitigation measures could include the shifting of green signal time from one approach to another, the daylighting of an existing parking lane for use as a travel lane, and various lane configuration/utilization adjustments.

d) Transit and Pedestrians

For commercial and residential development between 2010 and 2025, construction sites would be much less concentrated than they would be prior to 2010, and the duration of construction projects would be much less. It is anticipated that lane and sidewalk closures would be minimal, and any closures would be dispersed throughout Hudson Yards. Though there would likely be more traffic and more pedestrian activity as a result of new development in the Project Area, the amount and scale of construction would be much less. Sidewalks and lanes could be closed in the vicinity of construction sites, and some temporary impacts to traffic and pedestrians could occur. Maintenance and Protection of Traffic plans would be implemented to mitigate impacts to traffic and pedestrians. Access to public transportation would be maintained throughout the construction period at all construction sites, and access by the NYPD, FDNY, and emergency medical services to all properties would not be interrupted.

The Midblock Park and Boulevard System, proposed to be located between Tenth and Eleventh Avenues and West 33rd and West 39th Streets, would be constructed on a platform over the Amtrak Empire Line – a subsurface, exposed rail alignment. Though the design of the park is not complete, construction of the platform would likely require steel supports mounted on caissons or piles. Installation of the support system would be coordination with Amtrak to ensure that any alterations to service would be minimized. This work would likely occur during the night and on weekends. No significant adverse impacts to Amtrak service are anticipated.

e) Air Quality

The construction-related air quality impacts for the year 2017 are expected to be less than 2006 for the following reasons:

- The levels of construction activity for the 2017 peak period would be less than the 2006 peak period (i.e., less diesel-powered construction equipment and less amount of excavation with the associated truck trips).
- Cleaner diesel engines would be in use for construction equipment and delivery trucks as a result of more stringent regulations. As discussed previously, the EPA Tier II and Tier III emission standards for non-road diesel equipment, promulgated in 1998, will take effect between 2004 and 2008. The implementation of these standards and the new final EPA Tier IV rule for non-road diesel engines combined with cleaner fuels (ULSD) for all non-road diesel engines would significantly reduce NO_x and PM diesel emissions.

As a result, it is expected that construction activities during 2017 would generate much lower emissions, even for an equivalent amount of construction activity, than those during the 2006 period. As discussed above, the total would not cause any exceedance of the NAAQS for any of these pollutants or the DEP $PM_{2.5}$ STVs and since 2017 is less than 2006, there would be no significant impact.

f) Noise and Vibration

Private developments similar to those assessed in the 2006 analysis year (commercial development on Projected Development Site 33 and residential development on Projected Development Site 14) would potentially occur at any of the projected development sites identified by the City. Significant

noise impacts within 150 feet of such constructions can be expected, especially if pile-driving operations were to occur.

G. CORONA YARD IMPROVEMENTS

1. Methodology

The same methodology used for analysis of construction impacts in Hudson Yards was used for analyzing impacts in Corona Yard. First, the study area was established with respect to each of the 12 impact areas discussed in Section B of this chapter. Second, the existing conditions within the study area were identified, and a reasonable worst-case scenario was developed for construction activities associated with the No. 7 Subway Extension in Corona Yard. Finally, impacts due to construction activity and possible mitigation measures are described.

2. Study Area

The improvements to the facility in Corona Yard pursuant to the extension of the No. 7 Subway would occur in an area characterized by large-scale recreational resources (Shea Stadium and the National Tennis Center), as well as the transportation infrastructure for the existing Corona Yard facility and adjacent Long Island Rail Road facilities. The portion of the property to be developed as support infrastructure for the Proposed Action is a largely vacant piece of land north of Roosevelt Avenue and west of the Flushing River in the western portion of the yard.

Residential uses are located within approximately 400 feet of the proposed improvements, west of the Corona Yard, on the other side of the Grand Central Parkway. Single-family dwellings are found on the north and south sides of 41st Avenue, and several two-story apartment buildings are located on the north side of 40th Avenue, at the intersection of 114th Street. However, these residential uses are considerably farther from the location of the actual construction activity proposed at Corona Yard. Immediately adjacent to this parcel are automotive repair and auto part storage yards located along and on the side streets of Willets Point Boulevard. A linear green space traversing the western boundary of the study area is located along the eastern and western sides of Meridian Road and Roosevelt Avenue, with lawn, trees, and benches.

There are no community facilities, historic or archaeological resources, and no public open space that would be affected by construction at Corona Yard.

3. Description of Construction and Techniques

While the Corona Yard improvements may not be necessary until after 2010, it has been evaluated in the 2010 analysis year for the purposes of this FGEIS. The Proposed Action would require the addition of 11 new trains to the existing No. 7 Subway fleet. In order to accommodate these additional trains, construction of new lay-up tracks would be required at Corona Yard. Approximately six new lay-up tracks are proposed for this purpose and would be constructed as a component of the No. 7 Subway Extension element of the Proposed Action.

The new lay-up tracks would be accommodated by relocating certain functions to the area northeast of the existing storage tracks at Corona Yard, on a largely vacant portion of MTA-owned property located north of Roosevelt Avenue and west of the Flushing River. One of the tracks in the maintenance shop located in the back yard would be modified and extended northeast, beneath the Roosevelt Avenue viaduct, where it would branch into four new tracks, two for refuse collection and two for Maintenance of Way. The refuse collection tracks would include a platform between the tracks. The relocation of refuse collection tracks and platform along with the maintenance tracks to the "back yard" would allow for the reconfiguration of their former areas in the "front yard". This area would be converted to six lay-up tracks. The approach track leading to the "back yard" tracks

would be constructed on an open deck supported by steel girders and driven piles. The refuse and Maintenance of Way tracks, depending on geotechnical characteristics of the soils, would either be placed over ballast on the surface or constructed on driven piles which support a platform.. In addition to the approach and refuse and Maintenance of Way tracks, a fire access road would be constructed north of and parallel to these tracks, in order to provide emergency access.

The approach tracks would pass through the tip of the tidal fringe wetland. The fire access road would be constructed outside of any wetland areas. (Both the refuse and Maintenance of Way tracks and fire access road would be placed within wetland adjacent areas.) Potential impacts to the wetland areas and adjacent areas could be minimized and mitigated by using permeable surfaces, where appropriate, and by constructing the tracks on pilings. Sediment control and soil erosion control techniques would be employed during construction to prevent tidal wetland areas from becoming silted in, and existing wetland areas that have been silted in would be restored to their natural conditions.

The conceptual Corona Yards improvements is proposed with the yard lead track as an open-deck track on a pile-supported structure south of Roosevelt Avenue. The yard lead track, refuse track, and maintenance-of-way (MOW) tracks north of Roosevelt Avenue could be constructed either as pile-supported structures or on stabilized earth. A watertight "bathtub" structure beneath the bridge could be appropriate in order to accommodate the limited vertical clearance.

The specific pile type and required pile depth would be determined prior to construction. Alternate pile spacing and configurations, as well as the use of friction-type piles, would be considered as a means of reducing the required pile depth.

a) Lead Track

In the absence of facility design plans, and considering updated geotechnical information that suggests that the subsurface conditions are insufficient to support track infrastructure, it is assumed that the track and platforms would be constructed on piles. Construction would begin with limited earth moving. This activity would be followed by pile driving. A steel framework, supported by the piles, would be installed, followed by the installation of concrete ties and rails. Welding of rail in the storage area might not be required, due to the slow speed of vehicle travel in the yard.

b) Refuse and Maintenance of Way Tracks

In the absence of facility design plans, and considering geotechnical information that suggests that the subsurface conditions are insufficient to support track infrastructure, it is assumed that the refuse and Maintenance of Way tracks for this facility would be constructed on piles. Construction of the refuse and Maintenance of Way tracks would begin with limited earth moving. This activity would be followed by pile driving. A steel framework, supported by the piles, would be installed, followed by the installation of concrete ties and rails. Welding of rail in the storage area might not be required, due to the slow speed of vehicle travel in the yard. Switches, crossovers and turnouts, and the third rail would be installed concurrent with rail installation.

c) Emergency Access Road

Construction of the emergency access road would begin with clearing and grading of the road alignment, followed by machine compaction. The next effort would be to install a sand and gravel sub-base to support the pavement. Asphalt pavement would then be installed, using a standard paving machine with asphalt delivered by dump trucks.

Drainage of the new storage area would be provided and directed into the existing yard drainage system. Lighting systems would be installed as necessary.

d) Sequencing, Materials, Equipment, and Transportation

Improvements to the facility at Corona Yard are anticipated to begin in 2005. Construction equipment for such improvements would include earth-moving equipment, front-end loaders, dump trucks, hand-operated and truck-mounted rollers/compactors, and generators.

TABLE 23-41
MATERIALS ENTERING AND SPOILS EXITING CORONA YARD AND REQUISITE TRUCK TRIPS

Material	Amount	Approximate Activity Period	Truck Trips
Soil (exiting)	1,400 cy	1/05 – 4/05	70[1]
Asphalt (entering)	1,400 cy	12/05 – 4/05	140[2]
Concrete (entering)	7,100 cy	4/05 – 5/06	710[3]
Steel (entering)[4]	850 tons	6/05 – 6/06	34[5]
Miscellaneous[6]	2,700 tons	12/05 – 9/08	270
		Total Truck Trips	**1,224**

1 Soil would be transported in 15 cy capacity trucks.
2 Asphalt would be transported in 10 cy capacity trucks.
3 Concrete would be transported in 10 cy capacity trucks.
4 Includes track, piles and pile caps, third rail, etc.
5 Assuming 25 tons per truck.
6 Building materials – 10 tons per truck.

4. Impacts

Construction of the Proposed Action in Corona Yard is not expected to generate significant impacts to the following impact categories: land use, neighborhood character, socioeconomic conditions, community facilities, open space, historic and archaeological resources, air quality, traffic and transportation, transit and pedestrians, noise, and infrastructure in the vicinity of the yard. No resources in these impact categories are located within the distance within which construction activities would exert impacts. Traffic volumes anticipated due to construction activity are not expected to generate impacts, because of the insignificant increase relative to existing traffic conditions. Passenger service on the 7 Subway line would not be affected by construction at the yard. Measures to control fugitive dust would be employed during excavation and construction. Vehicle and equipment emissions are not expected to exceed regulatory thresholds.

a) Natural Resources

Impacts to natural resources due to construction at Corona Yard could include wetland impacts and possible impacts to aquifers, depending on construction techniques, facility design, and the nature of contamination, if present. The storage tracks would pass through the tip of the tidal fringe wetland. Potential impacts to the wetland areas and adjacent areas could be minimized and mitigated by using permeable surfaces, where appropriate, and by constructing the tracks on pilings. Sediment control and soil erosion control techniques would be employed during construction to prevent any tidal wetland areas from becoming silted in, and existing wetland areas that have been silted in would be restored to their natural conditions.

The proposed approach tracks would encroach on the tidal wetland and wetland adjacent area. However, the construction techniques would minimize adverse effects to the adjacent area. Driven piles minimize the area directly affected and would allow for fewer impacts to the site's existing hydrology, as stormwater runoff could continue to flow from impervious areas into unaffected portions of the freshwater wetlands and adjacent upland areas. Although direct impacts to the wetlands and wetland adjacent area would be minimized by the use of pile supports, indirect impacts would include shading from the tracks overhead. However, these impacts are expected to be minimal, because sunlight would penetrate the open deck which would support the approach tracks.

Temporary disruption to the wetland adjacent area would result from construction and pile driving activity. Some surface preparation would be required to provide proper operating conditions for the pile driving machinery. To minimize impacts to the wetland adjacent area, construction activity in this area would be limited to the dry season, and the surface topography would be restored to pre-construction conditions. In addition, best management practices would be followed, as described below.

Impacts to the wetland and wetland adjacent areas would require the preparation and submission of the appropriate permit applications to State and federal agencies. Site-specific techniques and safeguards would be utilized throughout all construction areas to protect water quality in the event of materials, oil, or fuel spills from construction equipment, as well as for soil erosion and sedimentation control. Best management practices would include the installation of silt fences, hay bales, filter fabric, dewatering, and/or the utilization of sedimentation basins. A specific Stormwater Pollution Protection Plan, focusing on the protection and improvement of site water quality, would be developed. The mitigation plan would include wetland creation/restoration/enhancement and improvements to the site's water quality functions through the use of best management practices.

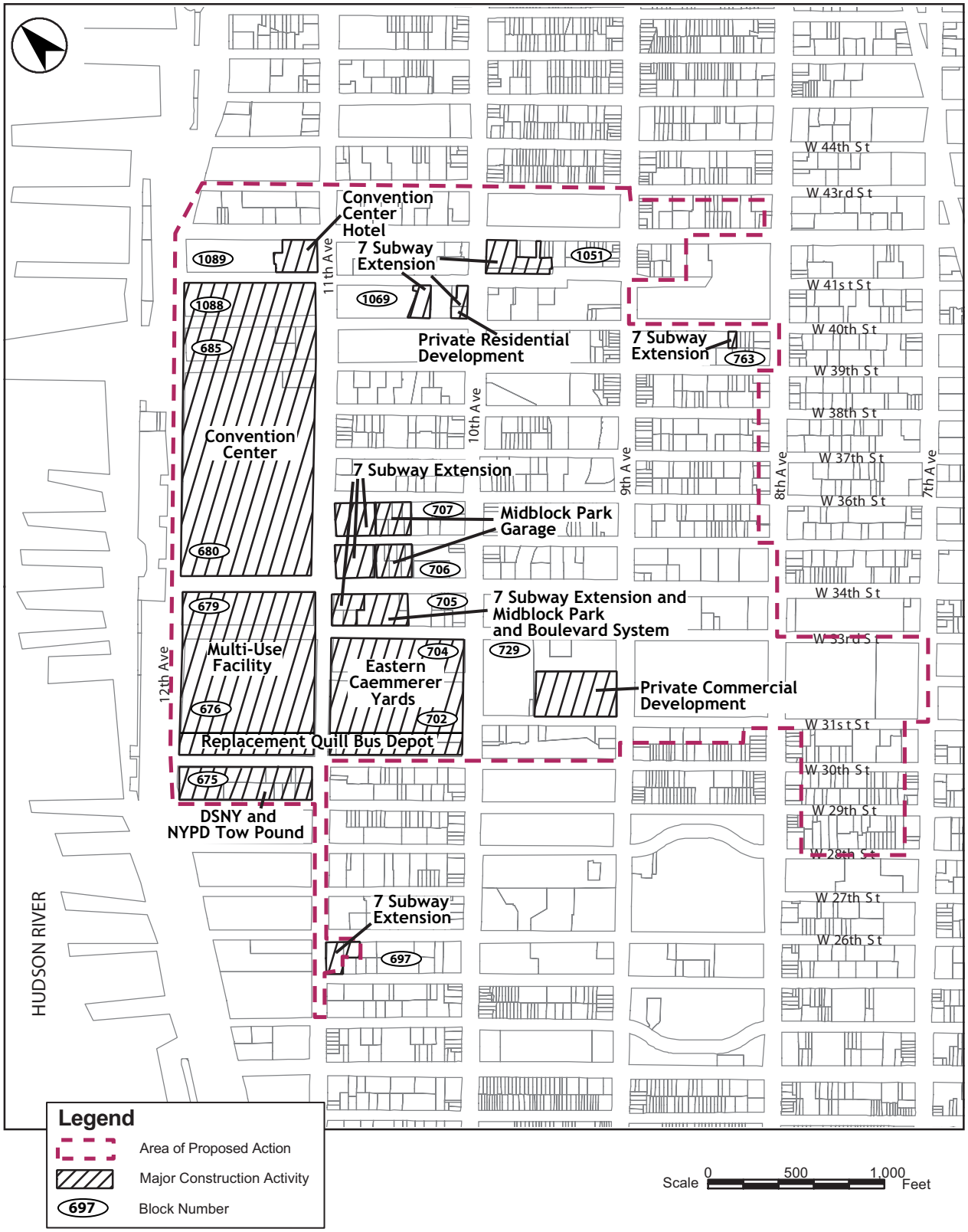
As discussed in Chapter 13, "Natural Resources", a portion of the Corona Yard improvements could be constructed on driven piles. If this is the case, and if the Upper Glacial and Magothy aquifers are hydraulically distinct in this area, driven piles could pierce the confining layer, provide a hydraulic connection between the two aquifers, and introduce a pathway for contamination. This would also depend on the depth of the piles needed for construction, the depth to the confining layer, and the nature and amount of the contamination, if present.

However, if Corona Yard is located in an area where there is no confining layer between the Upper Glacial and the Magothy, or between the Magothy and the Lloyd Aquifers, then there could be a hydrological connection without the proposed piles.

Testing for hazardous materials in site soils and in the groundwater immediately below the site would be completed before construction. If contaminants that have the potential to result in impacts upon the aquifer below the site are found to be present above levels of concern, measures to mitigate the potential impact would need to be instituted, including construction that does not involve piles. See Chapter 13, "Natural Resources," for a description of construction-related impacts and possible mitigation measures in Corona Yard.

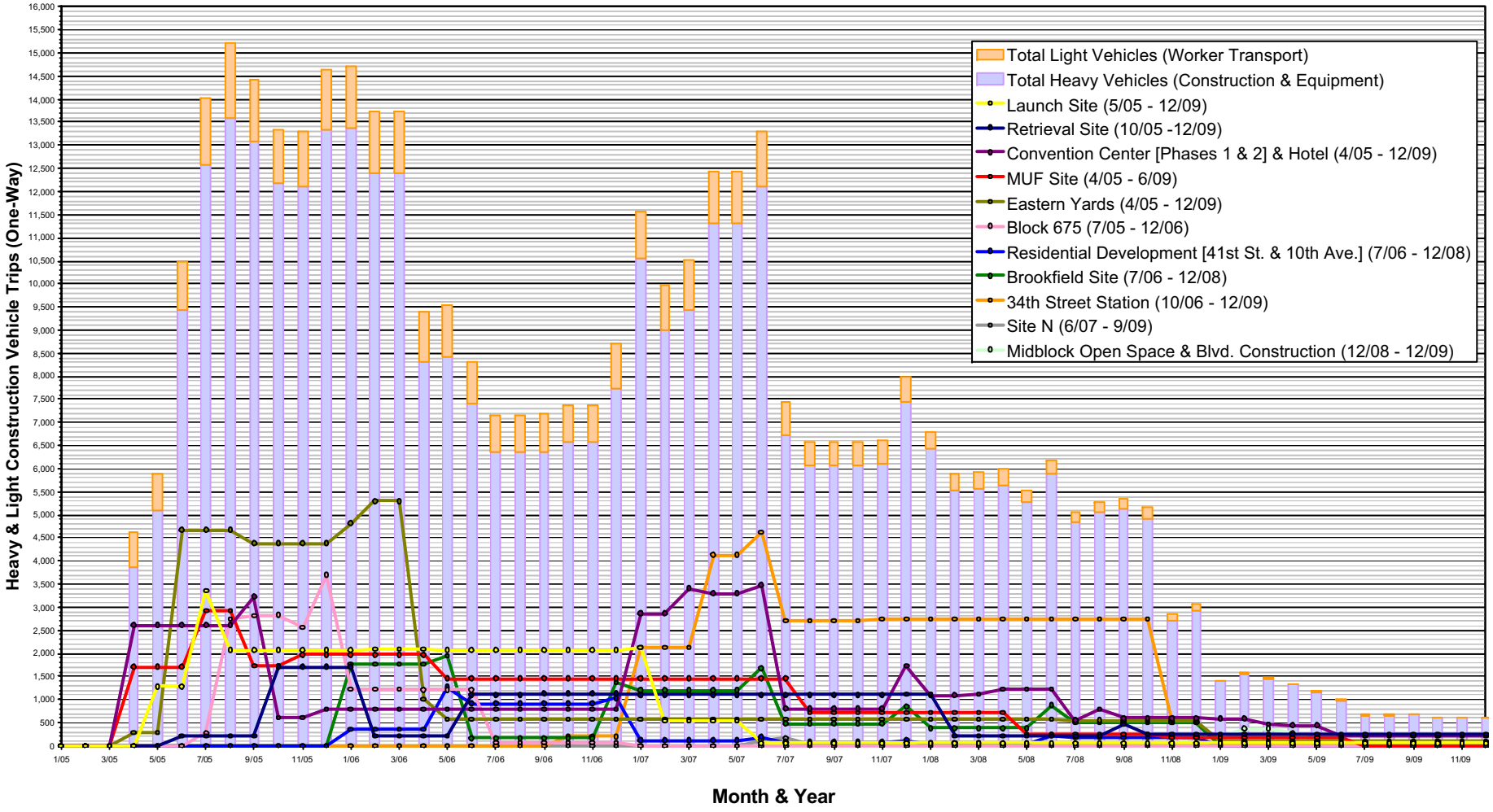
b) Hazardous Materials

As discussed in Chapter 14, "Hazardous Materials," prior to the start of construction, appropriate investigations would be conducted to more fully characterize possible contamination in the area and to identify any further action, investigation, or mitigation that would be required if the Proposed Action were to proceed. Chapter 14, "Hazardous Materials," Section H includes preventative procedures that would be followed in order to minimize human contact with contaminants. In order to avoid adverse impacts to the environment or to the public health, any such required action, investigation, or mitigation would be conducted in accordance with applicable law and any additional regulatory requirements of the NYSDEC or the DEP, as appropriate. ❖



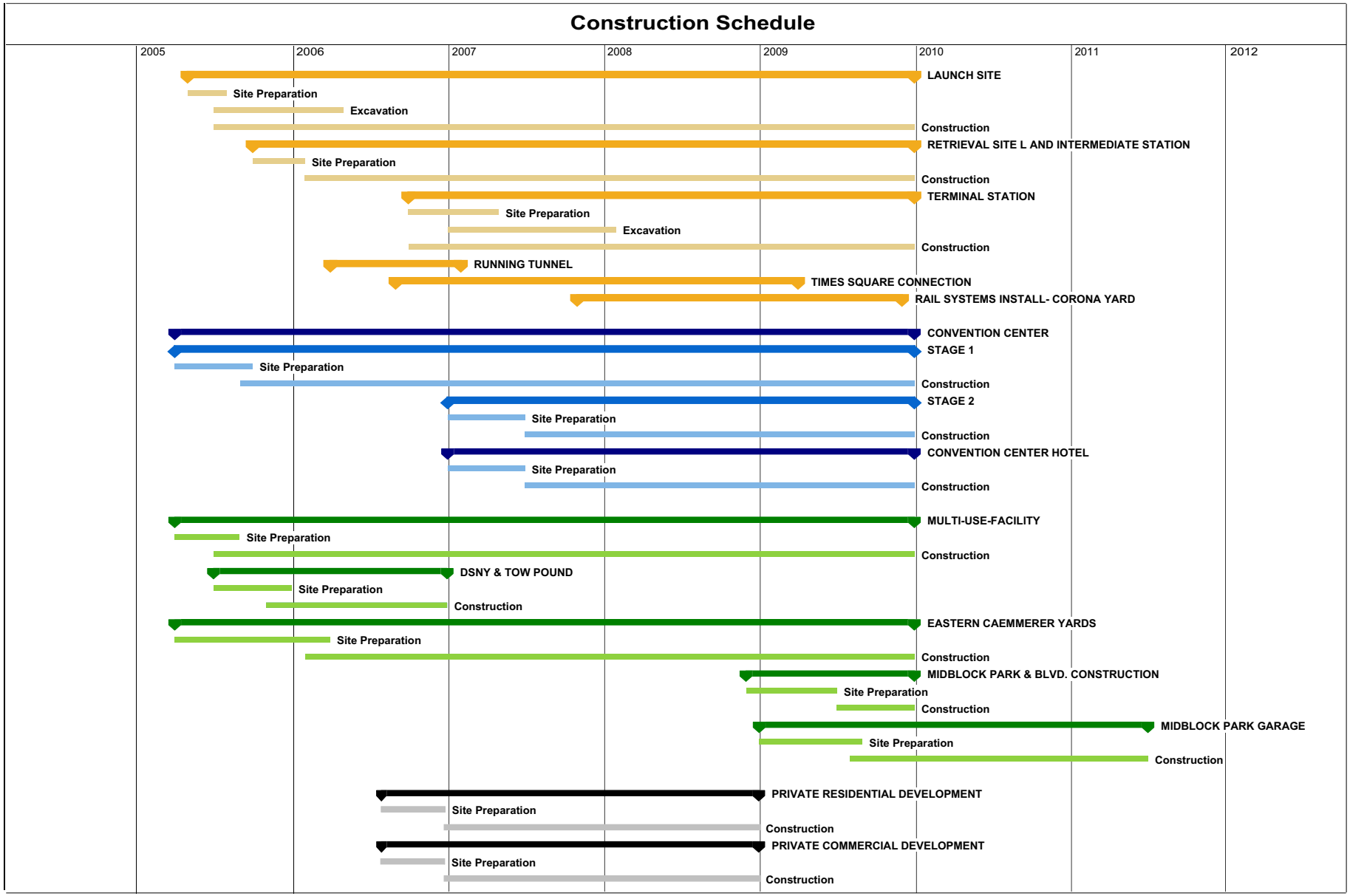
Major Construction Activity 2005-2010

Figure 23-1



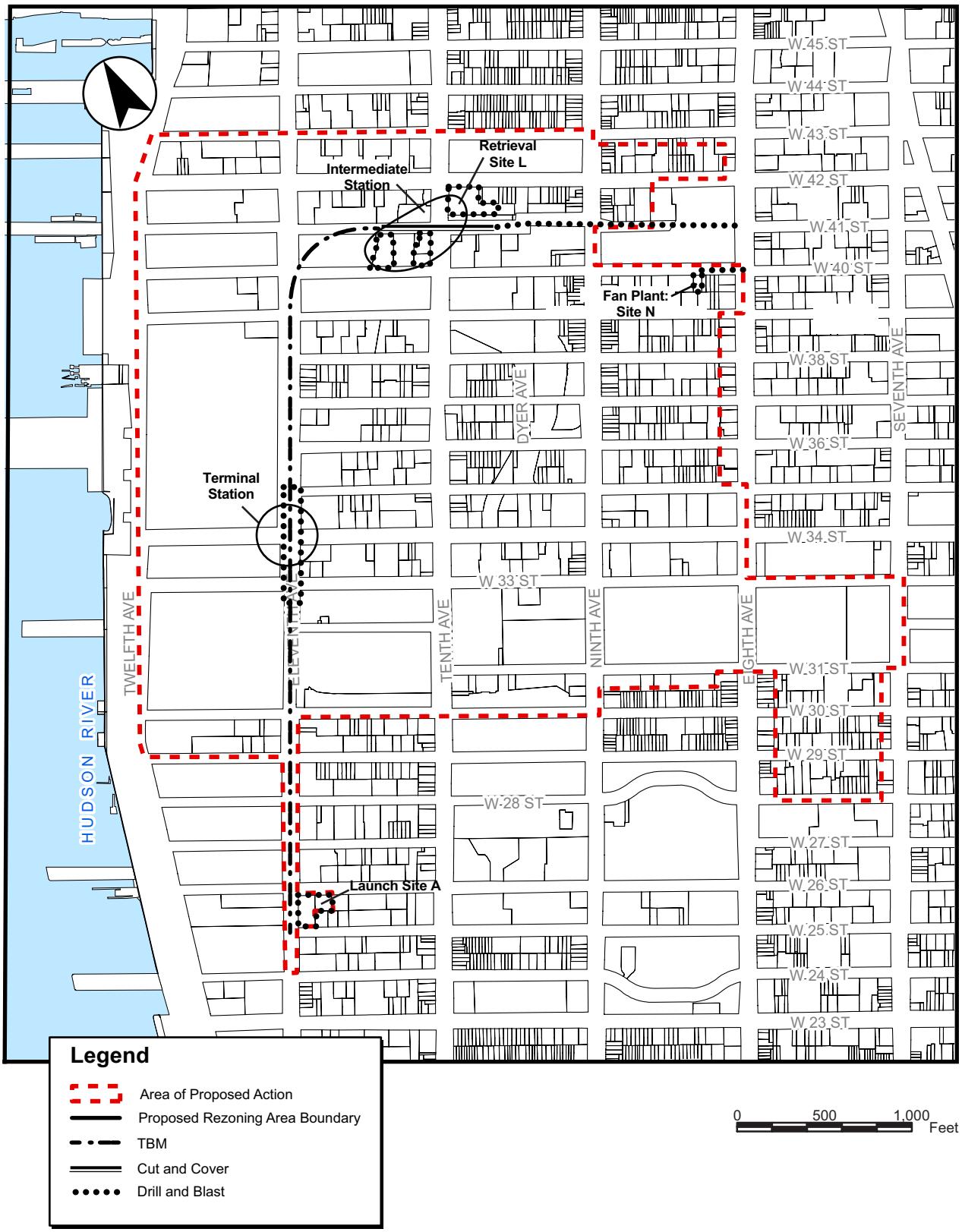
2005-2010 Heavy & Light Construction Vehicle Trips (One-Way)

Figure 23-2



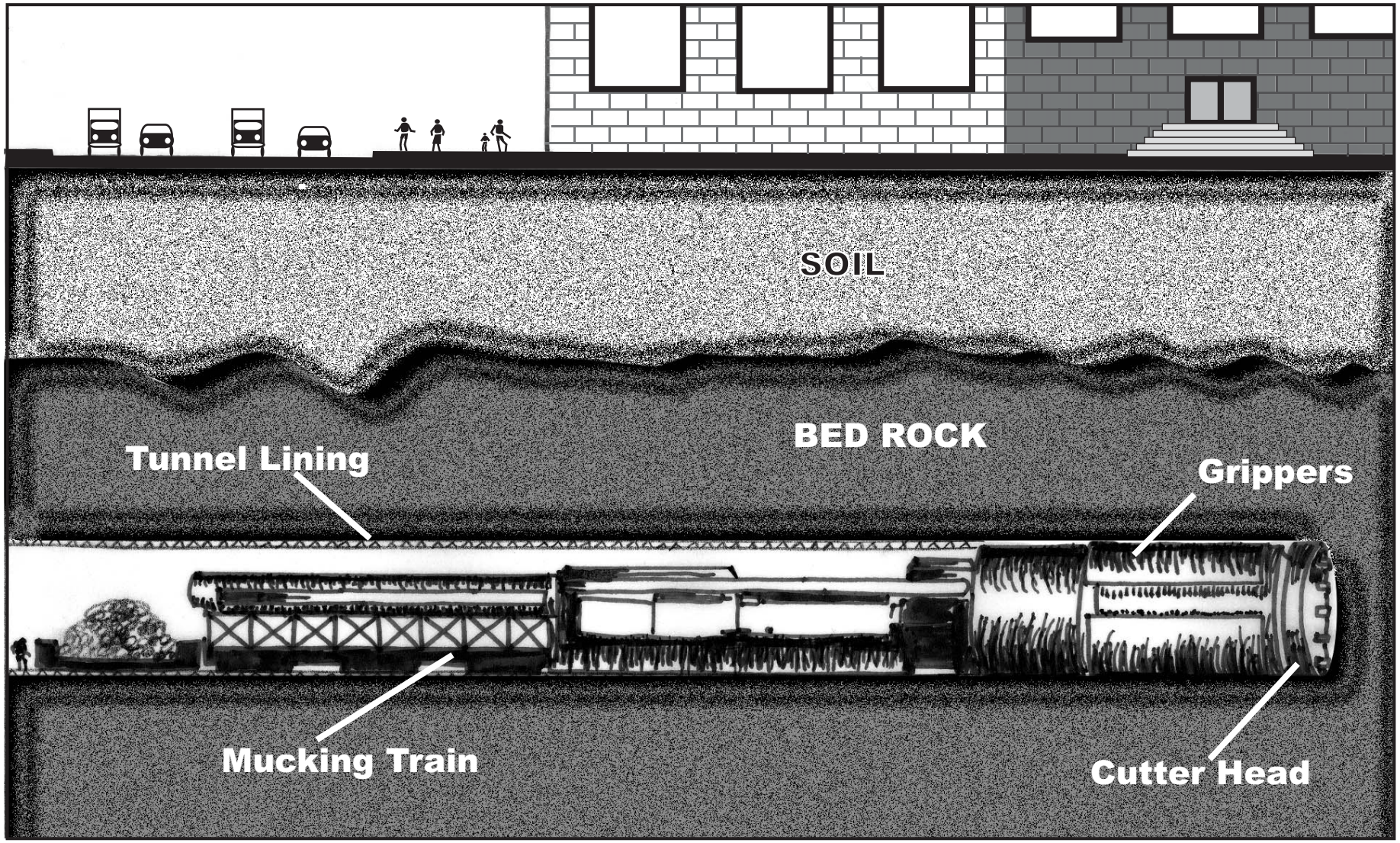
Construction Schedule

Figure 23-3



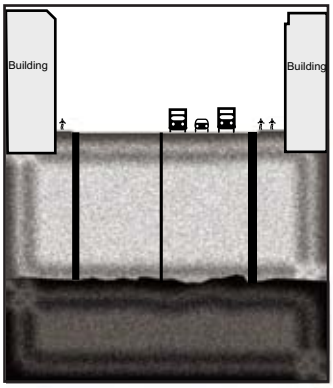
No. 7 Subway Extension: Excavation Methods

Figure 23-4

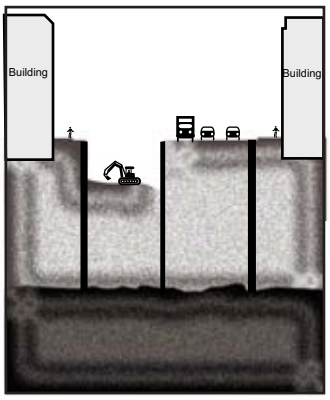


Conceptual Drawing of a Tunnel Boring Machine

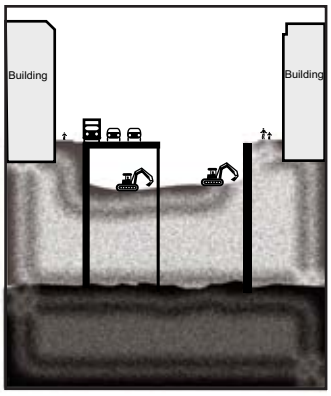
Figure 23-5



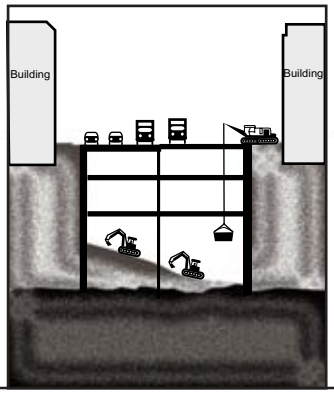
- Relocate utilities. Build slurry wall and install center piles.



- Divert traffic to one-half of roadway
- Excavate half of roadway to sufficient depth
- Deck over excavated half



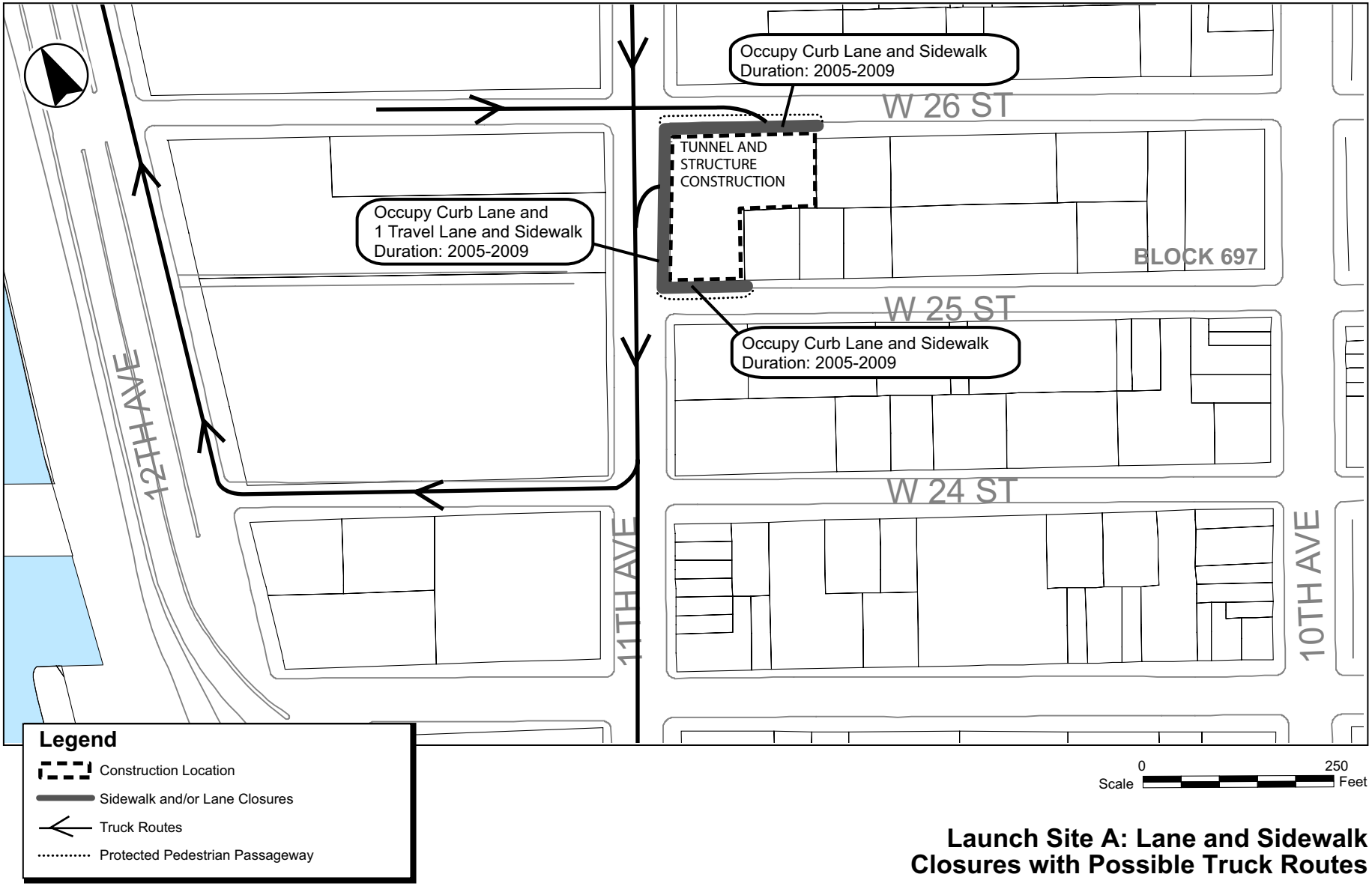
- Reroute traffic to decked half of roadway
- Excavate other half of roadway to sufficient depth
- Deck second half



- Small portion of roadway open for spoils removal

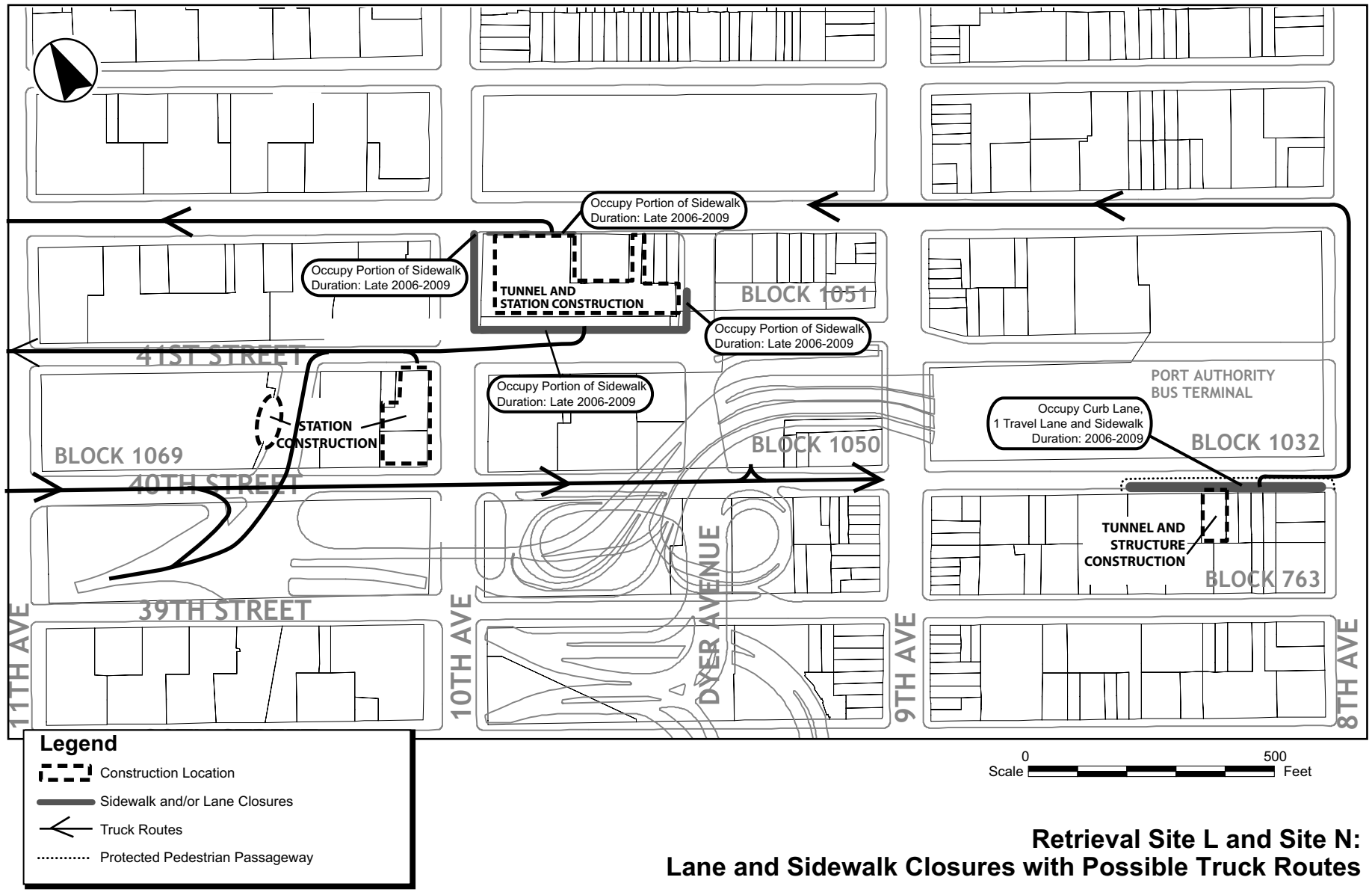
Conceptual Cut and Cover Station Construction, Section View

Figure 23-6



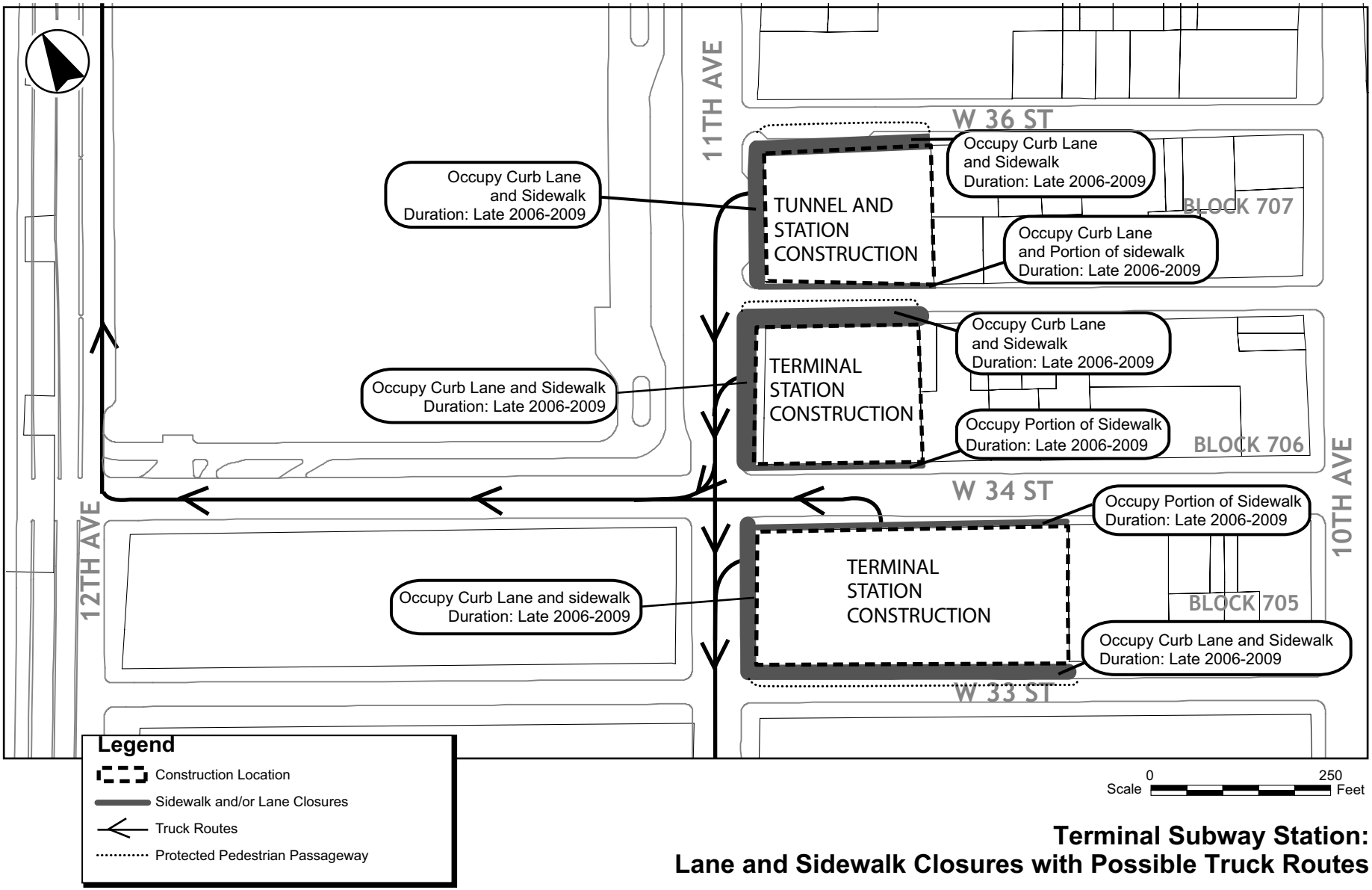
Launch Site A: Lane and Sidewalk Closures with Possible Truck Routes

Figure 23-7



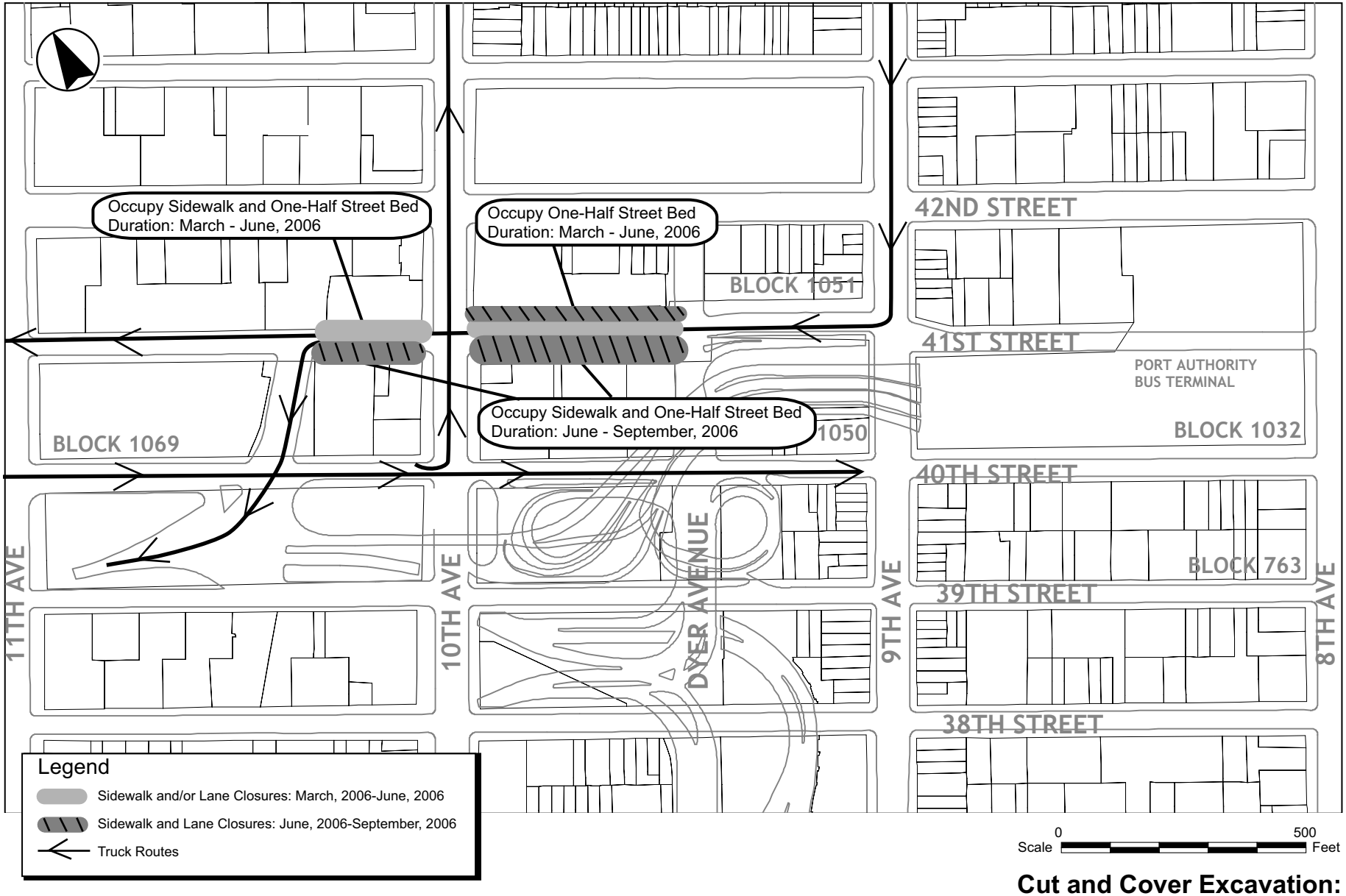
Retrieval Site L and Site N:
Lane and Sidewalk Closures with Possible Truck Routes

Figure 23-8



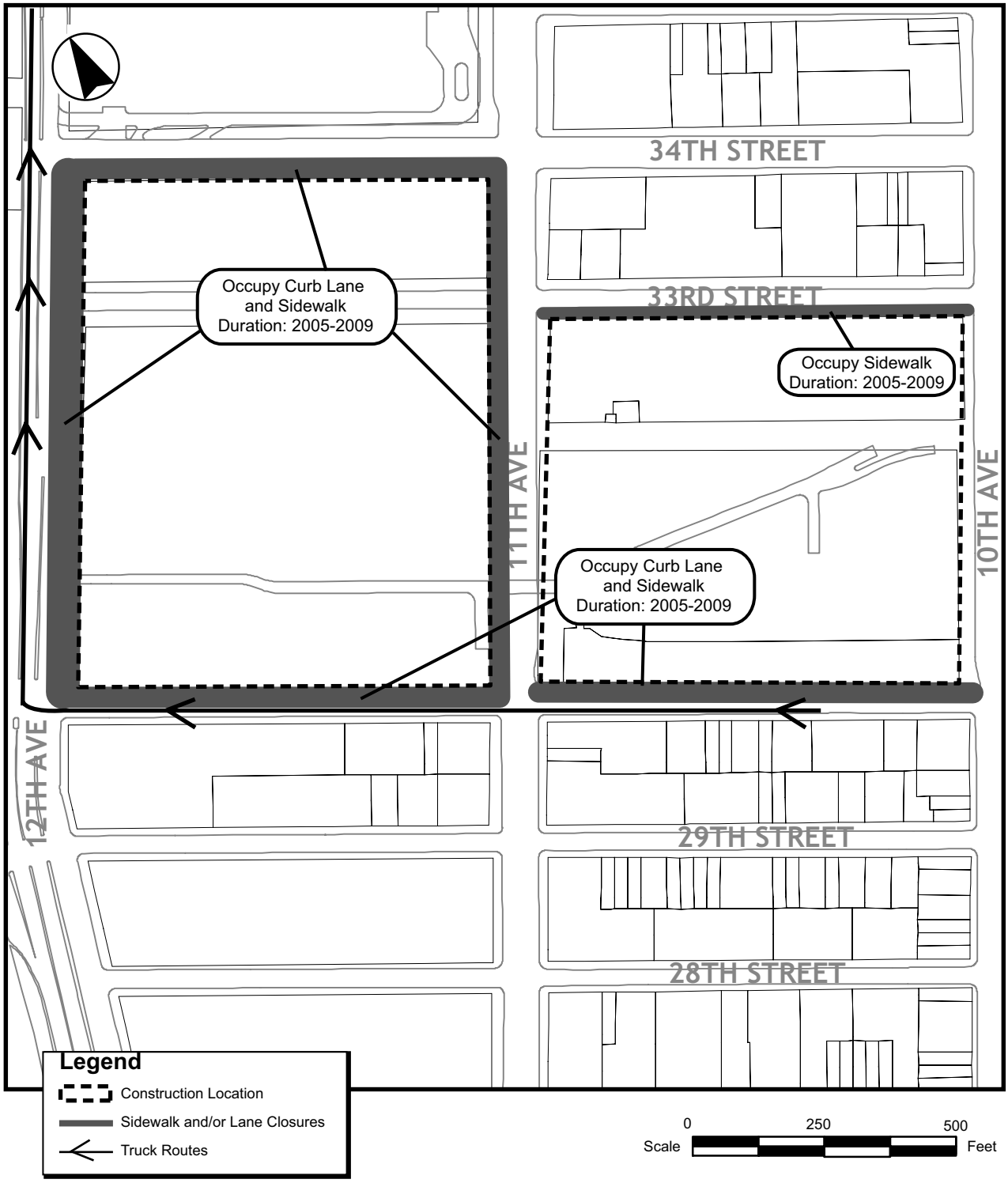
Terminal Subway Station:
Lane and Sidewalk Closures with Possible Truck Routes

Figure 23-9



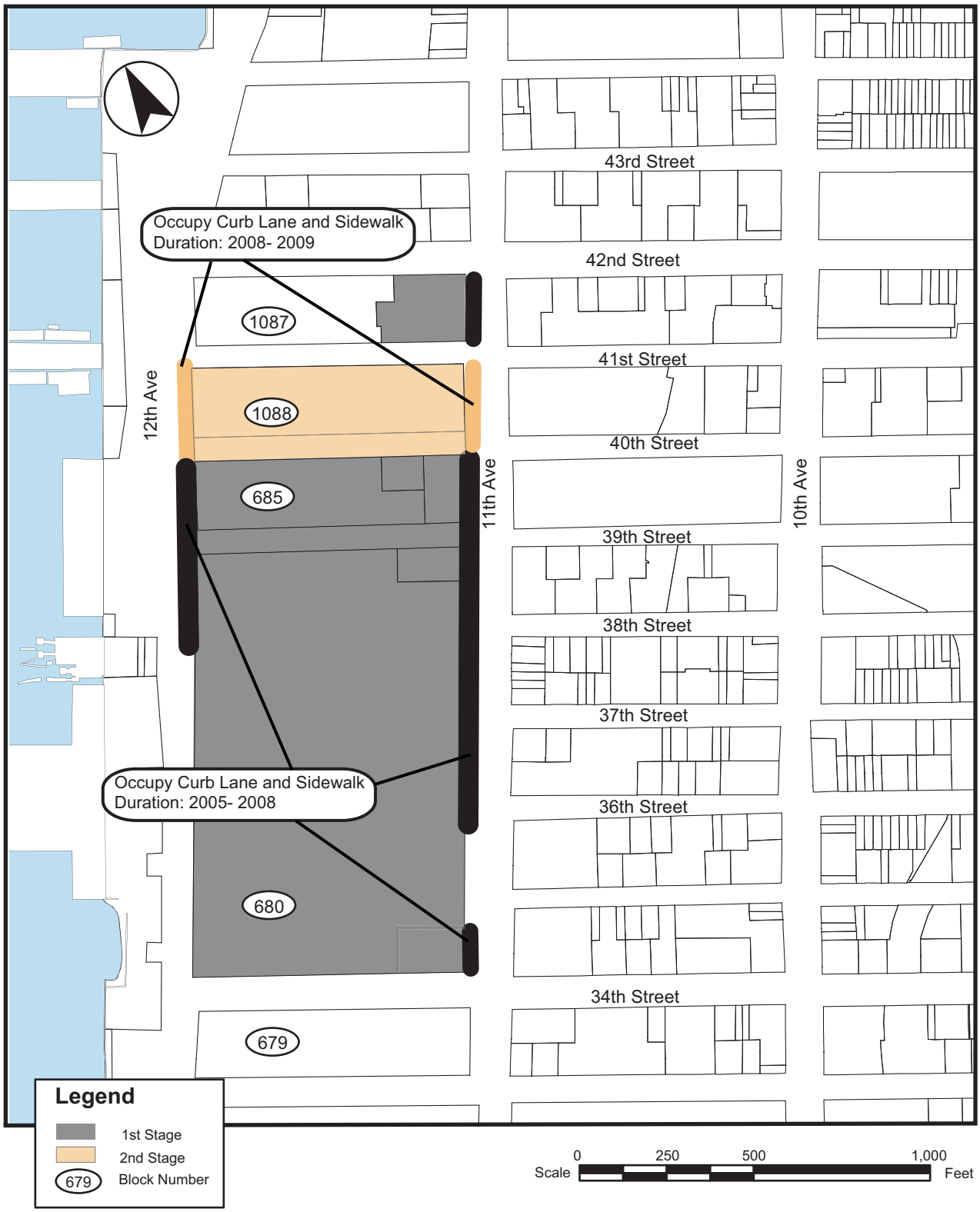
Cut and Cover Excavation:
Lane and Sidewalk Closures with Possible Truck Routes

Figure 23-10



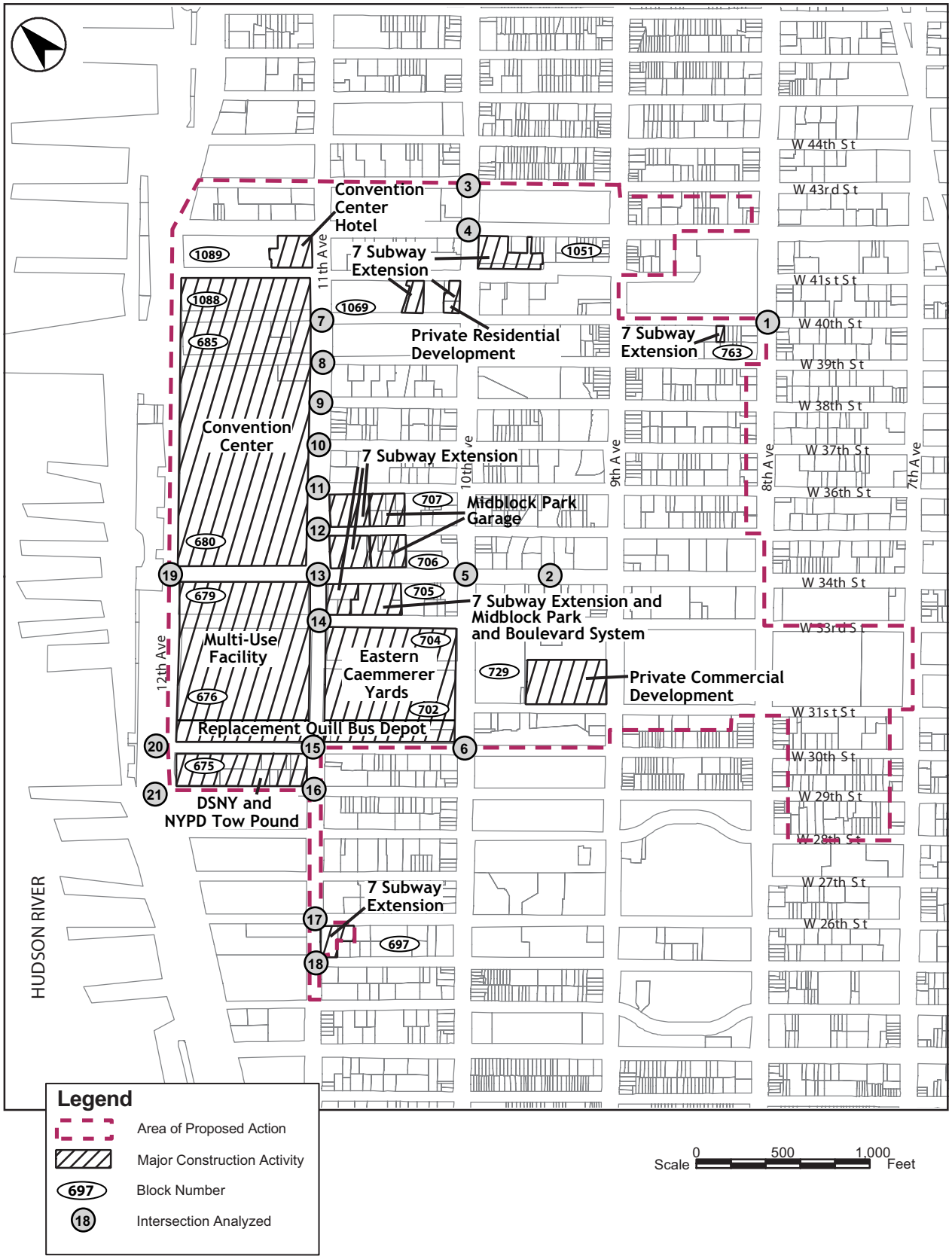
Multi-Use Facility, Caemmerer Yard:
Lane and Sidewalk Closures
with Possible Truck Routes

FIGURE 23-11



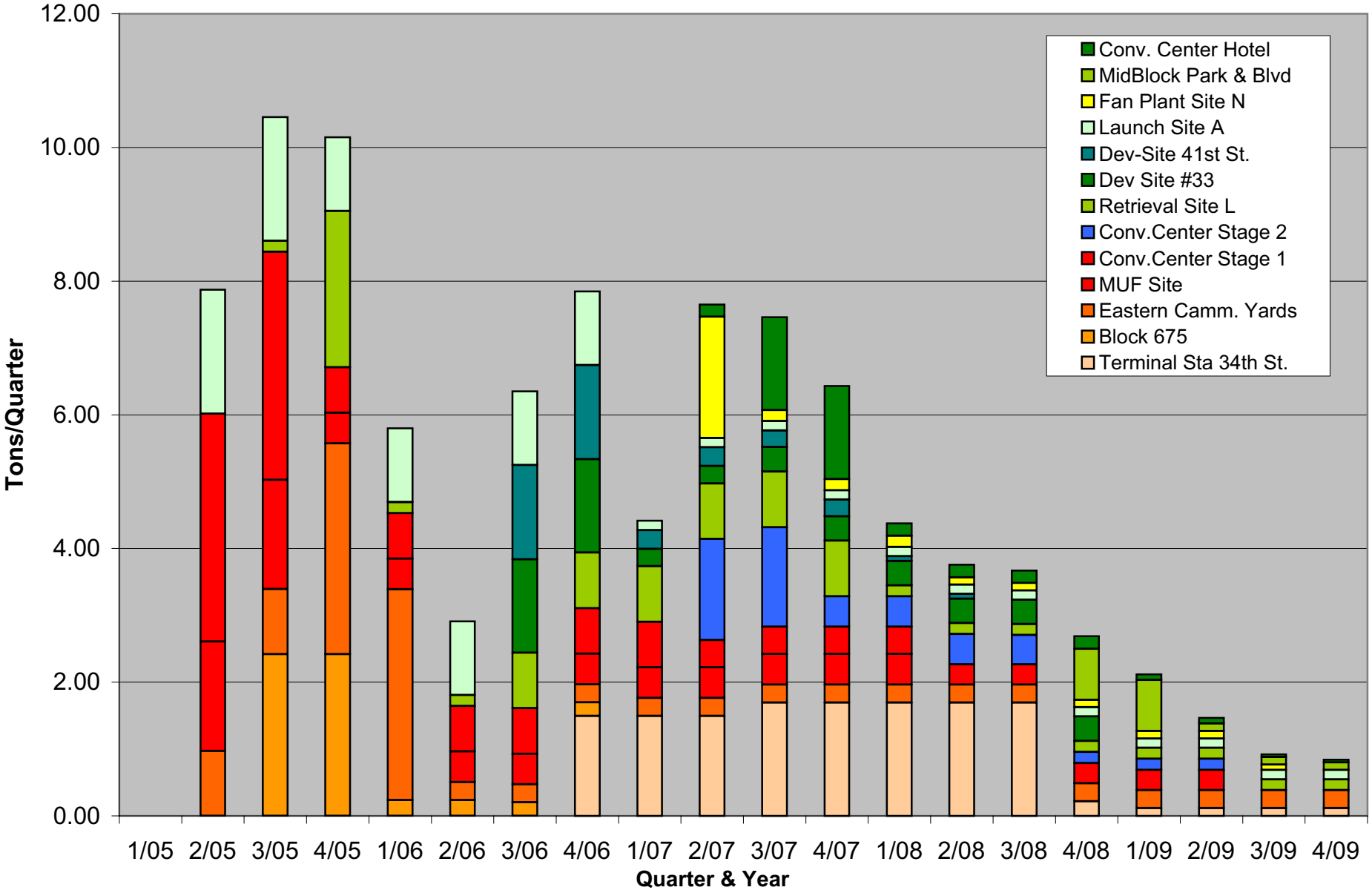
Convention Center Expansion:
Construction Staging with Lane and Sidewalk

Figure 23-12



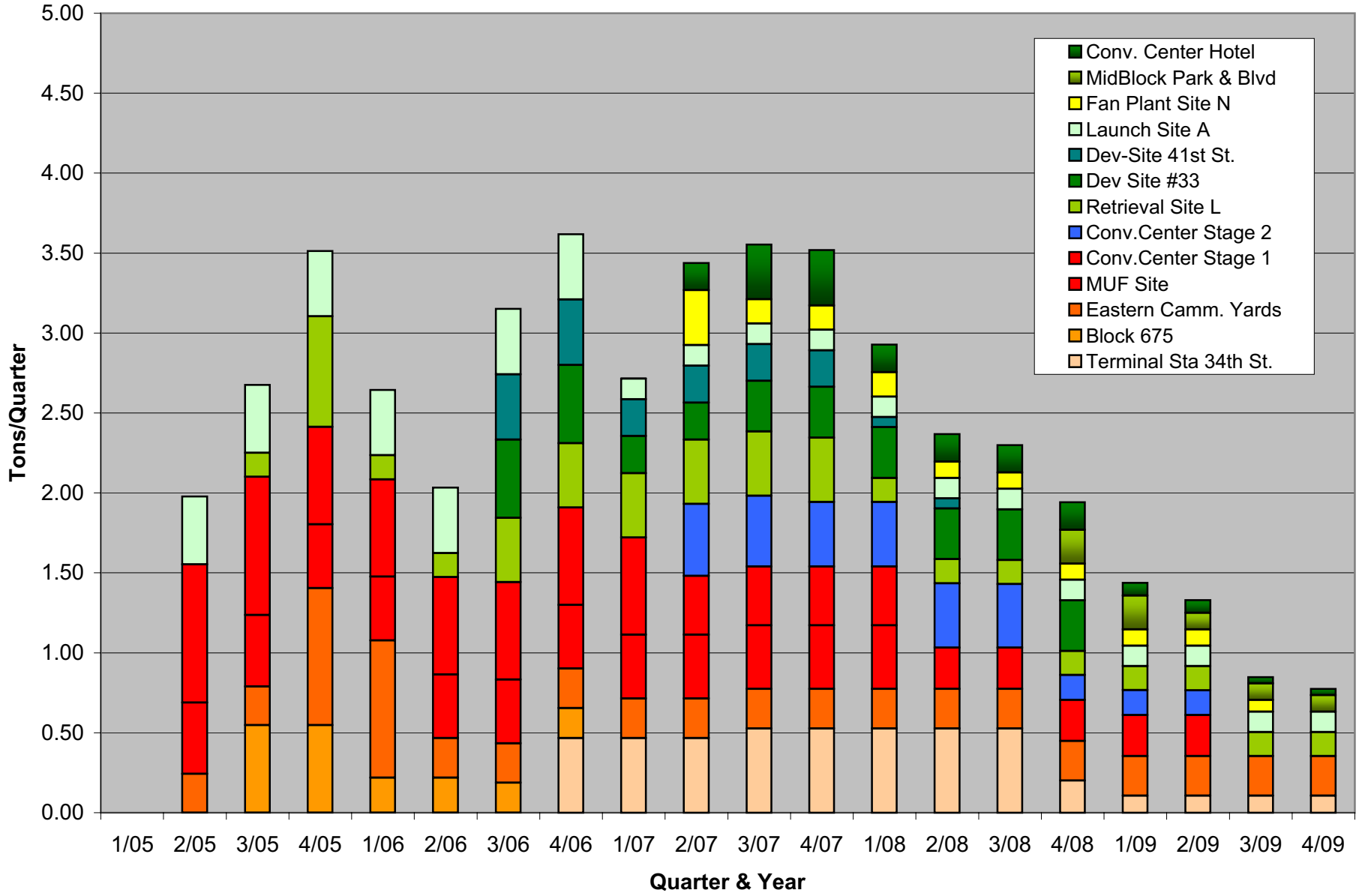
Construction Traffic Analysis Locations

Figure 23-13



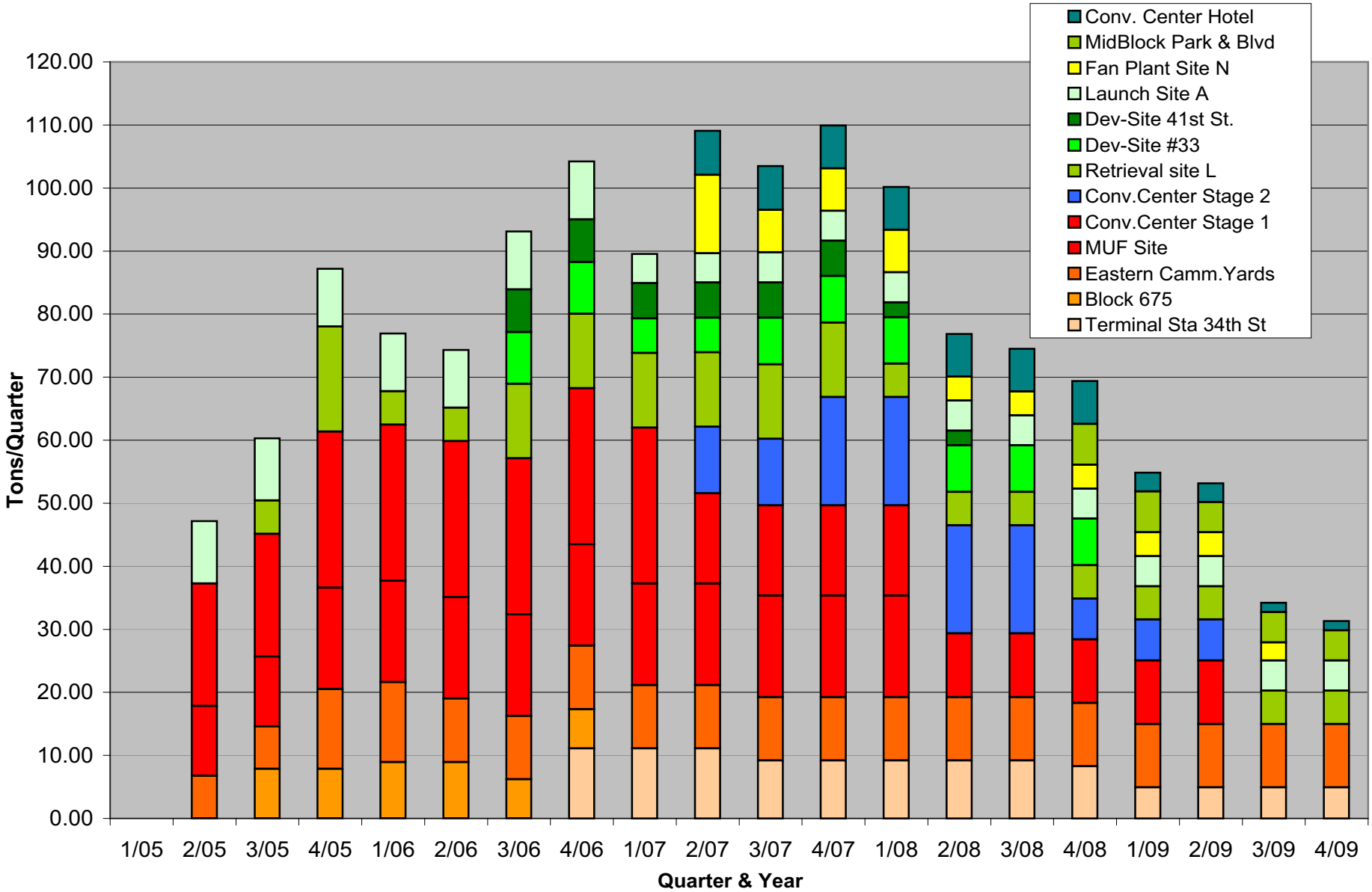
PM_{10} Emissions From Construction Activities 2005-2009 in Tons per Quarter

Figure 23-14



$PM_{2.5}$ Emissions From Construction Activities 2005-2009 in Tons per Quarter

Figure 23-15



NO_x Emissions From Construction Activities 2005-2009 in Tons per Quarter

Figure 23-16