Chapter 17: Construction Impacts

A. INTRODUCTION

This chapter summarizes the anticipated construction plan for the proposed project and identifies the potential for significant adverse impacts that could result from the demolition of existing structures; construction of the arena and other proposed development buildings; upgrading and reconfiguring the existing Long Island Rail Road (LIRR) Vanderbilt Yard, utilities and bridges; and opening a new entrance to the Atlantic Avenue/Pacific Street subway station. The construction activities and stages are described and followed by the assessment of potential impacts expected during construction. This chapter also discusses the measures to be implemented for the project's construction activities that avoid or reduce the potential for significant adverse impacts, as well as identifies additional mitigation measures to further reduce potential significant adverse impacts. Where necessary, feasible mitigation measures are identified and their benefits assessed.

Where applicable, the potential impacts from construction of the Phase II elements of the project on the operational Phase I components are also addressed.

The technical areas for which the potential for impact is analyzed include land use and neighborhood character, socioeconomic conditions, cultural resources, traffic and parking, transit, pedestrian, infrastructure, air quality, hazardous materials, noise, vibrations, rodent control, and cumulative impacts.

Since the issuance of the DEIS, the building program of the proposed project (both variations) has been modified to reflect a reduction in the proposed program. An analysis of the potential construction impacts associated with the modified building program and the latest planned construction activities was performed for the FEIS. Based on these analyses, the reduction in development density would not materially affect the phasing of construction activities nor would it result in a notable decrease in construction equipment, deliveries, and required workforce. Particularly during the initial stages of construction, the same demolition and excavation work would be required. Improvements to and decking over the LIRR Vanderbilt Yard would still take place. Roadway and utility infrastructure work would also be comparable. The main effects on construction activities associated with the reduction in development density would be a shorter period for steel erection and topping off for three of the project buildings.

Aside from the reductions associated with the modified building program since the issuance of the DEIS, construction phasing and activity projections were updated to reflect the shifting of certain construction tasks, including the reconstruction of the Carlton Avenue Bridge. The Carlton Avenue Bridge effort, which was scheduled to be completed within the first 12 months of construction in the DEIS, would likely take two years to facilitate LIRR Vanderbilt Yard reconstruction. The 6th Avenue Bridge would remain open during this period. In addition, a 6-foot wide emergency exit stair from the existing IRT sub-passage to the Flatbush Avenue sidewalk adjacent to Site 5 has been added. Where required, the analyses were updated to reflect the planned construction of the modified building program.

B. PRINCIPAL CONCLUSIONS

The 10-year construction period would be disruptive to the local area, and significant adverse impacts from construction activities would occur from construction-related traffic on the local street network, from construction-related noise, and from the demolition of two historic buildings. Mitigation has been developed to address these impacts where practicable. Since the issuance of the DEIS, construction noise mitigation measures for the Pacific Street Branch of the Brooklyn Public Library and the Temple of Restoration on Dean Street were developed. The following summarizes the technical areas that were analyzed, and the conclusions reached, for potential impacts during the construction period. In general, no changes in the principal conclusions of potential significant adverse impacts from construction that were reported in the DEIS were determined for the modified building program.

LAND USE AND NEIGHBORHOOD CHARACTER

No portion of the project site would be subject to the full effects of the construction for the entire construction period. Construction activities on all sites would adhere to the provisions of the New York City Building Code and other applicable regulations. Access to surrounding residences, businesses, and institutions, as well as access between the neighborhoods to the north and south of the project site would be maintained throughout the duration of the construction period. Construction activities would be disruptive and concentrated on some blocks for an extended period of time. Throughout the construction period, measures would be implemented to control noise, vibration, and dust on construction sites, including the erection of construction fencing and in some areas fencing incorporating sound reducing measures. This fencing would reduce potentially undesirable views of construction sites and buffer noise emitted from construction activities. Barriers would be used to reduce noise from particularly disruptive activities where practicable. Construction activity associated with the proposed project would have significant adverse localized neighborhood character impacts in the immediate vicinity of the project site during construction. The impacts would be localized and would not alter the character of the larger neighborhoods surrounding the project site.

SOCIOECONOMIC CONDITIONS

Construction activities associated with the proposed project would, in some instances, temporarily affect socioeconomic conditions in the vicinity of the project site. However, access to businesses near the project site would not be impeded, and most businesses are not expected to be significantly affected by a temporary reduction in the amount of pedestrian foot traffic that could occur as a result of construction activities. Overall, construction of the proposed project is not expected to result in any significant adverse impacts to surrounding businesses.

COMMUNITY FACILITIES

None of the community facilities would be affected by construction activities for an extended duration. All community facilities located in close proximity to the project site are at the western end of the site and therefore would be affected only during the Phase I construction period. The construction sites would be surrounded by construction fencing and barriers that would limit the effects of construction on nearby facilities. Measures outlined in the Construction Protection Plan (CPP) and Maintenance and Protection of Traffic (MPT) Plan would ensure that lane closures and sidewalk closures are kept to a minimum and that adequate pedestrian access is maintained to community facilities in the vicinity of the project site. Construction of the proposed project would not block or restrict access to any facilities in the area, and would not affect emergency response times significantly. NYPD and FDNY emergency services and response times would not be significantly affected due to the geographic distribution of the police and fire facilities and their respective coverage areas. The only community facility that would experience a significant adverse impact is the Pacific Branch of the Brooklyn Public Library, which would experience significant adverse impacts from noise between 2007 and 2009.Although other community facilities in the area may be affected by construction noise, they would not experience significant adverse impacts.

OPEN SPACE

Construction activities would not displace any existing open space resources. While three existing open spaces may be temporarily affected by noise from construction activities, access to these open spaces would not be impeded at any point during the construction period. The use of the proposed open spaces to be constructed as part of the project would be temporarily affected by the construction of adjacent buildings. Three open spaces would experience temporary significant adverse impacts from construction-related noise. The Brooklyn Bear's Pacific Street Community Garden would be impacted during 2008 and 2009 from construction on Site 5, the Dean Playground would be impacted over three years (2008, 2009, and 2011) from construction of the arena block and Building 15, and South Oxford Park would be impacted from 2008 through 2012; however, with respect to the Dean Playground, the impact would be partially mitigated by the provision of an amenity to the park users. Although the open space associated with the Atlantic Terminal Houses would be affected during Phase I while the water main is being replaced on the north side of Atlantic Avenue, the duration of the construction activity would be short (approximately one month) and access to the open space would be maintained. Therefore, no significant adverse impacts to the Atlantic Terminal Houses open space would result.

CULTURAL RESOURCES

Archaeological Resources

The Landmarks Preservation Commission (LPC) was consulted to determine whether the project site may contain archaeological resources. At LPC's recommendation, an archaeological study was prepared for the project site. The study determined that five lots on the project site west of 6th Avenue are potentially sensitive for historic-period archaeological resources. The archaeological study was reviewed by LPC and OPRHP and its conclusions and recommendations accepted by both agencies. Therefore, to avoid adverse impacts on potential archaeological resources, LPC and the New York State Office of Parks, Recreation and Historic Preservation (ORPHP) would be consulted regarding testing as set forth in the Stage 1B testing protocol for the project, which has been accepted by LPC and OPRHP, and, if required, mitigation measures.

Historic Resources

Project construction by 2010 would involve the demolition of two historic resources on the project site, the former Ward Bread Bakery complex at 800 Pacific Street and the former LIRR Stables at 700 Atlantic Avenue. Measures to partially mitigate the impact of the demolitions of these buildings have been developed in consultation with OPRHP and are stipulated in the LOR. The LOR outlines protective and mitigation measures related to cultural resources.

Project construction would also result in modifications to portions of the Atlantic Avenue Subway station. The proposed modifications would not affect the significant historic features of the station, and, therefore, the proposed construction is not expected to adversely impact this historic resource. To avoid adverse impacts to the Atlantic Avenue Station with respect to the proposed modifications, the project sponsors would prepare a Construction Protection Plan (CPP) for the station. The project sponsors would also consult with NYCT and OPRHP regarding the proposed finishes in the station where new construction would connect to the historic tiled platform walls, and to evaluate the potential salvage and reuse potential of materials to be removed in the non-public areas as part of the proposed modifications.

To avoid construction related impacts on historic resources within 90 feet of project construction, historic buildings within 90 feet of project construction would be protected by a Construction Protection Plan (CPP), which would be developed in consultation with OPRHP and would comply with the procedures set forth in TPPN #10/88 and other New York City Building Code regulations. The CPP would be prepared and implemented prior to construction activities on the project site and project-related demolition.

HAZARDOUS MATERIALS

The potential for contamination in the subsurface (related primarily to localized current or former gas stations and historic fill) and inside buildings (primarily related to asbestos) has been identified. However, with the implementation of asbestos removal in accordance with applicable regulations prior to building demolition and a variety of remediation and site-safety measures during excavation, no significant adverse impacts related to hazardous materials would be expected to occur as a result of construction of the proposed project. These measures would include development and implementation of a construction health and safety plan, community air monitoring plan during excavation, and regulatory oversight of petroleum-related spills by the New York State Department of Environmental Conservation, where applicable.

TRAFFIC

The detailed construction traffic analysis shows that significant adverse traffic impacts would occur at numerous locations throughout the construction period. However, these impacts would be attributable primarily to factors other than the added traffic from construction trucks and worker vehicles. The permanent closure of several streets within the project site, the lane disruptions during utility installation and rail yard improvements, and the reconstruction of two bridges over the rail yard were determined to be the main reasons for changes in area travel patterns and traffic diversions. These traffic diversions, when combined with construction-generated traffic, would concentrate traffic at specific intersections near the project site and result in the projected significant adverse traffic impacts.

Although construction traffic would be more dispersed away from the construction site, significant adverse traffic impacts were also identified for outlying intersections along Atlantic Avenue west of the project site. Furthermore, as roadway disruptions associated with temporary lane and street closures would affect area intersections during construction peak hours, they would have similar effects on peak hour conditions when background and, following the completion of Phase I of the proposed project, operational traffic would be higher. Overall, significant adverse traffic impacts during construction were identified for 12 intersections in proximity to the project site and seven outlying intersections.

Mitigation measures proposed to mitigate project operational impacts were evaluated to determine the appropriate strategies for addressing traffic impacts during construction. While the proposed mitigation measures would be appropriate for early implementation, some significant adverse traffic impacts during construction, as with the 2010 and 2016 operational conditions, would remain unmitigated. As described below, all significant adverse traffic impacts identified at the outlying intersections would be mitigated by the early implementation of proposed mitigation measures. However, certain significant adverse traffic impacts identified at 10 intersections adjacent to the project site would remain unmitigated.

PARKING

Parking demand for construction workers at the site is anticipated during the peak year to average 733 construction worker vehicles arriving at the project site during the 6 to 7 AM morning peak hour, and the total parking demand would be 916 construction-worker vehicles during the peak year. While some construction workers are expected to find nearby on-street parking, the overall projected demand exceeds what would be available on-street. To avoid overtaxing nearby on- and off-street facilities, the project sponsors would provide on-site (southern half of Block 1129) parking for construction workers at a fee that is comparable to other parking lots/garages in the area. By charging a fee and also limiting its parking capacity only to accommodate the anticipated demand, the on-site parking facility would help in minimizing the number of construction worker vehicles circulating for on-street parking in the area, while at the same time not encouraging the use of private automobiles as the means of travel to the project site. Since all projected construction worker parking demand would be met, no parking shortfall is anticipated during any phases of construction at Atlantic Yards and the proposed project is not expected to result in any potential significant adverse parking impacts during construction.

TRANSIT

With the projected construction workers distributed among the various subway and bus routes, station entrances, and bus stops near the project site, only nominal increases in transit demand would be experienced along each of these routes and at each of the transit access locations during hours outside of the typical commuter peak periods. As shown in Chapter 13, “Transit and Pedestrians,” substantial capacity would be available at all the analyzed transit elements, such that the projected construction worker trips by transit, when accounting for the favorable baseline conditions of nearby transit services and the hours when these trips would be made, would not result in any significant adverse transit impacts. However, temporary relocation of existing bus stops is likely to be required and limited additional buses may be needed to maintain the current headways and service schedules.

PEDESTRIANS

Considering that pedestrian trips generated by construction workers would occur during off-peak hours, primarily along pedestrian routes with low to moderate background pedestrian traffic, no significant adverse impacts associated with the projected increment of construction-related pedestrian trips are anticipated. Appropriate measures for maintaining temporary sidewalks and overhead protections would be provided throughout construction. Consultations with DOT would be undertaken to determine the feasibility of closing pedestrian access entirely for key segments during certain phases of construction.

AIR QUALITY

Concentrations of carbon monoxide (CO), nitrogen dioxide (NO_2), and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}) were not predicted to be significantly impacted by the construction of the proposed project in any phase of construction. Although concentrations of particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) may increase by more than the applicable 24-hour and annual average guidance thresholds in areas immediately adjacent to the construction activity, the $PM_{2.5}$ threshold exceedances were predicted to be limited in extent, duration, and severity. This low level of impact can be mostly attributed to the extensive measures incorporated in the proposed project construction program aimed at reducing $PM_{2.5}$ emissions. No significant adverse impacts on air quality are predicted during the construction of the proposed project.

NOISE AND VIBRATION

NOISE

The project sponsors have committed to incorporate into the project measures to reduce or avoid impacts due to project construction activities. After implementation of these measures, there would still be locations where construction activities alone, and construction activities combined with project-generated traffic, would result in predicted significant adverse noise impacts on the adjacent properties. The results indicate that there would be three open space resources that would experience significant adverse noise impacts during some portion of the construction period: Brooklyn Bear's Community Garden, the Dean Playground, and South Oxford Park. Because of safety and aesthetic concerns, there is no feasible and practicable mitigation that would eliminate project impacts; however, with respect to the Dean Playground, the impact would be partially mitigated by the provision of an amenity to the park users. Since the issuance of the DEIS, construction noise mitigation measures for the Pacific Street Branch of the Brooklyn Public Library and the Temple of Restoration on Dean Street were developed.

Significant noise impacts were predicted to occur at a number of residential locations during some portion of the construction periods. The survey showed that the majority of buildings near or adjacent to the project site either have double glazed windows or storm windows. In addition, a large number of residences have some form of alternative ventilation, either window, through-the-wall (sleeve), or central air conditioning. At locations where significant adverse noise impacts are predicted to occur, and where the residences do not contain both double-glazed or storm-windows and alternative ventilation (i.e., air conditioning), the project sponsor would make these mitigation measures available, at no cost for purchase and installation to owners of residences. In addition, as noted in the DEIS, potential significant adverse noise impacts from construction were identified at the upper floors of certain residential buildings on the north side of Atlantic Avenue and potentially on streets north of Atlantic Avenue. For the FEIS, the need for and feasibility of mitigation at these locations were further analyzed. Generally, all of the sites identified north of Atlantic Avenue already have double-glazed windows with sleeves for alternate ventilation. However, residents within the identified zone who do not have double-glazed or storm-windows and alternative ventilation and choose not to accept the mitigation measures made available, would still be predicted to experience significant adverse impacts from construction noise at these locations.

VIBRATION

The buildings of most concern with regard to the potential for structural or architectural damage due to vibration are the Swedish Baptist Church and nearby row houses along Dean Street, which are immediately adjacent to the site of Building 15. The project sponsors will implement a monitoring program to ensure that no architectural or structural damage will occur.

For limited periods of time due to infrequently occurring construction activities, vibratory levels will be perceptible in the vicinity of the construction site but would not be considered significant adverse impacts.

INFRASTRUCTURE

Several major water and sewer lines would have to be relocated, as well as many smaller utility lines. Water and sewer service lines would have to be connected to the new buildings. All relocations and replacements would meet the standards of New York City Department of Environmental Protection (DEP) and would have to be approved by that agency. The department regularly repairs, relocates, and replaces water and sewer lines without disruption to service. Therefore, no significant adverse impacts to the infrastructure systems or to users are expected.

Construction-generated solid waste would be disposed of off-site at appropriate land fills through the use of private carters.

During construction, energy for the construction activities would be provided to the project site through the grid power and, as necessary, on-site generators. The project sponsors have met with Con Edison to ensure the early connection of grid power to the site for use during construction. This would ensure that grid power would be available on site prior to the peak construction period. The amount of electricity required for project construction would not exceed the amount of electricity required to support the completed development. Relative to the capacity of the city's electric system, the increase in demand would be insignificant and there would be no significant adverse impact to the provision of energy to the site or the surrounding area.

RODENT CONTROL

Construction contracts would include provisions for a rodent (mouse and rat) control program. Prior to the start of construction, the contractor would engage the services of a professional abater who would survey and bait the appropriate areas and provide for proper site sanitation. During the construction phase, as necessary, the contractor would carry out a maintenance program. Coordination would be maintained with appropriate public agencies. Only EPA- and NYSDEC-registered rodenticides would be permitted, and the contractor would be required to perform rodent control programs in a manner that avoids hazards to persons, domestic animals, and non-target wildlife.

C. CONSTRUCTION ACTIVITIES

SCHEDULE AND PHASING

OVERVIEW

All construction is expected to be completed over a 10-year period. This chapter describes the expected construction elements and estimated timelines for the completion of the overall project, based on construction starting, as proposed, in the 4th quarter of 2006.

With construction starting in the 4th quarter of 2006, the end of construction would be in the 4th quarter of 2016, when all parts of the project are expected to be completed. Figure 17-1 shows the estimated construction schedule for major elements in the proposed project. As can be seen from Figure 17-1, the number of construction activities would vary over time, and are divided into two phases.

Phase I would begin with the reconstruction of the Vanderbilt Yard and the construction on Blocks 927, 1118, 1119, and 1127. Environmental remediation and demolition of all existing buildings would be the first tasks. Demolition on all blocks would occur in Phase I. The arena for the Nets basketball team and the subway entrance are expected to be open in October 2009, and the rest of the Phase I development would be completed by the 4th quarter of 2010. In general, the construction of the buildings would move from west to east, starting on Blocks 1118, 1119, and 1127 (Arena, Urban Room, and Buildings 1 through 4) followed by Block 927 (Site 5). Also included in Phase I are construction of the West Portal between the Vanderbilt Yard and Flatbush Avenue Terminal; New York City Transit (NYCT) connections; installation of major, new sewer and water lines; and other utility lines, such as telecommunication facilities with capacity for the complete project. During Phase I, the period with the greatest number of buildings simultaneously under construction would be in late 2008 to early 2009 when the arena, the LIRR improvements, and five buildings would be in various stages of construction. The levels of construction activities before and after the Phase I peak would be of lesser intensity.

In Phase II, the construction activity would be less intense than during Phase I. From 2010 to 2014, the activity would be centered on Block 1120 with a peak at the end of 2011 and the beginning of 2012. In 2014, the work would shift to Blocks 1121 and 1129 with a secondary peak in 2016. It is possible that the buildings in Phase II may proceed in a different sequence but the effects would not be materially different than described in this chapter.

PHASE I

Phase I would have the highest level of construction activity. In total, the following activities would take place:

- Environmental remediation and demolition of existing buildings;
- Installation of infrastructure (water, sewer, telecommunications and energy) improvements for Phase I development;
- Replacement of the 6th and Carlton Avenues Bridges;
- Construction of temporary and permanent parking;
- Reconstruction of the Vanderbilt Yard including a temporary yard, mat foundations to support the future platform and buildings and the West Portal, which would connect the new Vanderbilt Yard with the LIRR Atlantic Avenue Terminal;
- Construction of the Urban Room, a publicly accessible atrium;
- Construction of a new entrance to the subway through the Urban Room;
- Construction of the arena;
- Construction of five residential/commercial buildings; and
- Restoration or construction of new streets and sidewalks along the western blocks.

Figure 17-2 shows the areas of major construction during Phase I. During the four years of Phase I construction, the level of activity would start with disconnection of existing utilities, demolition of existing buildings, environmental remediation, excavation, and disposing of soils. The major in-street utility work would begin late in 2006 and last about 12 months. At the same time, sidewalk overhead protection would be installed along the Flatbush Avenue side of the Site 5 work areas to protect pedestrians in the area. Generally, sidewalks along the south side of Atlantic Avenue along Blocks 1118 and 1119, the north side of Flatbush Avenue, and the west side of 6th Avenue would be closed during Phase I construction. The level of construction activity would gradually increase, reaching a peak in late 2008 and early 2009 when multiple buildings and improvements would be under construction. A construction coordination center would be located on Block 1128. This center would house the construction management team and its support groups.

As described in more detail below, a number of different construction trades would be working on one building at the same time. After the foundation of a building is excavated and constructed, the floors are erected. During peak activity in a building, the following activities can occur simultaneously:

- Erecting to the highest floor, either concrete or steel;
- Floor decks being poured below the highest floors;
- Outside cladding being installed below the poured decks; and
- Interior space being finished on floors below the placement of floor decks.

Table 17-1 shows the estimated peak numbers of workers and deliveries to the project site by calendar quarter during Phase I. These represent peak days of work, and a number of days during the quarter would have fewer construction workers and delivery trucks. The number of workers and delivery trucks would peak during the first quarter of 2009.

Table 17-1
Peak Numbers of Construction Workers and Delivery Trucks during Phase I

Year	2006	2007				2008				2009				2010			
Quarter	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Workers	565	635	460	588	1,140	1,575	2,220	2,920	3,540	3,710	3,505	2,325	1,250	745	665	620	340
Deliveries	155	270	240	410	305	265	375	355	430	470	405	360	280	140	150	160	165

Source: Turner Construction Company and Forest City Ratner Companies
Note: These numbers apply to peak conditions and differ from the running average numbers discussed in the analysis sections.

In late 2006 and early 2007, the demolition program and the environmental remediation on the eastern blocks and within the Vanderbilt Yard would be undertaken. Figure 17-2 shows the major construction elements of Phase I. Reconstruction of the Carlton Avenue Bridge would take place from late 2006 through the end of 2008. As the Carlton Avenue Bridge is being reconstructed, new utilities along Atlantic Avenue would be installed. The reconstruction of the 6th Avenue Bridge and the construction of the West Portal would take place from about 4th quarter 2008 through 4th quarter 2009. At no time would the 6th Avenue and Carlton Avenue Bridges be closed at the same time. By late 2007, the excavation and foundation for Site 5, the arena, and Buildings 1 through 4 would be underway. Meanwhile, track relocation on the Vanderbilt Yard would be progressing. Construction of the West Portal connecting the Vanderbilt Yard to the Atlantic Terminal would start in mid- to late 2008 and be completed by the end of 2009. As part of the West Portal construction, the remaining utilities in Atlantic

Avenue would be completed. No dewatering is anticipated for any phase or activity of the project construction other than for surface stormwater.

In 2007/8, construction would begin on the four buildings to be located on the arena block (Buildings 1 through 4) as well as the building on Site 5. The level of construction activity on these five buildings, the arena, and the transit improvements would remain high through early 2009. This intense level of activity would be a result of multiple trades working on different construction tasks at the same time in each building. By mid-2009, the activity would lessen, and almost all of the construction work on these buildings would be indoors to finish the interiors of the buildings. The below-grade work within the Vanderbilt Yard would continue into 2010.

There would be less construction activity on the eastern end of the project site (Blocks 1121 and 1129) than on the western end during this period. Below grade, construction-related activity would consist primarily of relocation of the railroad tracks within the Vanderbilt Yard, and construction of the mat foundations for future buildings. In addition, the staging areas and the temporary parking for construction workers would be arranged on Block 1129. During Phase I, the at-grade construction work at the eastern end of the site would involve preparation of the temporary parking and staging area, demolition and replacement of the Carlton Avenue Bridge, some bulk excavation, support of the excavated area, and concrete pouring.

During 2010, the outside construction work would consist of laying the foundations for building 15 on Block 1128, completion of the reconstruction of the Vanderbilt Yard, and the commencement of platform construction over a portion of the Vanderbilt Yard. As part of the work within the Vanderbilt Yard, the supports for the Phase II buildings would also be constructed. The platform would provide a base for the Phase II buildings on part of Block 1120 and all of Block 1121. Columns and shear walls would be constructed on the mat foundations for future buildings. Large steel trusses, running north to south, would also be supported by the columns and the shear walls. Concrete to form and finish the platform would be poured upon decking, which would be placed on the steel trusses. The platform construction is expected to take about 16 months over Block 1120, and 20 months over Block 1121. (Construction of the Block 1121 platform would take place in Phase II.)

PHASE II

The major construction elements during Phase II are shown on Figure 17-3. By the beginning of Phase II, all of the arena construction, the transit improvements, and infrastructure upgrades would have been completed. These improvements would be in place to serve the Phase I elements and be ready for the Phase II elements. During Phase II, almost all of the work would be on the eastern end of the project site on Blocks 1120, 1121, 1128, and 1129. Eleven new buildings and the open space would be constructed over this six-year period. As in Phase I, multiple trades would be working on different construction tasks in one building at the same time. The estimated peak numbers of workers and delivery trucks are shown on Table 17-2. The peak construction activity would be during the last quarter of 2011 and the first two quarters of 2012, when Buildings 5, 6, 7, and 15 would be under construction with the platform being built on Block 1121 and Block 1129 being excavated.

Table 17-2
Peak Number of Construction Workers and Delivery Trucks During Phase II

Years	2011				2012				2013				2014				2015				2016			
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Workers	490	1,035	1,760	2,105	2,215	2,090	1,450	810	595	570	820	845	440	420	705	870	870	855	855	805	1,225	1,420	1,070	655
Deliveries	255	255	335	360	320	235	195	115	90	120	40	40	85	70	130	100	65	155	150	155	155	55	80	50

Notes: These numbers apply to peak conditions and differ from the running average numbers discussed in the analysis sections.
Sources: Turner Construction Company and Forest City Ratner Companies

HOURS OF WORK

It is anticipated that construction activities for the buildings and the arena would generally take place Monday through Friday with exceptions that are discussed separately below. In accordance with city laws and regulations, construction work would generally begin at 7 AM on weekdays, with some workers arriving to prepare work areas between 6 AM and 7 AM. Normally, work would end at 3:30 PM. It is anticipated that the workday would be extended for specific trades to complete some specific tasks beyond normal work hours. The work could include such tasks as completing the drilling of piles, finishing a concrete pour for a floor deck or completing the bolting of a steel frame erected that day. The extended workday would generally last until about 6 PM and would not include all construction workers on-site, but just those involved in the specific task. Extended workdays are expected to occur about 40 percent of the weekdays over the course of construction.

Over the course of construction, it is expected that evening and night work would be required. For example, certain of the transit improvements may involve street openings at the intersection of Flatbush and Atlantic Avenues, and this would likely be allowed only during the late evening and night when traffic is at its lightest. In addition, some of the larger construction tasks within the Vanderbilt Yard and the arena may require continuous periods of time to complete. So as not to interfere with the LIRR train schedule, LIRR work would be scheduled to start after the Yard has been vacated to meet the evening rush hour and be completed before trains return from the morning rush hour.

Weekend work would be required at times over the course of construction. Again, the numbers of workers and pieces of equipment in operation would be limited to those needed to complete the particular task at hand. For extended weekday and weekend work, the level of activity would be reduced from the normal workday. The typical weekend workday would be on a Saturday from 7 AM with worker arrival and site preparation to 5 PM for site cleanup. It is expected that weekend work may be required on one weekend day for approximately 50 percent of the weekends over the course of construction and, in exceptional circumstances, two weekend days would be required.

When work is required outside of normal construction hours, the proper approvals would be obtained from the appropriate agencies. A noise control plan would be developed and implemented to minimize intrusive noise emanating into nearby areas and affecting sensitive receptors. The noise control plan would include such restrictions as the prohibition, where possible, against placing generators at the property line and engaging in unnecessary loud activities at night.

LANE AND SIDEWALK CLOSURES

During the course of construction, traffic lanes and sidewalks would have to be closed or protected for varying lengths of time. Along with the closures, bus stops would have to be temporarily relocated and crosswalks redirected. Three segments of streets would be permanently closed and incorporated into the project. Other street lanes and sidewalks would be continuously closed for several months to over a year, and some lanes and sidewalks would be closed only intermittently to allow for certain construction activities. This work would be coordinated with and approved by the appropriate governmental agencies.

The three street segments and their sidewalks that would be permanently closed and incorporated into the project site are:

- Pacific Street between Carlton and Vanderbilt Avenues;
- Pacific Street between Flatbush and 6th Avenues; and
- 5th Avenue between Atlantic and Flatbush Avenues.

These street segments would be closed at the start of construction, which is expected to begin in the 4th quarter of 2006. In addition to the potential traffic impacts caused by the permanent closure of these streets assessed under operational impacts in Chapter 12, “Traffic and Parking,” this chapter addresses the potential combined impact of the permanent street closures on other temporary street and lane closures expected during construction.

During Phase I of construction, the activities would be centered at the western end of the project site, primarily Blocks 1118, 1119, 1127, and Site 5. For the most part, sidewalks immediately adjacent to the project site in this area would be continuously closed and intermittent lane closures along these block fronts would occur. Specifically from the 4th quarter of 2006 to the 4th quarter of 2008, the following sidewalks would be closed to pedestrian use:

- Atlantic Avenue (south side) from Flatbush Avenue to Carlton Avenue;
- Dean Street (north side) from Flatbush Avenue to 6th Avenue (at intervals only);
- 6th Avenue (west side) from Dean Street to Atlantic Avenue (at intervals only);
- Pacific Street (north side) from 6th Avenue to Carlton Avenue; and
- Carlton Avenue (both sides) from Atlantic Avenue to Pacific Street.

However, temporary sidewalks could be maintained, as required in most cases, to facilitate pedestrian flow. The only exception would be the areas adjacent to the Carlton Avenue Bridge reconstruction where maintaining pedestrian traffic may be difficult. Similar conditions along the south side of Atlantic Avenue would continue through the end of 2009 to complete the scheduled utility installation, reconstruction of the 6th Avenue Bridge, and the construction of the LIRR West Portal. For this second year of construction, the Carlton Avenue Bridge would remain closed. Subsequent to the reopening of the Carlton Avenue Bridge, 6th Avenue Bridge reconstruction would commence.

The sidewalks around the arena block would be subject to intermittent closures starting at the end of 2007 and continuing until the end of 2009. When the arena opens, overhead sidewalk protection would be provided along Dean Street and 6th Avenue. It is expected that the sidewalk to the Atlantic Avenue arena entrance would be constructed and opened when the arena is opened. At the end of Phase I in 2010, all of the sidewalks and lanes around the arena block and Site 5 would be open.

During Phase II, the sidewalks along the south side of Atlantic Avenue east of 6th Avenue, the north side of Dean Street, and the part of Vanderbilt Avenue along Block 1121 would be closed. These sidewalks would be reconstructed and reopened as the buildings are completed. By 2016, all of the sidewalks would be open.

Approximately 11 bus stops would be affected by the sidewalk closures. Six bus stops on the Site 5 and the arena blocks would be affected in Phase I. During Phase II, three bus stops on Atlantic Avenue (Blocks 1120 and 1121) and two bus stops on Vanderbilt Avenue (Blocks 1121 and 1129) would be affected. These bus stops would be temporarily relocated to nearby areas along the bus routes, usually within one block. The relocations would be subject to the review and approval of NYCT. The potential impacts of these relocations are discussed below in the "Transit" section of this chapter.

GENERAL CONSTRUCTION PRACTICES

Certain activities would apply throughout the project. These include community relations, coordination with appropriate governmental agencies, and site security. The project sponsors would have a field representative on-site through the whole construction period. The representative would serve as the contact point for the community and local leaders to voice any concerns about construction activities. A security staff would be on-site 24 hours per day, 365 days per year.

SITE ACCESS AND DELIVERIES

Because of site constraints and the presence of the large equipment and the type of work, access to the construction sites would be tightly controlled. The work area would be fenced off and limited access points for workers and trucks would be provided. Typically, worker vehicles would not be allowed into the construction area, but temporary parking for the construction workers would be provided on Block 1129. This temporary provision for construction worker parking is discussed below under "Staging and Temporary Parking Areas." Security guards and flaggers would be posted and all persons and trucks would have to pass through security points. Workers or trucks without a need to be on the site would not be allowed on the site. After work hours, the gates would be closed and locked. Security guards would patrol the construction sites after work hours and over the weekends to prevent unauthorized access.

As is the case on almost all large urban construction sites, materials deliveries to the site would be highly regimented and scheduled. Because of the high level of construction activity and constrained space, unscheduled or haphazard deliveries would not be allowed. For example, during excavation, each dump truck would be assigned a specific time that it must arrive on the site and a specific allotment of time to receive its load. If a truck is late for its turn, it would be accommodated if possible, but if not, the delivery would be assigned to a later time. A similar regime would be instituted for concrete deliveries, but the schedule is even stricter. If a truck is late, it would not be allowed on site and would be sent back to the concrete plant with its load. Because contract documents specify a short period of time within which concrete must be poured (typically 90 minutes), the load would be rejected if this time is exceeded.

During the finishing of the building interiors, the greatest number of individual deliveries is scheduled. Studs for the partitions, electrical wiring, mechanical piping, sheet rock, tape, and paint appliances are a few of the myriad materials that must be delivered and moved within each building. Each building under construction would have one or two hoists, and the available time for the hoist would be fully and tightly scheduled. A trade, such as the drywall subcontractor, would be assigned a specific time to have his materials delivered and hoisted into the building. If the delivery truck arrives outside its assigned time slot, it would be accommodated if possible without disrupting the schedule of other deliveries. However, if other scheduled deliveries would be disrupted, the out-of-turn truck would be turned away. This is a penalty for the subcontractor, because if its materials are not on-site, it cannot complete the task. Therefore, the contractor has a strong incentive to stay on schedule.

To aid in adhering to the delivery schedules, as is normal for buildings such as those included in the proposed project, flaggers would be employed at each of the gates. The flaggers could be supplied by the subcontractor on-site at that time or by the construction manager. The flaggers would control trucks entering and exiting the site, so that they would not interfere with one another. In addition, they would provide an additional traffic aid as the trucks enter and exit the on-street traffic streams.

SUSTAINABLE DESIGN GUIDELINES RELATED TO CONSTRUCTION

The proposed project would include a number of “sustainable design” features. As the design of the buildings progresses, these guidelines would likely change as more experience is gained about the effectiveness and appropriateness of the guidelines. Among those sustainable design/construction guidelines currently under consideration are:

- Use of low-emitting materials and materials with high recycled content/renewable or sustainable harvested materials;
- Use of locally and/or regionally extracted or manufactured materials where feasible; and
- Diversion of demolition and construction waste from landfills and to recycling and reuse where feasible.

STAGING AND TEMPORARY PARKING AREAS

Block 1129 would be used for the staging of construction materials, and for equipment and trucks that are awaiting their scheduled appointment at one of the construction sites. Entrances to the staging area would be via Vanderbilt and Carlton Avenues onto the closed portion of Pacific Street. During Phase 1, when the construction is taking place on the arena block and Site 5, the exits would be on Pacific Street and Carlton Avenue. The use of Block 1129 as a staging area would minimize the number of trucks waiting on the street for access to the construction area. The trucks, except for concrete mixers, would be required to turn off their engines while waiting. Concrete mixers use power from the engine to keep the concrete in motion to prevent setting.

In addition, temporary parking for construction workers would be on this block. As detailed further in Section D, "Potential Construction Impacts," under "Parking," the construction project is expected to generate a substantial demand for construction worker parking. While some construction workers are expected to find nearby available on-street spaces, the overall availability in the area would not be adequate to meet the projected demand. To avoid overtaxing nearby on- and off-street facilities, the project sponsor would provide on-site parking at a fee to construction workers that is comparable to other parking lots/garages in the area. The size of the project site area allocated for construction worker parking would vary over the construction timeline. For the peak period of construction worker activity, up to 800 attended parking spaces would be made available. During periods of lesser activity, fewer parking spaces for construction workers would be made available.

STORMWATER POLLUTION PREVENTION PLAN

A Construction Stormwater Pollution Prevention Plan (SWPPP) would be developed for the overall project construction activity in accordance with the requirements of NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-02-01). The SWPPP would include fully designed and engineered stormwater management practices with all necessary maps, plans and construction drawings, providing the site-specific erosion and sediment control plan and best management practices. The SWPPP would include designation of responsible parties and personnel who would have a role in management of construction stormwater runoff. The SWPPP would outline a routine site inspection and reporting program for identification and prompt repair of any deficiencies for the erosion and sediment control structures or practices.

Stormwater management during construction activities would be performed through implementation of a site-specific erosion and sedimentation control plan. In accordance with NYSDEC guidance, the SWPPP would include both structural and non-structural components. The structural components are expected to consist of hay bale barriers/silt fencing, inlet protection, and installation of a stabilized construction entrance or other appropriate means to limit potential offsite transport of sediment. The non-structural "best management practices" would include routine inspection, dust control, cleaning, and maintenance programs; instruction on the proper management, storage, and handling of potentially hazardous materials; and identification of parties responsible for implementation and ongoing maintenance programs. All temporary control measures would be maintained until disturbed areas of the site are stabilized.

DEMOLITION

The first step for construction of any of the buildings or the arena would be disconnection of existing utilities and demolition of the existing buildings to clear the sites. Demolition of buildings on one block could occur while construction of buildings is underway on other blocks. Asbestos abatement would be the first part of demolition. These specialty tasks are strictly regulated in New York City to protect the health and safety of the construction workers and the public, nearby residents and workers. Depending on the extent of the asbestos, either the whole building or portions of the building would be closed off by containment barriers made of either plastic or wood. The barriers prevent asbestos from leaving the containment area. Specially trained workers in protective clothing use hand tools to remove the asbestos. These asbestos containing materials are sealed in bags and taken to licensed landfills for disposal. While the asbestos is being abated, air monitoring is performed by a licensed, third-party inspector. After abatement is complete, an independent third party inspector would certify that the building is asbestos free, and general demolition would begin. Depending on the amount of asbestos to be removed, 10 to 20 workers could be employed for this task, and about one or two closed or tarped truckloads of bagged materials could be removed per day. This phase can typically last about one month per building.

The next step in general demolition is to remove any economically salvageable materials. Much of the reclaiming of salvageable materials is done on site and the materials are transported to recycling centers. Because of the structural properties of the existing buildings, large equipment would likely not be used to demolish most of the buildings. Hand tools would mainly be used in the demolition. However, for some of the buildings, including Site 5, larger equipment would be used. Typical demolition requires solid temporary walls and overhead protection around the building to prevent accidental dispersal of building materials into areas accessible to the general public. In addition, dust suppression measures, such as wetting of materials, would be used. An exposure assessment would be performed to determine appropriate dust control measures to manage any lead-based paint. After the structure is demolished, excavators or front-end loaders are used to load the debris into dump trucks. The demolition debris is taken to landfills for disposal. Depending on the size of the building demolished, about 10 to 20 workers would be employed for this task, and two to four truckloads of debris would be removed per hour. The general demolition is expected to last between one and three months per building; multiple buildings would be demolished at the same time.

ARENA CONSTRUCTION

The building and erection of the arena for the National Basketball Association (NBA) Nets basketball team would be the most complex of the individual construction tasks in the proposed project. The clear span over the seating and playing areas would require very complex trusses to support the roof. Essentially, building the span is akin to building a long span bridge in place. In addition, many specialty contractors would be involved in the finishing of the building, including specialists in audio visual equipment, public safety security, and telecommunications. A partial section of the Atlantic Avenue side of the arena is shown on Figure 17-4. It is expected that the arena construction, including the mass excavation, would take less than three years, ending in the fourth quarter of 2009. Several hundred to over 1,000 workers could be employed on this task, depending on the activity level. The arena would span three blocks (Blocks 1118, 1119, and 1127), and the different construction activities would overlap. In addition, four other buildings would be under construction on the same three blocks. Therefore, the site would experience an intense level of activity with five major construction projects in different states of completion and multiple construction activities occurring simultaneously. The phases envisioned for the arena construction would include excavation and foundations, the lower concrete superstructure, the upper steel superstructure and roof, the seating area and interior finishing, exterior walls, and specialties. As the completion of construction of the arena nears, there would be a commissioning phase when all systems are tested to confirm they work properly together and to ensure public safety for the public opening. Each phase is discussed below.

EXCAVATION AND FOUNDATIONS

This phase is expected to last about five months. The ground would be excavated to about 20 feet below grade, except along 6th Avenue and Dean Street where the excavation would extend to about 35 to 40 feet below the current street levels. This depth would allow for the construction of the foundations and accommodate two levels of parking. The event level would be about 13 feet below the main concourse level, which would meet the current grade of 6th Avenue. Excavation would start with the installation of augured steel piles, with heavy timbers to support the sides, then excavation and loading of the soil onto trucks and carting of the soil from the site. If any unreported underground tanks were to be uncovered, they would be removed in accordance with applicable New York State Department of Environmental Conservation (NYSDEC) regulations. As the excavation becomes deeper, a temporary ramp would be built to provide access for the dump trucks to the work site. As the final grade is approached, bulldozers or excavators would be used for shaping the ground. Forms would be placed and reinforcing bars installed. Then the concrete would be poured and/or pumped. Some portions of the arena foundation would involve large concrete pours.

The excavation would involve excavators, bulldozers, and backhoes. Blasting is not anticipated for the removal of soils. The concrete forms would be installed using cranes, which would also be used for the reinforcing bars. Compressors and hand tools would be used for the forms. Concrete mixer trucks would bring the concrete to the site for the mass concrete pours. Concrete pumps would be also used for placing the concrete. This phase of the work would have several hundred workers employed on this task, and several hundred trucks would enter and exit the site daily at the peak of work. The potential construction traffic impacts are discussed later in the section, "Traffic."

LOWER CONCRETE SUPERSTRUCTURE

This phase is the erection of the lower concrete superstructure, which would overlap with the foundation work. The concrete superstructure would extend to the main concourse, above which would be the steel superstructure and roof trusses. Much of the concrete superstructure would be precast at locations offsite and trucked to the site. The precast elements would be placed by cranes. However, some of the superstructure would be cast in place concrete, which requires forms. The lower superstructure forms the perimeter basement wall, which holds the outside cladding. The lower superstructure also supports the upper superstructure and roof.

A variety of construction equipment, including cranes, concrete pumps, compressors and generators, would be on site. A large number of hand tools would also be used. Several hundred workers would be employed on this task, and the number of trucks on this task would generally be fewer than 100 per day.

SUPERSTRUCTURE AND ROOF

Construction of the upper steel superstructure and roof would take about 10 months and would commence when the foundations and lower concrete superstructure have been completed. Parts of the superstructure and roof trusses would be fabricated offsite and transported to the arena site for installation. The superstructure and the trusses would be too large to transport over the road when fully assembled. As the superstructure is assembled, it would be lifted into place by cranes. The roof trusses, because of the long clear span over the event floor, would be extremely large. These trusses would be erected by one or more cranes in sections and connected together when lifted into place.

The large equipment on-site would include cranes, hoists, lift vehicles, concrete pumps, and compressors. Welding machines and impact wrenches would be used for assembling and placing the steel superstructure and roof trusses. Approximately 500-1,000 workers would be employed on this task, and about 100 truck trips per day would be expected during this activity.

EXTERIORS

Exterior work would involve the placement of curtain wall panels on the concrete-and-steel superstructure, and the completion of the roof enclosure. The exterior walls of the arena would be placed by cranes and local hoists on the superstructure frame. On the roof, metal decking would span between the trusses, and reinforcing mats would be placed upon the metal decking. Concrete would be pumped to the roof level to complete the roof structure. Waterproofing would be laid over the concrete, and a green roof system would be placed above the waterproofing. Other amenities would then be installed. The construction of the exteriors would take about 15 to 18 months. It would begin about three to four months after the start of the construction of the steel superstructure. The exteriors would be coordinated to be installed concurrently with erection of the steel superstructure and with elements of the interior finishing.

This activity would involve approximately 100 workers and fewer than 25 trucks per day. The equipment for erecting the curtain walls would be cranes and local hoists with hand tools used for anchoring the panels. Concrete pumps and hand tools would be used to complete the roof.

INTERIORS AND SEATING

Construction of the interiors and seating is expected to take about 24 months and would commence as soon as the lower concrete superstructure had been constructed. It would overlap with construction of the steel superstructure, installation of the exteriors and the work of the specialty trades. Much of the seating area would be constructed of precast concrete stadia members. The pieces would be fabricated offsite and trucked to the arena site. They would be placed by the same cranes that would install the steel superstructure and roof trusses and by auxiliary cranes dedicated to this task. After placement, the seats, handrails, and other appurtenances would be installed on the precast concrete members using hand tools.

Interior finishing is the most labor-intensive activity of a construction project, but it does not require as much heavy equipment as the other tasks, such as excavation. Interior finishing involves trades, such as electrical, heating/ventilation and air conditioning, sheet rocking, painting, and furnishing and is accomplished within the enclosure of the building. Mostly small hand tools are used for interior finishing, but a high number of deliveries for materials, such as sheet rock, ceiling tiles, flooring and interior electrical, mechanical, and plumbing fixtures are required.

Up to 1,000 workers could be employed on this task during the peak of the interior finishing activity. During this activity peak, several hundred delivery trucks could enter and exit the site each working day.

SPECIALTIES

As the interior work progresses, the specialty contractors would begin their work. Specialties include such items as security equipment, secure telecommunications for radio and television, the video display systems, IT and audio visual systems, wireless systems, vertical transportation, concessionaire stands, and commercial kitchens. Like the interior work, specialties do not use a great deal of large construction equipment, but are labor intensive. Several hundred construction workers could be employed on this task, and 100 or more deliveries for this task could arrive and depart each working day.

COMMISSIONING

Commissioning is basically a testing phase to ensure that all systems are working properly and do not interfere with one another. All of the life safety features, such as egress, fire alarms, and emergency lighting would be tested, inspected, and approved by the appropriate agencies. Other systems would also be tested and commissioned during this phase by specialty vendors. The commissioning process is expected to last about three months and would be the final part of the arena construction prior to its public opening. Relatively few workers and truck deliveries are expected for this activity.

CONSTRUCTION OF PLATFORM

Platforms would be built over the open, below-grade portions of the newly relocated Vanderbilt Yard. One platform would span the below-grade portion of Block 1120, and a second platform would span Block 1121. The platform construction is expected to take about 16 months over Block 1120 and 20 months over Block 1121. The construction of the platform over Block 1120 is scheduled for the last quarter of 2009 to the first quarter of 2011. For the platform over Block 1121, the construction would take place from the first quarter of 2011 to the third quarter of 2012.

The platform would provide a base for the Phase II buildings on part of Block 1120 and most of Block 1121. The construction techniques and sequencing for both platforms would be basically the same. Columns and shear walls would be constructed on the mat foundations for future buildings. Large steel trusses, running north to south, would be supported by the columns and the shear walls. Concrete would be poured upon decking, which would have been placed on the steel trusses to form and finish the platform. While construction of the platform is ongoing, flaggers and other safety personnel would be employed within the active portions of the Vanderbilt Yard and other railroad tracks. The work would be scheduled around the LIRR operations within the Vanderbilt Yard so as not to hinder the rail yard's functions. While the rail cars are in the Vanderbilt Yard, they are cleaned and readied for the evening rush hour.

Large construction equipment for this task would include cranes, lift trucks, concrete pumps, compressors, and generators. About 100 workers would be needed for this task during peak construction activity, and fewer than 50 trucks per day are expected.

CONSTRUCTION OF BUILDINGS

Construction of each of the 16 buildings (other than the arena) would generally follow the same sequence of construction activities. The foundations would be poured for buildings not located on a platform. For the most part, Buildings 6 through 9 would be built on platforms and would not require the foundation activity. Then the superstructure and floors would be erected for the concrete buildings, and the cladding attached to the superstructure. Finally, the interior finishing would be the last activity in constructing a building. Once the foundations are completed, a building rises at the rate of about two floors per week. When the building reaches about 10 stories, three construction activities happen simultaneously. The superstructure is erected on the higher floors, cladding is attached farther down, and the interior is finished on the lowest floors. The main difference among the buildings is that Buildings 6 through 9 would not have excavated foundations. These buildings would be founded on the platforms over the rebuilt Vanderbilt Yard. In addition, Building 1 would have a steel superstructure for the lower 25 floors. The upper floors in Building 1 and all other buildings are expected to be constructed with a concrete superstructure.

FOUNDATIONS

Following demolition, excavation, and grading, construction of the proposed project's foundation and below-grade elements would begin. For structures of this type, the foundations would typically be structural concrete mat with supporting piles in a few locations. Columns and concrete walls would be built to the grade level. This activity would require approximately three to five months and employ between 50 and 100 workers. On a typical day, 10 to 30 trucks would enter and exit the site in connection with this task.

SUPERSTRUCTURES

Following installation of foundations, the construction of the buildings' superstructures would commence. Construction of each building's superstructure is anticipated to last approximately 12 to 18 months. Typically, all superstructures are formed and poured in place. The exceptions would be the lowest levels of Building 1, the Urban Room and the arena, which would be steel superstructure with concrete floors on metal decking. Concrete would arrive in mixers and be pumped to the level under construction, and the steel would be pre-fabricated and assembled and erected on-site.

Two cranes and two hoists would typically service one building. Concrete pumps, compressors, generators, and lifts would be among the large pieces of on-site construction equipment for concrete superstructures. Cranes, welding machines, and generators would be used for steel superstructures. About 100 to 200 workers would be employed on this task, and about 40 to 50 trucks would enter and exit the site per day in connection with this task.

EXTERIORS

As the superstructure is installed, work would commence on the exterior. The work would involve final roofing and finishing details on the exterior walls. This phase is anticipated to take about 9 to 15 months.

The equipment for construction of the exteriors would be cranes and local hoists. For this task, about 10 to 20 trucks would enter and exit the site, and about 30 to 50 workers would be employed.

INTERIOR FINISHING

Interior finishing is the most labor-intensive activity of a construction project. At its peak, several hundred workers would be employed on this task, completing the interior finishing. Interior finishing involves electrical installation; heating, ventilation and air conditioning; sheet rocking; painting; and furnishing. Mostly small hand tools are used for interior finishing, but a high number of deliveries for materials, such as sheet rock, ceiling tiles, flooring and interior electrical, mechanical and plumbing fixture are required. About one hundred delivery trucks would enter and exit the site each working day in connection with this task.

TRANSIT IMPROVEMENTS

RECONSTRUCTION OF THE LIRR VANDERBILT YARD

The Vanderbilt Yard is usually filled with trains during the day, where they are cleaned, serviced, and marshaled for the evening rush hour out of the Flatbush Avenue Terminal. Therefore, some track work within the Vanderbilt Yard would have to be done during evening and weekends when the yard is empty. Reconstruction of the Vanderbilt Yard is expected to start in late 2006 and to be completed in 2010.

The first step in the reconstruction of the Vanderbilt Yard would be to build a temporary yard in Blocks 1120 and 1121. Existing tracks and other structures in the area of the temporary yard would be removed. Then a temporary trestle from the main line would be built to allow train access. The Carlton Avenue Bridge and its foundations would be demolished and rebuilt. Some temporary electrical switchgear and other operating equipment would be installed. A temporary ramp along the north edge of Pacific Street would be constructed to allow access. Finally, the new temporary tracks would be installed, and the existing yard closed. This phase of the work is expected to take about two years.

Once the temporary yard is operational in the southern half of Blocks 1120 and 1121, the tracks in the old yard would be removed. The 6th Avenue Bridge would be demolished, and its reconstruction started. Within the same area, a new drill track (track used for switching cars) would be built under Block 1119. In addition, construction of the West Portal would begin at the western end of Block 1120. The West Portal would connect the new Vanderbilt Yard to the Atlantic Terminal, located on the south side of Atlantic Avenue at Block 1120. Four new permanent tracks for maintaining and servicing the trains would be built on the north side of Block 1121. When the new, permanent tracks are operational, the temporary trestle to the temporary tracks on the south side of Block 1121 would be removed. This phase of the work is expected to take about 18 months.

At this point, the temporary tracks would be removed and replaced with permanent tracks on the south side of Block 1121. The West Portal into Atlantic Terminal and the drill track would be complete. All of the temporary switchgear and other operating equipment would be removed. The permanent signals and power would be installed, along with the new train maintenance and servicing equipment. This work is expected to take about 12 to 14 months, and the reconfigured Vanderbilt Yard would be fully operational in 2010. The new rail yard would have nine tracks for storing, cleaning, and toilet servicing of trains, a new drill track for switching trains, and a direct connection into Atlantic Terminal, all with modern operating equipment.

Almost all of the construction work on the rail yard would take place below the street grade, and would be less noticeable than that of the arena or project buildings. Reconstruction of the two bridges, excavation of an open trench for the West Portal, support of the excavated areas, and construction of the access ramp from the rail yard to the street level would be the main surface construction tasks. However, cranes would likely be at street level to lower materials and equipment into the below-grade areas. In addition, trucks would enter and exit the construction site from the streets.

Large pieces of construction equipment would be used for reconstruction of the Vanderbilt Yard. These would include cranes, bulldozers, backhoes, compactors, concrete pumps, and pavers. In addition, special railroad equipment would be used for laying ballast and track, and installing operating equipment. The reconstruction of the Vanderbilt Yard would take place over the course of 42 months, and the number of workers and truck trips would vary greatly over that period of time. At its peak, about 200 workers would be on-site, and about 40 to 60 trucks would enter and exit the site. For the majority of the reconstruction, the activity would be less than these peaks.

THE WEST PORTAL

The West Portal would connect the new Vanderbilt Yard to the Atlantic Terminal, located on the south side of Atlantic Avenue at Block 1120. Construction of the West Portal would be a "cut and cover" operation, which involves opening a large trench across several of the traffic lanes and the sidewalk on the south side of Atlantic Avenue. The trench would be too wide to be covered by steel plates and would be open for about a 10-month period in late 2008 and into 2009. At all times, at least two eastbound and three westbound lanes of traffic on Atlantic Avenue would be open. The method of maintaining traffic during this time and the potential impacts are discussed below in the "Traffic" section of this chapter. After the subterranean utilities are relocated and the structural steel installed for the West Portal, the trench would be closed, and traffic lanes reopened. After the cut and cover trench is closed, all work would be underground inside the tunnel and not noticeable to area workers, residents, or visitors. During construction of the West Portal, several measures would be taken to prevent damage and disruption to the LIRR tracks in and out of Atlantic Terminal. Walls would be erected to separate the main line tracks from the work within the West Portal area. The wiring for power and signals would be moved out of or away from the West Portal work area. During the opening of the existing tunnel wall, the work would be undertaken at night, when the tracks are not in use. In addition, a false wall to separate the existing tunnel from the active tracks would be installed to prevent any materials or debris from spilling onto the tracks.

The number of construction workers would vary depending on the actual construction operation, but would generally number between 20 and 30. The equipment would consist of backhoes, excavators, mobile cranes, cherry pickers, dump trucks, concrete trucks and many small hand tools.

The West Portal would be opened with excavators, which would place the excavated materials onto dump trucks for disposal. Then the foundations and walls would be built with reinforced concrete. About 15 trucks per day would be needed for this work on the West Portal. Steel girders would then be placed to form the roof of the West Portal and the base of the reconstructed Atlantic Avenue. The steel girders would be placed with mobile cranes and bolted into place. Atlantic Avenue would then be repaved to New York City Department of Transportation (DOT) specifications and standards.

TRANSIT ENTRANCE AND URBAN ROOM

Included in the proposed project is a series of transit connection improvements. The upgraded connections would improve transit access and safety from the south side of Atlantic Avenue since transit passengers would no longer have to cross Atlantic Avenue to gain access to the New York City subways. The new transit connections would also provide better distribution and circulation of passengers throughout the subway station. All of these improvements would be completed within Phase I.

The specific transit connection improvements would be as follows:

A plaza and the proposed Urban Room would be created at the southeast corner of the intersection of Atlantic Avenue and Flatbush Avenue. The Urban Room would serve as the main entrance from the arena to mass transit in the area and include escalators, stairways and passageways leading to the subway station; an elevator would also be included to comply with the Americans with Disabilities Act (ADA).

A new ramp from the new control area would connect to a rehabilitated passage under the IRT subway to provide access to the Interborough Rapid Transit (IRT) subway trains (2, 3, 4, and 5) located along Flatbush Avenue. This currently unused passage would provide access to both the northbound and southbound 4/5 platforms and to the southbound 2/3 platform. Another ramp from the control area would connect passengers to the northbound 2/3 platform and provide ADA access to the platform.

Access to the Brooklyn-Manhattan Transit (BMT) subway trains (B and Q) from the new control area would be via a rehabilitated, currently unused escalator shaft at the south of the original BMT station that then would connect to the existing platform via a new stairway from an intermediate refurbished mezzanine level.

Construction methodology for the Urban Room is described within the construction of the arena. For the transit connection, much of the construction work would be done within existing, but unused space within the transit facilities. The work in these areas would be demolition of old walls and installation of new finishes. To protect the users of the subways and the LIRR, the work areas would be separated from the public areas. This task would involve mostly hand tools and about 50 to 100 workers.

A new connection under Atlantic and Flatbush Avenues would have to be trenched. Because of the heavy use of this area, the open trench would likely be excavated at night, with steel plates installed on the roadways so they could be used during the day. Backhoes would be used to dig the trench and dump trucks would haul the soil away. Concrete mixer trucks would be used for installing the foundations and side walls. The construction of the connection would involve about 25 to 50 workers. In addition, comparatively smaller efforts are necessary to construct the 6-foot-wide emergency exit stair connecting the existing IRT sub-passage to the Flatbush Avenue sidewalk adjacent to Site 5.

INFRASTRUCTURE

ROADS AND SIDEWALKS

The sidewalks and roadways next to the site would be reconstructed. The major reconfigurations and improvements would include:

- Widening of Flatbush Avenue at Atlantic Avenue by 10 feet to provide a drop-off lane adjacent to the site;
- Widening and restriping of Atlantic Avenue between Flatbush Avenue and 6th Avenue to provide an additional eastbound travel lane and a drop-off lane adjacent to the project site;
- Conversion to two-way travel of 6th Avenue between Atlantic Avenue and Flatbush Avenue, with the segment between Pacific Street and Flatbush Avenue widened from 34 to 40 feet;
- Creation of a drop-off lane on 6th Avenue between Atlantic Avenue and Dean Street adjacent to the project site;
- Widening of Pacific Street between 6th Avenue and Carlton Avenue from 34 to 38 feet; and
- Creation of 20-foot-wide sidewalks along the south side of Atlantic Avenue from Flatbush Avenue to Vanderbilt Avenue and along the east side of Flatbush Avenue between Atlantic Avenue and Dean Street.

These network changes would be constructed towards the end of the construction on the adjacent site, generally during interior finishing activity. The grading for the sidewalks and the streets would use backhoes and be finished by hand labor. Then concrete would be poured for the sidewalks and asphalt laid for the streets. The sidewalks and streets would be designed and constructed to DOT specifications. Construction of each of the improvements is expected to take several weeks.

BRIDGE REPLACEMENT

The bridges at Carlton Avenue and 6th Avenue would be demolished and replaced as part of the proposed project. One bridge would remain open at all times; at no time would the two bridges be closed simultaneously. Certain parts of this work can be accomplished only when the areas of the LIRR Vanderbilt Yard directly below the bridges are vacant. Since the Vanderbilt Yard is full during the day, certain activities over active tracks would have to be performed at night and on weekends. These activities include bridge demolition, pile installation and steel erection. For each bridge, the dismantling and replacement would take about seven months, of which half would be early evening and weekend work. The closure and reconstruction of the Carlton Avenue Bridge would occur from late 2006 through late 2008, over about a 24-month period. The reconstruction of the 6th Avenue Bridge would commence following the opening of the Carlton Avenue Bridge, and would be completed in late 2009.

UPGRADED WATER AND SEWER LINES

To support the proposed project, some of the water and sewer lines within and around the project site would be replaced with a new grid of mains. Much of the major utility construction planned within the street beds would occur during Phase I of the proposed project. During Phase II, the infrastructure improvements would be those needed to support the buildings being constructed. The new water and sewer lines would be sized to accommodate the expected demand and meet

New York City Department of Environmental Protection (DEP) standards. The new water mains would include:

- A new 20-inch line under Dean Street west of 6th Avenue connecting to a new 20-inch line on Flatbush Avenue;
- A new 20-inch line under Dean Street east of Carlton Avenue connecting to a new 20-inch line on Vanderbilt Avenue;
- A new 20-inch line under Pacific Street east of 6th Avenue connecting to a new 20-inch line on Carlton Avenue;
- Replacement (as necessary) of the existing 36-inch cast iron water main under Atlantic Avenue to construct the New Carlton Avenue Bridge, West Portal, and other project elements;
- A new 12-inch line under Vanderbilt Avenue between Atlantic Avenue on the north and Dean Street on the south interconnecting the new Dean, Pacific, and Atlantic Avenue lines;
- New 8- and 20-inch lines under 6th Avenue interconnecting with the new Dean, Pacific, and Atlantic Avenue lines; and
- A new 20-inch line under Carlton Avenue interconnecting with the new Dean and Pacific Street lines.

Construction of the proposed project would also require the upgrading of sewers to collect the wastewater and storm flows and convey them to the sewer network. The area of study for sanitary and sewer systems is referred to as the “drainage plan.” Development in New York City must either comply with an area’s adopted drainage plan or propose an amendment to the plan. Because the proposed project would close certain segments of local streets and require new sanitary and stormwater infrastructure, an amended drainage plan was prepared in April 2006 and is currently being reviewed by DEP. The pipe sizes may change as a result of the DEP review.

Under the proposed drainage plan, this sewer replacement would serve the dual purposes of handling the added flow from the proposed project and replacing old pipes—some of which date from the late 19th and early 20th century—with new 15- to 60-inch sewers. In addition, the sewers beneath the segments of 5th Avenue and Pacific Street would be decommissioned and the flows re-routed to the new pipes proposed under the amended drainage plan. The installation of sewers would be phased, generally following the development of the proposed project, with sewers first installed west of 6th Avenue and then all sewers installed at full build-out. The work to be done is first described and the actual methodology is described below.

Stormwater and sanitary sewage from the project site flows in combined sewers into two major outlets under Flatbush Avenue, which are located between the BMT and the IRT subway structures. These outlets are:

- Outlet 1: a 32-by-57-inch brick culvert at Dean Street/Flatbush Avenue; and
- Outlet 2: a 48-inch circular pipe at 5th Avenue/Flatbush Avenue.

The Phase I sewer improvements would include:

- From Outlet 1 (intersection of Dean Street and Flatbush Avenue), east on Dean Street to the intersection of Dean Street and 6th Avenue, a 60-inch diameter combined sewer would be installed. The work would include the construction of a new outlet chamber at the Dean Street and Flatbush Avenue intersection to accommodate the new 60-inch combined sewer;

the existing 36-inch combined sewer in Flatbush Avenue; the new 42-inch combined sewer to be installed north to the intersection of Pacific Street and Flatbush Avenue (Outlet 2); and the existing combined sewer, which runs east to west under Flatbush Avenue.

- From the intersection of Dean Street and 6th Avenue, north on 6th Avenue to the intersection of Pacific Street, a new 42-inch combined sewer would be installed. A new manhole chamber would also be installed at the intersection of 6th Avenue and Pacific Street. This chamber would be designed to accommodate the existing flows from the 24- and 36-inch combined sewers in Pacific Street as well as the Phase II 36-inch combined sewer in Pacific Street.
- From Outlet 1 Chamber to Outlet 2 Chamber (intersection of Flatbush Avenue and Pacific Street), a new 42-inch diameter combined sewer would be installed to interconnect the two existing combined sewers in Flatbush Avenue. A new Outlet 2 Chamber would also be constructed to accommodate the proposed 42-inch combined sewer and the proposed 24-inch combined sewer, which would be installed from Outlet 2 to the intersection of Flatbush Avenue and Atlantic Avenue.
- From the proposed DEP 35-foot-wide sewer location at the intersection of Flatbush Avenue and Atlantic Avenue, a 24-inch diameter stormwater sewer would be installed.
- From the proposed sewer location, east toward 6th Avenue, 24- and 18-inch pipes are proposed.
- From the intersection of 6th Avenue and Atlantic Avenue east on Atlantic Avenue, 18- and 12-inch diameter pipes are proposed.

The Phase II sewer improvements would include:

- From the Phase I manhole chamber located at the intersection of Dean Street and 6th Avenue, a 48-inch diameter combined sewer would be installed in Dean Street, east to the intersection with Vanderbilt Avenue. New manhole chambers would be installed at the Dean Street intersections with Carlton Avenue and Vanderbilt Avenue to accommodate the existing combined sewers.
- From the intersection of Dean Street and Vanderbilt Avenue, north in Vanderbilt Avenue to the intersection of Pacific Street, a 48-inch diameter combined sewer would be installed. A new manhole chamber would be constructed at the intersection to connect the existing combined sewers to the newly installed 48-inch diameter combined sewer.
- From the Phase I manhole chamber at the intersection of 6th Avenue and Pacific Street east to the intersection of Pacific Street and Carlton Avenue, a 36-inch combined sewer would be installed.

Construction Techniques for Installing Water and Sewer Lines

To install a water line, a trench would be dug, usually about four to ten feet below the ground surface. The bottom of the trench would be lined with gravel to act as bedding material. Lengths of the water line would be laid and welded together, and the pipes would be tested in sections and then as a complete system. Gravel would be placed around the water line, and the trench would be filled with compacted soil. If the removed soil is suitable, it would be reused; if not, clean soil would be brought in. The street would be repaved in accordance with DOT specifications. Traffic control measures would be coordinated with DOT and implemented while work is ongoing to protect the workers and to maintain traffic flow. The trench would not be left open during non-working times, but would either be filled and patched or covered with steel plates. Typically, about 100 feet of water line can be installed per day.

When all of the water line is installed, it would be connected to the existing water line. This task is usually done during times of low water demand because the water flow to this section of the water line has to be cut off. The water system is designed and built in such a way that the water can flow around the cut-off section, and water service to users is not interrupted. After the new water line is tested to ensure that it is functioning properly, the old section would either be abandoned in-place or removed.

Sewer construction work primarily uses a "cut and cover" technique. A trench would be excavated in the street, a bedding layer of gravel laid in the bottom of the trench, the sewer pipe placed in the trench, the trench backfilled, and the pavement patched. This work typically involves the use of jackhammers and pavement cutters to open the street, backhoes to excavate the trench and place the backfill, and cranes to lift the sewer pipes into place. Flatbed delivery trucks are used to transport the sewer pipes to the site. Dump trucks are used to bring the bedding material and clean fill, if needed, to the work site. Asphalt trucks and rollers are needed to patch the street.

ENERGY AND TELECOMMUNICATIONS

To provide the level of energy service required by the proposed project to the site would require some localized upgrades in electrical and gas transmission lines and facilities serving the project site, as well as the decommissioning of lines in the streets proposed to be closed. Within the project site and adjoining streets, new gas mains, service lines, and metering would be necessary. As specific site designs move forward, the utility companies would identify those specific upgrade needs. The upgrading work would involve the use of backhoes to open trenches in the streets. Steel plates would cover the trenches when active work is not taking place.

OPEN SPACE

During Phase I, the only open space that would be constructed would be the private space on the roof of the arena and small seating, plaza, and landscaped areas on the arena block. The open space would be phased in as Phase II proceeds. Upon completion of Phase II, there would be 8 acres of publicly accessible active and passive open space constructed on land and over the renovated Vanderbilt Yard on Blocks 1120, 1121, and 1129.

During construction of the open space clean top soil would be imported for installation of the grassy areas and landscaping. Concrete sidewalks would be poured, and street furniture, such as benches and tables, would be installed. The top soil would involve dump trucks bringing the soil and hand spreading. Concrete trucks would be needed to bring concrete for the sidewalks. The street furniture would be delivered by truck and hand installed. For the active recreation areas, the ground surfaces would be installed, followed by the appropriate amenities, i.e., basketball hoops, volley ball nets, etc. The majority of this work would be done by hand. It is expected that the open space would be constructed near a building when the building is completed. The construction of each portion of the open space would take several months and would involve only weekday work.

LAND USE AND NEIGHBORHOOD CHARACTER

Construction activities would affect land use on the project site and in the surrounding area; these construction effects would be temporary. All construction staging activities for the proposed project would occur within the project site footprint or within portions of sidewalks, curbs, and travel lanes of public streets immediately adjacent to the project site. Additionally, access to surrounding land uses would be maintained throughout the construction period, and adherence to the provisions of the New York City Building Code and other applicable regulations would reduce the potential adverse effects of construction activities on land use patterns and neighborhood character. Moreover, although the project anticipates a 10-year construction schedule, the level of activity would vary and move throughout the project site, and no immediate area would experience the effects of the project's construction activities for the full 10-year duration. No permanent changes to the adjacent land uses are anticipated as a result of the construction activities at the project site; thus, there would be no significant adverse impacts to land use or neighborhood character.

PHASE I

During Phase I, all structures on the project site would be demolished, portions of Fifth Avenue and Pacific Street would be closed, and improvements to the below-grade rail yard would be undertaken. The 6th Avenue and Carlton Avenue Bridges would be rebuilt at different times during Phase I. However, the majority of the construction activity would be located on Site 5 (Block 927) and the arena block (Blocks 1118, 1119, and 1127). Land uses surrounding the western end of the project site generally consist of large-scale commercial uses to the north, across Atlantic Avenue, and a mix of residential, commercial, office, and institutional uses south of Atlantic Avenue. Land uses in these areas would be affected by general construction activity at these locations, such as demolition, excavation and construction, as well as sidewalk closures, intermittent travel lane closures, and the relocation of bus stops in the vicinity of the project site.

As described above under "Lane and Sidewalk Closures," sidewalks adjacent to the arena block and Site 5 would, for the most part, be continuously closed during Phase I, restricting pedestrian access around the perimeter of these blocks. On these streets, pedestrian access would be maintained on the opposite side of the streets (i.e., north side of Atlantic Avenue, west side of Flatbush Avenue, south side of Dean Street), and therefore sidewalk closures are not expected to result in any significant adverse impacts to the residential, commercial, or institutional uses on surrounding streets. The reconstruction of the 6th Avenue and Carlton Avenue Bridges would be phased such that at least one bridge would be open at all times during the construction period, to ensure that access is maintained between the neighborhoods to the north and south of the project site. While several bus stops would be affected by the sidewalk closures, these bus stops would be temporarily relocated to nearby areas along the bus routes.

Construction activities on the eastern portion of the project site would occur within the Vanderbilt Yard on Blocks 1120 and 1121, as well as on Blocks 1129 and portions of Block 1128. Construction activities in the rail yard would be confined to the below-grade areas and would not be disruptive to the surrounding residential, commercial, and institutional uses. On the project parcel located on Block 1128, the existing buildings would be demolished and the site would be used as the Construction Coordination Center throughout the remainder of the Phase I construction period. Block 1129 would be used for construction worker parking and the staging of construction materials, equipment, and trucks that are awaiting their scheduled appointment at one of the construction sites. The use of Block 1129 as a construction staging area and parking lot for construction-related vehicles is considered an industrial land use. As the current land uses on the block primarily consist of light manufacturing, industrial, parking, and vacant uses, this change in use during the construction period would not constitute a significant adverse impact on surrounding blocks.

The use of Block 1129 as a staging area would minimize trucks waiting on the street for access to the construction area. The trucks, except for concrete mixers, would be required to turn off their engines while waiting. Construction-related vehicles would access the staging area on Vanderbilt Avenue and on Dean Street. During Phase I, when a substantial number of construction activities are taking place on the arena block, trucks would exit the staging area at Pacific Street and Carlton Avenue and access the construction sites by Pacific Street. Trucks that are not required to utilize the staging area could access the arena block on Flatbush Avenue or on Dean Street west of 6th Avenue. Therefore, as there would be multiple points of access to the arena block and the staging area would limit the numbers of trucks waiting on the streets surrounding the project site, the construction-related traffic would not have a significant adverse impact on surrounding land uses.

PHASE II

The expected level of activity during Phase II would be less than that required for Phase I, as all of the arena construction, the transit improvements, and infrastructure upgrades would have been completed. During Phase II, all construction activity would be located on the eastern portion of the project site, on Blocks 1120, 1121, and 1129, as well as on the western portion of Block 1128. Land uses in the surrounding area generally consist of residential and institutional uses to the north, across Atlantic Avenue, and a mix of residential, retail, open space, parking, and industrial uses south of Atlantic Avenue. Land uses in these areas would be affected by sidewalk closures, intermittent travel lane closures, and the relocation of bus stops in the vicinity of the project site.

Sidewalks adjacent to these project site blocks would, for the most part, be continuously closed during Phase II. However, pedestrian access would be available on the opposite side of the streets (i.e., north side of Atlantic Avenue, east side of Vanderbilt Avenue, south side of Dean Street), and therefore sidewalk closures are not expected to result in any significant adverse impacts to the land uses surrounding the project site. The reconstruction of the 6th Avenue and Carlton Avenue Bridges would be completed by Phase II. Bus stops that may be affected by the sidewalk closures would be temporarily relocated to nearby areas along the bus routes.

Block 1129 would continue to be used for staging activities and construction worker parking at the beginning of Phase II, although the area used for staging and parking would diminish as the buildings and open space on Sites 11, 12, 13, and 14 are developed. Construction-related vehicles would access the construction sites on Blocks 1120, 1121, and 1129 at multiple locations, including on Atlantic Avenue, Vanderbilt Avenue, and Dean Street. Therefore, construction-related traffic would not have a significant adverse impact on surrounding land uses.

LAND USE IMPACT ASSESSMENT

No portion of the project site would be subject to the full effects of the construction for the entire construction period. Construction activities on all sites would adhere to the provisions of the New York City Building Code and other applicable regulations. Access to surrounding residences, businesses, and institutions, as well as access between the neighborhoods to the north and south of the project site would be maintained throughout the duration of the construction period. Construction activities would be disruptive and concentrated on some blocks for an extended period of time. However, measures to control noise, vibration, and dust on construction sites, including the erection of construction fencing, would reduce views of construction sites and buffer noise emitted from construction activities. Sound barriers would be used to reduce noise from particularly disruptive activities where practicable. Overall, construction would not significantly change or affect land use in the surrounding area, and no significant adverse impacts to land use are anticipated.

NEIGHBORHOOD CHARACTER IMPACT ASSESSMENT

Construction activity associated with the proposed project would have significant adverse localized neighborhood character impacts in the immediate vicinity of the project site during construction. The degree of this change would depend on the type of construction activity being performed, the location and the length of time this disruption is expected to occur, and the character of the immediately adjacent neighborhoods. Construction would change the character of the project site from an underutilized and blighted area to one of construction activity. The existing uses on the site do not contribute to a vibrant neighborhood character, and their replacement with construction activities would not result in significant adverse impacts to neighborhood character on the project site.

As stated above, no portion of the project site, and thereby the immediately adjacent neighborhood, would be subject to the full effects of construction for the entire 10-year period. During Phase I, construction activities would take place on the arena block and Site 5 on the western end of the project site and below-grade to the east (rail yard reconfiguration). The presence of cranes, earth moving and loading equipment, and other heavy equipment used during Phase I for the development on the arena block and Site 5 would temporarily affect the residential neighborhoods to the south and west and the commercial district to the north in the immediate vicinity of the project site. Neighborhood character effects would be less on the eastern end of the project site as the activity on Block 1129, which is closest to the residential neighborhood of Prospect Heights to the south, would be limited to construction staging and parking and the construction of the rail yard would occur below grade, reducing its effects.

During Phase II, construction activities would be completed west of 6th Avenue. On the project site east of 6th Avenue, the construction activity on the project site would temporarily affect the local neighborhood in the immediate vicinity of the project site. The level of construction activity would decrease during Phase II as different buildings are constructed and the proposed project reaches completion in 2016.

The proposed project would result in temporary sidewalk closures adjacent to the project site, particularly along the south side of Atlantic Avenue. However, pedestrian volumes are minimal on and immediately adjacent to the project site, with the exception of Flatbush Avenue and Atlantic Avenue west of Flatbush Avenue, and these closures would not appreciably change pedestrian conditions in the area. (Temporary sidewalks would be provided to maintain pedestrian flow where necessary.)

Construction would also have significant adverse impacts on the local street network and cause construction-related noise, particularly along the Dean Street corridor just south of the project site. During construction, the project site and the immediately surrounding area would be subject to added traffic from construction trucks and worker vehicles, partial and complete street closures, and the reconstruction of two bridges over the rail yard, resulting in changes in area travel patterns and the resultant significant adverse traffic impacts. Construction traffic and noise would change the quiet character of Dean Street and Pacific Street in the immediate vicinity of the project site.

As discussed in "Land Use Impact Assessment" above, measures to minimize noise, vibration, dust, and other construction-related nuisances would be employed where practicable. The impacts would be localized and would not alter the character of the larger neighborhoods surrounding the project site. The proposed project would not result in significant adverse neighborhood character impacts during construction, except in the immediate vicinity of the project site.

SOCIOECONOMIC CONDITIONS

Construction activities associated with the proposed project would, in some instances, temporarily affect socioeconomic conditions in the vicinity of the project site. However, access to businesses near the project site would not be impeded, and most businesses are not expected to be significantly affected by a temporary reduction in the amount of pedestrian foot traffic that could occur as a result of construction activities. Overall, construction of the proposed project is not expected to result in any significant adverse impacts to surrounding businesses.

PHASE I

During Phase I, construction activities would be located on the western portion of the project site, primarily on the arena block (Blocks 1118, 1119, 1127) and Site 5. Commercial uses located in the immediate vicinity of the Phase I construction sites are concentrated along Flatbush and Atlantic Avenues. For the most part, sidewalks adjacent to the Phase I construction site would be continuously closed and intermittent lane closures along these block fronts would occur. However, as only the sidewalks surrounding the project site would be affected, these closures are not expected to adversely impact the surrounding businesses. Access to the businesses in the vicinity of the project site would not be impeded, nor would signage be restricted. While construction may require the temporary closure of travel lanes on the north side of Atlantic Avenue and adjacent to the project site on Flatbush Avenue, curbside deliveries to surrounding businesses are not expected to be significantly affected.

Businesses on Flatbush Avenue consist of neighborhood-oriented retail and services, restaurants, and medical offices. Most of these businesses would not be adversely affected by the construction activity. Medical offices and businesses such as pharmacies and laundromats that cater to local residents do not rely on pedestrian foot traffic and therefore would not be likely to experience a decline in business due to construction. Other businesses, such as eating and drinking establishments, may experience a small decline in foot traffic from area residents and permanent workers, but this decline would be offset by the presence of several hundred construction workers, who would likely patronize local businesses. In addition, pedestrian traffic generated by the subway station at Flatbush Avenue and Bergen Street is not likely to be affected by the construction activity.

Atlantic Avenue commercial uses are concentrated in the Atlantic Center and Atlantic Terminal shopping centers, located immediately north of the arena block. Construction of the proposed project would not adversely affect these businesses, most of which are destination retail stores that do not rely on pedestrian traffic and attract customers from across Brooklyn.

As described below in "Traffic," several bus stops adjacent to the project site on Flatbush and Atlantic Avenues may be temporarily relocated to other nearby locations along the bus routes. However, bus service along these routes would not be significantly impacted, and the businesses along Flatbush and Atlantic Avenues are not expected to be adversely affected by the temporary relocation of bus stops near the project site. Overall, while a small number of businesses that rely on pedestrian foot traffic may be temporarily affected by the construction activity and the loss of some on-street parking surrounding the project site, these effects would be temporary. Phase I construction activity is not expected to result in any significant adverse impacts to surrounding businesses.

PHASE II

During Phase II, all construction activity would be located on the eastern portion of the project site, on Blocks 1120, 1121, 1129, and the western portion of Block 1128. While sidewalks adjacent to these blocks would be continuously closed and intermittent lane closures along these block fronts would occur, only sidewalks and lanes surrounding the project site would be affected, and these closures are not expected to adversely impact the surrounding businesses. Construction would not impede access or reduce the visibility of signage of the businesses surrounding the project site, such as those along Vanderbilt Avenue or Pacific Street. Curbside deliveries to surrounding businesses are also not expected to be significantly affected.

Commercial uses located in the immediate vicinity of the Phase II construction sites are concentrated along Vanderbilt Avenue, and consist primarily of restaurants, neighborhood-oriented retail and service establishments, and a small number of shoppers' goods stores such as clothing and home goods stores. While a small number of businesses that rely on pedestrian traffic may be temporarily affected by the nearby construction activity and the loss of some on-street parking surrounding the project site, most of the businesses on Vanderbilt Avenue would not be adversely affected by the construction activity. As stated above, it is expected that the several hundred workers on the construction site would generate business for the restaurants and other eating and drinking places and convenience goods stores in the area during the construction period. Bus stops adjacent to the project site on Vanderbilt and Atlantic Avenues may be temporarily relocated to other nearby locations along the bus routes. However, as described below in "Traffic," bus service along these routes would not be significantly impacted, and the businesses on Vanderbilt Avenue are not expected to be adversely affected by the temporary relocation of bus stops near the project site. As access to local businesses would not be affected and the effects of construction would be temporary, no significant adverse impacts to surrounding businesses are anticipated.

COMMUNITY FACILITIES

Construction of the proposed project would not block or restrict access to any facilities in the area, and would not affect emergency response times significantly. No community facility would be affected by construction activities for an extended duration. In addition, the construction sites would be surrounded by construction fencing and barriers that would limit the effects of construction on nearby facilities.

PHASE I

As stated above, construction activities would be primarily located on the western portion of the project site during Phase I, on the arena block, Sites 5, and the western portion of Block 1128. Several community facilities located in proximity to these sites would be temporarily affected by construction activities during Phase I. The Pacific Branch of the Brooklyn Public Library, located directly south of Site 5 at 25 4th Avenue, would experience significant adverse impacts from noise associated with the Site 5 construction activities between 2007 and 2009, including demolition, utility work, and above-ground construction of structures. The thresholds in the 2001 *CEQR Technical Manual* would be exceeded during the weekday and weekend days for all three years, and during weekday nights for 2008 and 2009. The Church of the Redeemer, located west of Site 5 at 24 4th Avenue, would also be affected by construction-related noise, but would not experience significant adverse impacts. However, access to these facilities would not be restricted during construction, and measures would be taken to limit the effects of construction activities on surrounding uses. A 16-foot barrier would be erected on a portion of Site 5 that would buffer noise and views associated with the construction. Therefore, as construction activities at this site would be of a limited duration, and measures would be taken to reduce the effects of construction on surrounding uses, no significant adverse impact to these facilities would result. Moreover, the Church of the Redeemer currently holds services only on Sunday at 11:00 AM, which would not be adversely affected since no regular construction activity is anticipated on Sundays.

Located farther east, near the arena block and Block 1128 are the New York City Fire Department (FDNY) Engine 219 and Ladder 105 Firehouse and the New York City Police Department (NYPD) 78th Precinct police station. The firehouse is located across the street from Block 1128 at 494 Dean Street and the police station is located at 65 6th Avenue at the corner of Bergen Street. While construction of the proposed project would result in temporary increases in noise and traffic during the construction period, access to and from these facilities would not be affected during the construction period.

Construction activities during Phase I are expected to result in the temporary closure of some travel lanes surrounding the project site, and the 6th Avenue and Carlton Avenue Bridges would be reconstructed. However, as described below under "Traffic," lane closures would be coordinated with DOT and the bridge reconstruction would be phased such that at least one bridge would be open at all times during the construction period. The construction of the proposed project neither is expected to significantly affect emergency response times nor would it affect the delivery of police or fire protection services. The project site and the surrounding area are well-served by NYPD and FDNY protection services as well as hospitals, from all directions (See Chapter 5, "Community Facilities"). Emergency response times would not be adversely affected because of the geographic distribution of their facilities and their respective coverage areas and the existence of multiple routes to their destinations. Furthermore, the City is implementing an automatic vehicle location (AVL) system in all ambulances and FDNY apparatus to allow for accurate real-time information as to the location of the vehicles. The use of this technology is expected to further reduce emergency response time.

There are two outpatient health facilities located south of the arena block—the Family Health Center and the New Direction Brooklyn Center located on Flatbush Avenue between Dean and Bergen Streets. One public school is located in the vicinity of the Phase I construction activity. Brooklyn High School for the Arts is located west of 4th Avenue at 345 Dean Street. Access to these facilities would not be restricted by the construction of the proposed project, and access to the buildings by personnel from the NYPD, the FDNY, and emergency medical personnel would be maintained at all times. In addition, the high school is located over 300 feet away from Site 5 and would be separated from any disruptive construction activities by intervening buildings. Therefore, these facilities would not be significantly impacted during the construction period. There are no publicly funded day care facilities located near the project site.

PHASE II

During Phase II, construction activities would be located on the eastern end of the site and are not expected to adversely affect any of the facilities described above. There are no additional libraries, police or fire stations, publicly funded day care facilities, or health facilities located in close proximity to the Phase II construction sites.

One public school—J.H.S. 113, the Ronald Edmonds Learning Center—is located directly north of Block 1121 at Atlantic and Clermont Avenues. This school would be temporarily affected by noise associated with the construction activities on that block for one to two years during Phase II while Buildings 8 and 9 are being constructed. However, access to this facility would not be restricted in any way during construction. Due to the limited duration of the construction activities in the area that is closest to the school and the measures that would be taken to reduce the effects of construction, no significant adverse impacts to this facility are expected to occur.

OPEN SPACE

Construction activities would not displace any existing open space resources. While three existing open spaces may be temporarily affected by construction activities, access to these open spaces would not be impeded at any point during the construction period. The use of the proposed open spaces to be constructed as part of the project would be temporarily affected by the construction of adjacent buildings. Three open spaces would experience temporary significant adverse impacts from construction-related noise. The Brooklyn Bear's Pacific Street Community Garden would be impacted during 2008 and 2009 from construction on Site 5, the Dean Playground would be impacted over three years (2008, 2009, and 2011) from construction of the arena block and Building 15, and South Oxford Park would be impacted from 2008 through 2012

PHASE I

During Phase I, construction activities would temporarily affect three open spaces located in close proximity to the project site. The Brooklyn Bear's Pacific Street Community Garden, located adjacent to Site 5 on Flatbush Avenue and Pacific Street, would experience temporary significant adverse noise impacts from construction activities on that site, including demolition, utility work, and above-ground construction of structures scheduled to take place between mid-2007 and 2010. These impacts would occur during weekday days and weekend days during 2008 and 2009. For much of this time, the sidewalk along the north side of Pacific Street between 4th Avenue and Flatbush Avenue would be closed. Access to the community garden would be available from Flatbush Avenue. The Dean Playground, located in close proximity to the arena block and the project site on the western portion of Block 1128, would also experience temporary significant adverse noise impacts from construction activities occurring on those blocks; however, this impact would be partially mitigated by the provision of an amenity to the park users. These impacts would occur during weekday days and weekend days during 2008, 2009 and 2010. However, construction would not limit access to or use of this park. Measures would be taken to limit the effects of construction activities on these open spaces and other surrounding uses, including the erection of a 16-foot barrier that would limit noise emitted from the construction site and reduce views of the construction-related activities.

The open space associated with the Atlantic Terminal Houses, located on Atlantic and Carlton Avenues, would also be affected for approximately one month during Phase I while the water main is being replaced on the north side of Atlantic Avenue. Given the short duration of the water main replacement and the fact that access to this open space would be maintained through the duration of this construction activity, no significant adverse impacts to this open space would result.

PHASE II

During Phase II, all of the construction activities would be located on the eastern portion of the project site. The Brooklyn Bear's Pacific Street Community Garden is located over 900 feet from the Phase II construction sites, and the Atlantic Terminal Housing Development open space is separated from the construction sites by Atlantic Avenue. The Dean Playground is located near the Block 1128 site, but is separated from Blocks 1120, 1121, and 1129—where most of the Phase II construction would occur—by intervening buildings. However, construction activities for Building 15 are expected to significantly impact this existing open space during 2011.

The Phase II open space would be phased in as residential buildings are completed, subject to operational and safety considerations. Phase II construction is expected to result in temporary restrictions to the use of some of the open spaces that would be developed as part of the project. Since the proposed open space would be constructed upon completion of each of the project's buildings, it is likely that the use of the new open spaces would be limited while adjacent buildings are being constructed. However, these restrictions would be for a limited duration and are necessary in order to provide new publicly accessible open space as part of the project, and therefore would not result in a significant adverse impact.

CULTURAL RESOURCES

PHASE I

Archaeological Resources

As discussed in Chapter 7, "Cultural Resources," Phase I construction could impact five archaeologically sensitive areas on the project site. The archaeological study was reviewed by LPC and OPRHP and its conclusions and recommendations accepted by both agencies. Therefore, to avoid adverse impacts on potential archaeological resources, LPC and the New York State Office of Parks, Recreation and Historic Preservation (ORPHP) would be consulted regarding testing as set forth in the Stage 1B testing protocol for the project, which has been accepted by LPC and OPRHP, and, if required, mitigation measures.

Historic Resources

Project construction by 2010 would involve the demolition of two historic resources on the project site, the former Ward Bread Baking complex at 800 Pacific Street and the former LIRR Stables at 700 Atlantic Avenue. Measures to partially mitigate the impact of demolition on these historic resources have been developed in consultation with OPRHP and are stipulated in the LOR. The LOR outlines protective and mitigation measures related to cultural resources.

Project construction would also result in modifications to portions of the Atlantic Avenue Subway station. The proposed modifications would not affect the significant historic features of the station, and, therefore, the proposed construction is not expected to adversely impact this historic resource. To avoid adverse impacts to the Atlantic Avenue Station with respect to the proposed modifications, the project sponsors would prepare a Construction Protection Plan (CPP) for the station. The project sponsors would also consult with NYCT and OPRHP regarding the proposed finishes in the station where new construction would connect to the historic tiled platform walls, and to evaluate the potential salvage and reuse potential of materials to be removed in the non-public areas as part of the proposed modifications.

To avoid construction-related impacts on historic resources within 90 feet of project construction, a Construction Protection Plan (CPP) would be developed in consultation with OPRHP and would comply with the procedures set forth in TPPN #10/88 and other New York City Building Code regulations. Implementation of the CPP would protect the historic resources within 90 feet of the project construction (those most likely to be affected) and would include provisions for the proper enclosure of demolition and construction sites, pre- and post-construction documentation, vibration monitoring, stop work orders, and general requirements regarding the reduction of construction dust and noise. The CPP would be prepared and implemented prior to construction activities on the project site and project-related demolition and construction activities would be monitored as specified in the GPP.

PHASE II

Archaeological Resources

No archaeologically sensitive areas were identified beyond those that would be disturbed through project construction by 2010. Therefore, no impacts to archaeological resources are anticipated from construction activity between 2010 and 2016.

Historic Resources

To avoid construction-related impacts on historic resources within 90 feet of project construction anticipated to occur between 2010 and 2016, historic buildings within 90 feet of project construction would be protected by the CPP. Any modifications to the Phase I CPP would be developed and implemented in consultation with OPRHP and would comply with the procedures set forth in TPPN #10/88 and other New York City Building Code regulations.

HAZARDOUS MATERIALS

The potential for significant adverse impacts from hazardous materials during construction and operation of the proposed project is discussed in more detail in Chapter 10, "Hazardous Materials." This section summarizes the potential for significant adverse impacts during construction.

The project site has a long history of industrial, manufacturing, and commercial uses. In addition to subsurface contamination (soil, soil gas, and/or groundwater) associated with current and historic uses on site or migrating from off-site or from historic fill, sampling in buildings identified the presence of lead-based paint, asbestos-containing materials, and potentially PCB-containing fluorescent light ballasts.

BUILDINGS

Prior to building demolition, asbestos removal would be conducted in accordance with applicable requirements. Also, any PCB-containing equipment and other waste materials that could not be disposed of as construction and demolition debris would be removed for separate disposal.

SOIL, SOIL GAS, AND GROUNDWATER

The proposed excavation depth of up to approximately 46 feet below grade (average 30 feet) would remove the majority of the historic fill, which is typically the uppermost 10 feet or less of material immediately below the buildings or paving, from the site. The excavation is not expected to encounter groundwater. Additionally, minor excavations in other areas within the site to depths of about six feet are anticipated for the installation of utilities. This fill, as occurs throughout New York City, generally contains levels of constituents (including arsenic, lead, semi-volatile organic compounds, and pesticides) above the most stringent guidance values. Soils and/or fill with petroleum-related contamination may be encountered near current or former gasoline stations and other locations where petroleum was stored. In general, deeper soils, which did not include fill materials, would have lower levels of contaminants with the exception of some soils near current or former gas stations. With the exception of one shallow soil sample from the western end of Block 1120, where elevated levels of lead were found, laboratory analysis of soil samples did not indicate exceedances of hazardous waste regulatory thresholds. In general, soil and groundwater conditions identified at the Vanderbilt Yard were not materially different from the rest of the project site. Detailed procedures would be incorporated into the project's construction documents to govern procedures for the excavation and handling of these excavated materials. For the various types of materials (e.g., petroleum tanks or petroleum-contaminated soils, historic fill, or native materials), requirements would be included in the specifications and the Construction Health and Safety Plan (described below) both to meet all applicable legal restrictions (e.g., for proper handling, transportation, and disposal) and to protect the safety of the public, community residents, and construction workers, as well as the larger environment.

CONSTRUCTION HEALTH AND SAFETY PLAN (CHASP) AND DUST CONTROL

Prior to site excavation, a Construction Health and Safety Plan (CHASP) would be prepared, in accordance with Occupational Safety and Health Administration (OSHA) regulations and guidelines, to address both the known contamination issues and contingency items. The CHASP would describe in detail the health and safety procedures to minimize exposure to workers and the public. The CHASP would include provisions for the identification, handling and disposal of known and/or unexpected buried tanks, petroleum-contaminated soil, historic fill, or other contaminated materials that might be encountered. The CHASP would also address procedures for stockpiling, testing, loading, transporting (including truck routes), and properly disposing of all excavated material.

To protect the public, the CHASP would require the Community Air Monitoring Plan (CAMP) procedures of the New York State Department of Health (NYSDOH) to be implemented during excavation. A site-specific CAMP would be prepared based on the most recent NYSDOH guidance documents. The current guidance document is titled "Generic Community Air Monitoring Plan" and is published as Appendix 1A to NYSDEC's guidance DER-10, Technical Guidance for Site Investigation and Remediation (draft December 2002). At the start of work, air monitoring stations would be established at the perimeter upwind of the work activities and at the downwind perimeter of the work zone. Monitoring for VOCs and PM_{10} at the upwind and downwind stations would be conducted when soil is disturbed. If levels exceed the CAMP action levels specified by the NYSDOH guidance at the downwind perimeter station, the prescribed control measures would be immediately implemented, and continuous monitoring at the downwind perimeter station would be conducted until air monitoring levels are re-established below the CAMP action levels. Background readings and any readings that trigger response actions would be recorded in the project logbook, which would be available on-site for agency review.

In accordance with New York City requirements, air monitoring would also be performed during all abatement of friable asbestos-containing materials. Air monitoring for asbestos is performed by an independent third-party monitor not associated with the abatement contractor. All monitoring must be performed by New York State-licensed asbestos project air sampling technicians. Air monitoring is generally performed before, during, and after abatement activities. Pre-abatement monitoring establishes baseline background levels. Monitoring during abatement is intended to detect any airborne asbestos which escapes from the containment systems used to enclose the abatement area. If asbestos concentrations exceeding action levels are detected, work is stopped while barriers are inspected and restored, and any surfaces impacted by fugitive asbestos are cleaned. Post-abatement monitoring is performed to confirm that no airborne asbestos is present prior to the start of demolition work.

Community air monitoring for lead is not generally required during building demolition. When conducting demolition, (unlike lead abatement work) lead-based paint is generally not stripped from surfaces. Structures are disassembled or broken apart with most paint still intact. Normal dust control measures (spraying the building with water) will be used during demolition. The lead content of any resulting dust is therefore expected to be low, and normal dust control measures are sufficient to prevent off-site impacts. Work zone air monitoring for lead may be performed during certain demolition activities with a high potential for releasing airborne lead-containing particulates in the immediate work zone, such as manual demolition of walls with lead paint, or cutting of steel with lead-containing coatings. This monitoring would be intended to ensure that workers performing these activities are properly protected against lead exposure.

During all subsurface disturbance work, dust control measures (e.g., applying water on haul roads, wetting equipment and excavation faces, spraying on equipment buckets during excavation and dumping, hauling materials in properly tarped or watertight containers, restricting vehicle speeds to five miles per hour on the project site and covering stockpiled excavated material) would be implemented. Chapter 10, "Hazardous Materials" of this FEIS provides further details on what would likely be included in the CHASP and air quality monitoring requirements during various components of construction.

GROUNDWATER AND VAPOR CONTROL

Although groundwater sampling indicated a range of contaminants including petroleum-related VOCs and chlorinated VOCs, groundwater is not used as a source of drinking water in Brooklyn and dewatering during construction is not anticipated. Thus, the potential concern associated with this contamination is that is that VOCs could migrate up from the groundwater, through the subsurface, into the proposed buildings. However, the designs of the proposed buildings would incorporate elements that provide safeguards against such mitigation. The residential and community facility uses would be located either above ventilated underground facilities or above the platform over the ventilated rail yard.

It is possible that NYSDEC, which has regulatory control over petroleum spills, may require groundwater cleanup to be implemented (as is currently occurring at Block 1127, Lot 1) at some of the current/former petroleum storage locations. Cleanup would typically consist of removal of any separate-phase petroleum floating on the water table (e.g., by pumping or vacuuming), followed by in-situ treatment (e.g., injection into the groundwater of an oxygen supply compound, such as a dilute hydrogen peroxide solution, to enhance the growth of naturally occurring bacteria that enhance petroleum hydrocarbon biodegradation rates).

CONCLUSIONS

The potential for contamination in the subsurface (related primarily to localized current/former gas stations and historic fill) and inside buildings (primarily related to asbestos) has been identified. However, with the implementation of a variety of measures set out above, no significant adverse impacts related to hazardous materials would be expected to occur as a result of construction of the proposed project.

TRAFFIC

The construction of various components of the proposed project is expected to result in surface disruptions and substantial construction worker and truck traffic for a 10-year period. Because of the lengthy duration of these activities, a detailed traffic analysis was conducted to assess the potential construction-related traffic impacts. As detailed below, since the projected construction-generated traffic would be less than the project operational traffic and, for the most part, would occur outside of the area's peak travel hours, the overall construction traffic impacts and required mitigation measures are expected to be within the envelope established for the project operational traffic analysis, as described in Chapter 12, "Traffic and Parking," and Chapter 19, "Mitigation." The analysis presented in this chapter focuses on localized effects of construction activities and determines the level of long-term mitigation measures or variations thereof that may be required during construction. Based on the results of this analysis, an assessment of the duration and intensity of construction-related traffic impacts, both locally and within the larger operational analysis traffic network, and potential mitigation measures that would need to be advanced for the project's construction, are described.

The detailed construction traffic analysis shows that significant adverse traffic impacts would occur at numerous locations throughout the construction period. However, these impacts would be attributable primarily to factors other than the added traffic from construction trucks and worker vehicles. The permanent closure of several streets within the project site, the lane disruptions during utility installation and rail yard improvements, and the reconstruction of two bridges over the rail yard were determined to be the main reasons for changes in area travel patterns and traffic diversions. These traffic diversions, when combined with construction-generated traffic, would concentrate traffic at specific intersections near the project site and result in the projected significant adverse traffic impacts.

Although construction traffic would be more dispersed away from the construction site, significant adverse traffic impacts were also identified for outlying intersections along Atlantic Avenue west of the project site. Furthermore, as roadway disruptions associated with temporary lane and street closures would affect area intersections during construction peak hours, they would have similar effects on peak hour conditions when background and, following the completion of Phase I of the proposed project, operational traffic would be higher. Overall, significant adverse traffic impacts during construction were identified for 12 intersections in proximity to the project site and seven outlying intersections.

Mitigation measures proposed to mitigate project operational impacts were evaluated to determine the appropriate strategies for addressing traffic impacts during construction. While the proposed mitigation measures would be appropriate for early implementation, some significant adverse traffic impacts during construction, as with the 2010 and 2016 operational conditions, would remain unmitigated. As described below, all significant adverse traffic impacts identified at the outlying intersections would be mitigated by the early implementation of proposed mitigation measures. However, certain significant adverse traffic impacts identified at 10 intersections adjacent to the project site would remain unmitigated.

CONSTRUCTION TRAFFIC PROJECTIONS

Average daily construction worker and truck activities by quarters were projected for the full 10 years of construction. These projections were further refined to account for various potential shifts of construction, worker modal splits and vehicle occupancy, arrival and departure distribution, and the passenger car equivalent (PCE) factor for truck traffic. As stated earlier, a modified building program incorporating a reduction in development density was developed since the issuance of the DEIS. An examination of the construction profiles was undertaken to determine whether the changes in work activities would affect the projections discussed below. This review concluded that these changes were relatively minor and would be inconsequential to the detailed trip projections prepared for the DEIS.

Daily Workforce and Truck Deliveries

For a reasonable worst-case analysis to address potential construction impacts of a meaningful duration, peak one-year levels were estimated to determine critical periods of construction, during which construction traffic is expected to be the highest. Based on the current schedule of commencing construction in the fourth quarter of 2006, it was determined that peak construction activities would occur during the third quarter of 2008 to the second quarter of 2009. The daily averages for construction workers and truck traffic during this peak construction year were estimated to be just over 3,400 workers and approximately 420 trucks. After the construction of the arena block and Site 5 would be completed and operational in 2010 (Phase I), another peaking in construction activities was identified for the third quarter of 2011 to the second quarter of 2012 (Phase II). During this one-year period, the daily averages were projected to be approximately 2,040 construction workers and 310 trucks. These estimates encompassed specific activities that may take place outside of the typical work day, accounted for work stoppage during holidays, and averaged the total required workforce and truck deliveries over a regular five-day work week.

Construction Work Shifts and Activities

Since a certain amount of extended hours, nighttime work, and weekend construction would likely be required, construction activities associated with the typical day shift (7 AM to 3:30 PM) would generate slightly fewer worker and truck trips than those described above. In general, the extended shift, which may occur once or twice a week during critical construction phases and end at approximately 6 PM, would involve no more than 20 percent of the day shift workforce. Nighttime work (3:30 PM to 11 PM), which may also occur once or twice a week during critical construction phases, could require a separate workforce, totaling no more than 10 percent of the number of day shift workers, to perform specific construction activities at the project site. Weekend activities (7 AM to 3 PM), on the other hand, are expected to occur more regularly throughout construction on one of the two weekend days and require, on average, approximately 20 percent of the regular day shift workforce. Truck deliveries would also take place during these extra work shifts; however, at considerably lower levels than the regular day shift.

Construction Worker Modal Splits

A detailed modal split analysis was conducted to estimate the number of vehicle trips associated with the worker projections. This analysis involved researching the census reverse journey-to-work (RJTW) data for the construction and excavation occupations, review of approved studies, discussions among industry experts, and actual surveys of representative construction sites. The 2000 U.S. Census RJTW data show that commuting to work via auto in New York City is more prevalent among workers in the construction and excavation occupations than for workers in other occupations. In various areas in Brooklyn, the auto share for these workers ranged between 43 and 60 percent, with an overall average of 55 percent. In comparison, the auto share for these workers traveling to a site in midtown Manhattan (34th to 57th Streets between Third and Eighth

Avenues) was 26 percent, as summarized in Exhibit F17a-1[1] in Appendix F. Since the census data on construction workers represent an aggregate behavior of all construction workers and do not differentiate among the type of work and size of construction, they may not be representative of the unique characteristics pertained to the proposed project.

Although there are no projects of similar size to Atlantic Yards currently under construction, two sizeable construction projects were selected for worker travel surveys to validate the information provided by the 2000 census data or to establish whether a lower share of travel via auto would be appropriate.

- The New York Times Building at Eighth Avenue and West 41st Street in midtown Manhattan—Interviews of 90 out of 500 to 600 workers were conducted on the morning of April 11, 2006. The data collected show that 28.9 percent of the workers surveyed traveled to work via auto and paid an average of nearly $15 per day for off-street parking. Although the auto shares from this survey and the 2000 census are very similar, the average number of occupants per vehicle varies substantially between the two sets of data. The census data show an average vehicle-occupancy of 1.22 for construction workers commuting to midtown Manhattan, whereas the April 11, 2006 survey showed an average vehicle-occupancy of 2.04.
- The Marriott Hotel at 350 Jay Street in Downtown Brooklyn—The construction manager of the project facilitated interviews with the various trade representatives and vendors working at the Marriott Hotel and compiled the results of these interviews on April 21, 2006. In total, 129 construction workers, representing a large percentage of the total workforce at the construction site, were interviewed. The results show that 55.8 percent of the construction workers traveled to the site via auto, with an average vehicle-occupancy of 1.89. This survey also revealed that certain construction workers were receiving subsidies from the contractor for parking at paid facilities in the area, which typically costs approximately $10 per day.

These survey results indicate that the actual auto shares are, to a great extent, consistent with those reported in the 2000 census. However, carpooling has become substantially more prevalent at these sites than in the data presented in the 2000 census. This change is likely attributable to three factors: 1) the surveyed projects have large workforces, which make it more viable for workers to carpool; 2) parking spaces have become more difficult to find; and 3) the cost of driving has escalated in recent years as a result of increases in tolls and the prices of gasoline and parking.

In identifying the travel characteristics of construction workers for analysis, conservative assumptions were made on the trip-making patterns to the Atlantic Yards project site. These assumptions, specifically a 55-percent auto share and an average vehicle-occupancy of 1.90, are conservative because the Atlantic Yards project is multiple times greater in scale than any other development project currently taking place in New York City. With a larger workforce, more opportunities exist for workers to carpool. Furthermore, unlike the Marriott Hotel contractor, the project sponsors for Atlantic Yards would not subsidize parking for construction workers, which is an incentive to drive instead of traveling via transit or other modes.

Peak Hour Construction Worker Vehicle and Truck Trips

For construction worker auto trips, vehicles would arrive at the area before each shift and depart after the shift. Trucks, on the other hand, are likely to remain in the area for shorter durations. For

[1] As a matter of convention, all tables and figures in the Appendices are referred to as Exhibits. In the main body of the EIS, they are referred to as Tables and Figures, respectively.

analysis purposes, each truck delivery was assumed to result in two truck trips during the same hour. Furthermore, in accordance with the *CEQR Technical Manual*, the traffic analysis has assumed that each truck has a PCE of 2. Hence, a truck delivery to the project site would result in an equivalent of 4 vehicle trips (2 entering and 2 exiting) during the same hour of analysis.

The estimated daily vehicle trips were distributed to various hours of the day based on projected work shift allocations and conventional arrival/departure patterns of construction workers and trucks. For construction workers, the majority (80 percent) of the arrival and departure trips would take place during the hour before and after each shift. For construction trucks, deliveries would occur throughout the time period while the construction site is active. However, to avoid traffic congestion, construction truck deliveries are expected to peak also during the hour before the regular day shift (25 percent of shift total), overlapping with construction worker arrival traffic. On a weekend day, should construction take place, early morning deliveries would still be likely to occur, but a lower concentration in truck arrivals would be anticipated before actual construction activities would commence at the project site. During the extended and night shifts, truck deliveries are expected to be more evenly distributed. A summary of the construction traffic temporal distribution is provided in Exhibit F17a-2 in Appendix F.

Based on the above assumptions, the peak hour construction traffic was estimated for the entire construction period for each of the potential shifts of construction. Since each truck delivery would account for four passenger car trip-ends during the same hour, the cumulative totals presented in Exhibit F17a-3 in Appendix F represent the total PCEs projected during different periods of construction. As shown, the highest level of construction activities would take place between the third quarter of 2008 and the second quarter of 2009. During this time, 733 construction worker vehicles would arrive the hour before (6 to 7 AM) and depart the hour after (3:30 to 4:30 PM) the regular day shift. The departure total would be slightly less if certain workers remain for an extended day shift, which would finish at 6 PM. With 25 percent of the truck deliveries anticipated to also occur during the early morning before the regular day shift, the 6 to 7 AM hour would have the highest increment of construction traffic. Approximately 94 truck deliveries (or 376 PCEs) were projected for this peak hour during the Phase I peak of construction. Overall, the early morning peak hour construction vehicle trip increment would be 1,109 PCEs. In the afternoon departure hour, truck deliveries would have ceased, unless some workers continue at the site for an extended day shift. When the occasional night shift takes place, maximums of 73 construction worker trips and three truck deliveries were projected for any one hour. Weekend construction activities would also be of substantially smaller scale than the typical day shift. Up to 147 peak hour construction worker vehicle trips were estimated during each of the 6 AM to 7 AM and 3 PM to 4 PM travel hours, with up to seven truck deliveries during any hour. After Phase I of the proposed project is completed and operational, a second peaking in construction activities is expected between the third quarter of 2011 and the second quarter of 2012. During this time, the regular day shift would yield 438 peak-hour construction worker vehicles and 70 peak-hour construction truck deliveries. Comparatively lower totals would be realized during the other potential construction shifts, with weekend construction resulting in peak-hour totals of 88 construction worker vehicle trips and six truck deliveries.

Analysis Time Periods

In determining the appropriate time periods for analysis, consideration was given to the projected construction trip generation, background traffic levels, and regularity of the construction shifts. Based on the information described above, it was concluded that quantitative traffic analyses would be appropriate for the weekday morning worker arrival time period, the afternoon worker departure time period, and the weekend afternoon worker departure time period. Table 17a-1 presents a comparison of the projected construction and operational traffic during various critical hours of analysis. The operational traffic summarized in this table reflects the revised projections developed for the modified building program.

Table 17a-1
Construction and Operational Traffic Comparison

	(1)	(2)	(3)	(4) = (2)+(3)	(5)	(6) = (2)+(5)
Hour	Pre-2010: Phase I Const. Peak 1-Yr Average	Post-2010: Phase I Build Increment	Post-2010: Phase II Const. Peak 1-Yr Average	Post-2010: Phase I Build & Phase II Const.	Post-2016: Phase II Build Increment	Post-2016: Completed Project in Operation
Weekday						
6-7 AM[1]	1,109	114	716	830	209	323
8-9 AM[2]	150	569	111	680	521	1,090
3-4 PM[3]	733	208	438	646	314	522
5-6 PM[4]	0	855	0	855	546	1,401
Saturday						
3-4 PM[5]	147	263	88	351	369	632
4-5 PM[6]	0	622	0	622	492	1,114

Notes: Construction-generated traffic was converted to PCEs.
The Phase I Build increment is composed of the commercial mixed-use variation for the weekday analysis and the residential mixed-use variation for the weekend analysis, as detailed in Chapter 12, "Traffic and Parking."
[1] Weekday construction regular day shift arrival peak hour
[2] Weekday operational AM peak hour
[3] Weekday construction regular day shift departure peak hour (actual projected 3:30 PM to 4:30 PM)
[4] Weekday operational PM peak hour
[5] Saturday construction departure peak hour
[6] Saturday post-game peak hour

This comparison shows that, in all cases, traffic levels generated at the project site during construction would be of lower magnitudes than what the overall project would generate when completed in 2016. Therefore, the maximum potential traffic impacts attributable to the proposed project have been fully addressed in the operational analysis presented in Chapter 12, "Traffic and Parking," and it is appropriate for the construction impact assessment to focus on those locations expected to be more affected by construction-generated traffic and anticipated roadway and lane closures during construction, as discussed in the following sections. Specific issues concerning the maintenance and protection of traffic (MPT), temporary traffic diversions, and construction worker parking are addressed as well.

CONSTRUCTION SEQUENCING AND TRAFFIC ANALYSIS DETERMINATION

As discussed in Section C, "Construction Activities," the 10-year project would include constructing the proposed buildings and open space, reconfiguring the Vanderbilt Yard, installing infrastructure and roadway improvements, and building new transit access to Atlantic Terminal. Aside from the construction trips described above, area roadway conditions would change as a result of sequencing of various construction elements. While detailed MPT coordination would continue throughout the duration of the construction project, preliminary strategies, as shown on Figures 17a-1 to 17a-6 and summarized below, were conceptualized to be used as the basis for developing assumptions on roadway conditions during construction and more detailed MPT plans for approvals by the New York City Department of Transportation (DOT) Office of Construction Mitigation and Coordination (OCMC). It should be noted that the lane closures depicted in these diagrams are generally somewhat conservative in that certain long-term lane closures may actually be intermittent, during off-peak hours, or for shorter segments than those depicted. The project construction would be conducted in coordination with the relevant approval agencies, including NYCDOT, to ensure that proper measures would be employed to maintain and protect vehicular, bicycle, and pedestrian traffic. Where appropriate, specific proposed changes to roadway configurations as part of the proposed project, described more fully in Chapter 12, "Traffic and Parking," may be implemented earlier to accommodate circulation issues during construction.

- Phase 1A Construction, 4th quarter 2006 through 4th quarter 2008 – The key work element affecting roadway conditions during this phase is the reconstruction of the Carlton Avenue Bridge over the Vanderbilt Yard, which would require the discontinuation of traffic between Atlantic Avenue and Pacific Street at this location. To maintain circulation through the area, 6th Avenue, which currently operates in the southbound direction between Atlantic and Flatbush Avenues and is proposed for widening and conversion to two-way traffic under the proposed project, would be restriped for early implementation of the two-way travel. In addition, the Carlton Avenue segment between Pacific and Dean Streets would be temporarily striped for two-way traffic to provide an outlet for eastbound Pacific Street. During this construction phase, substantial utility work would also be conducted, requiring the closure of curb lanes along Atlantic Avenue between Flatbush and Clermont Avenues, 6th Avenue between Pacific and Dean Streets, and Dean Street between Flatbush and 6th Avenues, as reflected in the preliminary MPT plan shown in Figure 17a-7. Among these, the roadway disruptions along Atlantic Avenue would be the most pronounced. Currently, the eastbound roadway widens to three through lanes on the approach to Cumberland Avenue. During Phase 1A construction, this widening could not take place until the approach to Clermont Avenue (two blocks east). In addition, because of the narrowing of Atlantic Avenue necessitated by the Carlton Avenue Bridge reconstruction, the eastbound left-turn movement at this location would need to be temporarily eliminated to maintain two through traffic lanes. This left-turn traffic to Carlton Avenue north of Atlantic Avenue would be diverted to either Clermont Avenue or Vanderbilt Avenue. These MPT measures, along with the closure of northbound Carlton Avenue south of Atlantic Avenue, would effectively eliminate all conflicting flows at the Atlantic Avenue and Carlton Avenue intersection. Maintaining a pedestrian sidewalk across the Carlton Avenue Bridge construction area may not be feasible. Therefore, as shown in Figure 17a-7, the intersection's traffic signal control would be temporarily eliminated through this phase of construction, resulting in continuous eastbound and westbound traffic flow on Atlantic Avenue and temporary closure of the east and west crosswalks at the intersection. More disruptive activities than those described above, including tying utility components across intersections, would be conducted during off-peak or nighttime hours and coordinated with DOT on the appropriate MPT measures.
- Phase 1B Construction, 4th quarter 2008 through 4th quarter 2009 – The key work element affecting roadway conditions during this phase is the reconstruction of the 6th Avenue Bridge over the Vanderbilt Yard, which would require the discontinuation of traffic between Atlantic Avenue and Pacific Street at this location. To maintain circulation through the area, Carlton Avenue between Atlantic Avenue and Pacific Street would be reopened and

reconfigured as part of the proposed project to accommodate two-way traffic. During the first half of this construction phase, substantial utility work would continue, requiring the closure of curb lanes along Atlantic Avenue between Flatbush and Cumberland Avenues, and Flatbush Avenue between Atlantic Avenue and Dean Street, as reflected in the preliminary MPT plan shown in Figure 17a-8. In addition, because of the temporary narrowing of Atlantic Avenue necessitated by the 6th Avenue Bridge reconstruction and the construction of the LIRR West Portal, the eastbound left-turn movement at this location would need to be temporarily eliminated to maintain two through traffic lanes. This left-turn traffic to South Portland Avenue (opposite 6th Avenue) north of Atlantic Avenue would be diverted to either South Oxford Street or Carlton Avenue. Furthermore, some of the "drop-off" areas in front of Atlantic Center would be displaced temporarily to accommodate the shifting of Atlantic Avenue traffic lanes. At the same time, because maintaining a pedestrian sidewalk across the 6th Avenue Bridge construction area may not be feasible, the east and west crosswalks at the intersection may also be temporarily closed. Along the east side of Flatbush Avenue between Atlantic Avenue and Dean Street, utility installation would require the temporary taking of the curb lane. To maintain peak traffic flow along Flatbush Avenue, this closure may need to be limited to only off-peak or nighttime hours. The appropriate MPT for this roadway segment would be determined in consultation with DOT.

- Phase 1C Construction, 4th quarter 2009 – This phase marks the completion of Phase I construction, with the arena block and Site 5 completed for operation. However, minor curb lane closures are still expected around each of these development sites to accommodate finishing work on building facades and adjacent sidewalks. All roadway improvements and new transit connections as part of the proposed project would also be completed by this time.
- Phase 2A Construction, 4th quarter 2009 through 1st quarter 2011 – This construction phase focuses on Blocks 1120 and 1128. Only minor curb lane closures, typical of building construction, are expected surrounding these two blocks. In addition, finishing work would continue around the arena block and Site 5.
- Phase 2B Construction, 1st quarter 2011 through 2nd quarter 2013 – With construction at the arena block and Site 5 completely finished and construction at Blocks 1120 and 1128 continuing, building structure work would commence for Blocks 1121 and 1129. As in Phase 2A construction, only minor curb lane closures, typical of building construction, are anticipated.
- Phase 2C Construction, 3rd quarter 2013 through 4th quarter 2016 – This last three and a half years of construction would primarily occur on Blocks 1121 and 1129 to complete the remaining seven towers. During this construction phase, minimal roadway disruptions, typical of building construction sites, are anticipated.

As discussed above under "Construction Traffic Projections," peak Phase I construction traffic would occur from the third quarter of 2008 to the second quarter of 2009, coinciding with the latter part of Phase 1B construction, under which substantial roadway disruptions are anticipated surrounding the project site. Hence, a detailed analysis was determined to be appropriate for identifying potential construction traffic impacts under these reasonable worst-case conditions. Since Phase 1A construction would also result in similar roadway disruptions to Phase 1B, but would generate comparatively lower construction traffic levels, a detailed analysis of critical locations for a smaller study area than what was determined for Phase 1B was conducted. After the Phase I components of the proposed project are completed and operational, the second peaking of construction traffic is anticipated to occur from the third quarter of 2011 to the second quarter of 2012, coinciding with the early part of Phase 2B construction. For this analysis, the final proposed roadway configurations were assumed to be in place and the incremental traffic would include both the projected construction worker and truck vehicle trips and operational traffic generated by the arena block and Site 5. The respective study areas for detailed analysis were determined based on travel patterns described in the next section, incorporating an understanding of truck traffic distribution for the various construction areas on the project site, on-site construction worker parking, and on-street construction worker parking in the surrounding areas. Because construction activities, roadway disruptions, and the potential for significant adverse traffic impacts during Phases 1C, 2A, and 2C would be less pronounced than those described, they were not individually analyzed and were determined to fall within the overall envelope of potential impacts identified for Phases 1A, 1B, and 2B.

PEAK HOUR TRAFFIC VOLUMES

To assess the potential impacts resulting from construction-generated traffic and the temporary roadway changes anticipated during different stages of construction, the appropriate baseline conditions were developed with which conditions during construction could be compared. Using the existing automatic traffic recorder (ATR) data and the future No Build peak period traffic volumes projected for the operational traffic analysis, baseline conditions were established for the weekday morning 6 AM to 7 AM, weekday afternoon 3 PM to 4 PM, and Saturday 3 PM to 4 PM construction peak analysis hours for the three analysis years during which Phase 1A, Phase 1B, and Phase 2B are scheduled to take place, as shown in Exhibits F17a-4 through F17a-9 in Appendix F. For the Phase 1A and Phase 1B baseline traffic networks, the extrapolation of traffic volumes was conservatively based on the 2010 No Build traffic volumes, although both phases are expected to occur before 2010. Similarly, the Phase 2B baseline traffic networks, representing conditions in 2011 to 2012, were conservatively developed based on the 2016 No Build traffic volumes.

Auto and truck traffic volumes were assigned to the study area traffic network based on travel patterns established in the operational traffic analysis, adjusted for likely origins and destinations of construction-related trips, and following DOT-designated truck routes for delivery vehicles. These traffic assignments are presented in Exhibits F17a-10 through F17a-18 for construction worker vehicle trips and in Exhibits F17a-19 through F17a-21 for construction truck trips. For the construction worker vehicle trips, separate assignments were developed for those anticipated to park on-street and at the on-site parking facility on Block 1129. The relative proportions of these vehicles during each of the construction phases selected for analysis were determined to adjust for the availability of on-street parking and the likely capacity of the on-site parking at those particular times. A more detailed discussion of construction worker parking issues is provided below under “Parking.” The resulting construction traffic networks, accounting for specific diversions, incremental construction-related vehicle trips, and doubling of projected truck traffic to account for PCEs, are shown in Exhibits F17a-22 to F17a-30. For the Phase 2B construction traffic analysis, the project-generated traffic volumes from the operation of the completed Phase I development (arena block and Site 5) during the construction analysis peak hours were also incorporated into the construction traffic network for impact assessment.

TRAFFIC STUDY AREAS

Based on the assignment patterns and projected construction traffic volumes, five, 16, and 15 intersections were selected for the Phase 1A, Phase 1B, and Phase 2B analyses, respectively, as depicted in Exhibits F17a-31 through F17a-33. Since Phase 1A is expected to generate substantially less construction traffic than the other two analysis phases, the selected study area incorporates critical locations that would likely be affected by localized diversions associated with the Carlton Avenue Bridge reconstruction and utility work along Atlantic Avenue. For the Phase 1B and Phase 2B study areas, nearby intersections expected to be affected by both incremental and diverted traffic were analyzed. In addition, two representative portal locations were selected for analysis to determine traffic conditions along key corridors outside of the immediate area of the project site and where incremental traffic associated with construction truck and worker vehicle volumes would be the highest.

Based on the individual traffic assignments presented in Exhibits F17a-10 through F17a-21, Atlantic Avenue to the east and to the west, and Flatbush Avenue to the north were identified as the main travel corridors for construction-related traffic originating from or destined to the project site. For the intersections along Atlantic Avenue to the east, the through traffic associated with construction truck and worker vehicle trips would not likely have an appreciable effect on their service levels because these locations were generally identified, by the operational traffic analysis presented in Chapter 12, “Traffic and Parking,” as not congested under existing and future conditions. Thus, a portal analysis location was not selected among these intersections. West of the project site, traffic congestion was identified for numerous locations along Atlantic Avenue during various peak analysis periods. To establish the basis for determining the potential effects of construction-related traffic on outlying locations along Atlantic Avenue to the west, the Atlantic Avenue and Boerum Place intersection, which processes traffic to and from both the Brooklyn-Queens Expressway (BQE) and the Brooklyn Bridge, was selected as one of the portal analysis locations. Similarly, north of the project site, because traffic congestion was also identified at several intersections along Flatbush Avenue during various peak analysis periods, the Tillary Street and Flatbush Avenue intersection, which processes traffic to and from the Brooklyn Bridge, Manhattan Bridge, and the BQE, was selected as the other portal analysis location.

CONSTRUCTION TRAFFIC ANALYSIS

A detailed analysis of the study area intersections was conducted for the time periods and analysis scenarios described above. While numerous significant adverse traffic impacts were identified from the analysis results, the nature of the impacts in proximity to the project site indicates that they are attributable largely to factors other than the added traffic from construction trucks and worker vehicles. The permanent closure of several streets within the development blocks would result in the long-term rerouting of traffic to other streets in the area. Under Phase 1A and Phase 1B construction, lane disruptions particularly along Atlantic Avenue, reconstruction of the Carlton and 6th Avenue Bridges, and construction of the LIRR West Portal would contribute to localized diversions of traffic. The traffic analysis conducted to address construction-related impacts conservatively considered those diversion routes in the immediate area to reflect reasonable worst-case conditions. These diversions, combined with routing most construction worker vehicles to on-site parking and specific truck movements on surrounding streets, are expected to concentrate traffic at several study area intersections.

Under Phase 2B construction, traffic associated with the operation of the arena block and Site 5 was included for analysis. Although operational and construction traffic generally have different peak hours, there would be also operational traffic during construction traffic peak hours. As analyzed, the overlapping of the operational traffic with the actual construction traffic increments, as illustrated in Exhibits F17a-16 to F17a-18 for construction worker vehicles and in Exhibit F17a-21 for construction trucks, would increase the overall impacts identified for construction. The analysis results for the three phases of construction are discussed below and summarized in Exhibit F17a-34.

For the outlying intersections along Atlantic and Flatbush Avenues, potentially significant adverse traffic impacts were determined based on the analysis results for the two portal analysis intersections, background and operational traffic and service levels for specific turning movements, and the amount of projected construction traffic passing through these intersections. The analysis methodology and findings for these outlying intersections are detailed below.

Phase 1A

The Phase 1A construction traffic analysis focused on specific locations expected to be most affected by the temporary closure of the Carlton Avenue Bridge. Although 6th Avenue between Atlantic and Flatbush Avenues would be restriped to accommodate two-way traffic during this earliest phase of construction, the temporary discontinuation of Carlton Avenue at Pacific Street would result in traffic diversions primarily to Vanderbilt Avenue. In addition, traffic diversions associated with prohibiting left turns from Atlantic Avenue onto Carlton Avenue were incorporated into the analysis. A summary of the analysis results is presented in Table 17a-2.

Table 17a-2
Phase 1A Construction – Significantly Impacted Locations

Intersection	Weekday 6-7 AM	Weekday 3-4 PM	Saturday 3-4 PM
Atlantic Ave. at 5th Ave.	—	—	—
Atlantic Ave. at S. Portland Ave.	SB LTR	WB L SB LTR (X)	WB L NB L SB LTR
Atlantic Ave. at Vanderbilt Ave.	NB L (X) & T	WB L (X) NB L (X)	WB L (X) NB L (X)
Dean St. at 6th Ave.	—	—	EB LTR
Dean St. at Vanderbilt Ave.	EB LTR (X)	EB LTR (X)	EB LTR (X)

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
L = Left-turn; T = Through; R = Right-turn
(X) = Conditions worse than 2010 operations during comparable peak periods
— = No significant impact identified

Significant adverse traffic impacts at the intersection of Atlantic and South Portland Avenues are attributable largely to general traffic diversions associated with changes in the area's street grid. Specifically, the southbound impact is a result of introducing an opposing flow from the converted two-way 6th Avenue while the northbound impact is largely a product of the permanent closure of 5th Avenue through the arena block. At Atlantic Avenue and Vanderbilt Avenue, diversion of northbound traffic from Carlton Avenue necessitated by the reconstruction of the Carlton Avenue Bridge is the main reason for the northbound impacts. Combining this traffic with that generated by construction activities at the project site, additional turning conflicts at the intersection are anticipated, resulting in the westbound traffic impact. However, the southbound traffic impact previously identified for the afternoon departure period in the DEIS would no longer occur. This change in analysis results, which would also apply for the Phase 1B and Phase 2B analyses below, is attributed to DOT's recent prohibition of southbound left turns at the intersection. As noted in the summary table, several of the significant adverse traffic impacts identified for Phase 1A construction near the project site would be more severe than those determined for the 2010 operational conditions for comparable peak periods (i.e., construction weekday 6 AM to 7 AM versus operational weekday 8 AM to 9 AM).

Phase 1B

The traffic analysis conducted for Phase 1B construction encompasses a study area of sixteen intersections, including two critical portal locations at Tillary Street and Flatbush Avenue and at Atlantic Avenue and Boerum Place. For this analysis, Carlton Avenue would be reopened to traffic and take on its permanent configuration of accommodating two-way traffic between Atlantic Avenue and Pacific Street. With the 6th Avenue Bridge and the LIRR West Portal undergoing construction, northbound 6th Avenue traffic would primarily be diverted to Carlton Avenue. In addition, traffic diversions associated with prohibiting left turns from Atlantic Avenue onto South Portland and 6th Avenues were incorporated into the analysis. A summary of the analysis results is presented in Table 17a-3.

Table 17a-3
Phase 1B Construction – Significantly Impacted Locations

Intersection	Weekday 6-7 AM	Weekday 3-4 PM	Saturday 3-4 PM
Tillary St. at Flatbush Ave.	—	—	—
Atlantic Ave. at Flatbush Ave.	—	WB R (X)	—
Dean St. at Flatbush Ave.	EB LT (X)	EB LT	EB LT SB LT
Bergen St. at Flatbush Ave.	—	—	—
Atlantic Ave. at Boerum Pl.	—	—	WB LT
Atlantic Ave. at 4th Ave.	NB L	NB L	NB L
Atlantic Ave. at 5th Ave.	—	—	—
Atlantic Ave. at S. Portland Ave.	—	SB LR	SB LR
Atlantic Ave. at Carlton Ave.	WB L (X) NB LTR (X)	WB L (X) NB LTR (X)	WB L (X)
Atlantic Ave. at Vanderbilt Ave.	WB L NB L	WB L NB LT	WB L NB L
Dean St. at 5th Ave.	EB LTR (X)	—	NB TR
Dean St. at 6th Ave.	—	—	EB LTR
Dean St. at Carlton Ave.	EB LT (X) NB TR (X)	EB LT (X)	EB LT (X)
Dean St. at Vanderbilt Ave.	EB LTR	EB LTR (X)	EB LTR (X)
Bergen St. at 6th Ave.	—	—	—
Bergen St. at Vanderbilt Ave.	WB TR (X) SB TR (X)	SB TR (X)	—

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
L = Left-turn; T = Through; R = Right-turn
(X) = Conditions worse than 2010 operations during comparable peak periods
— = No significant impact identified

Similar to Phase 1A construction, significant adverse traffic impacts identified for the Phase 1B analysis locations are attributable largely to general traffic diversions associated with changes in the area's street grid and specific roadway disruptions anticipated for this time. At the Atlantic Avenue and Carlton Avenue intersection, both the westbound left-turn and northbound approach impacts are primarily results of diverted traffic that would otherwise be on 6th Avenue. The 6th Avenue diverted traffic is expected to also contribute to the impacts identified for the Atlantic Avenue and Vanderbilt Avenue, and the Dean Street and Carlton Avenue intersections. Because a substantial number of construction worker vehicles are anticipated to be accommodated within the sponsor-provided temporary parking facility on Block 1129, the cumulative effects of these vehicles with construction truck traffic and changes in the area's traffic circulation patterns are expected to result in significant adverse traffic impacts at the Dean Street intersections with 5th and Carlton Avenues, and at the Vanderbilt Avenue intersections with Dean and Bergen Streets. As noted in the summary table, several of the significant adverse traffic impacts identified for Phase 1B construction would be more severe than those determined for the 2010 operational conditions for comparable peak periods.

At the two portal analysis intersections of Tillary Street and Flatbush Avenue and Atlantic Avenue and Boerum Place, construction-generated traffic is not expected to have substantial effects on their service levels. These two intersections represent the critical outlying locations that would experience primarily through traffic from construction activities while not being affected by traffic diversions associated with construction and permanent roadway closures and reconfigurations. The above analysis results show that only the westbound Atlantic Avenue approach at Boerum Place would be significantly adversely impacted but only on a Saturday afternoon. This impact would be attributable to departing construction worker vehicles.

Phase 2B

The permanent roadway improvements, as described in Chapter 12, "Traffic and Parking," are anticipated to be completed at approximately the same time as the completion of the arena block and Site 5. As described above, the construction of the remaining portion of the proposed project would then shift to the east and involve minimal roadway disruptions. Hence, the potential traffic impacts during Phase II construction would be attributable predominantly to the combination of construction-generated traffic and operational traffic from the completed arena block and Site 5. A detailed traffic analysis was conducted for Phase 2B construction during which the highest level of Phase II construction traffic was projected. A summary of the analysis results is presented in Table 17a-4.

Absent the major roadway and lane closures planned for Phase 1A and Phase 1B construction and with the full complement of project roadway improvements in place, projected significant adverse traffic impacts during Phase 2B construction are expected to be less pronounced than for the Phase I analysis scenarios. However, at the intersections of Vanderbilt Avenue with Dean and Bergen Streets, the concentration of departing construction worker traffic at the end of the regular weekday shift is expected to result in traffic impacts greater than those projected for the 2016 PM operational peak hour. Similarly, impacts from arriving construction workers at the Carlton Avenue intersection with Dean Street during the morning peak hour would be greater than that projected for the 2016 AM operational peak hour at this location.

At the two portal analysis intersections, only the westbound Atlantic Avenue approach at Boerum Place would be significantly adversely impacted.

Table 17a-4
Phase 2B Construction – Significantly Impacted Locations

Intersection	Weekday 6-7 AM	Weekday 3-4 PM	Saturday 3-4 PM
Tillary St. at Flatbush Ave.	—	—	—
Atlantic Ave. at Flatbush Ave.	—	EB TR WB T (X)	—
Dean St. at Flatbush Ave.	EB LT	EB LT	EB LT SB LT
Bergen St. at Flatbush Ave.	—	—	—
Atlantic Ave. at Boerum Pl.	WB LT	WB LT (X)	WB LT
Atlantic Ave. at 4th Ave.	NB L	EB TR NB L	EB TR NB L & R
Atlantic Ave. at S. Portland Ave.	NB L SB LTR	WB L SB LTR	WB L NB L
Atlantic Ave. at Carlton Ave.	—	WB L	—
Atlantic Ave. at Vanderbilt Ave.	NB L & T	EB TR WB L NB L	WB L NB L
Dean St. at 5th Ave.	EB LTR	—	EB LTR NB TR
Dean St. at 6th Ave.	—	—	EB L & TR
Dean St. at Carlton Ave.	EB LT (X)	EB LT	EB LT
Dean St. at Vanderbilt Ave.	EB LTR	EB LTR (X)	EB LTR (X)
Bergen St. at 6th Ave.	—	—	—
Bergen St. at Vanderbilt Ave.	WB TR	SB TR (X)	—

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
L = Left-turn; T = Through; R = Right-turn
(X) = Conditions worse than 2016 operations during comparable peak periods
— = No significant impact identified

Other Potential Construction Traffic Impacts

The potential effects of construction-related traffic on outlying locations along Atlantic and Flatbush Avenues were determined based on the analysis conducted for the two portal locations and a comparison of future background and incremental traffic volumes during different time periods. As discussed, because the projected construction-generated traffic would be less than the project operational traffic and would occur outside of the area's peak travel hours, the overall construction traffic impacts are expected to be within the envelope established for the project operational traffic analysis. However, even with comparatively lower traffic volumes during the construction analysis peak hours, significant adverse traffic impacts, per *CEQR Technical Manual* criteria, could still occur, primarily due to the level of background traffic.

As noted above, the determination of significant adverse traffic impacts at the outlying intersections along the Flatbush Avenue and Atlantic Avenue corridors involved evaluating projected effects of construction traffic on the operation of the two portal analysis locations, background and operational traffic and service levels for specific turning movements, and the amount of projected construction traffic passing through these intersections. The outlying intersections are those between the intersections analyzed in the vicinity of the project site (see Exhibits 17a-31, 17a-32, and 17a-33) and the two portals identified above, along Flatbush and Atlantic Avenues.

1. The effects of construction traffic (or an overlaying of off-peak operational with construction traffic under the Phase 2B analysis) on the service levels of the two portal intersections during various analysis time periods were reviewed and compared to the

operational analysis results for comparable time periods. This review provided an indication of the likely magnitude of effects that certain additional traffic may have on specific traffic movements or lane groups at other intersections along the corridor.

2. Because the construction traffic increments at the outlying intersections would be primarily through traffic, the comparison of service levels against the projected construction traffic increments, which are largely either towards or away from the project site, was focused only on the relevant movements or lane groups at these intersections. Using the analysis results on the portal analysis intersection as a benchmark, if comparable or more favorable service levels were determined for a particular outlying intersection, no further analyses would be required. Where service levels for the comparable movements at the outlying intersections were projected to be worse than that of the corresponding portal analysis location, roadway capacities for the through movement and related intersection lane groups were considered, together with the projected traffic increments, to determine the potential for significant adverse traffic impacts. In some cases, more detailed analyses were conducted to make such determinations.

Using the above methodology, all outlying intersections along the two key construction travel corridors were analyzed. This analysis concluded that no significant adverse traffic impacts attributable to construction-related traffic would occur for the outlying Flatbush Avenue intersections north of the project site during any of the construction time periods. However, some of the intersections along Atlantic Avenue west of the project site would experience significant adverse traffic impacts, as discussed below.

Under Phase 1B construction, significant adverse traffic impacts were identified for the westbound Atlantic Avenue approach at Boerum Place during the Saturday afternoon analysis hour. A review of operating conditions at other intersections along the corridor revealed that the westbound approaches at Nevins and Hoyt Streets are likely to be significantly adversely impacted as well, although the incremental through traffic volume increases associated with construction activities at these locations would be only 22 PCEs (defined above as passenger car equivalents whereby each construction truck would be equivalent to two automobiles).

Under Phase 2B construction, significant adverse traffic impacts were identified for the westbound Atlantic Avenue approach at Boerum Place during all three analysis hours. A review of operating conditions at other intersections along the corridor revealed that the westbound approaches at 3rd Avenue, Nevins Street, and Hoyt Street are likely to be significantly adversely impacted as well during the weekday afternoon analysis hour, although the incremental through traffic volume increases associated with construction activities at these locations would be only 66 PCEs. Similarly, with a construction through traffic increment of only 13 PCEs, the westbound Atlantic Avenue approaches at Nevins, Bond, Hoyt, Smith, Clinton, and Henry Streets are expected to be significantly adversely impacted during the Saturday afternoon analysis hour.

Based on the comparison of detailed analysis results presented in Exhibit F17a-34, the projected impacts identified at the above intersections, as summarized in Table 17a-5, actually correspond to traffic volumes that would be equal to or lower than the background (No Build) traffic volumes during the adjacent operational peak hours. Effectively, the perceived traffic conditions during construction at these outlying locations would reflect an extension of the background peak periods (i.e., weekday 3 PM to 6 PM during Phase 2B and Saturday 3 PM to 5 PM during Phases 1B and 2B). Therefore, while significant adverse traffic impacts were identified for locations beyond those

Table 17a-5
Other Significantly Impacted Locations

Intersection	Phase 1B Saturday 3-4 PM	Phase 2B Weekday 3-4 PM	Phase 2B Saturday 3-4 PM
Atlantic Ave. at 3rd Ave.	—	WB TR	—
Atlantic Ave. at Nevins St.	WB LT	WB LT	WB LT
Atlantic Ave. at Bond St.	—	—	WB TR
Atlantic Ave. at Hoyt St.	WB LT	WB LT	WB LT
Atlantic Ave. at Smith St.	—	—	WB TR
Atlantic Ave. at Clinton St.	—	—	WBTR
Atlantic Ave. at Henry St.	—	—	WB LT

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
L = Left-turn; T = Through; R = Right-turn
— = No significant impact identified
Henry and Clinton Streets are further west of the selected Boerum Place portal intersection.

analyzed in detail, the level of congestion would be comparable to or lower than background conditions during the operational peak periods. Furthermore, since construction traffic increments during most of the 10-year construction period would be approximately half or less of those analyzed for Phases 1B and 2B (see Exhibit F17a-3), the typical potential construction traffic impacts at these outlying locations are expected to be substantially less.

As discussed, there would be minimal or no incremental construction traffic occurring during operational peak hours. However, as roadway disruptions associated with temporary lane and street closures would affect area intersections during construction peak hours, they would also have similar effects on operational peak hour conditions when background and project-generated traffic would be higher. Similar significant adverse traffic impacts as those identified for the construction peak hours at the study area locations are expected also for the corresponding operational peak periods.

Construction Traffic Mitigation

For the purpose of this analysis, the operational mitigation measures, as detailed in Chapter 19, "Mitigation," which are beyond those that would be required as part of the MPT coordination with DOT, were examined to determine whether it would be feasible to advance the implementation of some or all of these measures and the expected level of effectiveness of these measures in mitigating traffic impacts during construction. The results of this assessment are discussed below and summarized in Exhibit F17a-35 in Appendix F.

As detailed in Chapter 19, "Mitigation," several types of improvement strategies, including physical roadway improvements, demand management, transit service recommendations, and traffic operational improvements, were evaluated to address significant adverse traffic impacts. Strategies concerning demand management and transit service recommendations were developed principally to address arena arrival and departure issues. Physical roadway and traffic operational improvements, however, are applicable for typical travel hours and could be considered for early implementation to mitigate traffic impacts during construction. Physical roadway improvements encompassing the reconfiguration of the Atlantic Avenue/Flatbush Avenue/4th Avenue intersection and operational modifications to Pacific Street would not be considered for implementation before the bulk of construction work at Site 5 is completed to maintain the necessary truck access that would otherwise be affected. Since the issuance of the DEIS, physical improvement strategies were also developed for the Vanderbilt Avenue corridor between Dean Street and Atlantic Avenue, as detailed in Chapter 19, "Mitigation." While these improvements would partially mitigate[1] some of the projected significant adverse operational traffic impacts, they could not be implemented until the completion of the Phase II project development due to construction logistics required during the latter stages of construction at Blocks 1121 and 1129. Hence, their effects on traffic operations would not be relevant for the construction traffic analysis. The discussions below focus on required mitigation strategies for each of the analysis scenarios. Since construction Phases 1B and 2B are representative of reasonable worst-case conditions during each of Phase I and Phase II project development, recommended strategies to address specific impacts identified during these two construction phases would be implemented for the duration of each of the respective project development phases. Since no viable mitigation measures would be available during construction for the Atlantic Avenue and Vanderbilt Avenue intersection, any construction-related significant adverse impacts identified for this location would remain unmitigated.

During Phase 1A construction, the early implementation of 2010 traffic operational improvements at the Dean Street intersection with 6th Avenue is expected to fully mitigate the projected weekday construction impacts. However, these operational improvements could result only in partially mitigated conditions at the Atlantic Avenue intersection with South Portland Avenue and the Dean Street intersection with Vanderbilt Avenue.

During Phase 1B construction, the early implementation of 2010 traffic operational improvements is expected to have similar effectiveness in mitigating projected construction-related impacts. While most projected impacts are expected to be fully mitigated, there would be several exceptions in addition to the Atlantic Avenue and Vanderbilt Avenue intersection. At the Dean Street intersection with Flatbush Avenue, the eastbound construction-related impact during the weekday morning analysis peak hour is expected to be only partially mitigated. At the Atlantic Avenue intersection with 4th Avenue, without the implementation of the proposed physical roadway improvements, the northbound impact during construction for all three construction analysis time periods is expected to remain unmitigated. At the Atlantic Avenue intersection with Carlton Avenue, both the westbound and northbound impacts resulting from 6th Avenue traffic diversions are also likely to remain unmitigated. At the Dean Street intersections with 5th and Vanderbilt Avenues, construction traffic and general area traffic diversions would result in partially mitigated conditions. The same conclusion was reached for the Bergen Street intersection with Vanderbilt Avenue.

During Phase 2B construction, the early implementation of 2016 traffic operational improvements, along with the completion of the physical roadway improvements proposed for the Atlantic Avenue/Flatbush Avenue/4th Avenue intersection, and operational modifications to Pacific Street are expected to mitigate projected construction-related impacts to a similar extent as for the full build-out operational impacts. However, no viable mitigation measures would be available during construction for the Atlantic Avenue and Vanderbilt Avenue intersection. In addition, several projected impacts at the other construction study area intersections would remain partially mitigated. These locations include the Atlantic Avenue and South Portland Avenue and the Dean Street and Vanderbilt Avenue intersections during the weekday construction afternoon peak hour,

[1] A "partially mitigated" intersection is one to which mitigation measures have been applied; however, one or more lane groups/movements within the intersection would remain unmitigated.

and the Atlantic Avenue and 4th Avenue, Dean Street and 5th Avenue, and Dean Street and Carlton Avenue intersections during the Saturday construction afternoon peak hour.

At the outlying intersections along Atlantic Avenue west of the project site, where significant adverse traffic impacts had been identified, the proposed operational mitigation measures are expected to fully mitigate the projected construction-related traffic impacts. Table 17a-6 summarizes those significant adverse traffic impacts during construction that are expected to remain either partially mitigated or unmitigated.

Table 17a-6
Partially Mitigated or Unmitigated Construction Impacts

Intersection	Phase 1A	Phase 1B	Phase 2B
Atlantic Ave. at Flatbush Ave.		P: WB R	
Dean St. at Flatbush Ave.		A: EB LT	
Atlantic Ave. at 4th Ave.		A: NB L P: NB L S: NB L	S: EB TR; NB L & R
Atlantic Ave. at S. Portland Ave.	P: WB L; SB LTR		P: WB L; SB LTR
Atlantic Ave. at Carlton Ave.		A: WB L; NB LTR P: WB L; NB LTR S: WB L	
Atlantic Ave. at Vanderbilt Ave.	A: NB L & T P: WB L; NB L S: WB L; NB L	A: WB L; NB L P: WB L; NB LT S: WB L; NB L	A: NB L & T P: EB TR; WB L; NB L S: WB L; NB L
Dean St. at 5th Ave.		A: EB LTR S: NB TR	S: EB LTR; NB TR
Dean St. at Carlton Ave.			S: EB LT
Dean St. at Vanderbilt Ave.	A: EB LTR P: EB LTR	P: EB LTR	P: EB LTR
Bergen St. at Vanderbilt Ave.		A: WB TR	

Notes: EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
L = Left-turn; T = Through; R = Right-turn
A = Weekday 6-7 AM; P = Weekday 3-4 PM; S = Saturday 3-4 PM

CONSTRUCTION TRUCK MOVEMENTS

As shown in Figures 17a-1 through 17a-6, numerous gates and openings to various blocks of the construction site would be available for delivery vehicle access. Flaggers are expected to be present at each active driveway to manage the access and movements of trucks. Furthermore, because of the size of the construction site, these vehicles are not likely to have to undertake disruptive back-in maneuvers and would be able to enter the site head-in. Similarly, the departure maneuvers are also expected to be head-out. Some of the site deliveries may also occur along the perimeters of the construction site within delineated closed-off areas for concrete pour or steel delivery. As with any other construction projects, these activities would take place in accordance with DOT-approved MPT plans and would be managed by on-site flag-persons. Within Block 1129, the designated equipment staging area would accommodate certain truck deliveries that may arrive earlier than their scheduled times—particularly during the construction of the arena block, which would demand the highest level of truck deliveries; trucks staging in this area, while arriving at different times, would be dispatched and travel across Pacific Street at the appropriate times. After completing the actual delivery, these trucks would depart directly from the arena block via the several gates and openings available at this location. Based on the above description of construction truck movements, any mid-block disruptions due to truck entering and exiting maneuvers, curbside deliveries, and circulation along streets adjacent to the construction site are expected to be minimal and not result in significant adverse impacts to traffic flow.

PARKING

Construction worker vehicles are expected to be accommodated at various locations near the project site, including within the temporary parking facility on Block 1129, the surrounding streets, and at nearby public parking facilities. While extended-day, nighttime, and weekend construction shifts are anticipated, their frequency and the expected demand on area parking were projected to be substantially lower than for the regular weekday day shift, which is scheduled for the hours between 7 AM and 3:30 PM. Furthermore, parking utilization levels during non-weekday daytime hours are typically lower and curbside regulations are less stringent, resulting in a larger supply of on-street spaces. Hence, the analysis and discussions that follow consider conditions related to the regular weekday day shift only.

BASELINE CONDITIONS

Comprehensive surveys of available on- and off-street parking were conducted to determine existing utilization and available supply during different time periods, curbside regulations, and general parking patterns. The data gathered from these surveys were used to evaluate parking needs from construction-generated demand and to identify potential parking impacts.

Off-Street Parking

Within ¼ mile from the perimeters of the project site, there are seven off-street parking facilities, as shown in Exhibit F17a-35, with a total capacity of 1,415 spaces. The largest of these facilities (650 spaces) is located within Atlantic Center across the street from the project site. On a typical weekday, the overall parking utilization levels at these facilities were determined to be 48 percent in the early morning (735 spaces available), a peak of 77 percent in the midday (325 spaces available), and 68 percent during the afternoon commuter hours (455 spaces available). Within the Atlantic Center parking facility, only about half of the spaces were occupied (325 spaces available) during the early morning hours. Its occupancy was observed to peak in the afternoon at 70 percent, leaving nearly 200 available parking spaces.

On-Street Parking

Several surveys of on-street parking conditions were conducted for an area within ¼ mile from the perimeters of the project site. Curbside parking in this area is regulated by a variety of on-street parking rules. These rules include parking prohibition at all times, meter parking, fixed weekday street-cleaning, nighttime regulations, and residential alternate-side street-cleaning. For the construction parking analysis, the focus is on the area’s parking supply and utilization during the early morning hours when construction workers who travel via auto would arrive at the project site. Exhibit F17a-36 provides an illustration of the parking characteristics within the ¼-mile parking study area, reflecting early weekday morning (5:30 AM to 7 AM) conditions.

Recognizing that parking conditions during different days of the week in the study area could vary because of alternate-side street-cleaning regulations, the on-street surveys were conducted on days (Thursday and Friday) when parking supply and utilization would be the norm for the week and on a day (Wednesday) when the fewest curbside restrictions apply. These surveys demonstrate that out of more than 3,800 free on-street parking spots within ¼ mile from the project site, up to 540 spaces (14 percent) are available during the early morning hours. However, only approximately 260 spaces would be legal parking for the entire day as a result of alternate-side street-cleaning regulations. There are also approximately 320 meter spaces, most of which are subject to either weekday or alternate-side street-cleaning rules. Of the meter spaces, nearly 240 spaces (75 percent) were observed to be available during the early morning hours. Overall, the early morning parking availability was determined to be just under 19 percent (780) of the total area on-street parking supply.

Observations of midday parking conditions revealed that many of the spaces available in the early morning hours were occupied by area residents, commuters and business patrons traveling to the area, and other users. The overall parking availability was determined to diminish to as low as 2 percent (fewer than 90 spaces) of the area's total parking supply.

PARKING CONDITIONS DURING CONSTRUCTION

As discussed above under "Construction Traffic Projections," peak parking demand is anticipated to occur during Phase 1B construction when, on average, 733 construction worker vehicles are projected to arrive at the project site during the 6 AM to 7 AM morning peak hour. Since this volume represents 80 percent of the total projected day shift vehicle trips, the total peak parking demand would be 916 vehicles.

Accounting for parking spaces displaced by the project during its construction, alternate-side street-cleaning regulations, and reasonable walking distance to available meter spots, there would be potentially 150 to 200 on-street spaces available for construction worker parking with ¼ mile of the project site. Those construction workers who elect to park their vehicles on-street would occupy spaces that might otherwise be taken up by local residents and other patrons traveling to the area during the course of the day (considering that existing midday on-street utilization is near capacity). Based on the observations made on several different weekdays, it was concluded that this displacement of existing users from their current parking spots would likely primarily affect patrons or workers traveling to the area rather than local residents. This conclusion was reached by comparing on-street utilization levels during the early morning hours between days with different levels of parking restrictions. The comparison, which shows little variation in on-street utilization on different days of the week, implies that area residents who currently seek on-street parking, for the most part, are able to secure parking the night prior or elect to move their vehicles during the parking restriction hours.

While some construction workers are expected to find nearby on-street parking, the overall projected demand exceeds what would be available on-street. To avoid overtaxing nearby on-street and off-street facilities, the project sponsors would provide on-site (southern half of Block 1129) parking for construction workers at a fee that is comparable to other parking lots/garages in the area. This designated area can accommodate up to 800 vehicles, which would be adequate in accommodating the majority of the peak construction parking demand. Combined with the available supply on-street, all construction worker vehicles could be sufficiently accommodated during all phases of construction. In the event that additional parking is needed, the nominal overflow could be satisfied by the available supply at the nearby off-street parking facilities described above.

During the latter stages of the project construction, when many of the completed structures are operational and when construction of Block 1129 is underway, parking within this block may become difficult. As necessary, temporary on-site parking accommodations for the decreasing number of construction workers would be made available at other completed permanent parking facilities within the project site.

By charging a fee and also limiting its parking capacity to accommodate only the anticipated demand, the on-site parking facility would help in minimizing the number of construction worker vehicles circulating for on-street parking in the area, while at the same time not encouraging the use of private automobiles as the means of construction worker travel to the project site. It is also expected that many area residents who become acclimated to the pattern of construction worker vehicles seeking on-street parking in the early morning hours would secure the necessary spaces the night before, as most already do based on observations of area parking behavior over several different days. As detailed above, since all projected construction worker parking demand would be met, no parking shortfall is anticipated during any phase of construction at Atlantic Yards and the proposed project is not expected to result in any significant adverse parking impacts during construction.

TRANSIT

With 55 percent of the construction workers projected to travel via auto, the bulk of the remaining 45 percent would travel to and from the project site via transit. For the regular day shift, 3,165 workers would be projected during peak construction (see Exhibit F17a-3 in Appendix F, Phase 1B), resulting in up to 1,425 workers traveling by subway, bus, or LIRR. With 80 percent of these workers commuting during the peak travel hour (6-7 AM arrival and 3-4 PM departure), the total estimated number of peak hour transit trips would be 1,140. Distributed among the various subway and bus routes, station entrances, and bus stops near the project site, only nominal increases in transit demand would be experienced along each of these routes and at each of the transit access locations during hours outside of the typical commuter peak periods.

As shown in Chapter 13, "Transit and Pedestrians," substantial capacity would be available at all the analyzed transit elements under the 2010 No Build conditions analysis and the 2010 Build conditions analysis, which accounted for a comparatively higher demand for the area's transit services during commuter peak hours, and concluded no significant adverse transit impacts at existing transit facilities. Therefore, the projected construction worker trips by transit, when accounting for the favorable baseline conditions of nearby transit services and the hours when these trips would be made, would not warrant a detailed operational analysis, and the projected increment of transit trips associated with the travel of construction workers would not result in any significant adverse transit impacts. Similarly, during Phase II construction, given that peak construction worker transit demand would reach only approximately 680 during the early morning 6 AM to 7 AM and afternoon 3 PM to 4 PM hours under Phase 2B construction, and the availability of the new transit connection on the arena block, there would also not be a potential for significant adverse transit impacts attributable to the projected construction worker transit trips.

The proposed construction would not affect access to any of the nearby subway stations, although temporary nighttime and weekend service disruptions may be required to facilitate certain connections to the existing station elements. All such work would be coordinated with NYC Transit and not materially affect pedestrian circulation within and outside of the subway station. After the completion of the arena block, a new connection to the subway would be available at the southeast corner of Atlantic and Flatbush Avenues. While some construction activities are anticipated to continue during Phase 2A construction adjacent to the new station access locations, all circulation elements within this new connection would be maintained and available to existing and future patrons.

With regard to bus service, the closure of 5th Avenue between Atlantic and Flatbush Avenues would be in effect once construction begins. As described in Chapter 13, "Transit and Pedestrians," the B63 bus route, which currently travels northbound along 5th Avenue and turns left onto Atlantic Avenue to continue on its westbound route, would be diverted onto Flatbush Avenue. The continuation of its westbound route along Atlantic Avenue would require the same operational changes described in Chapter 13, "Transit and Pedestrians," specifically permitting City buses to make a northbound left-turn from Flatbush Avenue onto Atlantic Avenue.

Lane and sidewalk closures during construction would necessitate the temporary relocation of several bus stops bordering the project site, most of which are located along the south side of Atlantic Avenue between 4th and Vanderbilt Avenues. The most noticeable disruptions are anticipated for Phase 1A and the early part of Phase 1B construction when utility work would require curb and travel lane closures and the temporary realignment of Atlantic Avenue. To the extent possible, existing bus stops and pick-up/drop-off zones would be maintained during construction. However, in consultation with DOT and NYC Transit, temporary relocations of one or more of these bus stops are likely to be necessary to provide the required space for construction. As part of the coordination efforts with the above agencies, the location and duration that certain bus stops should be temporarily relocated would be determined to ensure that distances between bus stops would not be excessive, and that boarding and alighting passengers would have reasonable pedestrian paths en route to and from the existing or relocated bus stops. Along Flatbush Avenue, somewhat limited and intermittent curb lane closures would be required along the east side of the street between Atlantic Avenue and Dean Street, primarily during Phase 1B construction. Any necessary relocation of the existing bus stops along this segment is expected to be of short duration.

Temporary bus stop relocation is likely to be required less frequently during Phase II construction (2010 to 2016) because the bulk of the utility work, LIRR track reconfiguration and platform construction, and roadway improvements would have been completed. With the proposed project's construction shifting more towards Blocks 1120, 1121, 1128, and 1129, some intermittent relocation of bus stop locations may occur along the south side of Atlantic Avenue between 6th and Vanderbilt Avenues, and along the west side of Vanderbilt Avenue between Atlantic Avenue and Dean Street. Although intermittent lane closures are also anticipated along Dean Street, it is not expected that any existing bus stops between Flatbush and Vanderbilt Avenues would need to be relocated during construction.

As stated in Chapter 13, "Transit and Pedestrians," traffic congestion and significant adverse traffic impacts along corridors used by local bus routes may result in delays to bus travel under both Build and Build with Mitigation conditions. Additional buses may therefore be needed to maintain the current headways and service schedules. During construction, bus travel delays may also occur at locations identified to be congested. However, these delays are likely to be of shorter durations because, as concluded above from the construction traffic analysis, the effects of construction activities would be largely limited to locations near the project site and not extend to farther parts of these bus routes.

PEDESTRIANS

For the same reasons provided on transit operations, a detailed pedestrian analysis is also not warranted to address the projected demand from the travel of construction workers to and from the project site. Pedestrian trips generated by construction workers would be distributed among numerous sidewalks and crosswalks in the area. Most of those traveling via the subway or LIRR would approach the site from various entrances at Atlantic Terminal and the Bergen Street subway station, with the remainder using the other three area subway stations. Those traveling via bus would alight from the nearest bus stops. Workers traveling by car would either walk from the temporary parking facility at Block 1129 or from other on- and off-street locations nearby. Considering that these trips would occur during off-peak hours, primarily along pedestrian routes with low to moderate background pedestrian traffic, and would be projected to operate at acceptable levels in accommodating 2010 Build pedestrian volumes during commuter peak hours (see Chapter 13, "Transit and Pedestrians), the projected increment of pedestrian trips associated with the travel of construction workers would not result in any significant adverse pedestrian impacts.

As shown in Figures 17a-1 to 17a-6, sidewalk closures would occur throughout construction, particularly along the south side of Atlantic Avenue. In most cases, overhead protections on existing sidewalks or temporary sidewalks would be provided to standards agreed upon by DOT to maintain pedestrian flow. However, during Phases 1A and 1B when bridge reconstruction over the LIRR rail yard and the construction of the LIRR West Portal are scheduled to take place, it would be optimal to discontinue pedestrian flow through certain construction zones along Atlantic Avenue and to temporarily close the crosswalks connecting to these areas. As shown in Chapter 13, "Transit and Pedestrians," 2010 No Build pedestrian traffic along the south side of Atlantic Avenue was projected to be fewer than 20 pedestrians during peak 15-minute periods. Consultations with DOT would be undertaken to determine the feasibility of closing pedestrian access entirely for the affected segments during these phases of construction, as diverting this flow to other pedestrian facilities in the area would not result in a perceptible increase in pedestrian traffic at those locations. At other sidewalks bordering the project site, more limited closures are anticipated and, where necessary, temporary sidewalks would be provided to maintain pedestrian flow.

During the construction of Phase II project components, most of the proposed roadway and pedestrian improvements would have been completed. With the exception of limited sidewalk closures, all area sidewalks would be available for pedestrian traffic and, where needed, overhead sidewalk protection would be provided.

AIR QUALITY

INTRODUCTION

Construction activities have the potential to impact air quality as a consequence of emissions from on-site construction engines as well as emissions from on-road construction-related vehicles and their effects on traffic congestion. The analysis of potential impacts on air quality from the construction of the proposed project includes a quantitative analysis of both on-site and on-road sources of air emissions, and the overall combined impact of both sources where applicable.

In general, most construction engines are diesel powered, and produce relatively high levels of nitrogen oxides and particulate matter. Construction activities also emit fugitive dust. Impacts on traffic could increase mobile source-related emissions. Therefore, the pollutants analyzed for the construction period are nitrogen dioxide (NO_2), particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), and carbon monoxide (CO). For more details regarding air pollutants see Chapter 14, "Air Quality."

Construction activity in general, and large-scale projects in particular, have the potential to adversely affect air quality as a result of diesel emissions. The main component of diesel exhaust that has been identified as having an adverse effect on human health is fine particulate matter. To ensure that the construction of the proposed project results in the lowest feasible diesel particulate matter (DPM) emissions, the project sponsors have committed to implementing a state-of-the-art emissions reduction program, consisting of the following components:

1. *Diesel Equipment Reduction.* The construction of the proposed project would minimize the use of diesel engines, and use electric engines operating on grid power in lieu of diesel engines, to the extent practicable. To that end, the project sponsors have met with Con Edison to ensure the early connection of grid power to the site by commissioning permanent service for Buildings 2 and 3 for use during construction. This would ensure that grid power would be available on site by the third quarter of 2007, prior to the peak construction period. Construction contracts would specify the use of electric engines where practicable, and ensure the distribution of power connections throughout the site as needed. Equipment that would use grid power in lieu of diesel engines would include, but may not be limited to, welders, rebar benders, scissor lifts, and hydraulic articulating boom lifts. This would also eliminate generators that would normally be needed for construction equipment.
2. *Clean Fuel.* Ultra-low sulfur diesel (ULSD) fuel would be used exclusively for all diesel engines throughout the site. This would enable the use of tailpipe reduction technologies (see below), and would directly reduce DPM emissions. The exclusive use of this fuel for all diesel engines would also reduce the emission of sulfur oxides to a negligible level.
3. *Best available tailpipe reduction technologies.* Nonroad diesel engines with a power rating of 50 horsepower (hp) or greater, and controlled truck fleets (i.e., truck fleets under long-term contract with the proposed project, such as concrete trucks), would utilize the best available tailpipe technology for reducing DPM emissions. The project sponsors have identified diesel particle filters (DPFs) as being the tailpipe technology currently available that is verified to have the highest reduction capability. Construction contracts would specify that all diesel nonroad engines rated at 50 hp or greater would utilize DPFs or other tailpipe reduction technology, either original equipment manufacturer (OEM) or retrofit technology with add-on controls verified to reduce DPM emissions by at least 85 percent. Controls may include active DPFs,[1] if necessary. Exceptions would be made only in cases where DPFs cannot be used for safety reasons, or where it is proven that a certain engine is necessary for the task where a DPF would not function properly; in those cases, the use of diesel oxidation catalyst (DOC) or other tailpipe reduction technology verified to reduce DPM by at least 25 percent would be required.

Additional measures would be taken to reduce pollutant emissions during construction in accordance with all applicable laws, regulations, and building codes. These include dust

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[1] Most DPFs used currently are 'passive,' which means that the heat from the exhaust is used to regenerate (burn off) the PM to eliminate the buildup of PM in the filter. Some engines do not maintain temperatures high enough for passive regeneration. In such cases, 'active' DPF can be used, i.e., DPFs that are heated either by an electrical connection from the engine, by plugging in during periods of inactivity, or by removal of the filter for external regeneration.

suppression measures and the restriction of on-road vehicle idle time to three minutes for all vehicles that are not using the engine to operate a loading, unloading or processing device (e.g., concrete mixing trucks).

This program to reduce air pollutant emissions from construction exceeds that of any large scale private construction project in New York City to date. In addition to adopting the measures delineated in New York City Local Law 77 of 2003, the program institutes the use of electric engines in lieu of diesel engines where practicable, eliminating the associated local emissions entirely, and introduces the use of active DPFs in cases where passive DPFs would not function. Overall this program is expected to reduce DPM emissions by more than 90 percent as compared with standard private construction practice although for analysis purposes it is conservatively assumed that PM emissions would be reduced by 85 percent rather than 90 percent.

METHODOLOGY

The following sections delineate additional details relevant only to the construction air quality analysis methodology. A review of the pollutants for analysis; applicable regulations, standards, and benchmarks; and general methodology for stationary and mobile source air quality analyses can be found in Chapter 14, "Air Quality." NAAQS are presented in Table 14-1. EPA has recently revised the $PM_{2.5}$ NAAQS, effective December 18, 2006. The revisions include lowering the 24-hour average standard from the current level of 65 µg/m^3 to 35 µg/m^3 and revoking the annual standard for PM_{10}. The State Environmental Quality Review Act (SEQRA) regulations and the *City Environmental Quality Review (CEQR) Technical Manual* state that the significance of a likely consequence (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected. In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the NAAQS, or increase the concentration of $PM_{2.5}$ above the interim guidance thresholds, would be deemed to have a potential significant adverse impact. See Chapter 14, "Air Quality," for a full discussion of the standards and impact criteria.

The analyses presented here were prepared for the DEIS. As described above, some changes in the construction program have since been incorporated in the proposed project. As a result, some reduction in traffic volumes and construction activity would be expected. However, in the case of on-site activity, the peak activity would not be expected to change. Therefore, the analyses prepared for the DEIS would still present a reasonable worst-case analysis, and in some cases the results presented may be somewhat higher than would be expected under the current building program. Nonetheless, since significant adverse air quality impacts were not predicted in the DEIS, the impacts predicted with the current building program would be similar or less, and therefore no significant adverse impacts would be expected.

Mobile Source Assessment

The general methodology for mobile source modeling presented in Chapter 14, "Air Quality," was followed for intersection modeling during the construction period.

As described in the introduction above, the project sponsors have committed to requiring that all concrete trucks involved in construction of the proposed project are equipped with DPFs. The emission factors for the concrete truck portion of the construction trucks used in this analysis were reduced by 85 percent to reflect the application of DPFs.

Sites for mobile source analysis were selected based on the air quality results reported for the operational phase in Chapter 14, "Air Quality," and on the construction model scenarios and truck trip assignments analyzed for the assessment of traffic impacts during construction. The sites were chosen with the objective of capturing the highest construction-related concentration increment, the highest expected increments at locations where background concentrations were predicted to be high in the No Build condition, and the mobile source increments in areas near the project site where relatively high increments are predicted from on-site construction activity. Based on those criteria, PM and CO concentrations were analyzed for Phase I and Phase II at three intersections, as presented in Table 17b-1 and Figure 17b-1. Site 1 was selected as the location with the highest predicted background levels, with high predicted construction truck volume increments, that is also near a residential location where the highest potential increase in concentrations from on-site emissions was predicted. Site 2 is the intersection where the highest predicted increment in CO concentrations can be expected, since most private construction worker vehicles arriving at the site to park would drive through that intersection (cars, which run on gasoline, emit higher CO levels than diesel trucks). Site 3 represents the location with the highest predicted construction truck volume increment, and is also a location where the highest short-term increases in air quality concentrations were predicted from on-site construction emissions.

Table 17b-1
Mobile Source Analysis Sites

Analysis Site	Intersection
1	Atlantic Avenue, Flatbush Avenue, and 4th Avenue
2	Dean Street and Carlton Avenue
3	6th Avenue and Dean Street

Based on the predicted traffic conditions, the traffic scenario for Phase 1B was determined to be demonstrative of the worst-case potential air quality from mobile sources, since that phase would include the highest volume of construction-related vehicles, as well as traffic disruptions, such as lane closures. This worst-case period was, therefore, used to demonstrate the highest predicted mobile source CO, $PM_{2.5}$, and PM_{10} increments for any construction period when added to the concurrent on-site emissions from construction equipment and activity.

On-Site Construction Activity Assessment

Overall, construction of the proposed project is expected to occur over a period of 10 years. To determine which construction periods constitute the worst-case periods for the pollutants of concern (PM, CO, NO_2), construction-related emissions were calculated throughout the duration of construction on an annual and peak-day basis for $PM_{2.5.}$ $PM_{2.5}$ was selected as the worst-case pollutant, based on the fact that as compared with other pollutants, $PM_{2.5}$ has the highest ratio of emissions to impact criteria. Therefore, $PM_{2.5}$ was used for determining the worst-case periods for analysis of all pollutants. Generally, emission patterns of other pollutants would follow PM emissions, since both are related to diesel engines by horse power (hp). CO emissions may have a somewhat different pattern, but generally would also be highest during periods when the most activity would occur. Based on the resulting multi-year profiles of annual average and peak day average emissions of $PM_{2.5}$, a worst-case year and a worst-case short-term period were identified for the modeling of annual and short-term (i.e., 24-hour, 8-hour, and 1-hour) averaging periods. Dispersion of the relevant air pollutants from the site during these periods was then analyzed, and the highest resulting concentrations are presented in the following sections. Broader conclusions regarding predicted concentrations during other periods, which were not modeled explicitly, are presented as well, based on the multi-year emissions profiles and the worst-case period results. As a check, $PM_{2.5}$ was analyzed for additional time periods to confirm these conclusions.

The general methodology for stationary source modeling (regarding model selection, receptor placement, and meteorological data) presented in Chapter 14, "Air Quality," was followed for modeling dispersion of pollutants from on-site sources during the construction period.

The sizes, types, and number of construction equipment were estimated based on the construction activities schedule. Emission factors for nitrogen oxides (nitrogen oxide and NO_2, collectively referred to as NO_x), CO, PM_{10}, and $PM_{2.5}$, from on-site construction engines were developed using the United States Environmental Protection Agency (EPA) NONROAD2005 Emission Model (NONROAD). The model is based on source inventory data accumulated for specific categories of nonroad equipment. The emission factors for each type of equipment were calculated from the NONROAD output files (i.e., calculated from regional emissions estimates). With respect to trucks, emission rates for $NO_{X,}$ CO, PM_{10}, and $PM_{2.5}$ for on-site truck engines were developed using the EPA MOBILE6.2 Emission Model (MOBILE6), using the year 2006 as the base year, and were adjusted for project-specific emission reduction measures, as explained below.

As described in the introduction above, the project sponsors have committed to a number of measures to greatly reduce air pollutant emission during construction of the proposed project, with special attention given to diesel particulate matter. These measures include the use of electric-powered engines in lieu of diesel engines where practicable; the exclusive use of ULSD for all construction engines; the use of DPFs on all nonroad construction engines with an engine output rating of 50 hp or greater, which are predicted to reduce PM emissions by at least 85 percent (and often 95 percent or more); and DOCs, which are predicted to reduce PM emissions by at least 25 percent (DOCs would be used for applications where DPFs are not effective or not practical for safety reasons, and no such instances were identified in these analyses). In addition, controlled truck fleets (i.e., truck fleets under long-term contract with the proposed project, such as concrete trucks) would utilize only trucks equipped with DPFs.

Based on the above commitments, emission factors were calculated assuming the exclusive use of ULSD and the application of DPFs on all nonroad diesel engines 50 hp or greater, and concrete trucks; other trucks were assumed to have emissions consistent with the general truck fleet (all diesel vehicles will use ULSD by November 2006). DPFs were conservatively assumed to reduce PM emissions by only 85 percent, which is the lowest reduction achieved by agency-verified DPFs, in order to account for the fact that there may be a small fraction of engines that cannot be practicably fitted with a DPF. Most welders, rebar benders, generators, scissor lifts, and hydraulic articulating boom lifts would be electric and would, therefore, have no associated emissions. The resulting engine emission factors were used for the emissions and dispersion analyses. In addition, dust emissions from operations (e.g., grading, excavation, loading excavated materials into dump trucks, demolition) were calculated based on EPA procedures delineated in AP-42 Table 13.2.3-1 (EPA, 1995-2006). Vehicle speeds on-site would be limited to five miles per hour in order to avoid the resuspension of dust.

Average annual and peak-day $PM_{2.5}$ emissions profiles for the entire duration of the construction were prepared by multiplying the above emission rates by the number of engines, work hours per day, and fraction of the day each engine would be expected to work during each quarter. The construction activity details are presented in Appendix F17, and details of the emissions calculations are presented in Appendix F17b. The resulting annual and peak day emissions profiles are presented in Figures 17b-2 and 17b-3, respectively.

Based on the $PM_{2.5}$ construction emissions profiles, three short-term periods (S1 through S3), and four annual periods (A1 through A4) were selected for modeling, as presented in Figures 17b-2 and Figure 17b-3. The third quarter of 2007 (S2), and the first year of construction (A1, from the fourth quarter of 2006 through the third quarter of 2007) were identified as the worst-case Phase I short-term and annual periods for analysis, respectively, based on project-wide ground-level emissions (i.e., emissions from activity that is not occurring at elevated locations in the constructed buildings). Most emissions would be near ground level, and the nearest receptors are at ground level; therefore, the highest impacts would be expected at ground level. In addition, the second quarter of 2007 (S1) and the second year of construction (A2, from the third quarter of 2007 through the second quarter of 2008) were analyzed for $PM_{2.5}$ impacts as peak and annual periods, respectively; these represent samples of other periods in which emissions are somewhat lower. The third year of construction, from the third quarter of 2008 through the second quarter of 2009 (A3), was analyzed for $PM_{2.5}$ as well, and represents the period with the overall highest emissions, including emissions from elevated sources. The third quarter of 2011 (S3) and the period including the four quarters of 2011 (A4) were selected as representative worst-case short-term and annual periods for Phase II, respectively. Since overall impacts during Phase II of construction are much lower than those for Phase I, the analyses for Phase II included only $PM_{2.5}$ and NO_2, which would be the pollutants with the highest concentration increments in Phase I relevant to applicable benchmarks. For other pollutants, the results presented for Phase I are a conservatively high estimate of worst-case impacts for Phase II as well.

The dispersion of pollutants during the short-term and annual periods with the highest emissions was then modeled in detail to predict resulting maximum concentration increments and total concentrations (including background concentrations) in the surrounding area from construction activity. For the purpose of this assessment, a conservative assumption was made that 40 percent of NO_x would be transformed to NO_2 at the nearest receptors. Details on how that transformation rate was arrived at can be found in Appendix F17b.

Although the modeled results are based on construction scenarios for specific sample periods, conclusions regarding other periods were derived based on the fact that, generally, lower concentration increments from construction would be expected during periods with lower construction emissions. As presented in Figures 17b-2 and 17b-3, emissions during other periods would be lower, and often much lower, than the peak emissions. However, since the worst-case short-term results may often be indicative of very local impacts, similar maximum local impacts may occur at any stage at various locations, but would not persist in any single location since emission sources would not be located continuously at any single location throughout construction. Equipment would move throughout the site as construction progresses.

For the short-term model scenarios, predicting concentration averages for periods of 24 hours or less, all engines that would be stationary, such as compressors, pumps, or drill rigs, were simulated as point sources. Other engines, which would move around the site, were modeled as area sources.

Receptors (locations in the model where concentrations are predicted) were placed along the sidewalks surrounding the construction sites on both sides of the street, at residential and other sensitive uses at both ground-level and elevated locations (e.g., residential windows), and at publicly accessible open spaces. In addition, a ground-level receptor grid was placed to enable extrapolation of concentrations throughout the entire area at locations more distant from the proposed project. For the modeling of Phase II conditions, receptors were also placed on the completed Phase I elements adjacent to the construction.

Detailed modeling parameters for sources and the location of sources and receptors are presented in Appendix F17b.

Cumulative Assessment

Since there are various source types (mobile, construction, operational HVAC) that may contribute to concentration increments concurrently, a cumulative assessment of all project sources was undertaken to determine the potential maximum effect of all sources combined. During Phase I of construction, this would include on-site construction and off-site mobile sources. Since Phase II construction would take place while Phase I is operational, the combined effect for the Phase II construction period includes the effect of permanent sources from the operation of Phase I.

Total cumulative concentration increments were estimated by adding the highest results from the mobile source analysis, the construction analysis, and, in Phase II, the Phase I operational stationary source analysis by location. Mobile sources included construction vehicles for Phase I and Phase II, and Phase I operational vehicles during Phase II. As described above, the traffic scenario 1B was used to represent the highest impact throughout the entire construction period (Phase I and Phase II). The mobile source and stationary source analyses are performed separately with different dispersion models, as appropriate for the different types of analyses. The combination of the highest results is a conservatively high estimate of potential impacts, since it is likely that the highest results from different sources would occur under different meteorological conditions (e.g., different wind direction and speed) and would not actually occur simultaneously.

POTENTIAL CONSTRUCTION AIR QUALITY IMPACTS—PHASE I

Mobile Source Assessment

Maximum predicted pollutant increments and total concentrations (including background concentrations) at all analysis sites for the worst-case mobile source conditions are presented in Table 17b-2 and Table 17b-3, respectively. The total concentrations presented in Table 17b-3 are equal to the sum of the background and the increments presented in Table 17b-2. The Proposed Project total includes both monitored background as well as contributions from background traffic.

Concentration increments due to construction related mobile sources were predicted to be small when compared to the NAAQS and the applicable interim guidance thresholds for $PM_{2.5}$. Other than $PM_{2.5}$ concentrations, which are high in the background condition, total concentrations would not exceed the NAAQS. During all other phases, maximum increments and total concentrations would be lower than those presented here.

Overall, the mobile source affect on pollutant concentrations would be small as compared with the NAAQS and interim guidance threshold levels. For the total combined impact of all sources, see the “Cumulative Assessment” section, below.

Table 17b-2
Worst-Case Mobile Source Concentration Increments (μg/m³)

Pollutant	Averaging Period	Maximum Predicted Increment Site 1	Site 2	Site 3	Interim Guidance Threshold	NAAQS
Local Contributions from No-Build Traffic						
$PM_{2.5}$	24-hour	1.07	0.97	0.30	—	35 [1]
	Annual Local	0.41	0.27	0.12	—	15
PM_{10}	24-hour	12.2	9.3	3.8	—	150
	Annual	4.4	2.6	1.6	—	None [1]
CO	8-hour	3.5 ppm	0.5 ppm	0.6 ppm	—	9 ppm
Proposed Project Increments (Project Minus No-Build)						
$PM_{2.5}$	24-hour	0.26	0.55	0.45	5	35 [1]
	Annual— Local Neighborhood Scale	 0.03 0.02	 0.15 0.02	 0.12 0.02	 0.3 0.1	15
PM_{10}	24-hour	0.4	5.0	4.5	—	150
	Annual	-0.1 [2]	1.3	1.2	—	None [1]
CO	8-hour	0.2 ppm	0.1 ppm	0.6 ppm	—	9 ppm

Notes: These results are maximum predicted increments for the worst-case traffic scenario 1B. Results for any other period, or locations other than these sites, would be lower.
The CO increments reflect the highest of AM, PM, and Weekend.
$PM_{2.5}$ concentration increments should be compared with threshold values. Increments of all other pollutants can be compared with the NAAQS to evaluate the magnitude of the increments, but exceedance of the NAAQS would be based on the total concentrations in the next table.

1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 μg/m³ to 35 μg/m³ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."
2. Decrement in PM_{10} is due to changes in lane-use due to construction. Overall, some minor increments were identified, but the maximum predicted concentrations were lower.

Table 17b-3
Total Worst-Case Mobile Source Concentrations (μg/m³)

Pollutant	Averaging Period	Background Concentration	Maximum Predicted Concentration Site 1	Site 2	Site 3	NAAQS
No-Build Total (Total Background Concentration)						
$PM_{2.5}$	24-hour	40.8	41.9	41.8	41.1	35 [1]
	Annual	15.3	15.7	15.6	15.4	15
PM_{10}	24-hour	50.0	62.2	59.3	53.8	150
	Annual	21.0	25.4	23.6	22.6	None [1]
CO	8-hour	2.5 ppm	6.0 ppm	3.0 ppm	3.1 ppm	9 ppm
Proposed Project Total						
$PM_{2.5}$	24-hour	40.8	42.1	42.3	41.6	35 [1]
	Annual	15.3	15.7	15.7	15.5	15
PM_{10}	24-hour	50.0	62.7	64.3	58.4	150
	Annual	21.0	25.3	24.9	23.8	None [1]
CO	8-hour	2.5 ppm	6.1 ppm	3.9 ppm	3.5 ppm	9 ppm

Notes: These results are maximum predicted increments for the worst-case traffic scenario 1B. Results for any other period, or locations other than these sites, would be lower.
The CO increments reflect the highest of AM, PM, and Weekend. Maximum CO concentrations may be from different periods.
The sum of increments in Table 17b-2 and background values may not be equal to the totals presented here due to differences in time periods and/or rounding.

1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 μg/m³ to 35 μg/m³ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

On-Site Construction Activity Assessment

Maximum predicted concentration increments from construction during Phase I, and overall concentrations including background concentrations, are presented in Table 17b-4 and Table 17b-5, respectively. The maximum predicted $PM_{2.5}$ concentration increments and total NO_2 concentrations at all locations for the various construction model scenarios are presented in isopleth form (lines representing constant concentration) in Figures 17b-4 through 17b-10. The totals in Table 17b-5 are the sum of background concentrations and construction increments presented in Table 17b-4. (Since the numbers presented in the tables are significant figures only, there may be some rounding differences.)

Table 17b-4
Pollutant Increments from Construction Site Sources (µg/m^3)—Phase I

Pollutant	Averaging Period	Maximum Predicted Increment		Interim Guidance Threshold	NAAQS
		Sidewalk or Open Space [1]	Residential		
$PM_{2.5}$	24-hour [2]	9.9 / 10.3	5.4 / 5.5	5	35 [4]
	Annual— [3]				15
	Local	0.66 / 0.63 / 0.29	0.32 / 0.44 / 0.13	0.3	
	Neighborhood Scale	0.04		0.1	
PM_{10}	24-hour	60.6	35.2	—	150
	Annual	5.6	2.9	—	None [4]
CO	8-hour	2.3 ppm	0.7 ppm	—	9 ppm
NO_2	Annual	20.2	8.1	—	100

Notes:

$PM_{2.5}$ concentration increments should be compared with threshold values. Increments of all other pollutants can be compared with the NAAQS to evaluate the magnitude of the increments, but exceedance of the NAAQS would be based on the total concentrations in the next table.

1. 'Open Space' refers to the Brooklyn Bear's Pacific Street community garden.
2. 24-hour average $PM_{2.5}$ increments are presented for construction period scenarios S1 / S2.
3. Annual average $PM_{2.5}$ increments are presented for construction period scenarios A1 / A2 / A3.
4. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

Table 17b-5
Total Pollutant Concentrations from Construction Site Sources (µg/m^3)—Phase I

Pollutant	Averaging Period	Background Concentration	Maximum Predicted Total Concentration		NAAQS
			Sidewalk or Open Space [1]	Residential	
$PM_{2.5}$	24-hour [2]	40.8	50.7 / 51.1	46.2 / 46.3	35 [4]
	Annual [3]	15.3	15.99 / 15.93 / 15.59	15.62 / 15. 74 / 15.43	15
PM_{10}	24-hour	50.0	110.6	85.2	150
	Annual	21.0	26.6	23.9	None [4]
CO	8-hour	2.5 ppm	4.8 ppm	4.7 ppm	9 ppm
NO_2	Annual	71.5	91.7	79.6	100

Notes:

1. 'Open Space' refers to the Brooklyn Bear's Pacific Street community garden.
2. 24-hour average $PM_{2.5}$ increments are presented for construction period scenarios S1 / S2.
3. Annual average $PM_{2.5}$ increments are presented for construction period scenarios A1 / A2 / A3.
4. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

The maximum increments of 24-hour and annual average $PM_{2.5}$ concentrations were predicted to exceed the threshold levels of 5 micrograms per cubic meter ($\mu g/m^3$) and 0.3 $\mu g/m^3$, respectively, at locations along sidewalks adjacent to the construction activity. In the Brooklyn Bear's Pacific Street community garden, on the corner of Pacific Street and Flatbush Avenue, there may be only a few days during S2 only when the 24-hour threshold may be exceeded, and annual increments may exceed the threshold in A1, for a distance of up to 20 feet from the construction fence at most.

Annual average $PM_{2.5}$ increments may exceed the threshold for one year on the sidewalk and at ground-floor residential locations along the south side of Pacific Street between 4th Avenue and Flatbush Avenue along the western half of the block, (principally as a result of construction at Site 5), and for one year at the ground floor of the building immediately adjacent to construction on Block 1128 (north side of Dean Street between 6th Avenue and Carlton Avenue).

There is also a slight chance that 24-hour increments may exceed the threshold on a single day on the sidewalk and at ground-floor residential windows near the intersection of Dean Street and 6th Avenue; levels slightly exceeding the 24-hour guidance threshold were predicted at that intersection for S1 at one ground-level residential location and for S2 at another ground-level residential location under meteorological conditions that occurred only once in the five-year meteorological data sample (same meteorological day in both scenarios). Exceedances would not occur at any location above ground-floor level. Since the precise location of engine activity on site would vary from day to day for the various periods, and since peak activity for all task would not always coincide, as is assumed in the peak day modeling, it is unlikely that these precise meteorological and construction conditions would coincide; nonetheless, a single day of exceedance at one residential ground-floor location in 2007 or 2008 could not be ruled out.

As presented in Figures 17b-4 and 17b-5, although maximum 24-hour average $PM_{2.5}$ concentration increments are similar for the different periods, the location and the extent of the highest increments varies, with S2 having the higher and more extensive impacts. Similarly, the annual average $PM_{2.5}$ concentration increments, as presented in Figures 17b-6, 17b-7 and 17b-8, are higher and more extensive in A1, and diminish during A2. Nonetheless, some limited exceedances of guidance thresholds were predicted, as described above. These would include sidewalk locations immediately adjacent to the construction fence, and may include a single year of exceedance of the annual threshold at ground-floor residences on Pacific Street between Fourth Avenue and Flatbush Avenue and at the ground floor of the building immediately adjacent to construction on Block 1128, and up to a single day per year of exceedance of the 24-hour threshold at a some residential location on Dean Street across the street from the construction site to the south.

The highest annual average neighborhood-scale $PM_{2.5}$ increment was predicted to be 0.04 $\mu g/m^3$, which is lower than the threshold level of 0.1 $\mu g/m^3$.

The maximum measured background annual average $PM_{2.5}$ concentration was 15.3, which exceeds the NAAQS. The attainment determination procedure, which was the basis for EPA's determination that the New York City area is nonattainment for $PM_{2.5}$, was based on the three-year average $PM_{2.5}$ concentrations. Since the maximum increment as a result of construction would not occur in the same location and at the highest intensity for a three-year period, the three-year average increment at any location would be lower than the one-year average increments discussed above. Increments exceeding the annual threshold at any of the locations described above would be limited to one year, except for the sidewalk at the corner of Flatbush

Avenue and Dean Street adjacent to the construction fence, where such an exceedance could occur for two years.

Total concentrations of PM_{10}, CO, and NO_2 would not be expected to exceed the NAAQS. Although the maximum potential 24-hour average PM_{10} concentration could be substantial for a limited period of time at some locations, total concentrations would still be substantially lower than the NAAQS due to low background levels of PM_{10}.

Background 24-hour average concentrations of $PM_{2.5}$ exceed the new NAAQS of 35 $\mu g/m^3$ in the current conditions. Annual average $PM_{2.5}$ concentrations, in the background condition have ranged from slightly lower to slightly higher than the NAAQS level in recent years, with the three-year average somewhat lower then the NAAQS level. Nonetheless, the region has been determined to be nonattainment by the EPA; therefore, the discussion of significance of $PM_{2.5}$ impacts is based on incremental threshold guidance levels, as described above. Maximum potential annual average NO_2 concentrations could increase substantially as well, but would remain well below the NAAQS.

Cumulative Assessment

Maximum predicted combined concentration increments from on-site construction and mobile sources during Phase I, and overall combined concentrations including background concentrations, are presented in Table 17b-6 and Table 17b-7, respectively. NO_2 is not presented here since it is not included in the mobile source analysis; cumulative NO_2 results would be the same as those presented above. The cumulative increments presented in Table 17b-6 are a sum of the Phase I construction on-site increments from Table 17b-4 and the maximum construction related mobile-source increments from the mobile source site closest to the location of the maximum on-site increments. Note that in some cases the mobile-source increments near the maximum on-site increments were lower than the maximums presented in Table 17b-2.

Table 17b-6
Cumulative Pollutant Increments ($\mu g/m^3$)—Phase I

Pollutant	Averaging Period	Maximum Predicted Increment		Interim Guidance Threshold	NAAQS
		Sidewalk or Open Space [1]	Residential		
$PM_{2.5}$	24-hour [2]	10.2 / 10.6	5.9 / 6.0	5	35 [4]
	Annual— [3] Local	0.69 / 0.66 / 0.41	0.35 / 0.47 / 0.28	0.3	15
	Neighborhood Scale	0.06		0.1	
PM_{10}	24-hour	65.6	40.2	—	150
	Annual	5.8	3.1	—	None [4]
CO	8-hour	2.9 ppm	1.3 ppm	—	9 ppm

Notes:

$PM_{2.5}$ concentration increments should be compared with threshold values. Increments of all other pollutants can be compared with the NAAQS to evaluate the magnitude of the increments, but exceedance of the NAAQS would be based on the total concentrations in Table 17b-7.

1. 'Open Space' refers to the Brooklyn Bear's Pacific Street community garden.
2. 24-hour average $PM_{2.5}$ increments are presented for construction period scenarios S1 / S2.
3. Annual average $PM_{2.5}$ increments are presented for construction period scenarios A1 / A2 / A3.
4. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

Table 17b-7
Total Cumulative Pollutant Concentrations (μg/m^3)—Phase I

Pollutant	Averaging Period	Maximum Predicted Total Concentration		NAAQS
		Sidewalk or Open Space [1]	Residential	
$PM_{2.5}$	24-hour[2]	52.1 / 52.5	47.0 / 47.1	35 [4]
	Annual [3]	16.4 / 16.4 / 16.1	15.8 / 16.2 / 16.0	15
PM_{10}	24-hour	127.8	94.0	150
	Annual	31.2	25.7	None [4]
CO	8-hour	8.5 ppm	5.0 ppm	9 ppm

Notes: Total background concentrations would include the No-Build traffic increments. Total background concentrations would, therefore, vary by location, and are presented in Table 17b-3.
1. 'Open Space' refers to the Brooklyn Bear's Pacific Street community garden.
2. 24-hour average $PM_{2.5}$ increments are presented for construction period scenarios S1 / S2.
3. Annual average $PM_{2.5}$ increments are presented for construction period scenarios A1 / A2 / A3.
4. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 μg/m^3 to 35 μg/m^3 and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

The cumulative assessment conservatively adds together the highest predicted effect of on-site and mobile-source emissions. Since the highest short term increments for each component are predicted under different meteorological conditions, these results are conservatively high. Furthermore, since the analysis conservatively assumed the worst case construction traffic for all phases, even though the actual truck increments would be lower during periods of lower construction activity, the results presented for scenarios S1 are conservatively high. Nonetheless, the results are similar to those presented for on-site sources only and the conclusions would be the same.

POTENTIAL CONSTRUCTION AIR QUALITY IMPACTS—PHASE II

Mobile Source Assessment

Since the worst-case effects of mobile sources on pollutant concentrations, predicted for Phase I of construction, were small as compared with the NAAQS and interim guidance threshold levels, mobile sources were not modeled for Phase II. Mobile source pollutant increments during Phase II would be less than those presented above for Phase I. For a discussion of the overall effect of all project related emissions, see the "Cumulative Assessment," below.

On-Site Construction Activity Assessment

Predicted $PM_{2.5}$ and NO_2 concentration increments from construction during Phase II, and overall concentrations including background concentrations, are presented in Table 17b-8 and Table 17b-9, respectively. Other pollutants were predicted to have insubstantial impacts in Phase I and would have even lower impacts during Phase II; therefore, the analyses of Phase II focused on $PM_{2.5}$ and NO_2. The maximum predicted $PM_{2.5}$ concentration increments and total NO_2 concentrations at all locations for the various construction model scenarios are presented in isopleth form (lines representing constant concentration) in Figures 17b-11 through 17b-13.

Table 17b-8
Pollutant Increments from Construction Site Sources ($\mu g/m^3$)—Phase II

Pollutant	Averaging Period	Maximum Predicted Increment		Interim Guidance Threshold	NAAQS
		Sidewalk	Residential		
$PM_{2.5}$	24-hour	8.0	5.1	5	35 [1]
	Annual— Local Neighborhood Scale	0.49 0.037	0.32	0.3 0.1	15
NO_2	Annual	17.5	8.9	—	100

Notes:
$PM_{2.5}$ concentration increments should be compared with threshold values. Increments of all other pollutants can be compared with the NAAQS to evaluate the magnitude of the increments, but exceedance of the NAAQS would be based on the total concentrations in Table 17b-9.
1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

Table 17b-9
Total Pollutant Concentrations from Construction Site Sources ($\mu g/m^3$) Phase II

Pollutant	Averaging Period	Background Concentration	Maximum Predicted Total Concentration		NAAQS
			Sidewalk	Residential	
$PM_{2.5}$	24-hour	40.8	48.8	45.9	35 [1]
	Annual	15.3	15.79	15.62	15
NO_2	Annual	70.8	88.3	79.7	100

Note:
1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

The maximum predicted increments in 24-hour and annual average $PM_{2.5}$ concentrations would exceed the threshold levels of 5 $\mu g/m^3$ and 0.3 $\mu g/m^3$, respectively, at some locations along sidewalks adjacent to the construction activity. Annual and 24-hour threshold exceedances could be expected to occur on sidewalks along Dean Street between Carlton Avenue and Vanderbilt Avenue; a slight exceedance of the annual guidance threshold (0.32 $\mu g/m^3$) may occur in 2011 on the south side of the street at two ground-floor residential locations. 24-hour exceedances were also predicted on the sidewalk at the northeast corner of the intersection of Dean Street and 6th Avenue. A single occurrence of 24-hour average concentration slightly exceeding the 24-hour threshold value (5.1 $\mu g/m^3$) was predicted at a single ground-floor residential location on Dean Street between Carlton Avenue and Vanderbilt Avenue under meteorological conditions which occurred on only one day of the five-year meteorology sample period. Since the probability of this meteorological condition occurring on a day when all activity is at peak, which could occur on some days during a single three-month period, exceedance of the 24-hour average $PM_{2.5}$ threshold at residential locations is extremely unlikely.

All other pollutants would be expected to have a smaller impact than those presented for Phase I and, therefore, no new exceedances of the NAAQS would be expected.

Background 24-hour average concentrations of $PM_{2.5}$ exceed the NAAQS of 35 $\mu g/m^3$ in the current conditions. Annual average $PM_{2.5}$ concentrations in the background condition have ranged from slightly lower to slightly higher than the NAAQS level in recent years, with the three-year average somewhat lower then the NAAQS level. Nonetheless, the region has been determined to be nonattainment by the EPA; therefore, the discussion of significance of $PM_{2.5}$ impacts is based on incremental threshold guidance levels, as described above.

Cumulative Assessment

Maximum predicted combined concentration increments from on-site construction, mobile sources, and stationary sources from the operational portions of the proposed project during Phase I, and overall combined concentrations, including background concentrations, are presented in Table 17b-10 and Table 17b-11, respectively. The cumulative increments presented in Table 17b-6 are a sum of the Phase II construction on-site increments from Table 17b-8, the maximum increment predicted from the Phase I operational stationary sources at the same location as the construction on-site maximum increments, and the maximum construction related mobile-source increments from the mobile source site closest to the location of the maximum on-site increments. Note that in some cases the stationary-source and the mobile-source increments near the maximum on-site increments were lower than the maximums presented in Chapter 14, "Air Quality" and Table 17b-2.

Since construction activity during Phase II would be shifting to the eastern side of the site, and peak increments from the boiler systems of the operational Arena Block were predicted to be in the area of Sixth Avenue, the peak increments of the two sources would not coincide, and therefore, the cumulative increments are predicted to be similar to those discussed above from the on-site construction sources only and the conclusions would be the same.

Table 17b-10
Cumulative Pollutant Increments (µg/m^3)—Phase II

Pollutant	Averaging Period	Maximum Predicted Increment		Interim Guidance Threshold	NAAQS
		Sidewalk	Residential		
$PM_{2.5}$	24-hour	9.4	5.8	5	35 [1]
	Annual—				
	Local	0.65	0.40	0.3	15
	Neighborhood Scale	0.07		0.1	
NO_2	Annual	17.5	8.9	—	100

Notes:

$PM_{2.5}$ concentration increments should be compared with threshold values. Increments of all other pollutants can be compared with the NAAQS to evaluate the magnitude of the increments, but exceedance of the NAAQS would be based on the total concentrations in Table 17b-11.

1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

Table 17b-11
Total Cumulative Pollutant Concentrations (μg/m³)—Phase II

Pollutant	Averaging Period	Background Concentration	Maximum Predicted Total Concentration		NAAQS
			Sidewalk	Residential	
$PM_{2.5}$	24-hour	41.8	51.2	47.9	35 [1]
	Annual	15.6	16.3	16.0	15
NO_2	Annual	71.5	89.0	80.4	100

Notes: Since all highest concentrations increment occurred near mobile-source site 2, background concentrations are total No-Build concentrations from that site. See Table 17b-3 for details.

1. EPA has recently reduced the 24-hour $PM_{2.5}$ standard from 65 μg/m³ to 35 μg/m³ and revoked the Annual PM_{10} standard, effective December 18, 2006. A full discussion of the NAAQS can be found in Chapter 14, "Air Quality."

CONCLUSIONS

Concentrations of CO, NO_2, and PM_{10} were not predicted to be significantly impacted by the construction of the proposed project in any phase of construction. $PM_{2.5}$ concentrations may increase in areas immediately adjacent to the construction by more than the applicable 24-hour and annual average guidance threshold. For the most part, these exceedances would occur on sidewalks along the construction fence. Annual average $PM_{2.5}$ concentrations may exceed the guidance threshold at some ground-floor residential locations immediately adjacent to the construction activity. As explained below, the exceedance at any such location would be expected to occur for only one year. The 24-hour average $PM_{2.5}$ concentrations may exceed the guidance threshold at some ground-floor residential locations immediately adjacent to the construction activity. The exceedance at any such location would be expected to occur for only one day.

Under SEQRA, determination of the significance of impacts is based on the assessment of the predicted impacts based on their intensity, duration, geographic extent, reversibility, and the number of people that would be affected by the predicted impacts. The predicted $PM_{2.5}$ threshold exceedances were limited in extent, duration, and severity. The increments in excess of interim guidance thresholds were predicted to be highly localized, i.e., almost entirely due to construction activity in close proximity to the affected location and not due to cumulative impacts from the larger project site. Potential short-term impacts could occur along the sidewalk adjacent to the construction fence near the area of peak activity only on days when wind speeds would be low and blowing from the site towards that sidewalk. Potential annual impacts could occur on the sidewalks immediately adjacent to the construction fence, mainly to the south of the site, near the areas where peak activity would occur in Phase I, and possibly for a single year in Phase II. Potential short-term impacts at residential locations would be unlikely, and if they did occur would be for a single day at ground-floor residential windows on Pacific Street between Flatbush and Fourth Avenue, and possibly a single day at a single ground-floor residential on Dean Street between Flatbush Avenue and 6th Avenue. Potential annual impacts at ground-floor residential locations could occur for one year on Pacific Street between Flatbush and Fourth Avenue and at a single ground-floor residential location on Dean Street adjacent to Building 15. Due to the extensive measures incorporated in the proposed project construction program aimed at reducing $PM_{2.5}$ emissions, this low level of impact is comparable to increments predicted for many standard small-scale construction operations and would be much lower than impacts of standard construction operations of a similar size.

For these reasons, no significant adverse impacts on air quality are predicted during the construction of the proposed project.

NOISE AND VIBRATION

NOISE

Introduction

Impacts on community noise levels during construction of the proposed project can result from noise and vibration from construction equipment operation and from construction vehicles and delivery vehicles traveling to and from the site. Noise and vibration levels at a given location are dependent on the kind and number of pieces of construction equipment being operated, the acoustical utilization factor of the equipment (i.e., the percentage of time a piece of equipment is operating), the distance from the construction site, and any shielding effects (from structures such as buildings, walls, or barriers). Noise levels caused by construction activities would vary widely, depending on the phase of construction and the location of the construction relative to receptor locations. Absent blasting and/or rock removal (which is not anticipated for the proposed project), the most significant construction noise sources are expected to be impact equipment such as jackhammers, pile drivers, impact wrenches, and paving breakers, as well as the movements of trucks and cranes.

Noise from construction activities and some construction equipment is regulated by the New York City Noise Control Code and by the U.S. Environmental Protection Agency (USEPA). The New York City Noise Control Code, as amended December 2005 and effective July 1, 2007, requires the adoption and implementation of a noise mitigation plan for each construction site, limits construction (absent special circumstances as described below) to weekdays between the hours of 7 AM and 6 PM, and sets noise limits for certain specific pieces of construction equipment. Construction activities occurring after hours (weekdays between 6 PM and 7 AM and on weekends) may be authorized by the Commissioner of the NYCDEP in the following circumstances: (i) emergency conditions; (ii) public safety; (iii) construction projects by or on behalf of city agencies; (iv) construction activities with minimal noise impacts; and (v) where there is a claim of undue hardship resulting from unique site characteristics, unforeseen conditions, scheduling conflicts and/or financial considerations. The USEPA requirements mandate that certain classifications of construction equipment meet specified noise emissions standards.

Given the scope and duration of construction activities for the proposed project, a quantified construction noise analysis was performed. The purpose of this analysis was to determine if significant adverse noise impacts would occur during construction, and if so, to examine the feasibility of implementing mitigation measures to reduce or eliminate such impacts.

As noted in the DEIS, potential significant adverse noise impacts from construction were identified at the upper floors of certain residential buildings on the north side of Atlantic Avenue and potentially on streets north of Atlantic Avenue. For the FEIS, the need for and feasibility of mitigation at these locations were further analyzed. Since the issuance of the DEIS, additional noise monitoring was also undertaken. Also, the evaluation of construction noise impacts with the modified building program for the proposed project was performed.

Construction Noise Impact Criteria

The *CEQR Technical Manual* states that significant noise impacts due to construction would occur "only at sensitive receptors that would be subjected to high construction noise levels for an extensive period of time." In general, this has been interpreted to mean that such impacts would occur only at sensitive receptors where high noise levels would occur for 2 years or longer. In addition, the *CEQR Technical Manual* states that impact criteria for vehicular sources, using existing noise levels as the baseline, should be used for assessing construction impacts. See Chapter 15, "Noise" for an explanation of noise measurement and sound levels. The criteria are as follows:

> If the existing noise levels are less than 60 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period, the threshold for a significant impact would be an increase of at least 5 dBA $L_{eq(1)}$. For the 5 dBA threshold to be valid, the resulting proposed action condition noise level with the proposed action would have to be equal to or less than 65 dBA. If the existing noise level is equal to or greater than 62 dBA $L_{eq(1)}$, or if the analysis period is a nighttime period (defined in the CEQR criteria as being between 10 PM and 7 AM), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$. (If the Existing noise level is 61 dBA $L_{eq(1)}$, the maximum incremental increase would be 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold.)

These impact criteria, as suggested in the *CEQR Technical Manual*, were used for assessing impacts from mobile and on-site construction activities.

Selection of Noise Receptor Sites

Eighteen sites, near to the project site were selected as discrete noise receptor sites for the construction noise analysis. Many of these sites are located directly adjacent to the project site. Each receptor site is the location of a residence or other noise sensitive use. At some locations (e.g., site 9, 9b, 9c) noise receptors were analyzed at adjacent/nearby properties and multiple elevations—at street level and at upper story elevations. Figure 17c-1 shows the location of the 18 noise receptor locations. These sites are representative of other sensitive noise receptors in the immediate project area, and are the locations where maximum project impacts due to construction noise would be expected.

These 18 receptor sites were not the only locations analyzed in the nearby community. In addition to these 18 site-specific noise receptor sites, noise contours depicting the incremental noise due to construction activities (both on-site construction equipment operation and construction-related traffic) were developed for the area surrounding the project site.

DETERMINATION OF EXISTING NOISE LEVELS

Noise Monitoring

Existing noise levels at receptors in the study area were determined based upon a combination of field measurements and computer modeling. A combination of continuous and 20-minute measurements was made. For the weekday construction period between 7:00 am and 11:00 pm, continuous noise measurements were made at receptor sites 1 through 7 on March 20, 23, 29, 30, and at Site 15 on May 22, 2006. 20-minute noise measurements were made at Sites 8, 11, 13 and 14 on May 22, 2006. For the Saturday daytime construction period between 7:00 am and 6:00 pm, continuous noise measurements were made at receptor sites 2 and 15 on April 8 and May 20, 2006, respectively, and additional 20-minute measurements were made on Saturday April 8, 2006 at receptor sites 1, 3, 4, 5, 6 and 7, and on May 20, 2006 at receptor sites 8, 11, 13 and 14, to obtain weekend noise levels. An additional continuous measurement was made at receptor site 11 on Friday, October 13 to Sunday, October 15, 2006. Noise measurements were not performed at receptor sites 9, 10, 12, 16, 17 and 18, but measured existing noise levels at nearby sites with comparable noise sources (i.e., traffic levels) are used for these noise receptor sites (i.e., measured noise levels at receptor site 7 were assumed to be applicable for receptor sites 9 and 10, measured noise levels at receptor site 2 were assumed to be applicable for receptor sites 12 and 16, measured noise levels at receptor site 3 were assumed to be applicable for receptor site 17, and measured noise levels at receptor site 11 were assumed to be applicable for receptor site 18).

The noise measurements were made using a Brüel & Kjær Model 2260 sound level meter. The instrument was mounted at a height of 5 feet above the ground surface and at least 6 feet away from any large sound-reflecting surface to avoid major interference with sound propagation. The meter was calibrated before and after readings with a Brüel & Kjær Type 4231 sound level calibrator using the appropriate adaptor. Measurements at each location were made on the A-scale (dBA). Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. A windscreen was used during all sound measurements, except for calibration. Weather conditions were noted to ensure a true reading using limits as follows: wind speed under 15 mph; relative humidity under 90 percent; and temperature above 14°F and below 122°F. All measurement procedures conformed to the requirements of ANSI Standard S1.13-1971 (R1976).

Hours of Construction

The new New York City Noise Control Code limits construction activities to weekdays between 7 AM and 6 PM. As discussed in earlier in this chapter under "Hours of Work", it is anticipated that construction activities for the buildings and the arena would generally take place Monday through Friday with a few exceptions. Construction work would generally begin at 7 AM and end at 3:30 PM on weekdays, with extended shifts for specific trades to complete some specific tasks beyond normal work hours (generally until about 6 PM). Occasionally, evening and night work (weekday 2nd shift) would be required (until 11 PM), and in these instances the project sponsors would seek variances to work beyond normal work hours as required by the new New York City Noise Control Code. The work during the weekday 2nd shift time period would be much less frequent, but would occur with sufficient regularity to necessitate an analysis of noise impacts during this time period. In addition, weekend work would occur, with typical weekend workday on a Saturday starting at 7 AM and finishing by 5 PM, with sufficient regularity to necessitate an analysis of noise impacts during this time period.

Existing Noise Levels

In order to address the potential noise impacts from weekday, 2nd shift weekday and weekend work, baseline noise measurements were taken for these periods. Table 17c-1 show the lowest measured one-hour L_{eq} and L_{10} monitoring noise levels for the three time period of concern for the construction noise analysis—weekday (normal) daytime time period—7:00 AM-3:30 PM, weekday night (2nd shift) time period—3:30 PM-11:00 PM, and weekend daytime time period—7:00 AM-6:00 PM. These are the three time periods when construction activities would occur and are the three time periods used for the construction noise analysis. While at times there would be an extended shift on weekdays past the 3:30 PM shift, this would involve less construction activity than the weekday daytime shift. Therefore, the weekday daytime shift was conservatively applied to represent impacts from 7 AM to 6 PM, and the weekday night (2nd) shift was utilized to assess impacts from 6 PM to 11 PM on weekdays.

Table 17c-1
Existing Noise Levels—Lowest Values (dBA)

Receptor	Location	Time	$L_{eq(1)}$	$L_{10(1)}$
1	Pacific Street between Flatbush and 4th Avenues	Weekday Daytime	60.8	63.5
		Weekday (2nd shift) Nighttime	58.6	61.0
		Saturday Daytime	63.3	66.0
2	Flatbush Avenue at Dean Street	Weekday Daytime	71.8	75.0
		Weekday (2nd shift) Nighttime	70.4	72.7
		Saturday Daytime	69.6	72.2
3	Dean Street between Flatbush and 6th Avenues	Weekday Daytime	64.7	66.8
		Weekday (2nd shift) Nighttime	61.6	63.0
		Saturday Daytime	60.6	61.6
4	Pacific Street between Carlton and 6th Avenues	Weekday Daytime	63.9	65.6
		Weekday (2nd shift) Nighttime	61.5	62.8
		Saturday Daytime	58.6	60.6
5	Dean Street between Vanderbilt and Carlton Avenues	Weekday Daytime	67.5	69.6
		Weekday (2nd shift) Nighttime	63.7	65.8
		Saturday Daytime	66.9	68.7
6	Vanderbilt Avenue between Pacific and Dean Streets	Weekday Daytime	68.6	71.6
		Weekday (2nd shift) Nighttime	65.7	69.4
		Saturday Daytime	65.3	69.8
7	Atlantic Avenue between Clermont and Carlton Avenues	Weekday Daytime	73.5	77.1
		Weekday (2nd shift) Nighttime	71.7	76.4
		Saturday Daytime	70.9	75.2
7a*	Vanderbilt Avenue between Fulton Street and Atlantic Avenue	Weekday Daytime	67.4	71.0
		Weekday (2nd shift) Nighttime	64.8	69.5
		Saturday Daytime	63.6	67.9
8	4th Avenue between Atlantic Avenue and Pacific Street	Weekday Daytime	69.8	72.3
		Weekday (2nd shift) Nighttime	67.9	70.5
		Saturday Daytime	69.6	72.2
9*	Atlantic Avenue between South Oxford and Cumberland Streets	Weekday Daytime	73.5	77.1
		Weekday (2nd shift) Nighttime	71.7	76.4
		Saturday Daytime	70.9	75.2
9b*	Academy Park Place between South Elliot Place and South Portland Avenue	Weekday Daytime	60.3	65.0
		Weekday (2nd shift) Nighttime	57.0	61.3
		Saturday Daytime	58.9	61.7
9c*	Academy Park Place between South Elliot Place and South Portland Avenue	Weekday Daytime	58.3	63.0
		Weekday (2nd shift) Nighttime	55.0	59.3
		Saturday Daytime	56.9	59.7
10*	Atlantic Avenue between Clermont and Carlton Avenues	Weekday Daytime	73.5	77.1
		Weekday (2nd shift) Nighttime	71.7	76.4
		Saturday Daytime	70.9	75.2
10a*	Atlantic Avenue between Clermont and Carlton Avenues	Weekday Daytime	65.4	69.0
		Weekday (2nd shift) Nighttime	63.4	68.1
		Saturday Daytime	61.7	66.0
10b*	Atlantic Avenue between Clermont and Carlton Avenues	Weekday Daytime	61.6	65.2
		Weekday (2nd shift) Nighttime	58.7	63.4
		Saturday Daytime	57.8	62.1
10c*	Carlton Avenue between Fulton Street and Atlantic Avenue	Weekday Daytime	64.0	67.6
		Weekday (2nd shift) Nighttime	61.8	66.5
		Saturday Daytime	60.0	64.3
10d*	Carlton Avenue between Fulton Street and Atlantic Avenue	Weekday Daytime	65.2	68.8
		Weekday (2nd shift) Nighttime	62.6	67.3
		Weekday Daytime	60.6	64.9
11	Hanson Place between South Oxford and Cumberland Streets	Weekday (2nd shift) Nighttime	71.7	76.4
		Saturday Daytime	70.9	75.2
		Saturday Daytime	55.9	58.7

Table 17c-1 (cont'd)
Existing Noise Levels—Lowest Values (dBA)

Receptor	Location	Time	$L_{eq(1)}$	$L_{10(1)}$
12*	Pacific Street at Flatbush Avenue	Weekday Daytime	71.8	75.0
		Weekday (2nd shift) Nighttime	70.4	72.7
		Saturday Daytime	69.6	72.2
13	Dean Street between 4th and 5th Avenues	Weekday Daytime	62.0	64.8
		Weekday (2nd shift) Nighttime	59.1	62.1
		Saturday Daytime	64.3	66.2
14	Carlton Avenue between Pacific and Dean Streets	Weekday Daytime	63.8	67.1
		Weekday (2nd shift) Nighttime	59.1	62.6
		Saturday Daytime	60.4	63.7
15	Bergen Street between Carlton and Vanderbilt Avenues	Weekday Daytime	65.2	68.7
		Weekday (2nd shift) Nighttime	60.2	64.5
		Saturday Daytime	64.5	68.9
16*	Flatbush Avenue at Pacific Street	Weekday Daytime	71.8	75.0
		Weekday (2nd shift) Nighttime	70.4	72.7
		Saturday Daytime	69.6	72.2
17*	Dean Street between 6th and Carlton Avenues	Weekday Daytime	64.7	66.8
		Weekday (2nd shift) Nighttime	61.6	63.0
		Saturday Daytime	60.6	61.6
18*	South Oxford Street Park	Weekday Daytime	59.9	64.6
		Weekday (2nd shift) Nighttime	57.4	61.7
		Saturday Daytime	58.7	61.5

Notes:
Field measurements were performed by ARKF, Inc. on March 20, 23, 29, 30, and April 9, and May 20, 22, 2006, and October 13 – 15, 2006.
***** The lowest existing noise levels were developed at these receptor sites using comparable measured existing noise levels at similar receptor sites and the difference in predicted existing levels for each receptor in the TNM (i.e., Site 7 represents Sites 7a, 9 and 10, 10a, 10b, 10c, 10d, Site 2 represents Sites 12 and 16, and Site 3 represents Site 17, and Site 11 represents Sites 9b, 9c, and 18).

Measured values for the entire measurement program are provided in Appendix 17c. Weekday daytime values in this table are representative for the normal weekday work shift (including the extended shift to 6 PM), weekday nighttime for the 2nd shift, and weekend for the weekend daytime shift.

At all of the measurement sites traffic was the dominant noise source, and the measured noise levels reflect the level of traffic on adjacent streets. In general, noise levels at major heavily trafficked high capacity through-streets (such as Flatbush Avenue and Atlantic Avenue) are relatively high, noise levels at moderately trafficked high-capacity through streets (such as Vanderbilt Avenue) are moderate, and noise levels at minor local residential streets (such as Pacific Street, and Dean Street) are relatively low.

NOISE ANALYSIS METHODOLOGY

Construction activities for the proposed project would be expected to result in increased noise levels as a result of: (1) the operation of construction equipment on-site; and, (2) the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. The effect of each of these noise sources was evaluated. The results presented show the total cumulative impacts due to operational effects (caused by project-generated vehicular trips as various components of the total project begin to function after the completion of Phase I) and construction effects (as work proceeds on uncompleted components of the project).

In general noise due to the operation of construction equipment on-site at a specific receptor location near a construction site is calculated by computing the sum of the noise produced by all pieces of equipment operating at the construction site. For each piece of equipment the noise levels at a receptor site is a function of:

- the noise emission level of the equipment;
- a usage factor, which accounts for the percentage of time the equipment is operating;
- the distance between the piece of equipment and the receptor;
- topography and ground effects; and
- shielding.

Similarly, noise levels due to traffic are a function of:

- the noise emission levels of the type of vehicle (i.e., auto, light-duty truck, heavy-duty truck, bus, etc.)
- vehicular speed;
- the distance between the roadway and the receptor;
- topography and ground effects; and
- shielding.

The analysis assumes a confluence of worst-case conditions—peak project-generated traffic, peak construction, and lowest ambient noise levels for no build conditions. This methodology results in a conservative estimate of impacts, particularly on weekends for Phase II, when the analysis assumes a full arena event together with construction activities.

Model Selection and Development

Noise effects due to construction activities were evaluated using the Cadna A model. The Cadna A model is a computerized model developed by DataKustik for noise prediction and assessment. The model can be used for the analysis of a wide variety of noise sources including stationary sources (i.e., construction equipment, industrial equipment, power generation equipment, etc.), transportation sources (i.e., roads, highways, railroad lines, busways, airports, etc.) and other specialized sources (i.e., sporting facilities, etc.) The model takes into account the noise power levels of the noise sources, attenuation with distance, ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The Cadna A model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2. This standard is currently under review for adoption by the American National Standards Institute as an American Standard. The Cadna A model is a state-of-the-art analysis for noise analysis.[1]

Geographic input data used with the Cadna A model included CAD drawings which defined site work areas, adjacent building footprints and heights, locations of streets, and locations of sensitive receptors. For each analysis period, the geometric location and operational characteristics including equipment usage rates (percentage of time equipment is used) for each piece of construction equipment operating at the project site, as well as noise control measures, were input to the model. In addition, reflections

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[1] An initial screening analysis was performed to compare the results obtained using the Cadna A model with a simple spreadsheet model for construction equipment. Both models yielded $L_{eq(1)}$ values that were within 0-2 dBA. Similarly, a screening analysis was performed to compare the results obtained using the Cadna A model with the TNM model for construction truck traffic. Again, both models yielded $L_{eq(1)}$ values that were within 0-2 dBA.

and shielding by barriers erected on the construction site, as well as shielding due to both adjacent buildings and project buildings, as they were constructed, were accounted for in the model. In addition, construction-related vehicles were assigned to the adjacent roadways. The model produced A-weighted $L_{eq(1)}$ noise levels at each receptor location, for each analysis period, which showed the noise level at each receptor location, as well as the contribution from each noise source.

Analysis Periods

Separate analyses were performed to examine potential noise impacts during each year of the anticipated 10-year construction period. To be conservative, for each analysis year the 3 month time period with the most intensive construction operations taking place was analyzed. Noise levels and noise impacts during other time periods would be lower than the period analyzed. Table 17c-2 shows the quarter year period used within each analysis year. Three analysis time periods have been examined for each analysis year—normal weekday daytime construction activities (representative for 7 AM to 6 PM), weekday (2nd shift) nighttime operations (representative for 6 PM to 11 PM), and Saturday operations (occurring between 7 AM and 5 PM). The expected amount of construction activity for each of these respective time periods was included in these analysis periods.

Table 17c-2
Analysis Periods

Year	Quarter
2007	3rd
2008	4th
2009	1st
2010	1st
2011	3rd
2012	1st
2013	1st
2014	1st
2015	2nd
2016	1st

Noise Reduction Measures

An iterative approach was followed in performing the construction noise analyses. Initially, computations were performed assuming typical construction equipment operation, minimal use of sound barriers, and equipment placement on-site with no consideration of potential noise impacts. Based upon these initial computations, a program was developed to identify and develop practical measures for incorporation into the project to substantially reduce potential construction noise impacts. This program included:

- Source controls;
- Path controls; and
- Receptor controls.

In terms of **source controls** (e.g., reducing noise levels at the source or during most sensitive time periods), six types of measures were examined and would be implemented:

- The project sponsors have committed to utilizing equipment that meets the sound level standards for equipment (specified in Subchapter 5 of the new New York City Noise Control Code) from the start of construction activities and using a wide range of equipment, including construction trucks, that produces lower noise levels than typical construction equipment

(Table 17C-3 shows the noise levels for typical construction equipment and the mandated noise levels for the equipment that would be used for construction of the Atlantic Yards);

- Where feasible, the project sponsors would use quiet construction procedures, and equipment (such as generators, hydraulic lift vehicles, trucks, and tractor trailers) quieter than that required by the New York City Noise Control Code;
- Generally, the project sponsors would schedule and perform the most noisy work during weekday daytime hours (and not during weekday nighttime or weekend hours);
- Generally, the project sponsors would schedule equipment and material deliveries during weekday daytime hours, and not during weekday nighttime or weekend hours;
- As early in the construction period as practicable, diesel-powered equipment would be replaced with electrical-powered equipment, such as electric scissor lifts and electric articulating boom lifts (i.e., early electrification); and
- The project sponsors would require all contractors and subcontractors to properly maintain their equipment and have quality mufflers installed.

In terms of **path controls** (e.g., placement of equipment, implementation of barriers between equipment and sensitive receptors), three types of measures were examined and would be implemented to the extent feasible:

- Noisy equipment, such as generators, cranes, tractor trailers, concrete pumps, concrete trucks and dump trucks, would be located at locations which are away from sensitive receptor locations and are shielded from sensitive receptor locations (For example, during the early construction phase of work delivery trucks and dump trucks would be located approximately 20 feet below grade to take advantage of shielding benefits. Once building foundations are completed, delivery trucks would be located adjacent to noisy streets—Atlantic Avenue, Flatbush Avenue, 6th Avenue, etc.—rather than at quieter streets—such as Dean Street and Pacific Street—where there are residences. In addition, delivery trucks would operate behind noise barriers;
- Noise barriers would be utilized to provide shielding (i.e., the construction sites would have a minimum 8-foot barrier, with a 16-foot barrier adjacent to sensitive locations—on locations along Pacific Street, Dean Street, and Flatbush Avenue opposite residences and the Brooklyn Bear's Pacific Street Community Garden —and truck deliveries would take place behind these barriers once building foundations are completed);
- Noise curtains and equipment enclosures would be utilized to provide shielding to sensitive receptor locations[1].

As discussed below in the mitigation portion of this construction noise analysis section and in Chapter 19, "Mitigation", in terms of **receptor controls** (e.g., measures at sensitive receptors to reduce sound levels at these locations), at residences, where the source and path controls listed above are not sufficient to prevent significant adverse noise impacts from occurring, and where the residences do not contain both double-glazed or storm-windows and alternative ventilation (e.g.. air

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[1] Although temporary noise curtains and barriers would be employed where feasible and practical, no credits where taken for the attenuation provided by this measure in terms of the noise analysis.

Table 17c-3
Construction Equipment Noise Emission Levels

Atlantic Yards Equipment	FTA (or FHWA) Typical Noise Level (dBA) at 50 feet	Atlantic Yards Analysis Noise Level (dBA) at 50 feet
Air Monitoring Equipment	70	70
Asphalt Paver	89	85*
Asphalt Roller	74	74
Backhoe	80	80
Bar Bender	80	80
Boom Trucks/MTL Deliveries	85	85
Bulldozer	82	82
Chain Saws	85	85
Cherry Picker 35-55 ton	85	85
Compactor	82	82
Compressors	81	75*
Concrete Pumps	82	82
Concrete/Grout Pumps	82	82
Concrete Trucks (10Cy)	85	80**
Construction Hoist/Elevators	70	70
Crane - Demolition Attachment	88	85*
Crawler Service Crane (100T)	83	83
Diamond Saws	76	76
Drill Rigs	84	84
Drill Rigs 14"- 48" dia	85	85
Dump Trucks	88	80**
Dumpster/Rubbish Removal (30Cy)	85	77*
Excavator .5 - 5 CY	85	85
Excavators	85	85
Excavators w/ Hoe Ram (Pneumatic)	85	85
Excavators/Backhoes	85	85
Front End Loader	80	80
Front End Loader 1- 3.5 CY	80	80
Fuel Trucks	80	80
Generators	81	70**
Generators (25 KVA)	81	81
Hand Tools/Hammers	70	70
Hoe Rams	90	85*
Hyd. Truck Crane 125-160 ton	83	83
Hydraulic Cranes -45t	83	83
Hydraulic Cranes -90t	83	83
Hydraulic Grippers	85	85
Hydraulic Lift Vehicle (Gasoline)	85	63****
Impact Wrenches (Compressed Air)	85	85
Jack Hammers (90lbs. Compressed Air)	85	71*
Lift Booms/Scissor Lifts (Elect)	85	65**
Loader	85	85
Manitowoc 999/2250	85	85
Pavement Milling/Reclaimer	89	85*
Pick-Up Trucks	55	55
Power Actuated Hammers	88	88
Rack Trucks	85	80**
Roller/Compactor	74	74
Rubber Tire Loader	85	85
Saws	76	76
Service/Utility Fuel Trucks	55	55
Sledge hammers	85	85
Sonic Drill Rigs	84	84
Straight Truck 6 wheel rack/fuel/water	85	80**
Street Cleaner	85	85
Tie-Back Drill Rig	84	84
Tower Cranes	83	83
Tractor Trailers	84	80**
Transformer (1000AMP)	50	50
Water Pumps	76	76
Water Trucks	55	55
Welders (480V)	73	73

Note:
* NYC Noise Code, effective on July 1, 2007.
** Project mandated quieter equipment.
Source: Transit Noise and Vibration Impact Assessment, FTA, May 2006, and FHWA Roadway Construction Noise Model (FHWA RCNM), 2006.

conditioning), the project sponsors would make these mitigation measures available, by purchasing and installing at no cost to the owners of residences. At non-residential locations, such as open space, receptor controls such as sound barriers may not be feasible because of safety and aesthetic concerns.

CONSTRUCTION NOISE ANALYSIS RESULTS

Using the methodology described above, and utilizing the noise abatement measures described for source and path controls above, noise analyses were performed to determine maximum one-hour equivalent ($L_{eq(1)}$) noise levels that would be expected to occur during each year of construction at each of the receptor sites for each of three analysis time periods. Tables 17c-4, 5, and 6 show the maximum predicted peak hour of activity construction noise results for weekday daytime, weekday 2nd shift, and Saturday analysis time periods, respectively. Sites 7a, 9b-c, 10a-d were included as part of the evaluation in the FEIS for the need and feasibility of mitigation at upper floors of residential buildings on the north side of Atlantic Avenue and potentially on streets north of Atlantic Avenue. These include the nearby NYCHA Atlantic Terminal Houses and the HDC apartment buildings. Each table shows the following for each receptor site:

- existing noise levels;
- maximum predicted build noise levels which are the sum of noise due to construction activities (i.e., noise generated by on-site construction activities [assuming maximum construction activities during the analysis time period], and noise generated by construction vehicles traveling to and from the project site during the hour which generated the maximum number of construction vehicles), and noise due to traffic on the adjacent street,[1] and
- maximum predicted increases in noise levels based upon comparing the Build noise levels with estimated noise levels without the proposed project.

Locations where noise levels exceed the CEQR impact criteria (i.e., results in an increase of more than 3-5 dBA) are shown in bold. For impact determination purposes, significant adverse noise impacts were based on whether maximum predicted incremental off-site noise levels at sensitive receptor locations would be greater than the impact criteria suggested in the *CEQR Technical Manual* for 2 consecutive analysis periods or more. While increases exceeding the CEQR impact criteria for 1 year or less may be noisy and intrusive, they were not considered to be significant adverse noise impacts.

The format of Table 17c-7 has been revised for the FEIS. Table 17c-7 summarizes the locations, time periods (i.e., weekday daytime, weekday nighttime, and Saturday daytime), and phases of construction when noise levels would exceed the CEQR impact criteria and result in a potential significant adverse noise impact, provides information concerning the floors where significant adverse impacts would be expected to occur; and lists the major noise sources producing the increased noise levels at the receptor location. The site specific results are indicative of street segments where impacts would occur and provide a basis for determining the extent of project impacts. For example, the results obtained for receptor sites 3 and 5 are indicate of the results on Dean Street from Flatbush to Vanderbilt Avenues.

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[1] Noise due to traffic on adjacent streets was estimated based upon proportional modeling using existing conditions and the results from the analyses presented in Chapter 15 for the years 2011 and 2016.

Table 17c-4
Construction Noise Analysis Results (Weekday Daytime Leq(1) (in dBA))

Noise Receptor	Receptor Height	Existing	Phase I										Phase II									
			2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
			Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase
1	1st floor	60.8	70.7	**9.8**	76.6	**15.7**	73.4	**12.4**	62.3	1.3	62.0	0.9	62.0	0.8	62.0	0.7	62.1	0.7	62.3	0.8	62.4	0.8
	3rd floor	60.8	75.9	**15.1**	77.3	**16.4**	74.7	**13.8**	63.1	2.1	59.4	-1.6	59.3	-1.8	59.2	-2.0	59.2	-2.2	59.5	-2.0	59.6	-2.0
2	1st floor	71.8	73.9	2.0	75.8	**3.8**	75.1	**3.0**	72.6	0.4	74.3	2.0	74.4	2.0	74.3	1.9	74.5	2.0	74.9	2.4	75.2	2.6
	3rd floor	71.8	75.9	**4.0**	76.6	**4.6**	76.1	**4.0**	72.6	0.4	74.1	1.8	74.3	1.9	74.2	1.8	74.5	2.0	74.8	2.3	75.1	2.5
3	1st floor	64.7	69.8	**5.0**	72.7	**7.8**	72.1	**7.0**	67.6	2.4	70.9	**5.6**	69.9	**4.6**	69.0	**3.8**	69.1	**3.9**	69.7	**4.6**	69.8	**4.7**
	3rd floor	64.7	75.2	**10.4**	75.8	**10.9**	75.6	**10.5**	71.0	**5.8**	70.9	**5.6**	69.8	**4.5**	68.8	**3.6**	68.9	**3.7**	69.4	**4.3**	69.6	**4.5**
4	1st floor	63.9	66.7	2.7	68.7	**4.7**	68.1	**4.0**	71.7	**7.6**	73.8	**9.6**	70.8	**6.6**	67.9	**3.6**	64.8	0.5	66.4	2.1	66.3	1.9
	3rd floor	63.9	68.4	**4.4**	70.4	**6.4**	69.3	**5.2**	77.9	**13.8**	74.8	**10.6**	73.3	**9.1**	67.9	**3.6**	65.5	1.2	67.3	**3.0**	67.4	**3.0**
5	1st floor	67.5	68.1	0.4	68.1	0.3	68.3	0.3	68.5	0.4	71.0	2.7	70.7	2.4	70.2	1.8	70.0	1.6	72.2	**3.8**	72.9	**4.4**
	3rd floor	67.5	68.4	0.8	68.3	0.5	68.4	0.5	68.7	0.6	73.3	**5.1**	73.0	**4.8**	71.0	2.7	71.8	**3.5**	76.1	**7.8**	74.5	**6.1**
6	1st floor	68.6	69.3	0.6	70.8	2.0	71.0	2.2	69.5	0.6	70.6	1.6	70.8	1.8	69.7	0.7	70.1	1.0	75.1	**6.0**	72.3	**3.2**
	3rd floor	68.6	70.3	1.6	71.0	2.2	71.1	2.3	69.7	0.8	72.9	**3.9**	72.9	**3.9**	70.6	1.6	71.5	2.4	76.1	**7.0**	73.4	**4.3**
7	1st floor	73.5	74.3	0.7	74.4	0.8	74.4	0.7	74.2	0.5	75.5	1.7	75.3	1.4	75.6	1.6	81.3	**7.1**	75.5	1.2	75.6	1.2
	3rd floor	73.5	74.6	1.0	74.6	1.0	74.6	0.9	74.3	0.6	76.1	2.3	75.9	2.0	75.8	1.8	81.2	**7.0**	75.6	1.3	75.7	1.3
7a	1st floor	67.4	68.0	0.6	67.5	0.2	67.5	0.2	67.3	0.1	68.2	1.0	68.2	0.9	68.0	0.6	68.0	0.5	69.9	2.4	70.4	2.8
	3rd floor	67.4	67.7	0.4	67.6	0.3	67.6	0.4	67.3	0.1	68.6	1.5	68.7	1.5	68.1	0.8	68.7	1.3	70.8	**3.3**	70.6	**3.0**
	6th floor	67.4	68.1	0.8	68.0	0.7	68.1	0.9	67.5	0.3	69.6	2.5	69.6	2.4	68.6	1.3	70.0	2.6	71.6	**4.1**	70.9	**3.3**
8	1st floor	69.8	72.6	2.7	72.5	2.5	72.9	2.8	70.6	0.4	71.2	0.9	71.3	0.9	71.4	0.9	71.5	0.8	71.6	0.8	71.7	0.8
9	1st floor	73.5	74.5	0.9	74.7	1.0	74.7	1.0	75.0	1.2	76.8	2.9	74.8	0.8	74.7	0.7	74.7	0.6	75.0	0.8	75.1	0.9
	3rd floor	73.5	74.9	1.3	75.2	1.5	75.0	1.3	75.8	2.0	77.2	**3.3**	75.0	1.0	74.7	0.7	74.9	0.8	75.0	0.8	75.1	0.9
9b	1st floor	60.3	61.4	1.2	64.5	**4.4**	64.4	**4.4**	62.1	2.2	66.9	**7.1**	64.6	**4.7**	64.1	**4.2**	63.9	3.9	63.8	3.8	63.7	3.6
	15th floor	60.3	73.7	**13.4**	71.5	**11.3**	71.3	**11.1**	67.3	**7.2**	68.8	**8.7**	64.7	**4.9**	62.3	2.7	61.8	2.5	61.5	2.5	61.3	2.5
9c	1st floor	58.3	59.3	1.3	61.4	**3.7**	64.2	**6.7**	58.6	1.4	62.3	**5.4**	61.9	**5.0**	60.5	3.6	60.2	3.2	60.0	3.0	60.3	3.3
	15th floor	58.3	75.6	**17.3**	72.1	**13.8**	72.0	**13.7**	67.4	**9.1**	68.2	**9.9**	62.9	**5.1**	60.0	2.7	58.8	1.9	58.5	2.1	58.2	2.32.3
10	1st floor	68.1	69.4	1.2	69.4	1.2	69.4	1.1	69.5	1.2	72.2	**3.8**	71.4	2.9	71.6	**3.1**	72.0	**3.4**	70.3	1.6	70.4	1.7
	23rd floor	68.1	78.2	**10.0**	74.5	**6.3**	73.7	**5.4**	73.3	**5.0**	76.9	**8.5**	76.0	**7.5**	74.4	**5.8**	74.8	**6.1**	71.2	2.5	71.3	2.5
10a	1st floor	65.4	65.9	0.4	66.0	0.4	66.2	0.6	66.2	0.5	69.3	**3.5**	68.3	2.4	68.4	2.4	67.1	1.0	67.5	1.3	67.9	1.6
	26th floor	65.4	74.4	**8.9**	72.9	**7.4**	71.8	**6.2**	71.6	**6.0**	73.9	**8.2**	72.7	**6.9**	71.5	**5.7**	66.9	1.0	67.3	1.3	67.6	1.6
10b	1st floor	61.6	69.2	**7.6**	62.3	0.6	62.3	0.6	62.0	0.2	64.5	2.7	64.5	2.6	64.8	2.8	67.9	**5.8**	64.2	2.0	64.8	2.5
	26th floor	61.6	72.2	**10.6**	66.4	**4.8**	66.5	**4.8**	65.1	3.4	70.4	**8.7**	70.2	**8.4**	64.7	2.7	72.3	**10.2**	67.0	**4.8**	67.2	**4.8**
10c	1st floor	64.0	64.7	0.6	64.6	0.5	64.7	0.5	64.7	0.5	67.4	**3.1**	67.0	2.6	67.5	2.9	66.7	2.0	66.2	1.4	66.7	1.7
	15th floor	64.0	68.8	**4.8**	69.1	**5.0**	68.4	**4.3**	67.9	**3.7**	71.0	**6.8**	70.0	**5.7**	69.3	**4.9**	65.6	1.1	66.2	1.6	66.5	1.8
10d	1st floor	65.2	66.4	1.1	65.7	0.4	65.8	0.4	65.6	0.2	67.3	1.8	67.3	1.6	67.9	2.0	67.2	1.1	67.8	1.6	68.4	2.0
	15th floor	65.2	68.8	**3.6**	68.1	2.9	68.0	2.7	67.5	2.2	70.1	**4.8**	69.0	**3.5**	68.6	2.9	67.0	1.1	67.7	1.7	68.2	2.0
11	1st floor	57.5	60.6	3.1	61.7	4.3	62.8	**5.4**	61.1	3.8	66.5	**9.2**	62.6	**5.2**	58.7	1.2	58.8	1.2	58.5	0.9	58.7	1.0
	3rd floor	57.5	59.7	2.3	64.0	**6.7**	63.9	**6.6**	61.8	4.6	66.8	**9.7**	62.9	**5.7**	59.8	2.5	60.2	2.8	58.5	1.1	58.7	1.2
12	1st floor	71.8	73.6	1.8	74.8	2.9	75.0	**3.1**	72.2	0.2	72.6	0.6	72.8	0.7	72.9	0.7	73.1	0.8	73.4	1.0	73.6	1.1
	3rd floor	71.8	75.8	**3.9**	75.6	**3.7**	75.8	**3.8**	72.4	0.4	72.3	0.2	72.5	0.3	72.5	0.2	72.8	0.4	73.0	0.5	73.3	0.7
13	1st floor	62.0	64.2	2.2	66.8	**4.8**	68.3	**6.2**	63.5	1.4	63.1	1.0	63.2	1.0	62.4	0.2	62.5	0.2	62.9	0.5	63.1	0.7
	3rd floor	62.0	65.2	**3.2**	68.6	**6.5**	69.6	**7.5**	63.3	1.1	62.8	0.6	62.9	0.6	62.2	-0.1	62.3	-0.1	62.7	0.2	62.9	0.4
14	1st floor	63.8	66.4	2.4	68.1	**3.9**	68.2	**3.9**	67.4	2.9	70.3	**5.6**	70.2	**5.5**	77.7	**12.9**	66.4	1.6	67.6	2.8	67.6	2.7
	3rd floor	63.8	69.5	**5.5**	68.1	**3.9**	68.2	**3.9**	69.3	**4.8**	75.5	**10.8**	75.2	**10.4**	80.1	**15.3**	68.0	**3.1**	69.7	**4.8**	69.7	**4.7**
15	1st floor	65.2	66.2	0.9	69.8	**4.3**	70.1	**4.5**	67.0	1.3	68.4	2.5	68.1	2.2	67.5	1.6	67.2	1.3	67.4	1.5	69.5	**3.5**
	3rd floor	65.2	66.3	1.0	69.4	**3.9**	69.7	**4.1**	67.2	1.5	69.3	**3.4**	68.8	2.9	68.9	**3.0**	68.2	2.2	67.8	1.8	69.4	**3.6**
16	5 feet	71.8	74.3	2.4	76.3	**4.4**	75.2	**3.2**	72.5	0.5	73.5	1.4	73.7	1.5	73.7	1.4	74.0	1.6	74.2	1.7	74.5	1.9
17	5 feet	64.7	67.6	2.2	69.9	**3.9**	70.2	**3.5**	68.2	0.9	70.5	2.5	68.3	0.8	67.5	0.4	67.7	1.1	67.6	1.5	67.7	2.0
18	5 feet	59.9	62.9	3.0	63.2	3.4	64.3	4.5	63.3	3.6	67.0	**7.3**	63.1	3.3	60.6	0.7	60.5	0.5	60.9	0.9	61.2	1.1

Table 17c-5
Construction Noise Analysis Results (Weekday Nighttime Leq(1) (in dBA))

Noise Receptor	Receptor Height	Existing	Phase I										Phase II									
			2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
			Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase
1	1st floor	58.6	59.6	0.9	66.8	**8.0**	62.2	**3.2**	59.1	0.0	59.2	0.0	59.3	0.0	59.4	0.0	59.5	0.0	59.6	0.1	59.7	0.1
	3rd floor	58.6	60.4	1.7	68.2	**9.4**	62.6	**3.7**	59.1	0.1	56.5	-2.6	56.6	-2.6	56.6	-2.7	56.8	-2.6	56.9	-2.6	57.0	-2.6
2	1st floor	70.4	70.8	0.3	71.3	0.7	71.3	0.6	70.8	0.0	75.8	**4.9**	76.0	**4.9**	76.1	**4.8**	76.3	**4.8**	76.4	**4.7**	76.6	**4.7**
	3rd floor	70.4	71.2	0.7	71.6	1.0	71.7	1.0	70.8	0.0	75.7	**4.8**	75.9	**4.8**	76.0	**4.7**	76.2	**4.7**	76.3	**4.6**	76.5	**4.6**
3	1st floor	61.6	62.4	0.7	65.2	**3.4**	65.5	**3.7**	62.5	0.6	65.9	**3.9**	65.8	**3.7**	65.8	**3.6**	66.0	**3.7**	66.2	**3.8**	66.4	**3.9**
	3rd floor	61.6	63.9	2.2	65.5	**3.7**	68.5	**6.7**	65.0	**3.1**	66.0	**4.0**	65.7	**3.6**	65.7	**3.5**	65.9	**3.6**	66.1	**3.7**	66.3	**3.8**
4	1st floor	61.5	61.9	0.3	62.2	0.6	62.6	0.9	68.8	**7.1**	63.8	2.0	63.0	1.1	60.8	-1.2	58.6	-3.5	57.7	-4.4	57.0	-5.2
	3rd floor	61.5	62.0	0.4	62.4	0.8	62.5	0.8	75.4	**13.7**	64.7	2.9	65.5	**3.6**	60.8	-1.2	59.0	-3.1	58.2	-4.0	57.7	-4.6
5	1st floor	63.7	63.8	0.0	63.9	0.1	64.0	0.1	64.4	0.5	67.1	**3.1**	67.1	**3.1**	67.0	2.9	67.2	**3.1**	67.6	**3.5**	68.0	**3.8**
	3rd floor	63.7	63.8	0.0	63.9	0.1	64.0	0.1	64.8	0.9	68.9	**4.9**	68.8	**4.8**	67.4	**3.3**	68.0	**3.9**	69.0	**4.9**	68.1	**3.9**
6	1st floor	65.7	65.8	0.0	66.1	0.2	66.2	0.2	66.3	0.2	67.5	1.3	67.5	1.3	66.6	0.3	66.7	0.4	69.7	**3.4**	67.7	1.3
	3rd floor	65.7	65.8	0.0	66.1	0.2	66.2	0.3	66.4	0.4	68.7	2.6	68.7	2.5	66.7	0.5	67.3	1.0	70.3	**4.0**	68.1	1.7
7	1st floor	71.7	71.8	0.1	71.8	0.1	71.8	0.0	71.9	0.1	72.6	0.8	72.7	0.7	72.7	0.5	73.0	0.6	73.1	0.6	73.3	0.6
	3rd floor	71.7	71.8	0.1	71.8	0.1	71.8	0.1	71.9	0.2	72.9	1.2	73.0	1.1	72.6	0.5	73.1	0.8	73.0	0.6	73.2	0.6
7a	1st floor	64.8	64.9	0.0	65.0	0.0	65.1	0.1	65.1	0.0	65.5	0.3	65.7	0.4	65.8	0.5	66.1	0.7	67.0	1.6	67.2	1.7
	3rd floor	64.8	64.9	0.0	65.0	0.0	65.1	0.1	65.1	0.0	65.6	0.4	65.8	0.5	65.8	0.5	66.2	0.8	67.4	2.0	67.3	1.8
	6th floor	64.8	64.9	0.0	65.0	0.0	65.1	0.1	65.1	0.0	66.2	1.0	66.3	1.0	65.9	0.6	66.5	1.1	67.6	2.2	67.4	1.9
8	1st floor	67.9	68.1	0.1	69.1	1.0	68.5	0.4	68.2	0.0	68.5	0.2	68.7	0.3	69.0	0.5	69.2	0.6	69.4	0.8	69.7	1.0
9	1st floor	71.7	71.8	0.0	72.1	0.2	72.2	0.2	72.8	0.7	74.0	1.8	74.0	1.7	74.2	1.8	74.5	1.9	74.8	2.1	75.1	2.3
	3rd floor	71.7	71.9	0.1	72.1	0.2	72.2	0.2	73.3	1.2	74.2	2.0	74.0	1.7	74.2	1.8	74.5	1.9	74.8	2.1	75.1	2.3
9b	1st floor	57.0	57.0	0.1	57.2	0.5	57.4	0.8	57.7	1.3	60.4	**4.1**	59.1	2.7	59.2	2.7	59.3	2.7	59.4	2.8	59.5	2.8
	15th floor	57.0	63.3	**6.3**	61.5	**4.6**	62.1	**5.2**	62.1	**5.3**	61.3	**4.5**	58.8	2.3	57.2	1.0	56.9	0.9	56.8	1.1.	56.7	1.3
9c	1st floor	55.0	54.9	0.3	55.1	**0.9**	55.3	**1.5**	53.8	0.4	55.9	2.9	55.6	2.5	55.1	2.0	55.2	2.0	55.3	2.0	55.5	2.2
	15th floor	55.0	64.8	**9.8**	62.1	**7.1**	62.6	**7.5**	61.8	**6.7**	60.6	**5.5**	57.2	**2.6**	54.4	**0.4**	53.4	-0.1	53.1	0.2	52.6	0.2
10	1st floor	66.5	66.5	0.1	66.5	0.1	66.5	0.2	67.0	0.7	68.0	1.8	68.0	1.6	67.6	1.1	67.0	0.3	67.2	0.3	67.2	0.2
	23rd floor	66.5	66.7	0.2	66.7	0.2	66.8	0.4	69.0	2.6	71.2	**4.8**	71.1	**4.5**	68.8	2.1	67.7	0.8	67.7	0.7	67.8	0.6
10a	1st floor	63.4	63.4	0.0	63.5	0.1	63.5	0.1	63.7	0.3	64.3	0.9	64.4	0.9	64.3	0.8	63.9	0.3	64.0	0.3	64.1	0.4
	26th floor	63.4	64.1	0.7	64.1	0.7	64.3	0.8	67.9	**4.4**	66.7	**3.2**	67.0	**3.4**	66.1	2.5	64.1	0.4	64.1	0.4	64.2	0.4
10b	1st floor	58.7	58.8	0.0	58.9	0.0	59.0	0.1	59.1	0.1	60.9	1.8	61.0	1.8	60.5	1.3	60.7	1.4	60.2	0.8	60.5	1.1
	26th floor	58.7	58.7	0.0	58.8	0.1	58.8	0.1	58.9	0.2	66.1	**7.4**	65.7	**6.8**	59.7	0.6	61.6	2.3	61.7	2.2	61.7	2.0
10c	1st floor	61.8	61.9	0.1	61.9	0.0	62.0	0.1	62.3	0.3	63.0	1.0	63.1	1.0	63.1	1.0	62.6	0.4	62.7	0.5	62.8	0.5
	15th floor	61.8	62.2	0.4	62.4	0.5	62.6	0.7	64.6	2.6	65.0	3.0	65.1	3.0	63.8	1.6	62.9	0.6	63.0	0.7	63.2	0.8
10d	1st floor	62.6	62.6	0.0	62.7	0.0	62.8	0.1	62.8	0.0	63.5	0.7	63.6	0.7	63.6	0.7	63.3	0.3	63.4	0.4	63.5	0.4
	15th floor	62.6	63.0	0.4	63.1	0.4	63.2	0.5	64.3	1.5	64.8	2.0	64.7	1.8	63.8	0.9	63.4	0.4	63.5	0.5	63.6	0.5
11	1st floor	54.7	55.0	0.3	55.6	0.9	57.3	2.7	57.6	**3.0**	59.1	**4.5**	56.9	2.2	55.9	1.1	56.0	1.0	56.1	1.0	56.3	1.1
	3rd floor	54.7	54.8	0.2	56.3	1.8	57.6	**3.1**	58.0	**3.6**	59.8	**5.5**	57.2	2.8	55.7	1.2	55.6	1.0	55.7	1.0	55.9	1.1
12	1st floor	70.4	70.7	0.2	71.3	0.7	71.1	0.3	70.9	0.0	71.3	0.3	71.5	0.4	71.6	0.4	71.8	0.4	72.0	0.5	72.1	0.5
	3rd floor	70.4	71.0	0.5	71.6	1.0	71.2	0.5	70.8	0.0	70.9	0.0	71.1	0.1	71.2	0.0	71.4	0.1	71.6	0.2	71.7	0.1
13	1st floor	59.1	59.3	0.2	61.1	2.0	60.5	1.3	59.2	0.0	59.5	0.3	59.7	0.3	59.8	0.2	59.9	0.1	60.0	0.1	60.2	0.1
	3rd floor	59.1	59.5	0.4	61.8	2.6	61.0	1.8	59.3	0.0	59.4	0.1	59.6	0.1	59.7	0.1	59.9	0.1	60.0	0.0	60.2	0.1
14	1st floor	59.1	59.2	0.0	60.1	0.8	60.3	0.9	62.7	**3.2**	63.4	**3.8**	62.8	**3.1**	68.1	**8.4**	60.9	1.1	60.7	0.9	60.8	0.9
	3rd floor	59.1	59.2	0.0	59.9	0.6	60.1	0.8	64.0	**4.6**	68.3	**8.8**	67.9	**8.3**	70.2	**10.6**	61.3	1.6	60.5	0.8	60.6	0.8
15	1st floor	60.2	60.3	0.0	61.3	1.0	61.4	1.1	60.5	0.2	61.9	1.6	61.5	1.1	61.4	1.0	61.2	0.7	61.1	0.6	62.4	1.8
	3rd floor	60.2	60.3	0.0	61.2	0.9	61.4	1.1	61.6	1.3	63.1	2.8	62.6	2.2	62.1	1.6	62.0	1.5	61.4	0.8	62.2	1.5
16	5 feet	70.4	70.7	0.2	71.8	1.2	71.1	0.4	70.8	0.0	72.0	1.1	72.2	1.1	72.4	1.2	72.6	1.2	72.7	1.1	72.9	1.2
17	5 feet	61.6	61.9	0.2	63.3	1.5	63.9	2.0	62.4	0.4	66.1	**4.0**	64.8	2.7	63.6	1.4	62.7	0.5	61.2	-1.0	60.1	-2.2
18	5 feet	57.4	57.8	0.4	58.1	0.7	59.3	2.0	59.6	2.3	60.9	**3.6**	58.9	1.5	58.5	1.0	58.7	1.0	58.9	1.1	59.2	1.3

Table 17c-6
Construction Noise Analysis Results (Saturday Daytime Leq(1) (in dBA))

Noise Receptor	Receptor Height	Existing	Phase I										Phase II									
			2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
			Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase	Build	Increase
1	1st floor	63.3	70.9	**7.5**	74.0	**10.5**	69.9	**6.2**	64.2	0.4	64.4	0.5	64.5	0.5	64.6	0.5	64.8	0.6	64.9	0.7	65.0	0.7
	3rd floor	63.3	76.0	**12.6**	74.9	**11.4**	72.5	**9.0**	64.3	0.7	62.0	-1.7	62.1	-1.7	62.1	-1.8	62.3	-1.7	62.4	-1.6	62.5	-1.6
2	1st floor	69.6	71.8	2.0	73.9	**3.9**	72.9	2.8	70.5	0.2	73.7	**3.2**	73.9	**3.3**	74.0	**3.2**	74.3	**3.4**	74.6	**3.6**	74.8	**3.6**
	3rd floor	69.6	74.2	**4.4**	74.7	**4.7**	74.0	**3.8**	70.6	0.2	73.6	**3.0**	73.8	**3.1**	73.9	**3.1**	74.2	**3.2**	74.4	**3.3**	74.7	**3.5**
3	1st floor	60.6	67.3	**6.7**	70.5	**9.9**	69.6	**8.9**	64.1	3.4	68.8	**8.1**	68.7	**7.9**	68.5	**7.7**	68.7	**7.8**	69.1	**8.1**	69.3	**8.3**
	3rd floor	60.6	74.2	**13.6**	72.7	**12.1**	73.4	**12.7**	69.4	**8.7**	69.3	**8.6**	68.7	**7.9**	68.5	**7.7**	68.6	**7.7**	69.0	**8.0**	69.2	**8.2**
4	1st floor	58.6	63.2	4.5	63.4	4.6	63.3	4.5	70.1	**11.2**	68.1	**9.1**	67.3	**8.2**	65.3	**6.2**	58.4	-0.8	60.9	1.6	61.2	1.9
	3rd floor	58.6	64.7	**6.0**	63.3	4.5	63.6	4.8	76.8	**17.9**	68.9	**9.9**	71.3	**12.2**	65.0	**5.8**	59.6	0.3	62.1	2.8	62.7	3.3
5	1st floor	66.9	67.3	0.4	67.1	0.1	67.2	0.2	67.3	0.2	69.7	2.6	69.6	2.4	69.2	2.0	69.2	1.9	70.7	**3.4**	70.9	**3.5**
	3rd floor	66.9	67.4	0.5	67.2	0.2	67.3	0.3	67.6	0.5	72.7	**5.6**	72.4	**5.2**	70.1	2.9	70.5	**3.2**	74.0	**6.7**	72.3	**4.9**
6	1st floor	65.3	65.7	0.3	66.2	0.7	66.3	0.8	65.9	0.3	68.2	2.5	68.1	2.3	66.3	0.5	66.8	0.9	73.5	**7.6**	70.0	**4.0**
	3rd floor	65.3	66.4	1.0	66.4	0.9	66.5	1.0	66.3	0.7	71.0	**5.3**	71.0	**5.2**	67.3	1.5	68.5	2.6	74.3	**8.4**	71.6	**5.6**
7	1st floor	70.9	71.5	0.4	71.6	0.3	71.7	0.3	72.0	0.4	72.9	1.1	72.7	0.9	72.8	1.0	72.8	1.0	72.7	1.0	72.8	1.1
	3rd floor	70.9	71.7	0.6	71.6	0.4	71.7	0.3	72.0	0.5	73.6	1.9	73.4	1.7	72.9	1.2	73.4	1.7	72.8	1.2	72.9	1.3
7a	1st floor	63.6	63.9	0.5	63.3	0.1	63.2	0.1	62.9	0.0	64.1	1.4	64.2	1.4	63.8	0.9	63.9	0.8	66.3	**3.1**	67.6	**4.3**
	3rd floor	63.6	63.6	0.2	63.4	0.1	63.3	0.2	63.1	0.1	64.9	2.1	65.1	2.2	64.0	1.0	64.8	1.6	67.5	**4.2**	67.9	**4.5**
	6th floor	63.6	63.9	0.5	63.6	0.3	63.6	0.5	63.3	0.3	66.5	**3.7**	66.6	**3.7**	64.7	1.7	66.4	**3.3**	68.7	**5.5**	68.2	**4.9**
8	1st floor	69.6	71.7	2.0	71.0	1.2	71.8	2.0	70.1	0.2	70.7	0.7	70.8	0.7	70.9	0.7	71.1	0.7	71.2	0.7	71.3	0.7
9	1st floor	70.9	71.6	0.7	71.8	0.9	71.7	0.7	72.5	1.5	75.6	**4.6**	73.4	2.3	73.2	2.1	73.3	2.1	73.5	2.2	73.7	2.4
	3rd floor	70.9	72.1	1.2	72.0	1.0	71.9	0.9	73.5	2.4	76.0	**4.9**	73.6	2.4	73.2	2.0	73.3	2.0	73.6	2.3	73.8	2.4
9b	1st floor	58.9	59.4	0.7	59.9	1.4	60.3	2.0	60.1	2.0	65.1	**7.2**	62.6	4.6	62.0	4.0	62.0	4.0	62.1	3.9	62.1	3.9
	15th floor	58.9	72.5	**13.7**	68.1	**9.4**	68.3	**9.6**	65.8	**7.2**	66.4	**7.9**	62.9	4.7	59.8	1.9	59.2	1.9	59.3	2.0	59.2	2.2
9c	1st floor	56.9	57.9	**1.3**	58.2	1.8	59.2	3.1	57.5	1.6	60.7	**5.1**	60.6	**5.0**	58.6	2.9	58.6	2.9	58.6	2.9	59.1	3.3
	15th floor	56.9	74.5	**17.7**	69.0	**12.2**	69.1	**12.4**	65.7	**9.0**	65.7	**9.1**	61.5	**5.4**	57.0	1.4	55.7	0.6	56.1	1.6	55.9	1.9
10	1st floor	65.3	66.2	0.7	66.2	0.5	66.4	0.5	67.5	1.4	70.4	**4.1**	69.2	2.9	68.0	1.8	67.1	0.9	67.3	1.1	67.4	1.3
	23rd floor	65.3	72.6	**7.1**	67.8	2.2	67.6	1.8	70.5	**4.6**	74.8	**8.7**	74.6	**8.5**	71.3	**5.2**	68.6	2.5	68.6	2.6	68.8	2.8
10a	1st floor	61.7	62.1	0.3	62.4	0.4	62.7	0.6	63.1	0.8	67.4	**5.0**	66.2	3.8	64.2	1.8	62.6	0.2	62.7	0.3	62.9	0.5
	26th floor	61.7	69.9	**8.1**	65.7	3.8	66.5	3.5	69.2	**7.1**	71.6	**9.4**	71.0	**8.8**	68.2	**6.0**	62.6	0.4	63.1	0.9	63.1	**0.9**
10b	1st floor	57.8	63.1	**5.1**	58.4	0.3	58.6	0.3	58.7	0.3	61.6	3.0	61.6	3.0	60.6	1.9	61.3	2.6	60.5	1.8	61.8	3.0
	26th floor	57.8	66.5	**8.6**	59.7	1.7	60.6	2.5	60.7	2.5	69.0	**10.7**	69.0	**10.6**	61.3	2.9	64.8	**6.3**	64.7	**6.2**	65.1	**6.5**
10c	1st floor	60.0	60.6	0.5	60.6	0.4	60.8	0.4	61.3	0.8	65.0	**4.4**	64.6	4.0	63.4	2.8	61.3	0.6	61.2	0.5	61.3	0.6
	15th floor	60.0	65.5	**5.4**	63.7	3.5	63.2	2.9	65.4	**5.0**	68.8	**8.3**	68.0	**7.5**	65.7	**5.2**	61.1	0.5	61.8	1.2	61.9	1.3
10d	1st floor	60.6	61.3	0.6	61.2	0.4	61.4	0.4	61.4	0.3	64.5	3.3	64.2	2.9	63.4	2.1	61.7	0.3	62.0	0.6	62.1	0.6
	15th floor	60.6	65.5	**4.8**	63.6	2.8	63.6	2.8	64.4	3.5	67.7	**6.7**	66.6	**5.5**	64.5	3.4	61.7	0.5	62.3	1.1	62.5	1.2
11	1st floor	55.9	59.2	3.4	59.1	3.3	60.5	4.8	59.7	4.0	65.0	**9.4**	61.9	**6.2**	57.0	1.2	56.9	0.9	56.8	0.7	56.8	0.6
	3rd floor	55.9	58.0	2.2	61.2	**5.5**	61.5	**6.0**	60.5	**5.1**	65.2	**9.9**	62.1	**6.7**	57.8	2.3	57.0	1.4	56.4	0.7	56.5	0.7
12	1st floor	69.6	72.0	2.3	73.0	**3.1**	73.1	**3.1**	70.3	0.1	70.6	0.3	70.7	0.3	70.8	0.3	71.0	0.4	71.2	0.5	71.4	0.6
	3rd floor	69.6	74.5	**4.8**	73.6	**3.7**	73.7	**3.7**	70.3	0.1	70.3	0.0	70.4	0.0	70.6	0.1	70.8	0.2	71.0	0.3	71.2	0.4
13	1st floor	64.3	65.0	0.7	66.2	1.9	66.9	2.6	64.8	0.5	66.5	2.2	66.6	2.2	66.6	2.1	66.8	2.1	66.9	2.1	67.1	2.2
	3rd floor	64.3	65.7	1.4	67.2	2.9	68.4	**4.0**	64.8	0.4	66.3	1.9	66.5	2.0	66.5	1.9	66.6	1.8	66.7	1.8	66.9	1.9
14	1st floor	60.4	61.9	1.4	62.5	1.9	62.6	1.8	63.6	2.7	67.6	**6.6**	67.5	**6.5**	74.6	**13.5**	62.6	1.5	64.4	3.3	64.3	3.1
	3rd floor	60.4	64.1	3.6	62.5	1.8	62.5	1.7	65.6	**4.6**	73.7	**12.6**	73.7	**12.6**	77.8	**16.7**	64.4	3.2	66.8	**5.6**	66.9	**5.7**
15	1st floor	64.5	64.9	0.4	66.0	1.4	66.2	1.6	65.0	0.3	66.5	1.8	66.2	1.5	66.0	1.2	65.7	0.9	65.9	1.1	67.4	2.5
	3rd floor	64.5	65.0	0.5	65.8	1.3	65.9	1.3	65.4	0.8	67.7	**3.1**	67.2	2.6	67.1	2.4	66.7	2.0	66.3	1.6	67.3	2.5
16	5 feet	69.6	72.6	2.8	74.9	**5.0**	73.1	**3.0**	70.4	0.2	71.2	0.8	71.3	0.8	71.5	0.9	71.7	1.0	71.9	1.1	72.1	1.2
17	5 feet	60.6	64.0	3.3	66.3	**5.5**	66.5	**5.7**	63.1	2.2	64.7	3.7	62.3	1.3	60.7	-0.4	61.0	-0.1	60.4	-0.7	60.2	-1.0
18	5 feet	58.7	61.8	3.2	61.2	2.7	62.2	3.7	62.5	4.1	65.9	**7.6**	62.5	4.1	59.4	0.9	59.3	0.7	59.6	1.0	59.7	1.0

Table 17c-7
Summary of CEQR Significant Impact Construction Noise Locations

Noise Receptor	Which Floors Exceed CEQR Significant Impact Threshold (Weekday Daytime)	Which Floors Exceed CEQR Significant Impact Threshold (Weekday Nighttime [2nd Shift])	Which Floors Exceed CEQR Significant Impact Threshold (Weekend Daytime)
1	Phase I[1] - All Floors	Phase I[1]- All Floors	Phase I[1] - All Floors
2	Phase I[1] - All Floors	Phase II[2] - All Floors	Phase I[1] - 3rd Floor, Phase II[2] - All Floors
3	Phase I[1] and II[3] - All Floors	Phase I[1] and II[2] - All Floors	Phase I[1] and II[2] - All Floors
4	Phase I[1] and II[1] - All Floors	No Significant Impact	Phase I[1] and II[1] - All Floors
5	Phase II[1] - All Floors	Phase II[3] - All Floors	Phase II[3] - All Floors
6	Phase II[1] - All Floors	No Significant Impact	Phase II[1] - All Floors
7	No Significant Impact	No Significant Impact	No Significant Impact
7a	No Significant Impact[4]	No Significant Impact	No Significant Impact[4]
8	No Significant Impact	No Significant Impact	No Significant Impact
9	No Significant Impact	No Significant Impact	No Significant Impact
9b	Phase I[1] - All Floors, Phase II[3] – 1st to 6th Floor	Phase I[1] - 6th to 15th Floor	Phase I[1] - 6th to 15th Floor
9c	Phase I[1] - 3rd to 15th Floor	Phase I[1] 6th to 15th Floor	Phase I[1] - 6th to 15th Floor
10	Phase I[1] - 10th to 31st Floor, Phase II[1] - All Floors	Phase I[1] and II[1] - 6th to 31st Floor	Phase I[1] and II[1] - 6th to 31st Floor
10a	Phase I[1] 10th to 31st Floor, Phase II[1] - 3rd to 31st Floor	Phase I[1] - 10th to 31st Floor	Phase I[1] and II[1] - 6th to 31st Floor
10b	Phase I[1] - 16th to 31st Floor, Phase II[1] - 6th to 31st Floor	Phase I[1] and II[1] - 6th to 31st Floor	Phase II[1] - 6th to 31st Floor
10c	Phase I[1] - 10th to 15th Floor, Phase II[1] - 3rd to 15th Floor	No Significant Impact	Phase I[1] - 10th to 15th Floor, Phase II[1] - 6th to 15th Floor
10d	Phase I[1] and II[1] - 15th Floor	No Significant Impact	Phase I[1] and II[3] - 6th to 15th Floor
11[5]	Phase I[1] - All Floors	Phase I[1] - All Floors	Phase I[1] - 3rd Floor
12	Phase I[1] - 3rd Floor	No Significant Impact	Phase I[1] - All Floors
13	Phase I[1] - All Floors	No Significant Impact	No Significant Impact
14	Phase I[1] and II[1] - All Floors	Phase I[1] and II[1] - All Floors	Phase I[1] - 3rd Floor, Phase II[1] - All Floors
15	No Significant Impact[4]	No Significant Impact	No Significant Impact
16[5]	Phase I[1] - Ground Level	No Significant Impact	Phase I[1] - Ground Level
17[5]	Phase I[1] - Ground Level	No Significant Impact	Phase I[1] - Ground Level
18[5]	No Significant Impact	No Significant Impact	No Significant Impact

Notes:
A Significant Impact does not mean that there is an impact in every year on all floors in its respective phase. See appendix for more details.
1. Noise increase due to operation of on-site construction equipment operation.
2. Noise increase due to project-generated traffic.
3. Noise increase due to a combination of on-site construction equipment operation and project-generated traffic.
4. Exceedance of the 3 dBA impact criteria would be less than 2 years.
5. Receptor sites that are representative of nearby parks.

Figure 17c-2 is a map summarizing the locations where significant impacts are predicted to occur due to Phase I construction or the cumulative effects of Phase II construction activities and project-generated traffic. The locations where significant impacts are predicted to occur are typically the floors of a building which have a direct line-of-site to the site of construction. As shown in Figure 17c-2, significant noise impacts due to construction activities and project-generated traffic are predicted to occur at locations in close proximity to the project site—along Flatbush Avenue from approximately south of Atlantic Avenue to Bergen Street (including the site of the Brooklyn Bear's Community Garden), Dean Street from approximately 4th Avenue to Vanderbilt Avenue (including the location of the Dean Playground), Pacific Street between 4th Avenue and Flatbush Avenue (including the portion of the Pacific Street Branch of the Brooklyn Public Library facing Site 5) and from 6th Avenue to Carlton Avenue, Carlton Avenue from approximately Pacific Street to Bergen Street, 6th Avenue from approximately Dean Street to Bergen Street, Atlantic Commons between South Oxford Street and Cumberland Street (including the northern half of the South Oxford Street Park), Vanderbilt Avenue from approximately Pacific Street to Dean Street, South Elliot Place from approximately 150 feet south of Hanson Place to South Portland Avenue, on the upper floors of buildings on South Portland Avenue from Atlantic Avenue north approximately 300 feet, on the upper floors of buildings on South Oxford and Cumberland Streets from approximately Atlantic Avenue to Atlantic Commons, on the upper floors of buildings on Carlton Avenue from Atlantic Avenue north approximately 500 feet, and on the upper floors of buildings on Atlantic Avenue between approximately South Portland Avenue and Clermont Avenue which have a direct line of sight to the project construction.

Additional details of the construction noise analysis including site diagrams depicting the placement of construction equipment, incremental noise contour maps, etc. are contained in Appendix 17c.

In general, noise generated by construction vehicles traveling to and from the project site was not predicted to be significant. However, after construction of Phase I is completed, in the year 2011 through 2016, Phase I operations would add traffic to the surrounding street network. The cumulative effect of Phase II construction activities and Phase I operations have been analyzed and at several locations adjacent to major feeder roadways to and from the arena, project-generated traffic results in predicted significant noise impacts.

With the exception of the Vanderbilt Yard activities, construction activities would generally proceed from the western portion of the project site to the east and noise impacts due to construction activities alone are predicted to generally follow that pattern. Predicted significant adverse noise impacts during construction of Phase I of the project are generally at receptor locations adjacent to the western portion of the project site. During Phase II significant noise impacts occur at some locations due to construction activities, at some locations due to project-generated traffic as construction of some project elements is completed, and at some locations due to a combination of both construction activities and project-generated traffic.

Even though ambient noise levels are lower during weekday nighttime (2nd shift) and weekend time periods, in general the largest noise increases are predicted to occur during the weekday daytime (normal) construction time period. This is because only limited construction activities, which need to take place to avoid impeding construction would be scheduled to take place during the weekday nighttime (2nd shift) and weekend time periods. The primary exceptions would be work restricted in time in order to avoid impeding on transit operations or traffic flow would be scheduled to occur.

In general, receptor locations which have a clear line of sight to locations on the project site where construction activities are taking place tend to have higher noise levels then locations which have restricted views. Noise barriers are more effective when they break the line of sight between the source and receptor. At elevated receptor locations and/or when construction operations are taking place at elevated locations, noise barriers located at ground-level may not provide any or any appreciable noise attenuation. Consequently, noise impacts at buildings are higher at elevated receptor locations than at 1st floor locations. At locations on the north side of Atlantic Avenue and on streets north of Atlantic Avenue, the locations of noise impacts tend to be a function of line of sight. At these locations significant noise impacts tend to occur on the upper stories of buildings.

Significant adverse noise impacts are predicted to occur at a large number of locations, particularly residential locations adjacent to the project site. However, because of the construction noise mitigation measures that have been incorporated into the project and committed to by the project sponsors, the magnitude of the noise levels produced by construction activities for this project are below those typically produced by major construction projects in New York City. Typical construction activities for major construction projects produce noise levels ranging from the high 70s to about 90 dBA with an uncontrolled average of about 85 dBA. With the insight from the detailed analyses performed and the subsequent incorporation of noise reduction methods in the proposed project, normal weekday construction activities for the proposed project are expected to produce noise levels at nearby receptor locations generally ranging from about 57 to 78 dBA, with an average in the low 70s dBA range; 2nd shift weekday nighttime construction activities, on those occasions when they occur, are expected to produce noise levels at nearby receptor locations generally ranging from about 56 to 75 dBA, with an average in the mid 60s dBA range; weekend daytime construction activities, on those occasions when they occur, are expected to produce noise levels at nearby receptor locations generally ranging from 57 to 75 dBA, with an average about 70 dBA.

In general, even during construction, L_{10} noise levels would generally be in the high 60 to high 70 dBA range and would be in the *CEQR Technical Manual's* "marginally acceptable" to "marginally unacceptable" categories. One location where an exception to this statement would occur would be at receptor 7, located on Atlantic Avenue between Clermont and Carlton Avenues. In the year 2014, because of the noise produced by high traffic volumes on Atlantic Avenue and the noise produced by nearby on-site construction activities, L_{10} noise levels at this location would be in the low 80 dBA range, and would be in the "clearly unacceptable" category. Other years, when a high level of construction activity is not taking place adjacent to this receptor, L_{10} noise levels would be lower, in the high 70 dBA range, and would be in the "marginally unacceptable" category. (Noise levels in many areas of New York City are in the "marginally unacceptable" range.)

While construction activities would be noticeable and intrusive, the noise levels produced by construction activities with the incorporated noise reduction measures would be relatively low for construction of a project of this magnitude. Additional mitigation measures that were identified to further reduce these incremental construction noise levels at nearby residences are described below and summarized in Chapter 19, "Mitigation".

On-site, construction activities would produce noise levels at open space areas that exceed the levels recommended by CEQR for passive open spaces (55 dBA L_{10}). (Noise levels in these areas exceed CEQR recommended values for existing and No Build conditions.)While this is not desirable, there is no effective practical mitigation[1] that could be implemented to avoid these levels during construction. Noise levels in many parks and open space areas throughout the City, which are located near heavily trafficked roadways and/or near construction sites, experience comparable, and sometimes higher, noise levels.

[1] Noise barriers would not be practical because of security concerns.

MITIGATION

As discussed above, the project sponsors expended significant efforts to explore the feasibility of implementing mitigation measures to reduce or eliminate project impacts due to construction activities. This included the identification of the most significant sources of noise impacts off-site during the anticipated 10 year construction period for both weekday day, weekday night, and weekend conditions. However, after evaluating all practical source and path controls, there would still be locations where construction activities alone and construction activities combined with project-generated traffic would result in predicted significant adverse noise impacts on the adjacent properties. Therefore, an assessment of off-site mitigation measures at receptors (i.e., receptor controls) was undertaken. The first step in this assessment was to assess the potential locations that would be predicted to have significant adverse impacts from construction of the project, and evaluate whether these receptors would already have additional receptor attenuation for internal noise levels. Where they do not, receptor controls would be made available to residents within the significant adverse impact area identified in Figure 17c-2. At the Brooklyn Bear's Community Garden, the Dean Playground, and South Oxford Park, because of safety and aesthetic concerns, there is no feasible and practicable mitigation that would eliminate project impacts; however, with respect to the Dean Playground, the impact would be partially mitigated by the provision of an amenity to the park users. The analysis shows the potential for significant adverse noise impacts at the Pacific Street Branch of the Brooklyn Public Library. Measurements of internal/external noise levels at the library undertaken in October 2006 showed that the library's windows/walls provide approximately 20 dBA of attenuation. In addition, the library is already air conditioned. Therefore, during the 1st three years of construction—2007, 2008, and 2009—interior L_{10} noise levels within the library building during periods of peak construction would be in the range of approximately 50 to mid-50 dBA. This would be above the 45-50 dBA L_{10} noise level range that would be desirable for this type of land use. Consequently, as noted in the DEIS, construction of the proposed project would result in a significant adverse impact at this library. This impact would be of limited duration and magnitude. Since the issuance of the DEIS, noise mitigation measures that would include additional acoustic treatment for the library windows on the Pacific Street side were identified. With this measure, the significant adverse construction noise impact on the Pacific Branch of the Brooklyn Public Library would be mitigated. In addition, construction activities, as well as project-generated traffic, would significantly increase noise levels at locations along Dean Street including at locations adjacent to the Temple of Restoration. Many of the windows of the building housing the Temple of Restoration are double-glazed windows. The large center stained glass window has a protective glass in front of the window that functions acoustically as a storm window. In addition, the building contains a number of window air conditioning units. As mitigation, similar to the mitigation proposed for residences on Dean Street that would be significantly impacted by the proposed project, the project sponsors would make available to the Temple of Restoration storm windows for windows on the second level of the building (above the Temple of Restoration sign), which face Dean Street, which do not currently have either double-glazed windows or storm windows. With this measure, maximum interior noise level within the building would be in the range of 40–50 dBA L_{10}, which would satisfy CEQR interior noise level requirements for this use.

With regard to residential locations where significant noise impacts are predicted to occur, surveys were performed to examine the types of windows and alternative ventilation so that an assessment could be made of the impact of noise produced by the project on interior noise levels of residences and other buildings near and adjacent to the project site, and to determine whether interior noise levels would meet the CEQR interior L_{10} noise criteria for residences of 45 dBA. The survey showed that the majority of buildings near or adjacent to the project site either have double glazed windows or storm windows. In addition, a large number of residences have some form of alternative ventilation, either window, through-the-wall (sleeve), or central air conditioning.

At locations where significant adverse noise impacts are predicted to occur, and where the residences do not contain both double-glazed or storm-windows and/or alternative ventilation (i.e., air conditioning), the project sponsor would make these mitigation measures available, at no cost for installation to owners of residences[1]. In addition, as noted in the DEIS, potential significant adverse noise impacts from construction were identified at the upper floors of certain residential buildings on the north side of Atlantic Avenue and potentially on streets north of Atlantic Avenue. For the FEIS, the need for and feasibility of mitigation at these locations were further analyzed. Generally, all of the sites identified north of Atlantic Avenue already have double-glazed windows with sleeves for alternate ventilation. The proposed measures (i.e., window treatment and alternative ventilation) would provide approximately 30 dBA of attenuation for the interiors of the residences (i.e., noise levels inside the residence would be approximately 30 dBA less than those experienced outside the residence at the same relative location). With this level of mitigation, interior L_{10} noise levels at most, if not all residences, during most periods of time, where significant noise impacts are predicted to occur would be below the CEQR 45 dBA L_{10} recommended level. However, residents within the zone identified in Figure 17c-2 who do not have double-glazed or storm-windows and alternative ventilation and choose not to accept the mitigation measures made available, would still be predicted to experience significant adverse impacts from construction noise at these locations.

VIBRATION

Introduction

Construction activities have the potential for resulting in vibration levels that may result in structural or architectural damage, and/or annoyance or interference with vibration sensitive activities. In general, vibratory levels at a receiver are a function of the source strength (which, in turn is dependent upon the construction equipment and methods utilized), the distance between the equipment and the receiver, the characteristics of the transmitting medium, and the receiver building construction. Construction equipment operation causes ground vibrations which spread through the ground and decrease in strength with distance. Vehicular traffic, even in locations close to major roadways, typically does not result in perceptible vibration levels, unless there are discontinuities in the roadway surface. With the exception of the case of fragile, typically historically significant structures or buildings, generally construction activities do not reach the levels that can cause architectural or structural damage, but they can achieve levels that may be perceptible and annoying in buildings very close to a construction site. An assessment has been prepared to quantitatively access potential vibration impacts of construction activities on structures and residences near the project site.

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[1] At locations where the significant impacted residences are historic building, alternative ventilation measures that satisfy the requirements of the Landmarks Preservation Commission will be provided (i.e., interior storm windows and/or window air conditioning units, if building owners do not presently have either).

Construction Vibration Criteria

For purposes of assessing potential structural or architectural damage to historic structures or other fragile buildings that may be susceptible to vibration damage, the vibration impact criteria used by the New York City Landmarks Preservation Commission of a PPV (peak particle velocity) of 0.50 inches/second would constitute a significant impact. For non-fragile buildings vibration levels below 0.60 inches/second would not be expected to result in any structural or architectural damage.

For purposes of evaluating potential annoyance or interference with vibration-sensitive activities, vibration levels greater than 65 VdB would have the potential to result in impacts. While levels exceeding this limit may result in perceptible vibration, such levels would only be considered to be significant if they were to occur for a prolonged period of time.

Analysis Methodology

For purposes of assessing potential structural or architectural damage the following formula was used:

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

where: PPV_{equip} is the peak particle velocity in in/sec of the equipment at the receiver location;

PPV_{ref} is the reference vibration level in in/sec at 25 feet; and

D is the distance from the equipment to the received location in feet.

For purposes of assessing potential annoyance or interference with vibration sensitive activities the following formula was used:

$$L_v(D) = L_v(ref) - 30\log(D/25)$$

where: $L_v(D)$ is the vibration level in VdB of the equipment at the receiver location

$L_v(ref)$ is the reference vibration level in VdB at 25 feet; and

D is the distance from the equipment to the receiver location in feet.

Table 17C-8 shows vibration source levels for construction equipment.

Table 17c-8
Vibration Source Levels for Construction Equipment

Equipment	PPV_{ref} (in/sec)	Approximate L_v (ref) (VdB)
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, May 2006.

Analysis Results

The buildings of most concern with regard to the potential for structural or architectural damage due to vibration are the Swedish Baptist Church and nearby row houses along Dean Street, which are immediately adjacent to the Site of Building 15. Vibration levels at buildings within this area will be kept below the 0.50 inches/second PPV limit. In addition, the project sponsors will implement a monitoring program to ensure that this limit is not exceeded, and that no architectural or structural damage will occur. At all other locations, the distance between construction equipment and receiving building is sufficiently large to avoid vibratory levels which would result in architectural or structural damage.

For limited periods of time due to infrequently occurring construction activities, vibratory levels will be perceptible in the vicinity of the construction site but would not be considered significant adverse impacts.

INFRASTRUCTURE

As discussed above, several major water and sewer lines would have to be relocated as well as many smaller utility lines. Water and sewer service lines would have to be connected to the new buildings. All relocations and replacements would meet the standards of DEP and would have to be approved by that agency. DEP regularly repairs, relocates, and replaces water and sewer lines without disruption to service. Therefore, no significant adverse impacts to the infrastructure systems or to users are expected.

As with the water and sewer lines, new electrical and telecommunication service lines would have to be connected to the new buildings. Energy and telecommunication suppliers regularly repair, relocate, and replace lines without disruption to service. Therefore, no significant adverse impacts to the systems or to its users are expected.

RODENT CONTROL

The construction would include a contract for providing for a rodent (mouse and rat) control program. Prior to the start of construction, the contractor would survey and bait the appropriate areas and provide for proper site sanitation. As necessary, the contractor would carry out a maintenance baiting program. Trash would be removed daily from the construction sites. Coordination would be maintained with appropriate public agencies. Only EPA- and NYSDEC-registered rodenticides would be permitted, and the contractor would be required to perform rodent control programs in a manner that avoids hazards to persons, domestic animals, and non-target wildlife. ✷