# Chapter 20: Construction

## A. INTRODUCTION

This chapter summarizes the construction plans for the Proposed Project and considers the potential for significant adverse impacts during the construction period. Techniques likely to be employed for the construction of the Proposed Project, a complex of five mixed-use buildings, are described, and followed by the types of activities likely to occur during construction. The construction schedule is summarized, and the number of workers and truck deliveries are estimated. Construction techniques and activities are discussed, as are measures required by applicable code requirements and additional measures to minimize the effects of construction that would be incorporated into the Restrictive Declaration that will be recorded as part of the Proposed Project. The chapter also discusses potential impacts with regard to land use, historic resources, socioeconomic conditions, hazardous materials, traffic and transportation, air quality, noise and vibration, public health and rodent control.

The Proposed Project would include both below-grade and above-grade uses. The first level below grade (cellar level) would be constructed and operated as an interconnected space for automotive service uses. Two sub-cellar levels would contain parking uses, and could be constructed and operated as either an interconnected garage beneath all five project buildings, or as five individual garages.

As discussed in more detail below, the below-grade portion could be constructed using one of two different approaches. The first approach would have the below-grade space for all five buildings constructed before any above grade structures are built. The superstructure for each of the project buildings would then be built above a site-wide “podium.” This is called the “podium approach.” The second approach would be to construct the individual foundation and basement of a building, followed by the superstructure of that building, sequentially until all five project buildings are built. This is called the “individual basements approach”. Both the podium and the individual basements approaches have been examined for each of the technical areas being analyzed. Where relevant, the results have been presented for both of the approaches, or the approach that would yield the most conservative results.

### PRINCIPAL CONCLUSIONS

*LAND USE AND NEIGHBORHOOD CHARACTER*

The inconvenience and disruption arising from the construction would include temporary diversions of pedestrians, vehicles, and construction truck traffic to other streets. No one location on-site would be under construction for the full eight years. Throughout the construction period, access to surrounding residences, businesses, institutions, and waterfront uses in the area would be maintained. In addition, throughout the construction period, measures would be implemented to control noise, vibration, and dust on the construction sites and minimize impacts on the surrounding areas. These measures would include the erection of construction fencing and, in some areas, fencing incorporating sound-reducing measures. Even with these measures in place, impacts, and in some cases significant impacts are predicted to occur. However, because none of these impacts would be continuous in any one location or permanent, they would not create significant impacts on land use patterns or neighborhood character in the area.

*HISTORIC RESOURCES*

The Proposed Project would result in new construction within 90 feet of the Consolidated Edison Power House, which is pending a New York City Landmarks designation (NYCL) and is considered eligible for listing on the State and National Register of Historic Structures (S/NR-eligible). Therefore, the Proposed Project would comply with Landmarks Preservation Commission (LPC) *Guidelines for Construction Adjacent to a Historic Landmarks* as well as the guidelines set forth in section 523 of the *New York City Environmental Quality Review (CEQR) Technical Manual* and the procedures set forth in New York City Department of Buildings (NYCDOB) *Technical Policy and Procedure Notice* (TPPN) #10/88. This includes preparation of a Construction Protection Plan (CPP), prepared prior to demolition and construction activities that would be submitted to LPC for review and approval. The other architectural resources—the Amsterdam Houses and the Hudson River Bulkhead—are located more than 90 feet away from the project site and would not be expected to be adversely affected by the Proposed Project's construction-related activities.

Archaeological documentary studies conducted with respect to Parcel N identified two areas of potential precontact sensitivity (as disclosed in the 1992 Final Environmental Impact Statement [FEIS]) and those conclusions have not changed as a result of the Proposed Project. To determine if archaeological resources are present, Phase 1B archaeological testing will be carried out in these archaeologically sensitive areas. Prior to the initiation of Phase 1B investigations, a testing protocol will be submitted to LPC for review and approval. Testing will be undertaken in consultation with LPC. If no resources of significance are encountered, no further archaeological study would be warranted. Should any resources of potential significance be found, further testing would be undertaken in consultation with LPC to identify the boundaries and significance of the find. If required, data recovery would be undertaken in consultation with LPC. With implementation of all of the above measures which will be incorporated into the Restrictive Declaration, there would be no significant adverse impacts on archaeological resources.

*SOCIOECONOMIC CONDITIONS*

Construction activities associated with the Proposed Project would not result in any significant adverse impacts to socioeconomic conditions. Construction would, in some instances, temporarily affect pedestrian and vehicular access on street frontages immediately adjacent to the project site. However, lane and/or sidewalk closures are not expected to occur in front of entrances to any existing or planned retail businesses, and construction activities would not obstruct major thoroughfares used by customers or businesses. Utility service would be maintained to all businesses, although very short term interruptions (i.e., hours) may occur when new equipment (e.g., a transformer, or a sewer or water line) is put into operation. Overall, construction of the Proposed Project is not expected to result in any significant adverse impacts on surrounding businesses.

Construction would create direct benefits resulting from expenditures on labor, materials, and services, and indirect benefits created by expenditures by material suppliers, construction workers, and other employees involved in the direct activity. Construction also would contribute to increased tax revenues for the City and State, including those from personal income taxes. Based on the applicant's estimates of project-generated economic and fiscal benefits using the IMPLAN (IMpact analysis for PLANning) input-output modeling system[1], the proposed project would generate approximately 8,159 person-years[2] of construction employment on-site, and an additional 3,139 person-years of indirect construction-related employment in the City. Tax revenues during the construction period for the City, State and MTA are estimated to total $204 million, with an additional $110 million in mortgage recording fees and taxes. The total effect of construction on the local economy, measured as economic output or demand, is estimated at $3.1 billion in New York City and $3.6 billion in New York State.

*HAZARDOUS MATERIALS*

Because of the known and potential subsurface contamination, remedial measures would be undertaken to avoid adverse impacts during excavation for the Proposed Project. These would include conducting soil disturbance under a new New York City Mayor's Office of Environmental Remediation (OER)-approved Remedial Action Plan (RAP) and an updated Construction Health and Safety Plan (CHASP), proper handling and disposal of excavated soil, and implementing other practices to protect workers and the surrounding neighborhood. In addition, the buildings would be constructed with waterproofing which would also serve as a vapor barrier to any remaining VOCs or methane. With these measures, as set forth in the Restrictive Declaration that will be recorded as part of the Proposed Project, no significant adverse impacts would result during or after construction as a result of the potential disturbance of any hazardous materials.

*TRAFFIC*

Nearly 50 percent of the construction workers are projected to travel via auto, with most if not all of the remaining construction workers traveling to and from the project site via transit. The construction of various components of the Proposed Project would be expected to result in increased traffic levels in the study area due to construction worker vehicular and truck traffic over an eight year period from 2011 and 2018. The peak period for construction related activities was determined to be during the second quarter of 2012. Construction generated traffic during both the construction 6:00–7:00 AM arrival peak hour and 3:00–4:00 PM afternoon departure peak hour would be lower than the operational traffic generated by the Proposed Project in the operational AM (8:00–9:00 AM) and PM (5:00–6:00 PM) peak hours, respectively. The detailed traffic analysis of construction generated traffic concluded that during the peak period for construction related activities, significant adverse impacts would occur at one intersection during the 6:00-7:00 AM peak hour (West End Avenue and West 59th Street) and three intersections during the 3:00 – 4:00 PM peak hour (Ninth Avenue and West 57th Street, Columbus Avenue and West 60th Street, and West End Avenue and West 59th Street). Mitigation measures to address these impacts are discussed in Chapter 22, "Mitigation."

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[1] The IMPLAN (IMpact analysis for PLANning) input-output modeling system uses the most recent economic data from sources such as the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor Statistics, and the U.S. Census Bureau to predict effects on the local economy from direct changes in spending. The model contains data for New York County on more than 500 economic sectors, showing how each sector affects every other sector as a result of a change in the quantity of its product or service. A similar IMPLAN model for the State of New York is used to trace the effects on the State economy.

[2] A person-year is the equivalent of one person working full time for one year.

*PARKING*

The construction traffic impact analysis conservatively assumes that all construction traffic, both construction worker vehicles and deliveries, would use the project site as the destination and origin for arrivals and departures, respectively. However, with very few exceptions, construction workers would have to use off-site parking for the duration of the construction of the Proposed Project. In addition, it should be noted that vehicles currently parking on the project site would be displaced during the construction period. (A portion of these vehicles may again be accommodated on-site upon completion of the Proposed Project's parking garage.) Overall, there would be insufficient capacity within a quarter-mile radius of the project site to accommodate peak parking demand during the AM and midday peak period, and sufficient capacity in the pre-theater and overnight periods. However, sufficient capacity would be available within a half-mile radius of the project site to accommodate all construction worker and displaced on-site parker demand. Therefore, significant adverse parking impacts during the peak construction period are not anticipated.

*TRANSIT*

Nearly 50 percent of the construction workers are projected to travel via auto, with most if not all of the remaining construction workers traveling to and from the project site via transit. During the peak 2012 construction period, this modal distribution would represent approximately 600 workers traveling by subway or bus. With 80 percent of these workers arriving or departing during the peak construction hours (6:00-7:00 AM arrival and 3:00-4:00 PM departure), the total estimated number of transit trips in any one peak hour would total approximately 480.

Approximately 140 of each peak hour's transit trips would be expected to be via bus. During the construction peak hours, the project-generated demand on local bus routes serving the project site would therefore not be expected to exceed 200 riders, the *CEQR Technical Manual* threshold below which significant adverse transit impacts are considered unlikely to occur. Significant adverse bus impacts are therefore not anticipated as a result of construction worker bus trips.

The remaining approximately 340 peak hour transit trips would be construction worker subway trips. While the demand would be higher than the 200-trip *CEQR Technical Manual* threshold, it would be substantially lower that the subway transit demand created by the Proposed Project (937 and 1,299 trips in the AM and PM peak hours, respectively). As discussed in Chapter 17, "Transit and Pedestrians," project-generated subway demand is not expected to result in significant adverse impacts at the 59th Street-Columbus Circle subway station in the 2018 Build scenario. Since the construction subway demand would be substantially less than that of the Proposed Project, the construction demand would not be expected to result in significant adverse subway impacts with regard to any station elements analyzed.

*PEDESTRIANS*

The construction worker pedestrian trips would occur primarily outside of the peak hours for the study area street system and would be distributed among numerous sidewalks and crosswalks in the area. Therefore, significant adverse pedestrian impacts attributable to the projected construction worker trips are not anticipated.

During construction, where sidewalk closures are required, adequate protection or temporary sidewalks would be provided in accordance with New York City Department of Transportation (NYCDOT) requirements.

*AIR QUALITY*

The results of both stationary and mobile source modeling analyses found that the total concentrations of, particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers ($PM_{10}$), and carbon monoxide (CO) would not exceed the National Ambient Air Quality Standards (NAAQS). Therefore, no significant adverse impacts from construction sources with respect to these pollutants are expected at the closest sensitive receptors during the peak emission periods. Since the predicted concentrations were modeled for periods that represent the highest site-wide air emissions at the closest sensitive receptors, the increments and total predicted concentrations during other periods of construction and at other locations are also not expected to have any significant adverse impacts.

Dispersion modeling determined that the maximum predicted incremental concentrations of particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) (using a worst-case emissions scenario) would exceed the city's applicable interim guidance criteria at a few non-residential discrete receptor locations immediately adjacent to the construction site fence, where the likelihood of exposure is very low. Concentrations of $PM_{2.5}$ would not exceed the city's interim guidance criteria at any residential receptor locations. The occurrences of elevated 24-hour average concentrations for $PM_{2.5}$ at non-residential receptors are very limited in duration and are only slightly above the interim guidance thresholds. Therefore, after taking into the account the temporary nature of construction, the variability of $PM_{2.5}$ emissions over time (which are often considerably less than those used in the modeling analysis), the limited frequency of 24 hour exceedances, and the limited area-wide extent of the 24-hour and annual discrete location impacts (the $PM_{2.5}$ neighborhood scale analysis concentrations were well below the city's interim guidance criteria), it was concluded that no significant adverse air quality impacts for $PM_{2.5}$ are expected from the on-site construction sources.

*NOISE*

For the podium approach, construction activities would be expected to result in significant adverse noise impacts at the following locations which have a direct line of site to the project site:

- Receptor A1—residential, the east façade of 33 West End Avenue
- Receptor A2—residential, the west façade of 33 West End Avenue
- Receptor B2—Amsterdam Houses, the west and south façades of 249 West 61st Street
- Receptor C—Heschel School and residential, the west façade of 20 West End Avenue
- Receptor D—residential and commercial, the west façade of 10 West End Avenue
- Receptor E—John Jay College, the west and north façades of 521 West 58th Street
- Receptor F—residential and commercial, the north façade of 847 West End Avenue
- Receptor H1—residential, the west and south façades of 75 West 63rd Street
- Receptor N1—residential, the west and north façades of 555 West 59th Street

- Receptor N2—residential, the west and south façades of 555 West 59th Street
- Receptor O—residential, the west and north façades of 234 West 61st Street
- Receptor Q—residential and Lander College, the west and south façades of 225 West 60th Street
- Receptor R—residential, the west and north façades of 517 West 59th Street
- Receptor U—commercial, the north façade of 614 West 58th Street
- Receptor V—commercial, the north façade of 631 West 57th Street

The exceedance of the 3-5 dBA CEQR impact criteria (occuring for two or more consecutive years) would be due principally to noise generated by the large amount of construction equipment operating on-site. However, with the exception of receptors B2, and L2, all receptor locations have double-glazed windows and have some form of alternative ventilation (i.e., central air conditioning or PTAC units), which would provide a significant amount of sound attenuation, and would result in interior noise levels that are below 45 dBA $L_{10}$ (the CEQR acceptable interior noise level criteria), during much of the time when project-related construction activities are taking place.

Receptor site B2 (i.e., the corner building at Amsterdam Houses), has double-glazed windows and some tenants have installed air conditioning units on some windows. Based on the criteria described above, this location would experience significant adverse construction-related noise impacts. Mitigation measures to address these impacts are discussed in Chapter 22, “Mitigation.”

With regard to the residential terrace locations (i.e., receptors A1, A2, D, F, H1, N1, and N2), the highest $L_{10(1)}$ noise levels would range from approximately 73 to 79 dBA during some peak periods of construction activity. Without construction activities, noise levels at these terraces would exceed the CEQR acceptable range (55 dBA $L_{10(1)}$) for an outdoor area requiring serenity and quiet. During the weekday daytime time periods identified above when construction activities are predicted to significantly increase noise levels, construction activities would exacerbate these exceedances and result in significant adverse noise impacts at the terraces at these identified buildings. As discussed further in Chapter 22, “Mitigation,” there are no feasible mitigation measures that could be implemented to eliminate the significant noise impacts at these locations.

Construction activities at would at times produce noise levels which would be noisy and intrusive at other receptor sites in the study area, but due to their limited duration they would not result in significant noise impacts.

For the individual basement approach, construction activities would be expected to result in significant adverse noise impacts at the following locations which have a direct line of sight to the project site:

- Receptor A2—residential, the west façade of 33 West End Avenue
- Receptor C—Heschel School and residential, the west façade of 20 West End Avenue
- Receptor D—residential and commercial, the west façade of 10 West End Avenue
- Receptor E—John Jay College, the west and north façades of 521 West 58th Street
- Receptor N1—residential, the west and north façades of 555 West 59th Street
- Receptor N2—residential, the west and south façades of 555 West 59th Street
- Receptor U—commercial, the north façade of 614 West 58th Street
- Receptor V—commercial, the north façade of 631 West 57th Street

Similar to the results with the podium approach, the exceedances of the CEQR impact criteria would be due principally to noise generated by the large amount of construction equipment operating on-site. However, all receptor locations have double-glazed windows and have some form of alternative ventilation which would provide a significant amount of sound attenuation, and would result in interior noise levels that are below 45 dBA $L_{10}$ (the CEQR acceptable interior noise level criteria), during much of the time when project-related construction activities are taking place.

With regard to the residential terrace locations (i.e., receptors A2, D, N1, and N2), the highest $L_{10(1)}$ noise levels would range from approximately 73 to 79 dBA during some peak periods of construction activity. Without construction activities, noise levels at these terraces would exceed the CEQR acceptable range (55 dBA $L_{10(1)}$) for an outdoor area requiring serenity and quiet. During the weekday daytime time periods identified above when construction activities are predicted to significantly increase noise levels, construction activities would exacerbate these exceedances and result in significant adverse noise impacts at the terraces at these identified buildings. As discussed further in Chapter 22, "Mitigation," there are no feasible mitigation measures that could be implemented to eliminate the significant noise impacts at these locations.

Construction activities at the other receptor sites in the study area would at times produce noise levels that would be noisy and intrusive, but due to their limited duration, they would not result in significant noise impacts.

*PUBLIC HEALTH*

See Chapter 21, "Public Health" for conclusions related to construction activities.

*RODENT CONTROL*

Construction contracts would include provisions for a rodent (mouse and rat) control program. Before the start of construction, the contractor 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 U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC)-registered rodenticides would be utilized, 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.

## B. SUMMARY OF 1992 FEIS FINDINGS

The 1992 FEIS determined that the Riverside South project would not result in significant adverse construction impacts with respect to land use and neighborhood character, economic conditions and air quality.

The 1992 FEIS concluded that construction activity on the project site (which included all of the Riverside South development parcels between West 59th Street and West 72nd Street) could have a significant adverse impact on nearby historic resources—the Chatsworth Apartments, the four row houses at the northeast corner of Riverside Drive and 72nd Street, the West 71st Street Historic District, and the Con Edison Power House. To prevent damage to these historic structures, the 1992 FEIS stated that as mitigation, during construction on the project site, a protection plan would be implemented.

The 1992 FEIS also determined that with the combination of project-generated traffic and construction traffic, there would be significant traffic impacts at four intersections—71st Street and West End Avenue, 59th Street and West End Avenue, 57th Street and Columbus Avenue, and 57th Street and Eighth Avenue. However, the mitigation proposed for the project when operational would be sufficient to mitigate the additional effects to construction traffic.

The 1992 FEIS found that construction activities would significantly increase noise levels at nearby receptor locations. For example pile driving operations, while only occurring for a maximum of 3 months at a particular location, would result in increases of up to 27 dBA. Other construction related operations would increase noise levels by more than 3 dBA and result in noise levels that would noisy and intrusive. To mitigate the significant noise impacts generated by construction-related noise, attempts would be made to ensure that the $L_{eq\ (1/2\ hour)}$ would be less than or equal to 75 dBA at the nearest residential property line and less than or equal to 80 dBA at the nearest commercial building; these noise thresholds were promulgated by DEP for construction noise associated with tunneling permits and, whenever possible, generally for all construction activity. The feasibility of noise control measures, such as quiet equipment and the erection of barriers, to comply with the standards above would be explored. These thresholds were expected to be exceeded at several locations, especially those next to the project site, resulting in unmitigatible adverse noise impacts during construciton. The 1992 FEIS also stated that the developer would also ensure that the contractors follow the guidelines given in the DNA report, "Construction Noise Mitigation Measures" (CON-79-001, July 1979). Propery line sound and vibration level measurements would be made on a monthly basis and the results compared with the estimated off-site sound levels detailed in that report to assess the effectiveness of these measures.

With respect to hazardous materials, the 1992 FEIS stated that mitigation measures for potential significant adverse impacts resulting from the presence of hazardous materials in the soil and groundwater on the site would be implemented and all remediation plans and health and safety plans would be approved by DEP and appropriate regulatory agencies before site disturbance or construction. With these measures there would be no unmitigated significant impacts with regard to hazardous materials.

## C. CONSTRUCTION OF BELOW-GRADE SPACE AND BUILDINGS

### INTRODUCTION

If the Proposed Project is approved, construction would occur over about 8 years, with complete build-out assumed for analysis purposes in 2018. This section of the chapter first gives an overview of the construction, and then provides a detailed description of each type of construction activity. The activities discussed include abatement and demolition, excavation, foundations, below-grade construction, construction of the buildings, and interior fit-out. General construction practices, including those associated with deliveries and access, hours of work, and sidewalk and lane closures, are then presented. Estimates of the number of construction workers and truck trips are presented.

### CONSTRUCTION OVERVIEW

The majority of the project site is currently occupied by a suface automobile parking lot. Two buildings that have been combined to operate as a parking garage are located on the south side of the project site. An Amtrak rail line is located within a subgrade culvert, passing through the northeast corner of the site. An active underground Amtrak pump house is located in the southeastern portion of the site.

The first step in construction of the Proposed Project would be abatement of asbestos and any other hazardous materials within the existing buildings and structures. Next, the existing utilities would be disconnected, after which the buildings would be demolished. At this point, below-grade excavation and construction would begin.

The below-grade space of the Proposed Project could be constructed using one of two different approaches. The first approach would have the below-grade space for all five buildings constructed before any above grade structures are built. The superstructure for each of the project buildings would then be built above a site-wide “podium.” This is called the “podium approach,” referring to the architectural definition of a podium as the low-wall base for construction. A below-grade slurry wall would be constructed around the perimeter of Parcels L, M, and N and would rise to the existing ground level.” The second approach would be to construct the individual foundation and basement of a building, followed by the superstructure of that building, sequentially until all five project buildings are built. This is called the “individual basements approach.” After the podium and the structural support for a building or an individual foundation are constructed, then work on the buildings’ core would begin. After the core and structure of a building has been erected to 5 to 10 stories, then installation of the mechanical and electrical internal networks would start. As the building progresses upward, exterior cladding would be placed, and the interior fit out would begin. During the busiest time of building construction, the upper core and structure are being built, with mechanical/electrical connections, exterior cladding, and interior finishing progressing on lower floors.

*CONSTRUCTION STAGING*

The staging of construction materials and equipment would take place mainly on the project site. During construction of the slurry wall and excavation of the site, the primary entrances and exits for trucks would be on West 59th and 61st Streets. As discussed in Chapter 16, “Traffic and Parking,” the northbound left-turn at the intersection of the West End Avenue and West 61st Street is planned to be banned in the near future due to the installation of a pedestrian refuge island on the south crosswalk as part of the Safe Streets for Seniors campaign. For the purposes of this analysis, it is assumed that construction trucks would be permitted to make a northbound left turn at this intersection in order to enter the construction site. Utilizing this turning movement would require approval from the New York City Department of Transportation (NYCDOT) prior to commencement of construction activities for the project. These turns are only assumed during the construction period of the Proposed Project.

A staffed security booth and flaggers would be at each entrance/exit to ensure that only authorized trucks and personnel are allowed on the construction site, to assist the trucks when they enter and leave the construction site, and to safeguard the public. During the excavation and foundation phases, the trucks would enter the site to receive soil and to pump concrete. Depending on the location of the foundation concrete pour, some concrete trucks could use the curb lanes on West 59th and 61st Streets. During the construction of the below-grade portions of Buildings 2 and 5, concrete trucks may use the west curb lane on West End Avenue. Typically, several trucks would be pumping concrete at the same time. Additional concrete trucks would be waiting in truck marshalling areas on the project site or along the side streets.

During the construction of the above grade portions of each building, the staging and material laydown would be on the individual building sites. During the construction of Buildings 2 and 5, although some concrete trucks may use the west curb lane on West End Avenue, most would be on-site or on West 59th and 61st Streets. For Buildings 1, 3, and 4, all of the truck access would be from West 59th and West 61st Streets with material laydown on-site. After Buildings 2 and 5 are constructed, West 60th Street and Freedom Place South would be open to traffic and would not be used for construction purposes.

*CONCEPTUAL CONSTRUCTION SCHEDULE*

Generally, the construction sequence would move from east to west, starting with Building 2 at the northeast corner of Parcel N at the intersection of West 61st Street and West End Avenue. Then Building 5 at the corner of West 59th Street and West End Avenue would be constructed. Construction of Buildings 1, 3, and 4 would follow. Generally, two buildings would be under construction at any given time. **Figure 20-1** and **Table 20-1** show the conceptual construction schedule. All proposed buildings are expected to be completed by 2018. In the podium approach, the time to construct an individual building would be shorter, because the below-grade work would already be completed. In both approaches, the plan would be to stagger the buildings coming on-line with 1 to 2 years between the completion of buildings. On **Figure 20-1**, the Site and Finishing task consists of setting up trailers, installing fencing and security gates, final punch list items, and similar activities. In addition, delivering water and fuel to the site, removing trash, and inspection by agency engineers would be part of this task, which starts early during the construction and continues throughout the course of construction. However, it would not involve many workers and usually would not employ heavy equipment.

A more detailed discussion of the different stages of construction are given below, followed by a discussion of general construction practices.

**Table 20-1**
**Conceptual Construction Schedule**

| Building Number | Start Date | Finish Date | Duration (months) |
|---|---|---|---|
| **Podium Approach** | | | |
| Podium | February 2011 | March 2014 | 38 |
| 2 | November 2011 | June 2014 | 32 |
| 5 | January 2013 | August 2015 | 32 |
| 1 | November 2013 | April 2016 | 30 |
| 3 | June 2015 | January 2018 | 32 |
| 4 | April 2016 | November 2018 | 32 |
| **Individual Basements Approach** | | | |
| 2 | February 2011 | June 2014 | 41 |
| 5 | March 2012 | July 2015 | 41 |
| 1 | March 2013 | July 2016 | 41 |
| 3 | September 2014 | January 2018 | 41 |
| 4 | September 2015 | November 2018 | 39 |

**Notes:** Construction starts at the first of the month and finishes at the end of the month.
**Sources:** Bovis Lend Lease

## ABATEMENT AND DEMOLITION

The first step for construction would be disconnection of existing utilities and demolition of the existing building to clear the site. Prior to demolition, a New York City-certified asbestos investigator would inspect the buildings for asbestos-containing materials (ACMs). If ACMs are found, these materials must be removed by a New York State Department of Labor (DOL)-

1.20.10


Conceptual Construction Schedule

RIVERSIDE CENTER

Figure 20-1

licensed asbestos abatement contractor prior to building demolition. Asbestos abatement is strictly regulated by DEP, DOL, EPA, and the U. S. Occupational Safety and Health Administration (OSHA) to protect the health and safety of construction workers and nearby residents and workers. Depending on the extent and type of ACMs, these agencies would be notified of the asbestos removal project and may inspect the abatement site to ensure that work is being performed in accordance with applicable regulations. These regulations specify abatement methods, including wet removal of ACMs that minimize asbestos fibers from becoming airborne. The areas of the building with ACMs would be isolated from the surrounding area with a containment system and a decontamination system. The types of these systems would depend on the type and quantity of ACMs, and may include hard barriers, isolation barriers, and/or critical barriers. Specially trained and certified workers, wearing personal protective equipment, would remove the ACMs and place them in bags or containers lined with plastic sheeting for disposal at an asbestos-permitted landfill. Depending on the extent and type of ACMs, an independent third-party air-monitoring firm would collect air samples before, during, and after the asbestos abatement. These samples would be analyzed in a laboratory to ensure that regulated fiber levels are not exceeded. After the abatement is completed and the work areas have passed a visual inspection and monitoring, if applicable, the general demolition work can begin. Depending on the amount of ACMs to be removed and project phasing, 10 to 20 workers may be on site, and about one or two truckloads of material can be removed per day. At the same time that the ACMs are being abated, removal of other materials that could be hazardous would take place. These other materials may include fluorescent light bulbs that could contain mercury, lead based paints, and transformers that could contain polycyclic biphenels. This phase is expected to last about a month per building. Since there are two building structures on the project site, this phase may last approximately two months.

General demolition is the next step. First any economically salvageable materials are removed. Then the building is deconstructed using large equipment. Typical demolition requires solid temporary walls around the building to prevent accidental dispersal of building materials into areas accessible to the general public. As the building is being deconstructed, bulldozers and front-end loaders would be used to load materials into dump trucks. The demolition debris would be sorted prior to being disposed at landfills to maximize recycling opportunities. About 10 to 20 workers are expected to be on site, and typically two to four truckloads of debris would be removed per hour. The general demolition phase is expected to last one to two months per building. Since there are two building structures on the project site, this phase may last approximately two to four months.

## EXCAVATION, FOUNDATIONS, AND BELOW-GRADE CONSTRUCTION

As part of the Proposed Project, three levels of below-grade space would be built. Deep below-grade structures extending well below the groundwater table are common in New York City. Because the structures would extend well below the groundwater table, the below-grade space would be designed to withstand groundwater-induced water pressures and to minimize the potential for flooding. To address groundwater pressure, the bottom slab of the below-grade facility would provide a horizontal groundwater cut-off and would be designed to resist uplift pressures. The basement walls would provide the vertical groundwater cut-off. In addition, water proofing/vapor barriers would be installed below and around the foundations to prevent water and/or vapors from seeping into the basements.

As discussed above, 1 of 2 approaches to the excavation, foundations, and below-grade construction would be employed. The first is the podium approach, in which an underground slurry wall would be built around the whole site. The slurry wall provides a vertical wall to minimize groundwater seeping into the excavation. The entire site would then be excavated. The excavation would start at the northeast corner of Parcel N to allow the construction of Building 2 to start as early as possible. Because of the project site's long history of rail yard uses, it is likely that abandoned underground structures would be encountered. These would be demolished and removed.

Blasting may occur in those areas where rock removal is necessary. Foundation work would include the use of cranes, drill rigs, excavators, backhoes, rockbreakers, loaders, pumps, motorized concrete buggies, concrete pumps, jackhammers, pneumatic compressors, a variety of small tools, and dump trucks and concrete trucks.

In the individual basement approach, construction of each building would include the construction of conventional basements. Each building basement would be excavated to the design depth, and the horizontal basement slab and vertical basement walls built. The vertical basement walls would be designed to allow openings should the building basements be interconnected. A description of the construction techniques are given below.

A cut for the Amtrak railroad right-of-way is located at the eastern portion of Parcel N. The right-of-way is approximately 70 feet wide and enters Parcel N on the north approximately 50 feet west of West End Avenue. The railroad cut crosses the Parcel diagonally and leaves the parcel just north of West 59th Street. To accommodate the railroad cut and allow Amtrak to continue using it, a bridge would be build over the tracks. Vertical walls would be built to separate the right-of-way from the basements of the buildings. This type of construction has been used to construct the buildings for the Riverside South development to the north. Bridge type construction with buildings above currently covers the Amtrak right-of-way from West 59th Street to Pennsylvania Station at West 34th Street.

Amtrak also has an underground pump house located near the southeast corner of the project site. The pumps are used to remove water from the below grade tracks and discharge it into the combined sewer system. The project sponsor would provide Amtrak with a new pump house at a location agreeable to both parties. The pump house would be located in such a way that it would be able to continue to dewater the railroad tracks and not to interfere with the efficient functioning of the below grade space.

### *SLURRY WALLS*

#### *Podium Approach*

Slurry walls reduce the horizontal groundwater seepage into the open excavation and reduce the volume of water that must be pumped out of the excavation and discharged. In slurry walls construction, a long, narrow section, or "panel," is excavated along the perimeter of the basement. The excavation would be filled with slurry, which is a bentonite clay and water mixture that can be pumped. For each section or panel, a steel reinforcement cage, carefully measured to match the width and depth of the panel, would either be fabricated on the site or brought to the site in smaller sections for assembly. Each reinforcement cage is likely to measure between 30 and 60 feet long on the eastern portion of the project site and longer on the western side where the depth to bedrock is greater. Once completed, the reinforcement cages are lowered into the clean slurry-filled panels. The panels would then be filled with concrete from the bottom up, which would be pumped into tubes lowered to the panels' base. The rising level of concrete in the panel displaces the slurry, which would be pumped into a recycling facility on site. The recycling facility would likely consist of a pump, a mixer, several silos, and a separator, known as a "desander." At the recycling facility, suspended soil and sand would be removed from the slurry, so that the clean slurry could be reused for another panel.

Slurry wall construction occurs in stages. Slurry wall panels are constructed in a staggered configuration, so that no two adjacent panels are worked on consecutively. The concreting operation is very time sensitive, and panels have to be completed quickly (typically within 15 hours or less). The work begins with construction of concrete guide walls adjacent to the locations where the final wall would be. These concrete walls, each measuring approximately 2 feet wide by 4 feet deep, would be installed along a portion of the sidewalk. Next, the trench for the permanent wall would be dug between these guide walls, using a clamshell shovel suspended from a crane and/or trench cutter (hydromill) machines. The trench would be excavated in 10- to 20-foot-long segments, or panels. The trench would be 2 to 4 feet wide and range in depth from less than 30 feet, to approximately 60 feet. Slurry walls may extend or be keyed into bedrock. Percussion equipment (e.g., air-powered drills) would be employed to excavate rock or penetrate cobbles and boulders. The soil and rock excavated by the clamshell or hydromill would be placed on the ground to allow the soil to drain. Where there is a potential for contamination, the moist soil and rock would be first tested, then loaded onto trucks for transport out of Manhattan to a licensed disposal facility.

As each panel is completed, another would be constructed (but not immediately adjacent to the constructed segment, to allow time for the panel to harden), and this process would continue until the outside perimeter of the excavation is completed. Work on each 10- to 20-foot panel would take about three days.

The excavation and placement of reinforcing cages would take place during normal working hours. On occasion, the pouring of the slurry walls panels would require extended work hours. Slurry wall construction would require work crews of up to 50 workers at any point, assuming several areas are constructed at once. During the busiest phases of slurry wall construction, approximately 40 truck trips per day would be needed to deliver materials and remove excavated soil (including spent slurry) and rock.

*Individual Basements Approach*

Slurry walls would not be constructed in the individual basements approach, as the foundation for each building would be excavated separately and a conventional basement foundation would be constructed below-grade.

*BLASTING*

In areas where rock removal may be necessary, and where other rock excavation methods (e.g., mechanical excavators, rock splitters, and expansive chemical rock-splitting methods) cannot practicably be employed, controlled blasting may be used for short periods of time. Blasting in New York City is tightly regulated and restricted. All blasting would conform to New York City Fire Department (FDNY) regulations and any other applicable regulations. The regulations are intended to prevent endangering the public and to minimize vibrations that could affect nearby buildings. Blasting would involve the use of timed multiple charges with limited blast intensity, which would reduce potential impacts. Blastmats would be placed over the blasting areas to prevent rocks and debris from becoming air borne.

In areas where a controlled drill-and-blast method would be used, there would typically be one or two controlled blasting periods per day, each lasting for only a few seconds. More frequent blasting using smaller charges could also occur. Properties adjacent to these activities would be documented and monitored before, during, and following each blasting period, and strict parameters would be established and maintained by a safety officer at all times. As discussed below under "Vibration", the explosive charges would be designed to have a peak particle velocity of less than 0.60 inches per second. The monitoring would measure the peak particle velocity, and if necessary, the design of the explosive charges would be changed to maintain compliance with the criteria. Blasting would not occur at night. The time between controlled blasts is required to remove debris and setup for the next blast. Some vibrations at the street and inside adjacent properties may be detected due to drilling and blasting activities. The extent of vibrations would vary based on the density of the material being mined, with hard rock the most efficient in transmitting vibrations; how deep below-ground blasting occurs; proximity to structures; the foundation configuration of the adjacent structures; and the response to vibration of the adjacent structures.

*DEWATERING*

Because below-grade structures would extend below groundwater levels and due to the proximity of the project site to the Hudson River, the excavation would have to be dewatered. Even though a slurry wall would minimize groundwater seeping into the excavated area, the excavated area would not be water proof until the water/vapor barriers are installed and foundations are built. In addition, rain and snow would collect in the excavation, and that water would also have to be removed. The water would be sent to an on-site pretreatment system to remove the sediment and provide additional treatment to the water. The pretreatment system often includes sedimentation tanks, filters, and carbon adsorption. The decanted water would then be discharged into either the New York City sewer system or the Hudson River. The settled sediments, spent filters and removed materials would be transported to a licensed disposal area. Discharge in the sewer system is governed by DEP regulations, and discharge into the Hudson River is governed by NYSDEC regulations.

DEP has a formal procedure for issuing a Letter of Approval to discharge into the city sewer system. The authorization is issued by the DEP Borough office if the discharge is less than 10,000 gallons per day and an additional approval by the Division of Connections & Permitting is needed if the discharge is more than 10,000 gallons per day. All chemical and physical testing of the water has to be done by a laboratory that is certified by the New York State Department of Health. The design of the pretreatment system has to be signed by a New York State Professional Engineer or Registered Architect. For water discharged into the city sewers, DEP regulations specify the following maximum concentration of pollutants.

- Petroleum hydrocarbons 50 parts per million (ppm)
- Cadmium 2 ppm
- Hexavalent chromium 5 ppm
- Copper 5 ppm
- Amenable cyanide 0.2 ppm
- Lead 2 ppm
- Mercury 0.05 ppm
- Nickel 3 ppm
- Zinc 5 ppm
- pH between 5 to 12
- Temperature less than 150 degrees Fahrenheit

- Flash Point greater than 140 degrees Fahrenheit
- Benzene 134 parts per billion (ppb)
- Ethylbenzene 380 ppb
- Methyl-Tert-Butyl-Ether (MTBE) 50 ppb
- Naphthalene 47 ppb
- Tetrachloroethylene (perc) 20 ppb
- Toluene 74 ppb
- Xylenes 74 ppb
- PCB 1 ppb
- Total suspended Solids 350 ppm

Any groundwater discharged in the city system would meet these limits. DEP also imposes project specific limits, depending on the location of the project and contamination that has been found in nearby areas.

Discharge directly into the Hudson River is regulated by NYSDEC under its State Pollutant Discharge Elimination System (SDPES) permitting. NYSDEC imposes limits on the contaminants in the discharge based on the water quality classification of the receiving waters. The Hudson River's water quality classification in this area is I. Best usages for Use Class I waters are secondary contact recreation and fishing. Water quality should be suitable for fish propagation and survival. NYSDEC requires testing of the water to be discharged and a pretreatment system to ensure that water quality parameters are met.

*EXCAVATION AND FOUNDATION CONSTRUCTION*

Typically, soil excavation and foundation construction for a building takes approximately seven to nine months to complete, depending on the size of the development component. Trucks would remove excavated material for off-site disposal in a licensed landfill or recycling facility. Depending on the size of the excavation, the peak number of workers would range from about 150 per day on smaller buildings to about 350 workers per day on larger buildings, such as Building 1. Typical mobile equipment would include excavators, backhoes, bulldozers, loaders, and compactors.

The bedrock depth in the area varies. Where bedrock is shallow it is likely that solid rock excavation would be necessary. While the specific methods used for rock excavation cannot be determined until a subcontractor is selected, excavation typically includes rock drilling and/or controlled blasting, and the use of heavy excavation equipment and cranes to remove broken rock from the site.

Excavation of the below-grade areas would start, and upon reaching the underlying water table, construction-dewatering operations would be implemented and maintained, as needed. Soil and rock would be excavated and stockpiled for drying, classification, and testing. The classification and testing could include the use of a photoionization detector, odor, and chemical testing at laboratory. The classification and testing would determine the final use or disposal technique. Clean soil could be used for on-site backfill, if needed, or carted to an off-site location for reuse or disposal. Soils that contain elevated levels of contaminates would be disposed of at a licensed facility. The methods of segregation for possible on-site re-use (photoionization detector screening, olfactory and visual observations, and possible additional testing) would be outlined in the RAP and subject to OER approval. Stockpiles of material slated for on-site reuse would be managed in accordance with stipulations outlined in the RAP regarding placement, HDPE cover material, runoff control, etc. No on-site soil would be reused within two feet of final grade in areas that will not be capped by a building, pavement or other impermeable surface (i.e., landscaped areas). If any unreported underground tanks are uncovered, they would be removed in accordance with applicable NYSDEC regulations. As the excavation becomes deeper, a temporary ramp would be built to provide access for the dump trucks to the work site. For the podium approach, internal steel bracing and/or external soil/rock anchors (i.e., tiebacks) would be installed on, against, or through the slurry wall to ensure its stability. As the soil is excavated, the remaining soil on the outside exerts a large force inward. Steel braces (and/or tiebacks for the podium approach) would be used to resist this force until the below-grade foundations are built. The foundations then resist the inward force. The excavation would involve excavators, bulldozers, and backhoes. This phase of the work would have several hundred workers employed on this task, and over 100 trucks would enter and exit the site daily at the peak of work on each building. If two buildings are under construction simultaneously, the number of workers and trucks on the project site would be double.

As the excavation is being completed, deep foundation elements would be installed into competent bearing material (e.g., drilled caissons, drilled or driven piles or load bearing elements excavated using slurry wall equipment for the podium approach). Drill rigs, excavating tools, or pile drivers could be used simultaneously. On the eastern part of the site, bedrock is close to the ground surface, and the excavation would include rock removal. The foundations would be mats (a reinforced concrete slab, bearing directly on soil and/or rock, with no deep foundation elements) on the bedrock. On the western part of the site, the bedrock is deep below the ground surface, and the excavation would not reach bedrock. Deep piles to the bedrock would be used for the foundation. Concrete trucks would be used to pour the foundation and the below-grade structures.

Utility connections would also be installed during this phase. During this phase of a building's construction, about 40 construction workers would be on site. Construction of the below-grade structures would entail the use of heavy-duty construction equipment. Pile drivers and large cranes would be used to build the below-grade structures. After 9 to 12 months, the foundation would be constructed, and the construction of the core of the building would begin at ground level. For the podium approach, all of the foundations and below grade structures would be constructed in the early stage of the Proposed Project. For the individual basement approach, the excavation, foundations, and below grade structures would be the first tasks on each individual building.

## ABOVE-GRADE BUILDING CONSTRUCTION

Typical construction stages for the above grade portions of the buildings do not vary greatly and generally last approximately 28 to 30 months. Building construction generally involves building the core, fitting the exteriors or shell, installing the mechanical and electrical systems, and finishing the interior fit-out. The below-grade structures act as the foundations for the buildings. The building structure and the interior finishing stages would overlap one another, as the upper parts of the structure would be under construction while the exteriors and mechanical/electrical systems are being installed, and the lower floor interiors are finished.

### *CORE*

Construction of the core of a building would last approximately 13 to 19 months. Construction of the core of the building would include construction of the building's framework (installation of beams and columns), and floor decks. These activities would require the use of the tower crane, compressors, personnel and material hoists, concrete pumps, on-site reinforcing bar bending jigs, welding equipment, and a variety of hand-held tools, in addition to the delivery trucks that would bring construction materials to the site. Each day, anywhere from about 55 to 135 workers and 35 to 50 trucks would be required for the construction of each building.

*EXTERIORS*

Exterior construction involves the installation of the façade (exterior walls, windows, and cladding) and the roof. Exterior construction would take about three to six months, and would overlap with the completion of the superstructure and the interior finishing. Cranes would be used to lift the façade into place, and welding machines and impact wrenches would secure the exterior to the superstructure. Anywhere from 35 to 75 workers and 2 to 3 trucks per day would be needed for the exterior construction.

*INTERIOR FIT-OUT AND FINISHING*

This stage would include the construction of interior partitions, installation of lighting fixtures, and interior finishes (flooring, painting, etc.), and mechanical and electrical work, such as the installation of elevators. Mechanical and other interior work would overlap for 4 to 6 months with the tower building core and exterior construction. This activity would employ the greatest number of construction workers: up to 130 to 370 per day at each building during periods of maximum activity. In addition, about 15 to 20 trucks per day would arrive and leave the construction site each day at this stage of construction. Equipment used during interior construction would include exterior hoists, pneumatic equipment, delivery trucks, and a variety of small hand-held tools. However, this stage of construction is the quietest and does not generate fugitive dust.

## GENERAL CONSTRUCTION PRACTICES

Certain activities would be on-going throughout the project construction. The project sponsor would have a field representative on-site throughout the entire construction period. The representative would serve as the contact point for the community and local leaders. The representative would be available to meet and work with the community to resolve concerns or problems that arise during the construction process. New York City maintains a 24-hour-a-day telephone hotline (311) so that concerns can be registered with the city. Once abatement activities begin, a security staff would be on the specific construction sites 24 hours a day, 365 days a year.

The following describes governmental construction oversight agencies and typical construction practices in New York City. In certain instances, specific practices may vary from those described below. However, the typical practices are expected to be used because they have been developed over many years and have been found to be necessary to successfully complete large projects in a confined urban area. All deliveries, material removals, and hoist uses have to be tightly scheduled to maintain an orderly work area and to keep the construction on schedule and within budget.

*GOVERNMENTAL COORDINATION AND OVERSIGHT*

The governmental oversight of construction in New York City is extensive and involves a number of city, state, and federal agencies. **Table 20-2** shows the main agencies involved in construction oversight and the agency’s areas of responsibilities. The primary responsibilities lie with New York City agencies. NYCDOB has the primary responsibility for ensuring that the construction meets the requirements of the Building Code and that the building is structurally, electrically, and mechanically safe. In addition, NYCDOB enforces safety regulations to protect both the workers and the public. The areas of responsibility include installation and operation of the equipment, such as cranes and lifts, sidewalk shed, and safety netting and scaffolding. In addition, NYCDOB approves the CPP used when the construction is in proximity to fragile historic structures. DEP enforces the Noise Code, approves RAP's/CHASP's, and regulates water disposal into the sewer system. FDNY has primary oversight for compliance with the Fire Code and for the installation of tanks containing flammable materials. NYCDOT reviews and approves any traffic lane and sidewalk closures. New York City Transit (NYCT) is in charge of bus stop relocations. LPC approves studies and testing to prevent loss of archaeological materials and to prevent damage to fragile historic structures.

**Table 20-2**
**Construction Oversight in New York City**

| Agency | Areas of Responsibility |
|---|---|
| **New York City** | |
| Department of Buildings | Primary oversight for Building Code and site safety |
| Department of Environmental Protection | Noise, hazardous materials, dewatering |
| Fire Department | Compliance with Fire Code, tank operation |
| Department of Transportation | Lane and sidewalk closures |
| New York City Transit | Bus stop relocation |
| Landmarks Preservation Commission | Archaeological and architectural protection |
| **New York State** | |
| Department of Labor | Asbestos workers |
| Department of Environmental Conservation | Dewatering, hazardous materials, tanks Stormwater Pollution Prevention Plan, Industrial SPDES, if any discharge into the Hudson River |
| **United States** | |
| Environmental Protection Agency | Air emissions, noise, hazardous materials, toxic substances |
| Occupational Safety and Health Administration | Worker safety |

NYSDEC regulates discharge of water into rivers and streams, disposal of hazardous materials, and construction, operation, and removal of bulk petroleum and chemical storage tanks. DOL licenses asbestos workers. On the federal level, the EPA has wide ranging authority over environmental matters, including air emissions, noise, hazardous materials, and the use of poisons. Much of the responsibility is delegated to the state level. OSHA sets standards for work site safety and the construction equipment.

*DELIVERIES AND ACCESS*

Because of site constraints, the presence of large equipment, and the type of work, access to the construction sites would be tightly controlled. The work areas 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. 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 entry. 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 with almost all large urban construction sites, material 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 truck would be assigned to a later time. A similar regimen would be instituted for concrete deliveries, but the schedule would be even stricter. If a truck is late, it would be accommodated if possible, but if on-time concrete trucks are in line, the late truck would not be allowed on site. 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 limit is exceeded.

During the finishing of the building interiors, individual deliveries would be scheduled to the extent practicable. Studs for the partitions, drywall, electrical wiring, mechanical piping, ductwork, and other mechanical equipment 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 its 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 building construction in New York City, 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.

*HOURS OF WORK*

Construction activities for the buildings 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 7:00 AM on weekdays, with some workers arriving to prepare work areas between 6:00 AM and 7:00 AM. Normally, work would end at 3:30 PM, but it can be expected that to meet the construction schedule, the workday would be extended 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 6:00 PM and would not include all construction workers on-site, but just those involved in the specific task requiring additional work time. Limited extended workdays are expected to occur on weekdays over the course of construction.

At limited times over the course of constructing a building, weekend work would be required. 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 Saturday from 7:00 AM with worker arrival and site preparation to 5:00 PM for site cleanup.

A few tasks may have to be completed without a break, and the work can extend more than a typical 8-hour day. For example, in certain situations, concrete must be poured continuously to form one structure without joints. If the concrete is poured and then stopped for a period of time before more concrete is poured, a weak joint is formed. This weak joint may not be structurally sound and could weaken the building. An example of this is pouring concrete for slabs and foundations, which would be poured in sections. Those sections could require over 100 concrete trucks per day, which would necessitate at least 12 hours to complete. These long concrete pours often begin late on a Saturday, when traffic is light, and continue into Sunday. The plans for each long concrete pour would be coordinated with NYCDOT. In addition, a Construction Noise Mitigation Plan required by the New York City Noise Control Code[1] would be developed and implemented to minimize intrusive noise emanating into nearby areas and affecting sensitive receptors. A copy of the Construction Noise Mitigation Plan would be kept on-site for compliance review by DEP and NYCDOB.

*SIDEWALK AND LANE CLOSURES*

During the course of construction, traffic lanes and sidewalks would have to be closed or protected for varying periods of time. It is likely that the west curb lane on West End Avenue between West 59th and West 61st Streets would be used for construction purposes for the duration of constructing buildings 2 and 5. The north curb lane on West 59th Street would likely be used for construction purposes for the duration of the construction of the Proposed Project. A bus stop may have to be temporarily relocated and crosswalks redirected. Some other lanes and sidewalks may be closed intermittently to allow for certain construction activities. This work would be coordinated with and approved by the NYCDOT.

These closures would cause diversion of vehicular traffic, the potential impacts of which are discussed later in the impacts section of this chapter.

*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-0-10-001). 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, such as wheel washing stations, to limit potential off-site transport of sediment. The non-structural

[1] New York City Noise Control Code (i.e., Local Law 113). Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007.

"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.

## NUMBER OF CONSTRUCTION WORKERS AND MATERIAL DELIVERIES

**Table 20-3** shows the estimated numbers of construction workers and truck deliveries to the project site by calendar quarter for the podium approach. These represent peak days of work within each quarter, and a number of days during the quarter would have fewer construction workers and delivery trucks. For the podium approach, the peak period would have an average number of 608 workers during the construction of the project. The peak period would span the first quarter of 2014 through the third quarter of 2014, with between 970 and 1031 workers on-site daily. The number of truck trips would peak in the second quarter of 2012 through the fourth quarter of 2012 with between 200 and 210 trucks arriving per day. The average number of trucks would be about 97 per day throughout the construction period. Detailed workforce and delivery projections can be found in Appendix G-1.

**Table 20-3**
**Number of Construction Workers and Delivery Trucks—Podium Approach**

| Year | 2011 | | | | 2012 | | | | 2013 | | | | 2014 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarter | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th |
| Workers | 147 | 390 | 436 | 507 | 666 | 772 | 886 | 907 | 634 | 693 | 806 | 939 | 1,031 | 970 | 1,001 | 928 |
| Trucks | 30 | 87 | 117 | 146 | 186 | 200 | 208 | 210 | 132 | 111 | 100 | 116 | 128 | 108 | 84 | 82 |
| **Year** | **2015** | | | | **2016** | | | | **2017** | | | | **2018** | | | |
| Quarter | 931 | 941 | 729 | 777 | 755 | 448 | 571 | 486 | 470 | 466 | 426 | 333 | 165 | 150 | 130 | 15 |
| Workers | 82 | 84 | 76 | 81 | 79 | 97 | 126 | 95 | 94 | 93 | 60 | 35 | 22 | 20 | 17 | 4 |
| Trucks | | | | | | | | | | | | | | | | |
| **Year** | **Project** | | | | | | | | | | | | | | | |
| Quarter | Peak | | Average | | | | | | | | | | | | | |
| Workers | 1,031 | | 608 | | | | | | | | | | | | | |
| Trucks | 210 | | 97 | | | | | | | | | | | | | |

**Note:** This table represents estimated conditions in each quarter and may differ from the numbers discussed in some analysis sections. The analyses are based on reasonable worst case assumptions for that particular analysis area.
Source: Bovis Lend Lease

**Table 20-4** shows the estimated numbers of construction workers and truck deliveries to the project site by calendar quarter for the individual basements approach. These represent peak days of work within each quarter, and a number of days during the quarter would have fewer construction workers and delivery trucks. For the individual basements approach, the average number of workers would be about 577 during the construction of the project and would have three peak periods. The first peak period would be the third and fourth quarters of 2013 with 1,030 and 1,030 daily workers respectively. The second peak period would be the 4th quarter of 2014 and the 1st quarter of 2015, with about 1,061 and 1,059 workers on-site daily, respectively. The third peak period would be the fourth quarter of 2015 and first quarter of 2016, with about 1,015 and 1,034 workers on-site daily, respectively. The number of truck trips would have two peak periods. The first would be in the third and fourth quarter of 2013 and the second peak period would be 4th quarter of 2015 through the 3rd quarter of 2016 with between 127 and 144 trucks arriving per day. The average number of trucks would be about 87 per day throughout the construction period. Detailed workforce and delivery projections can be found in Appendix G-1.

**Table 20-4**
**Number of Construction Workers and Delivery Trucks—Individual Basement Approach**

| **Year** | **2011** | | | | **2012** | | | | **2013** | | | | **2014** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarter | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th |
| Workers | 71 | 186 | 186 | 163 | 202 | 478 | 551 | 559 | 528 | 866 | 1,030 | 1,030 | 967 | 793 | 767 | 1,061 |
| Trucks | 23 | 64 | 64 | 56 | 51 | 123 | 126 | 127 | 81 | 126 | 130 | 130 | 123 | 91 | 78 | 109 |
| **Year** | **2015** | | | | **2016** | | | | **2017** | | | | **2018** | | | |
| Quarter | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th | 1st | 2nd | 3rd | 4th |
| Workers | 1,059 | 1,021 | 780 | 1,015 | 1,034 | 937 | 531 | 484 | 468 | 464 | 424 | 331 | 165 | 151 | 131 | 16 |
| Trucks | 109 | 107 | 108 | 127 | 128 | 144 | 127 | 95 | 94 | 93 | 60 | 35 | 22 | 20 | 17 | 4 |

| **Year** | **Project** | |
|---|---|---|
| Quarter | Peak | Average |
| Workers | 1,061 | 577 |
| Trucks | 144 | 87 |

Note: This table represents estimated conditions in each quarter and may differ from the numbers discussed in some analysis sections. The analyses are based on reasonable worst case assumptions for that particular analysis area.
Source: Bovis Lend Lease

## D. FUTURE WITHOUT THE PROPOSED PROJECT

If the Proposed Project is not approved, two potential scenarios could occur. No Build Scenario 1 assumes that in the Future without the Proposed Project, the original program for Parcels L, M, and N that was approved in the 1992 FEIS would be constructed. No Build Scenario 2 assumes that the original 1992 FEIS approved program for Parcels L and M would be constructed, but Parcel N would remain in its current parking use. Construction of No Build Scenario 1 would likely lead to similar construction effects as with the Proposed Project. Because No Build Scenario 2 would involve less construction, the duration of construction would likely be shorter, but during active periods of construction, the effects would be similar to those of other construction projects in the city. Construction under the No Build scenarios would not incorporate the extensive air quality emissions reduction program or the noise control measures that are being committed to by the project sponsor as part of the Proposed Project (see discussion below under “Air Quality” and Noise”).

## E. FUTURE WITH THE PROPOSED PROJECT

Similar to many large development projects in New York City, construction can be disruptive to the surrounding area for limited periods of time throughout the construction period. The following analyses describe potential construction impacts on land use and neighborhood character, historic resources, socioeconomics, hazardous materials, infrastructure, traffic and transportation, air quality, noise and vibration, and rodent control.

### LAND USE AND NEIGHBORHOOD CHARACTER

Five multi-storied buildings would be constructed on the three parcels along with publicly accessible open space and two streets: Freedom Place South and the extension of West 60th Street. All of these above-grade elements would be built above an interconnected below-grade area.

The Proposed Project would result in construction over an eight-year period. The inconvenience and disruption arising from the construction would include temporary diversions of pedestrians, vehicles, and construction truck traffic to other streets. No one location on-site would be under construction for the full eight years. Throughout the construction period, access to surrounding residences, businesses, institutions, and waterfront uses in the area would be maintained (see discussions below in "Socioeconomic Conditions," and "Traffic and Transportation"). In addition, throughout the construction period, measures would be implemented to control noise, vibration, and dust on the construction sites and minimize impacts on the surrounding areas. These measures would include the erection of construction fencing and, in some areas, fencing incorporating sound-reducing measures. Even with these measures in place (which are described in detail below), impacts, and in some cases significant impacts are predicted to occur. However, because none of these impacts would be continuous in any one location or permanent, they would not create significant impacts on land use patterns or neighborhood character in the area.

In addition to the activity associated with construction, some part of the parcels not yet in construction would be used for construction staging. These uses would not conflict with or significantly affect neighborhood character in the surrounding areas.

## HISTORIC RESOURCES

### *ARCHITECTURAL RESOURCES*

There are three known architectural resources in the study area. The Consolidated Edison Power House was listed as a known resource in the 1992 FEIS; the Amsterdam Houses and the Hudson River Bulkhead were determined eligible for S/NR listing subsequent to the publication of the 1992 FEIS.

The Consolidated Edison Power House (former Interborough Rapid Transit [IRT] Power House) (heard, NYCL, S/NR-eligible) is located on Eleventh Avenue between West 58th and 59th Streets, approximately 60 feet south of the project site.[1] The Amsterdam Houses (S/NR-eligible) occupy the superblock between Amsterdam Avenue, West 64th Street, West 61st Street, and West End Avenue, approximately 100 feet from the project site. A portion of the Hudson River Bulkhead**,** which runs along the Hudson River on the west side of Manhattan, has been determined S/NR eligible. This is the portion of the bulkhead from Battery Place to West 59th Street. A small section of the bulkhead between West 58th and West 59th Streets is within the study area, and is located approximately 250 feet from the project site.

The Proposed Project would result in new construction within 90 feet of the Consolidated Edison Power House. Therefore, the Proposed Project would comply with LPC's *Guidelines for Construction Adjacent to a Historic Landmark* as well as the guidelines set forth in section 523 of the *CEQR Technical Manual* and the procedures set forth in NYCDOB's TPPN #10/88. This includes preparation of a CPP, to be prepared prior to demolition and construction activities, to be submitted to LPC for review and approval. Development and implementation of this protection plan would be a requirement of the Restrictive Declaration that will be recorded in connection with the proposed zoning actions. The other historic resources—the Amsterdam

[1] LPC held hearings with respect to the designation of the former IRT Power House building in 1979 and 1990. The building was not designated at that time. LPC held another public hearing to consider the designation of the building on July 14, 2009. A decision on designation remains pending.

Houses and the Hudson River Bulkhead—are located more than 90 feet away from the project site and would not be expected to be adversely affected by the project's construction-related activities.

Overall, with the preparation and implementation of a CPP to avoid adverse construction-related impacts on the Consolidated Edison Power House, the Proposed Project would have no adverse impacts to architectural resources.

*ARCHAEOLOGICAL RESOURCES*

As described in Chapter 7, "Historic Resources," the Proposed Project would disturb potential subsurface prehistoric remains on Parcel N. To determine if archaeological resources are present, Phase 1B archaeological testing will be carried out in these archaeologically sensitive areas as required by the Restrictive Declaration that will be recorded in connection with the proposed zoning actions. Prior to the initiation of Phase 1B investigations, a testing protocol would be submitted to LPC for review and approval. Following approval of the protocol, it is expected that the Phase 1B testing would be conducted prior to construction of the Proposed Project. If no resources of significance are encountered, a testing report would be prepared summarizing the conclusions of the testing for submission to LPC. Should any resources of potential significance be found, further testing would be undertaken in consultation with LPC to identify the boundaries and significance of the find. If required, data recovery would be undertaken in consultation with LPC. With implementation of all of the above measures which will be incorporated into the Restrictive Declaration, there would be no significant adverse impacts on archaeological resources.

## SOCIOECONOMIC CONDITIONS

Construction activities associated with the Proposed Project would not result in any significant adverse impacts to socioeconomic conditions. Construction would, in some instances, temporarily affect pedestrian and vehicular access on street frontages immediately adjacent to the project site. However, lane and/or sidewalk closures are not expected to occur in front of entrances to any existing or planned retail businesses, and construction activities would not obstruct major thoroughfares used by customers or businesses. Utility service would be maintained to all businesses, although very short term interruptions (i.e., hours) may occur when new equipment (e.g., a transformer, or a sewer or water line) is put into operation. Overall, construction of the Proposed Project is not expected to result in any significant adverse impacts on surrounding businesses.

The limited number of businesses surrounding the Proposed Project would not experience a significant decline in business due to construction. 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 likely be offset by the presence of several hundred construction workers, who would likely patronize local eateries.

Construction would create direct benefits resulting from expenditures on labor, materials, and services, and indirect benefits created by expenditures by material suppliers, construction workers, and other employees involved in the direct activity. Construction also would contribute to increased tax revenues for the city and state, including those from personal income taxes.

## HAZARDOUS MATERIALS

As more fully described in Chapter 11, "Hazardous Materials," potential on-site contaminants would be remediated as part of the Proposed Project. Environmental assessments of the site identified hazardous materials concerns associated with the presence of urban fill beneath the site, the potential for volatile organic compounds (VOCs) in soil gas, and potential impacts to soil from on and off-site uses. Excavation could result in adverse impacts by increasing pathways for human exposure to potential hazardous materials. Legal requirements for excavation and construction activities (including those relating to off-site soil disposal, petroleum tank removal, spill reporting, and the removal, handling and disposal of asbestos containing materials, lead-based paint and polychlorinated biphenyls (PCBs), as well as requirements associated with the 1992 FEIS, the 1992 Restrictive Declaration and the 1996 CHASP would be followed.

Construction activities would be performed in accordance with the following:

- Prior to building demolition activities, surveys would be conducted for ACMs. Confirmed ACMs would be removed and disposed of prior to demolition in accordance with all applicable regulations.
- Building demolition activities would be conducted in accordance with the applicable Occupational Safety and Health Administration regulation (OSHA 29 CFR 1926.62—*Lead Exposure in Construction*).
- Unless labeling or test data indicates that any hydraulic lifts or fluorescent lighting fixtures installed prior to 1979 do not contain PCBs, and that fluorescent lights do not contain mercury, these objects would be handled and disposed of in accordance with all applicable regulatory requirements. In addition, non-PCB containing hydraulic lifts installed after 1979 would be disposed of in accordance with the applicable regulatory requirements.
- Since excavation for new buildings would extend below the water table, dewatering would be necessary during construction and new foundations would require waterproofing, which would also act as a vapor barrier for both VOCs and methane. As such, additional testing for VOCs and methane would not be needed to prevent the potential for post-construction impacts, but, monitoring for VOCs and methane during construction would be performed.
- Excavated soil would be screened for signs of contamination (such as odors, staining, or elevated photoionization detector (VOC) readings). Any soil exhibiting such signs of contamination would be segregated and tested. All material that would need to be disposed of would be properly handled and disposed of off-site in accordance with all applicable requirements.
- In addition to VOC and methane monitoring, the construction site would be monitored for dust during any soil moving activity (excavation, loading onto dump trucks for off-site disposal, managing soil stockpiles, etc.).
- Air monitoring for VOCs, methane and particulates would be conducted during subsurface disturbance.
- Prior to dewatering, testing would be performed to ensure that the groundwater would meet applicable requirements. If necessary, pretreatment would be conducted prior to discharge, as required by DEP Sewer Discharge permits.
- A (SWPPP would be implemented to prevent contaminated sediment runoff into nearby water bodies. The SWPPP would include procedures for soil stockpiling and runoff control.

Excavated soil would be stockpiled for future reuse or off-site disposal. Stormwater management measures, such as hay bales or silt fencing, would be placed around stockpiles and properly maintained to ensure that stormwater runoff complies with the applicable requirements.

A RAP and an updated CHASP, both reviewed and approved by the OER, would be created incorporating the requirements outlined above. The plans would include, for example, requirements relating to vapor barrier/waterproofing; soil screening, stockpiling, delineating and segregating excavated soil for proper management for either subsequent on-site re-use as backfill (below building structures, behind structural walls or beneath roadbeds, etc.) or for off-site transportation and disposal; dust control; quality assurance; and contingency measures should petroleum, asbestos-containing serpentinite bedrock or other unexpected contamination be encountered, and would be updated both to conform to current regulatory requirements (including 6 NYCRR Part 375 Environmental Remediation Programs Subparts 375-1 to 375- 4 & 375-6) and to include the requirement for preparation and submission of a post-excavation closure report documenting that appropriate procedures were followed.

With the implementation of these measures, as set forth in the Restrictive Declaration that will be recorded as part of the Proposed Project, no significant adverse impacts related to hazardous materials would result from construction activities on the project site.

## TRAFFIC AND TRANSPORTATION

The construction of various components of the Proposed Project would be expected to result in increased traffic levels in the study area, due to construction worker and truck traffic over an eight year period, from 2011 and 2018. Because of the duration of the construction activities, a detailed traffic analysis was conducted to assess the potential construction related traffic impacts.

### *CONSTRUCTION TRAFFIC PROJECTIONS*

Average daily construction worker and truck activities by month, quarter, and rolling annual average were projected for the full construction period. This was done for both construction scenarios: the individual basement scenario and the podium scenario. Based upon this projection, it was determined that the podium scenario would yield the conservative worst-case analysis of potential construction traffic impacts because it would produce the highest number of combined construction worker and truck trips during any given three month time period. The projections for the podium scenario were further refined to account for worker modal splits, vehicle occupancy, and arrival and departure distributions.

#### *Daily Workforce and Truck Deliveries*

For a conservative reasonable worst-case analysis of potential construction traffic impacts, the peak three-month levels of construction were used as the basis for estimating peak hour construction traffic volumes. The proposed construction schedule assumes peak construction activities would occur in the second quarter of 2012. This peak construction period also includes the construction worker and truck trips from construction activities on parcels K1 and K2 (which are not part of the Proposed Project), since it is anticipated that they would also be under construction at that time. During peak construction months in 2012, the daily averages of construction workers and truck traffic were estimated at 1,260 daily workers and 416 daily trucks. These estimates of daily construction activities are further discussed below.

*Construction Worker Modal Splits*

According to the United States Census Bureau reverse journey-to-work (RJTW) data, commuting to work via auto in New York City is more prevalent among workers in the fields of construction and excavation than for workers in other occupations. Based on census data, the *Fordham University Lincoln Center Master Plan FEIS* reported that approximately 49 percent of construction workers would commute to the project site via auto, with an average auto-occupancy of 1.20. Recent experience and surveys conducted at actual construction sites showed that the census information on worker modal split is generally comparable to what actually takes place. However, carpooling has become substantially more prevalent, particularly at large construction sites. The likely reasons for this trend include: 1) more opportunities are available within a large workforce for workers to commute together; 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 price of gasoline and parking.

Although it is likely that the travel behaviors of future construction workers at the project site may resemble those described above (i.e., more carpooling), the detailed construction traffic analysis conservatively assumed a 49 percent auto share and an average auto-occupancy of 1.20, consistent with the data reported in the *Fordham University Lincoln Center Master Plan FEIS.*

*Peak Hour Construction Worker Vehicle and Truck Trips*

The construction schedule assumed that site activities would primarily take place during the typical construction shift of 7:00 AM to 3:30 PM. Construction worker travel would typically take place during the hour before and after the work shift, while construction truck trips would be made throughout the day, and trucks would remain in the area for shorter durations. For analysis purposes, each worker vehicle was assumed to arrive in the morning and depart in the afternoon, while each truck delivery was assumed to result in two truck trips during the same hour.

The estimated daily vehicle trips were distributed to various hours of the day based on typical work shift allocations and conventional arrival/departure patterns of construction workers and trucks. For construction workers, the substantial majority (80 percent) of the arrival and departure trips are expected to 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 congestion, construction truck deliveries are also expected to occur during the hour before the regular day shift, overlapping with construction worker arrival traffic. Based on these assumptions, the peak hour construction traffic was estimated for the entire construction period.

*Analysis Time Periods*

In determining the appropriate time periods for analysis, consideration was given to the projected construction trip generation and background traffic levels. **Table 20-5** shows the construction trips generated, including both construction worker vehicle and delivery trips, compared with the project generated trips (after construction is completed).

**Table 20-5**
**Operational and Construction Traffic Comparison**

| Year | Project Generated Vehicle Trips | | Construction Generated Vehicle Trips | |
|---|---|---|---|---|
| | Operational AM Peak Hour 8 – 9 AM | Operational PM Peak Hour 5 – 6 PM | Worker Arrival Peak Hour 6 – 7 AM | Worker Departure Peak Hour 3 – 4 PM |
| 2012 | NA | NA | 516 | 412 |
| 2018 | 657 | 775 | NA | NA |

In comparison, the construction generated traffic during both the construction 6:00–7:00 AM arrival peak hour and 3:00–4:00 PM afternoon departure peak hour would be lower than the operational traffic generated by the proposed action in the operational AM (8:00–9:00 AM) and PM (5:00–6:00 PM) peak hours, respectively. Additionally, the baseline traffic on the surrounding street system during 6:00–7:00 AM is approximately 55 percent of the baseline traffic during 8:00–9:00 AM, while the baseline traffic during 3:00–4:00 PM is approximately 93 percent of the baseline traffic during 5:00–6:00 PM. Since both the project increment and the baseline traffic volumes during the construction peak periods are lower than the project increment and baseline volumes during the operational peak periods, it is anticipated that the total traffic volumes on the study area street network would be generally lower during construction peak periods than during operational peak periods.

*STREET SYSTEM CHANGES DURING CONSTRUCTION*

Aside from the construction trips described above, area roadway conditions would change as a result of the various construction activities. Detailed maintenance and protection of traffic (MPT) plans would be developed for approval by NYCDOT Office of Construction Mitigation and Coordination (OCMC).

During construction, it is anticipated that sidewalks adjacent to the construction sites would be temporarily replaced by protected walkways, while curb lanes may be displaced for some periods of time. It is also expected that curbside regulations would be altered throughout construction to maintain optimal use of the available curbside space in the vicinity of the project site that does not otherwise need to be closed for construction.

*CONSTRUCTION TRAFFIC ANALYSES*

Detailed analyses of 2012 conditions, accounting for projected construction traffic, were conducted to identify potential traffic impacts during construction. The analysis results are presented below and, where appropriate, measures to mitigate projected impacts are identified.

*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 estimated for the weekday morning 6:00–7:00 AM and weekday early afternoon 3:00–4:00 PM construction peak analysis hours for the 2012 construction analysis year. The extrapolation of traffic volumes for these baseline traffic networks is based on the 2008 Existing traffic volumes, which were grown to the peak construction year of 2012. Additionally, the No Build projects that would be completed by the construction analysis year of 2012 were added to these grown traffic volumes; these total volumes were used as the baseline condition for the construction traffic analysis.

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 NYCDOT-designated truck routes for delivery vehicles. **Figures 20-2 and 20-3** show the assignments of construction worker vehicle trips and construction truck trips. Although it is not expected that there will be any worker parking available on-site, construction worker trips were assigned directly to the construction site. This assignment pattern is conservative with respect to the potential for traffic impacts, as it would result in worker trips being more concentrated on streets in the vicinity of the project site rather than being dispersed to off-street parking facilities and available on-street parking throughout the study area. A more detailed discussion of construction worker parking issues is provided below, under “Parking.”

*Traffic*

A detailed impact analysis of study area intersections was conducted for the time periods and analysis scenario described above. The traffic analysis conducted for the 2012 peak construction period examined 38 intersections in the AM peak period and 35 intersections in the PM peak period. The intersections selected for analysis were intersections which were either significantly adversely impacted under operational Build conditions or were expected to experience a higher incremental volume of traffic during construction than during the operational Build peak periods. A summary of the analysis results, comparing the 2012 No Build and construction traffic conditions, is presented in **Table 20-6**.

As shown in **Table 20-6** and described below, significant adverse traffic impacts due to construction are predicted to occur at one intersection during the 6:00-7:00 AM peak hour and three intersections during the 3:00 – 4:00 PM peak hour:

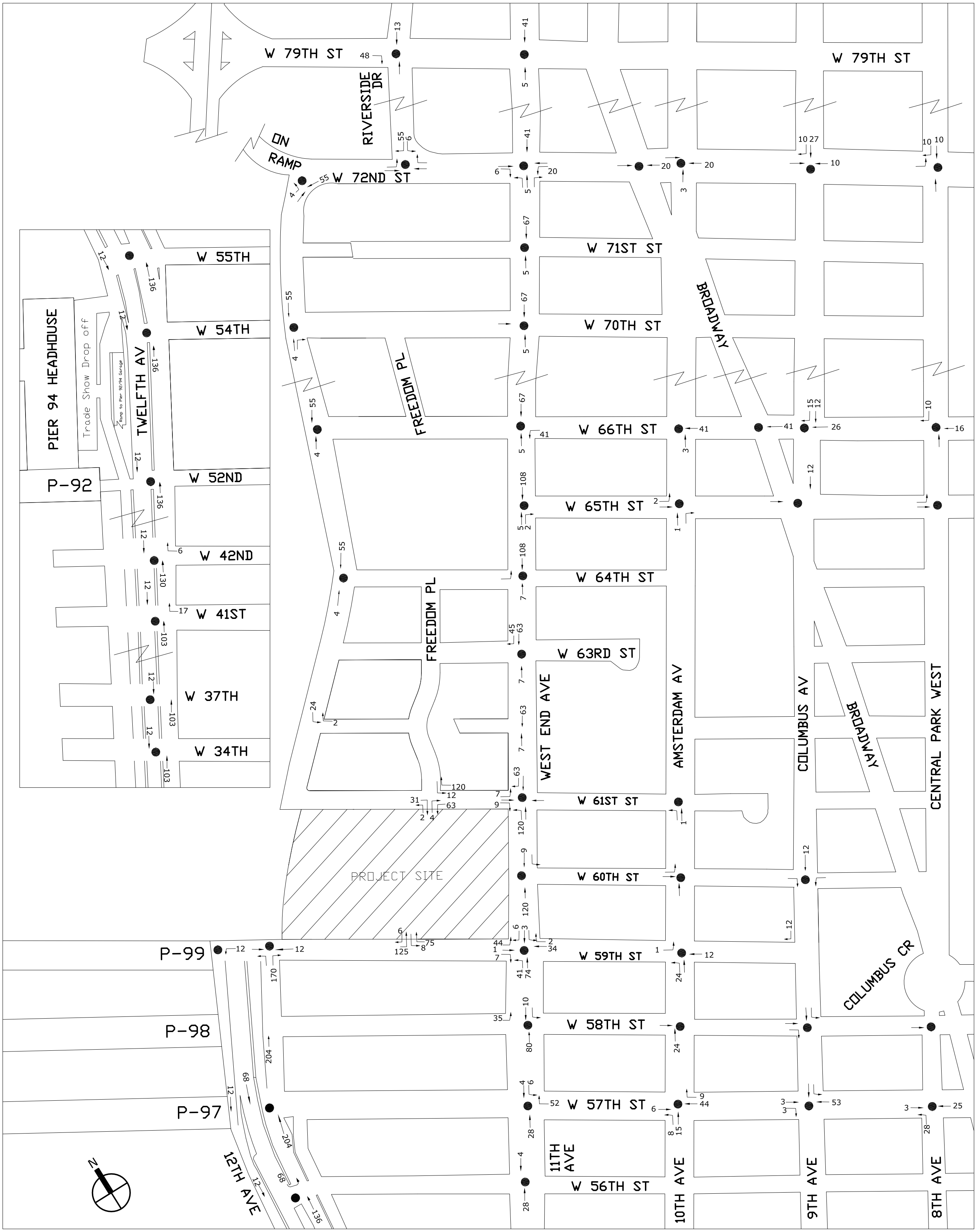
*AM Peak Period*

- West End Avenue and West 59th Street – Delay on the eastbound West 59th Street approach would increase from 37.5 seconds (level of service D) in the No Build to 122.8 seconds (LOS F) under construction conditions.

*PM Peak Period*

- Ninth Avenue and West 57th Street – Delay on the eastbound West 57th Street approach would increase from 80.7 seconds (LOS F) in the No Build to 106.5 seconds (LOS F) in the construction condition, and the v/c ratio would increase from 1.03 to 1.11.
- Columbus Avenue and West 60th Street – Delay on the eastbound West 60th Street approach would increase from 135.0 seconds (LOS F) in the No Build to 168.0 seconds (LOS F) in the construction condition, and the v/c ratio would increase 1.16 to 1.25.
- West End Avenue and West 59th Street – The eastbound West 59th Street approach would continue to operate at LOS F in the construction condition, delay would increase from 174.3 to 230.4 seconds, and the v/c ratio would increase from 1.26 to 1.40. The westbound West 59th Street approach would also be impacted, with LOS F conditions (unchanged from the No Build), average vehicle delay increasing from 108.2 to 215.7 seconds, and the v/c ratio increasing from 1.10 to 1.37.

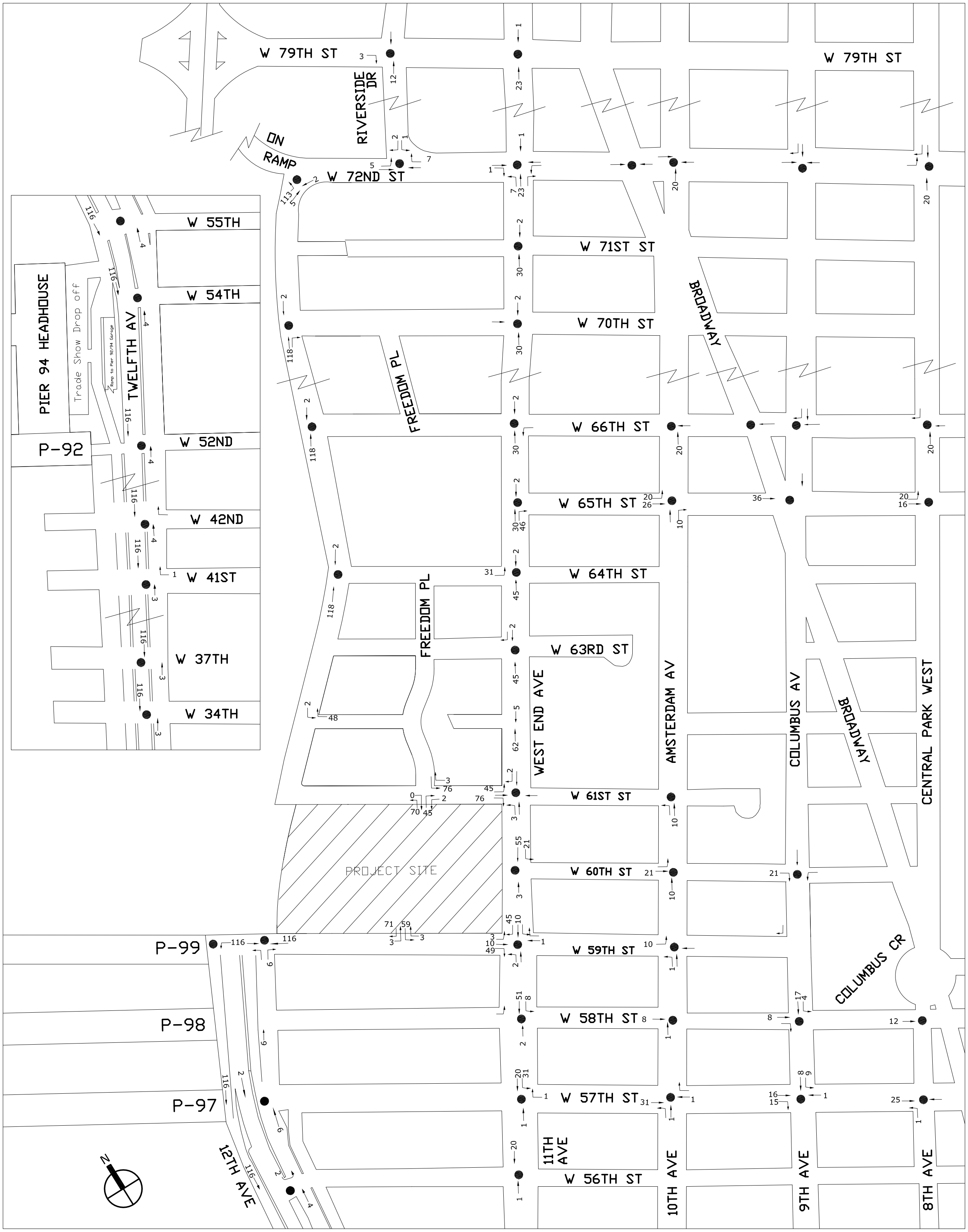
Mitigation measures to address these impacts are discussed in Chapter 22, “Mitigation.”




2012 Construction Increment Volumes - Weekday AM Peak Hour

RIVERSIDE CENTER

Figure 20-2




2012 Construction Increment Volumes - Weekday PM Peak Hour

**Table 20-6**
**2012 Peak Construction LOS Table**

| Signalized Intersection | Lane Group | 2012 No-Build Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 No-Build Construction PM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction PM V/C Ratio | Delay (sec/veh) | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Riverside Dr. | | | | | | | | | | | | | |
| Riverside Dr @ W. 79 St | EB LTR | 0.25 | 12.1 | B | 0.28 | 12.4 | B | -- | -- | -- | -- | -- | -- |
| | WB LTR | 0.18 | 11.5 | B | 0.18 | 11.5 | B | -- | -- | -- | -- | -- | -- |
| | NB LTR | 0.18 | 20.2 | C | 0.18 | 20.2 | C | -- | -- | -- | -- | -- | -- |
| | SB LTR | 0.54 | 24.5 | C | 0.56 | 25.0 | C | -- | -- | -- | -- | -- | -- |
| Riverside Dr @ W. 72nd St | EB L | 0.00 | 23.5 | C | 0.00 | 23.5 | C | 0.00 | 18.7 | B | 0.02 | 18.9 | B |
| | EB T | 0.00 | 23.5 | C | 0.00 | 23.5 | C | 0.00 | 18.7 | B | 0.00 | 18.7 | B |
| | WB T | 0.38 | 27.8 | C | 0.38 | 27.8 | C | 0.16 | 20.2 | C | 0.16 | 20.2 | C |
| | WB R | 0.05 | 1.6 | A | 0.05 | 1.6 | A | 0.25 | 2.5 | A | 0.26 | 2.6 | A |
| | SB LR | 0.44 | 14.1 | B | 0.57 | 16.7 | B | 0.66 | 25.5 | C | 0.67 | 25.8 | C |
| Riverside Blvd. | | | | | | | | | | | | | |
| Riverside Blvd. (N-S) @ W. 70th St (WB) UNSIGNALIZED 2-WAY STOP | WB LR | -- | -- | -- | -- | -- | -- | -- | 7.9 | A | -- | 8.3 | A |
| | NB TR | -- | -- | -- | -- | -- | -- | -- | 8.1 | A | -- | 9.7 | A |
| | SB LT | -- | -- | -- | -- | -- | -- | -- | 8.2 | A | -- | 8.4 | A |
| 12th Avenue | | | | | | | | | | | | | |
| 12th Avenue (NB) @ W. 59th St. (WB) UNSIGNALIZED 2-WAY STOP | EB LT | 0.00 | 8.2 | A | 0.00 | 8.2 | A | 0.00 | 8.3 | A | 0.00 | 8.7 | A |
| | NB LTR | 0.39 | 13.6 | B | 0.64 | 18.3 | C | 0.50 | 14.6 | B | 0.54 | 15.9 | C |
| 12th Ave. (SB) @ W. 59th St. (WB) UNSIGNALIZED 2-WAY STOP | WB LT | -- | -- | -- | -- | -- | -- | -- | 8.7 | A | -- | 9.4 | A |
| 12th Avenue @ W. 57th Street | WB R | 0.16 | 29.1 | C | 0.16 | 29.1 | C | -- | -- | -- | -- | -- | -- |
| | NB T | 0.39 | 21.0 | C | 0.39 | 21.0 | C | -- | -- | -- | -- | -- | -- |
| (Service road ) | NB T | 0.35 | 21.1 | C | 0.58 | 26.5 | C | -- | -- | -- | -- | -- | -- |
| (Service road unsigalized) | NB R | 0.48 | 13.0 | B | 0.48 | 13.0 | B | -- | -- | -- | -- | -- | -- |
| 12th Avenue @ W. 56th Street (ML) | NB T | 0.58 | 31.4 | C | 0.64 | 32.9 | C | 0.92 | 11.6 | B | 0.92 | 11.7 | B |
| | SB L | 0.49 | 24.4 | C | 0.54 | 25.4 | C | 0.87 | 68.3 | E | 0.87 | 68.6 | E |
| (Service road ) | NB TR | 0.38 | 28.1 | C | 0.38 | 28.1 | C | 0.27 | 3.6 | A | 0.27 | 3.6 | A |
| 12th Avenue @ W. 55th Street | WB L | -- | -- | -- | -- | -- | -- | 0.00 | 47.2 | D | 0.00 | 47.2 | D |
| | WB LR | -- | -- | -- | -- | -- | -- | 0.00 | 48.8 | D | 0.00 | 48.8 | D |
| | WB R | -- | -- | -- | -- | -- | -- | 0.09 | 50.6 | D | 0.09 | 50.6 | D |
| 12th Avenue @ W. 55th Street (SR) | NB T | -- | -- | -- | -- | -- | -- | 0.36 | 8.5 | A | 0.36 | 8.5 | A |
| | SB T | -- | -- | -- | -- | -- | -- | 0.19 | 12.1 | B | 0.25 | 12.7 | B |
| 12th Avenue @ W. 54th Street | WB R | -- | -- | -- | -- | -- | -- | 0.63 | 68.0 | E | 0.63 | 68.0 | E |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.93 | 8.9 | A | 0.94 | 8.9 | A |
| | SB L | -- | -- | -- | -- | -- | -- | 0.41 | 57.2 | E | 0.41 | 57.2 | E |
| | SB T | -- | -- | -- | -- | -- | -- | 0.68 | 11.6 | B | 0.68 | 11.6 | B |
| 12th Avenue @ W. 54th Street SV | SB T | -- | -- | -- | -- | -- | -- | 0.08 | 5.8 | A | 0.18 | 6.5 | A |
| 12th Avenue @ W. 52nd Street | EB LTR | 0.58 | 58.1 | E | 0.58 | 58.1 | E | 0.80 | 71.4 | E | 0.80 | 71.4 | E |
| | NB TR | 0.54 | 19.9 | B | 0.59 | 20.8 | C | 1.01 | 34.0 | C | 1.02 | 34.3 | C |
| | SB L | 0.48 | 68.3 | E | 0.48 | 68.3 | E | 0.74 | 84.9 | F | 0.74 | 84.9 | F |
| | SB T | 0.55 | 2.4 | A | 0.55 | 2.4 | A | 0.66 | 10.3 | B | 0.69 | 10.8 | B |
| 11th Avenue | | | | | | | | | | | | | |
| West End Ave @ W.79 St | EB LTR | -- | -- | -- | -- | -- | -- | 1.00 | 61.8 | E | 1.00 | 61.8 | E |
| | WB LTR | -- | -- | -- | -- | -- | -- | 0.54 | 26.3 | C | 0.54 | 26.3 | C |
| | NB LTR | -- | -- | -- | -- | -- | -- | 0.81 | 27.9 | C | 0.83 | 29.2 | C |
| | SB LTR | -- | -- | -- | -- | -- | -- | 0.59 | 22.8 | C | 0.59 | 22.9 | C |
| West End Ave @ W. 72nd St | EB LTR | 0.29 | 26.1 | C | 0.30 | 26.2 | C | 0.41 | 31.8 | C | 0.41 | 31.9 | C |
| | EB R | 0.32 | 28.9 | C | 0.34 | 29.3 | C | 0.45 | 37.7 | D | 0.45 | 37.7 | D |
| | WB LTR | 0.43 | 29.4 | C | 0.51 | 31.1 | C | 0.63 | 39.9 | D | 0.63 | 39.9 | D |
| | NB DefL | 0.49 | 22.5 | C | 0.50 | 23.5 | C | 0.45 | 19.3 | B | 0.46 | 19.6 | B |
| | NB TR | 0.25 | 14.4 | B | 0.25 | 14.5 | B | 0.45 | 4.0 | A | 0.46 | 4.1 | A |
| | SB TR | 0.34 | 21.5 | C | 0.38 | 22.0 | C | 0.68 | 34.6 | C | 0.69 | 34.7 | C |
| West End Ave @ W. 71st St | EB LR | -- | -- | -- | -- | -- | -- | 0.06 | 16.9 | B | 0.06 | 16.9 | B |
| | WB LTR | -- | -- | -- | -- | -- | -- | 0.34 | 20.5 | C | 0.34 | 20.5 | C |
| | NB LT | -- | -- | -- | -- | -- | -- | 0.49 | 12.3 | B | 0.50 | 12.5 | B |
| | SB TR | -- | -- | -- | -- | -- | -- | 0.62 | 18.3 | B | 0.62 | 18.3 | B |
| West End Ave @ W. 70th St | EB LTR | 0.37 | 24.0 | C | 0.37 | 24.0 | C | 0.46 | 25.8 | C | 0.46 | 25.8 | C |
| | NB LTR | 0.38 | 16.0 | B | 0.39 | 16.1 | B | 0.57 | 14.8 | B | 0.59 | 15.1 | B |
| | SB LTR | 0.44 | 13.3 | B | 0.48 | 13.7 | B | 1.03 | 59.0 | E | 1.04 | 62.2 | E |

**Table 20-6**
**2012 Peak Construction LOS Table**

| Signalized Intersection | Lane Group | 2012 No-Build Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 No-Build Construction PM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction PM V/C Ratio | Delay (sec/veh) | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| West End Ave @ W. 66th St | EB LR | 0.26 | 22.4 | C | 0.26 | 22.4 | C | 0.23 | 22.0 | C | 0.23 | 22.0 | C |
| | WB L | 0.35 | 24.4 | C | 0.42 | 26.1 | C | 0.52 | 28.8 | C | 0.52 | 28.8 | C |
| | WB T | 0.32 | 23.5 | C | 0.35 | 24.1 | C | 0.54 | 28.5 | C | 0.54 | 28.5 | C |
| | WB R | 0.33 | 24.2 | C | 0.33 | 24.2 | C | 0.78 | 41.7 | D | 0.78 | 41.7 | D |
| | NB L | 0.21 | 17.4 | B | 0.23 | 17.9 | B | 0.34 | 16.9 | B | 0.34 | 17.0 | B |
| | NB T | 0.24 | 16.0 | B | 0.25 | 16.1 | B | 0.34 | 12.2 | B | 0.36 | 12.3 | B |
| | SB TR | 0.36 | 14.5 | B | 0.41 | 15.0 | B | 0.69 | 21.3 | C | 0.69 | 21.3 | C |
| West End Ave @ W. 65th St | EB LTR | -- | -- | -- | -- | -- | -- | 0.05 | 22.7 | C | 0.05 | 22.7 | C |
| | NB L | -- | -- | -- | -- | -- | -- | 0.03 | 12.3 | B | 0.03 | 12.3 | B |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.53 | 16.5 | B | 0.59 | 17.4 | B |
| | SB L | -- | -- | -- | -- | -- | -- | 0.70 | 22.8 | C | 0.75 | 27.1 | C |
| | SB TR | -- | -- | -- | -- | -- | -- | 0.69 | 14.8 | B | 0.69 | 14.8 | B |
| West End Ave @ W. 64th St | EB LTR | -- | -- | -- | -- | -- | -- | 0.42 | 26.2 | C | 0.53 | 29.5 | C |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.38 | 8.6 | A | 0.40 | 8.8 | A |
| | SB L | -- | -- | -- | -- | -- | -- | 0.21 | 12.4 | B | 0.22 | 12.8 | B |
| | SB T | -- | -- | -- | -- | -- | -- | 0.72 | 18.4 | B | 0.72 | 18.5 | B |
| West End Ave @ W. 63rd St | WB LTR | 0.03 | 19.7 | B | 0.03 | 19.7 | B | 0.08 | 20.2 | C | 0.08 | 20.2 | C |
| | NB L | 0.28 | 13.6 | B | 0.31 | 14.4 | B | 0.47 | 17.9 | B | 0.47 | 17.9 | B |
| | NB TR | 0.34 | 12.1 | B | 0.35 | 12.2 | B | 0.34 | 8.3 | A | 0.36 | 8.5 | A |
| | SB L | 0.03 | 6.7 | A | 0.03 | 6.7 | A | 0.02 | 9.6 | A | 0.02 | 9.6 | A |
| | SB T | 0.50 | 10.0 | A | 0.55 | 10.6 | B | | | | | | |
| | SB R | 0.07 | 9.9 | A | 0.16 | 10.8 | B | | | | | | |
| | SB TR | | | | | | | 0.75 | 19.6 | B | 0.76 | 19.7 | B |
| West End Avenue @ W. 61st St | EB LTR | 0.03 | 19.7 | B | 0.11 | 21.0 | C | 0.04 | 19.8 | B | 0.36 | 24.5 | C |
| | NB T | 0.39 | 12.6 | B | | | | | | | | | |
| | NB LT | | | | 0.74 | 20.6 | C | | | | | | |
| | NB R | 0.06 | 9.9 | A | 0.06 | 9.9 | A | | | | | | |
| | NB TR | | | | | | | 0.38 | 8.6 | A | | | |
| | NB LTR | | | | | | | | | | 0.41 | 8.9 | A |
| | SB L | 0.14 | 11.1 | B | 0.17 | 11.7 | B | 0.23 | 12.9 | B | 0.23 | 12.9 | B |
| | SB TR | 0.50 | 10.1 | B | 0.58 | 11.2 | B | 0.69 | 17.6 | B | 0.69 | 17.7 | B |
| West End Avenue @ W. 60th St | EB LTR | -- | -- | -- | -- | -- | -- | 0.06 | 19.4 | B | - | - | - |
| | NB L | -- | -- | -- | -- | -- | -- | 0.10 | 7.8 | A | - | - | - |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.44 | 9.2 | A | 0.45 | 9.3 | A |
| | SB L | -- | -- | -- | -- | -- | -- | 0.46 | 20.1 | C | 0.59 | 26.4 | C |
| | SB TR | -- | -- | -- | -- | -- | -- | 0.63 | 16.4 | B | 0.67 | 17.3 | B |
| West End Avenue @ W. 59th St | EB LTR | 0.62 | 37.5 | D | 1.11 | 122.8 | F * | 1.26 | 174.3 | F | 1.40 | 230.4 | F * |
| | WB LTR | 0.52 | 32.1 | C | 0.67 | 37.7 | D | 1.10 | 108.2 | F | 1.37 | 215.7 | F * |
| | NB L | 0.06 | 7.5 | A | 0.24 | 10.2 | B | 0.02 | 4.0 | A | 0.03 | 4.1 | A |
| | NB TR | 0.35 | 9.2 | A | 0.41 | 9.8 | A | 0.23 | 4.5 | A | 0.22 | 4.5 | A |
| | SB L | 0.01 | 3.8 | A | 0.05 | 4.1 | A | 0.02 | 7.0 | A | 0.04 | 7.2 | A |
| | SB TR | 0.46 | 6.2 | A | 0.47 | 6.3 | A | 0.56 | 11.9 | B | 0.61 | 12.8 | B |
| 11th Avenue @ W. 58th St | EB LTR | 0.31 | 27.0 | C | 0.40 | 28.8 | C | 0.36 | 28.0 | C | 0.36 | 28.0 | C |
| | NB L | 0.10 | 7.8 | A | 0.10 | 7.8 | A | 0.05 | 4.2 | A | 0.05 | 4.2 | A |
| | NB TR | 0.42 | 10.0 | A | 0.48 | 10.7 | B | 0.27 | 4.7 | A | 0.26 | 4.7 | A |
| | SB L | 0.06 | 4.2 | A | 0.07 | 4.3 | A | 0.22 | 9.3 | A | 0.24 | 9.7 | A |
| | SB TR | 0.39 | 5.6 | A | 0.40 | 5.7 | A | 0.55 | 11.7 | B | 0.58 | 12.2 | B |
| 11th Avenue @ W. 57th Street | EB L | 0.36 | 18.8 | B | 0.36 | 18.8 | B | 0.43 | 21.8 | C | 0.43 | 21.8 | C |
| | EB T | 0.56 | 30.4 | C | 0.56 | 30.4 | C | 0.47 | 29.2 | C | 0.47 | 29.2 | C |
| | EB R | 0.05 | 22.6 | C | 0.05 | 22.6 | C | 0.40 | 28.9 | C | 0.40 | 28.9 | C |
| | WB L | 0.34 | 19.0 | B | 0.34 | 19.0 | B | 0.51 | 22.0 | C | 0.51 | 22.0 | C |
| | WB T | 0.41 | 27.7 | C | 0.41 | 27.7 | C | 0.70 | 36.0 | D | 0.70 | 36.0 | D |
| | WB R | 0.33 | 27.4 | C | 0.51 | 32.6 | C | 0.45 | 30.0 | C | 0.45 | 30.1 | C |
| | NB L | 0.05 | 14.6 | B | 0.05 | 14.6 | B | 0.23 | 15.6 | B | 0.24 | 15.8 | B |
| | NB TR | 0.35 | 17.3 | B | 0.38 | 17.7 | B | 0.35 | 14.7 | B | 0.35 | 14.7 | B |
| | SB L | 0.28 | 15.7 | B | 0.33 | 17.0 | B | 0.48 | 22.9 | C | 0.58 | 26.8 | C |
| | SB TR | 0.41 | 15.3 | B | 0.41 | 15.4 | B | 0.54 | 20.0 | B | 0.56 | 20.3 | C |
| 10th Avenue | | | | | | | | | | | | | |
| Amsterdam Ave @ W. 66th St | WB TR | -- | -- | -- | -- | -- | -- | 0.51 | 22.9 | C | 0.51 | 22.9 | C |
| | NB LT | -- | -- | -- | -- | -- | -- | 0.53 | 12.5 | B | 0.54 | 12.6 | B |
| Amsterdam Ave @ W. 65th St | EB LT | -- | -- | -- | -- | -- | -- | 0.41 | 22.6 | C | 0.46 | 23.4 | C |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.46 | 10.4 | B | 0.47 | 10.4 | B |
| Amsterdam Ave @ W. 61st | EB LT | -- | -- | -- | -- | -- | -- | 0.21 | 22.6 | C | 0.21 | 22.6 | C |
| | WB R | -- | -- | -- | -- | -- | -- | 0.05 | 20.7 | C | 0.05 | 20.7 | C |
| | NB TR | -- | -- | -- | -- | -- | -- | 0.48 | 8.5 | A | 0.48 | 8.6 | A |
| Amsterdam Ave @ W. 59th St | EB L | 0.26 | 23.9 | C | 0.30 | 24.8 | C | 0.31 | 26.1 | C | 0.43 | 29.8 | C |
| | WB T | 0.22 | 21.7 | C | 0.26 | 22.3 | C | 0.39 | 24.2 | C | 0.39 | 24.2 | C |
| | WB R | 0.02 | 19.6 | B | 0.02 | 19.6 | B | 0.03 | 19.7 | B | 0.03 | 19.7 | B |
| | NB LT | 0.25 | 7.6 | A | 0.26 | 7.7 | A | 0.43 | 8.7 | A | 0.43 | 8.7 | A |

**Table 20-6**
**2012 Peak Construction LOS Table**

| Signalized Intersection | Lane Group | 2012 No-Build Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction AM V/C Ratio | Delay (sec/veh) | LOS | 2012 No-Build Construction PM V/C Ratio | Delay (sec/veh) | LOS | 2012 Peak Construction PM V/C Ratio | Delay (sec/veh) | LOS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10th Avenue @ W. 57th Street | EB LT | 0.41 | 19.4 | B | 0.42 | 19.6 | B | 0.45 | 22.0 | C | 0.48 | 22.5 | C | |
| | WB TR | 0.34 | 18.4 | B | 0.41 | 19.2 | B | 0.62 | 24.8 | C | 0.62 | 24.8 | C | |
| | NB LTR | 0.40 | 13.2 | B | 0.40 | 13.3 | B | | | | | | | |
| | NB LT | -- | -- | -- | -- | -- | -- | 0.53 | 12.3 | B | 0.53 | 12.4 | B | |
| | NB R | -- | -- | -- | -- | -- | -- | 0.27 | 14.3 | B | 0.27 | 14.3 | B | |
| 9th Avenue | | | | | | | | | | | | | | |
| Columbus Ave @ W. 66th St | WB LT | 0.30 | 9.8 | A | 0.31 | 9.9 | A | 0.50 | 12.0 | B | 0.50 | 12.0 | B | |
| | SB TR | 0.48 | 26.4 | C | 0.50 | 26.7 | C | 1.10 | 89.5 | F | 1.10 | 89.5 | F | |
| Columbus Ave @ W. 60th St | EB R | 0.62 | 35.6 | D | 0.62 | 35.6 | D | 1.16 | 135.0 | F | 1.25 | 168.0 | F | * |
| | WB L | 0.30 | 23.7 | C | 0.30 | 23.7 | C | 0.57 | 29.3 | C | 0.57 | 29.3 | C | |
| | WB LT | 0.13 | 21.5 | C | 0.13 | 21.5 | C | 0.20 | 22.4 | C | 0.20 | 22.4 | C | |
| | SB T | 0.36 | 14.4 | B | 0.36 | 14.5 | B | 0.61 | 17.4 | B | 0.61 | 17.4 | B | |
| 9th Avenue @ W. 57th Street | EB TR | 0.66 | 35.6 | D | 0.68 | 36.2 | D | 1.03 | 80.7 | F | 1.11 | 106.5 | F | * |
| | WB DefL | 0.58 | 22.6 | C | 0.58 | 22.7 | C | 0.81 | 38.6 | D | 0.81 | 38.2 | D | |
| | WB T | 0.47 | 18.4 | B | 0.58 | 21.1 | C | 0.90 | 40.8 | D | 0.90 | 41.1 | D | |
| | SB L | 0.25 | 23.1 | C | 0.25 | 23.1 | C | 0.37 | 25.6 | C | 0.41 | 26.3 | C | |
| | SB TR | 0.51 | 22.9 | C | 0.51 | 22.9 | C | 0.62 | 25.9 | C | 0.62 | 25.9 | C | |
| | SB T | | | | | | | | | | | | | |
| Central Park W. | | | | | | | | | | | | | | |
| Central Park W @ W. 72nd Street | EB L | -- | -- | -- | -- | -- | -- | 0.14 | 19.3 | B | 0.14 | 19.3 | B | |
| | EB R | -- | -- | -- | -- | -- | -- | 0.41 | 24.6 | C | 0.41 | 24.6 | C | |
| | NB LT | -- | -- | -- | -- | -- | -- | 0.92 | 37.1 | D | 0.94 | 39.9 | D | |
| | SB TR | -- | -- | -- | -- | -- | -- | 0.62 | 17.8 | B | 0.62 | 17.8 | B | |
| Central Park W @ W. 66th Street | WB L | 0.24 | 25.3 | C | 0.24 | 25.3 | C | 0.21 | 24.8 | C | 0.21 | 24.8 | C | |
| | WB T | 0.63 | 33.1 | C | 0.66 | 34.3 | C | 1.05 | 83.2 | F | 1.05 | 83.2 | F | |
| | WB R | 0.47 | 29.9 | C | 0.47 | 29.9 | C | 0.94 | 63.5 | E | 0.94 | 63.5 | E | |
| | NB LT | 0.27 | 9.6 | A | 0.27 | 9.6 | A | 0.80 | 15.3 | B | 0.82 | 16.3 | B | |
| | SB TR | 0.45 | 15.9 | B | 0.46 | 16.1 | B | 0.94 | 39.3 | D | 0.94 | 39.3 | D | |
| 8th Avenue | | | | | | | | | | | | | | |
| 8th Avenue @ W. 57th Street | EB LT | 0.50 | 22.6 | C | 0.51 | 22.8 | C | -- | -- | -- | -- | -- | -- | |
| | WB TR | 0.38 | 20.8 | C | 0.42 | 21.3 | C | -- | -- | -- | -- | -- | -- | |
| | WB R | 0.17 | 19.0 | B | 0.17 | 19.0 | B | -- | -- | -- | -- | -- | -- | |
| | WB L | 0.16 | 12.7 | B | 0.21 | 13.3 | B | -- | -- | -- | -- | -- | -- | |
| | NB TR | 0.29 | 10.4 | B | 0.29 | 10.4 | B | -- | -- | -- | -- | -- | -- | |
| 12th Avenue | | | | | | | | | | | | | | |
| 12th Avenue @ W. 42nd Street | EB LTR | 0.02 | 45.9 | D | 0.02 | 45.9 | D | 0.07 | 46.6 | D | 0.07 | 46.6 | D | |
| | WB L | 0.18 | 49.1 | D | 0.18 | 49.1 | D | 0.61 | 62.4 | E | 0.61 | 62.4 | E | |
| | WB R | 0.29 | 26.4 | C | 0.31 | 26.8 | C | 0.62 | 48.5 | D | 0.62 | 48.5 | D | |
| | NB T | 0.51 | 29.3 | C | 0.57 | 30.4 | C | 0.81 | 18.3 | B | 0.81 | 18.4 | B | |
| | NB R | 0.16 | 24.2 | C | 0.16 | 24.2 | C | 0.21 | 10.5 | B | 0.21 | 10.5 | B | |
| | SB L | 0.25 | 50.0 | D | 0.25 | 50.0 | D | 0.80 | 84.2 | F | 0.80 | 84.2 | F | |
| | SB T | 0.43 | 2.5 | A | 0.43 | 2.5 | A | 0.73 | 14.6 | B | 0.76 | 15.5 | B | |
| 12th Avenue @ W. 41st Street | EB LR | 0.00 | 38.2 | D | 0.00 | 38.2 | D | -- | -- | -- | -- | -- | -- | |
| | WB L | 0.04 | 50.1 | D | 0.04 | 50.1 | D | -- | -- | -- | -- | -- | -- | |
| | WB R | 0.17 | 52.2 | D | 0.21 | 53.0 | D | -- | -- | -- | -- | -- | -- | |
| | NB T | 0.60 | 32.8 | C | 0.65 | 34.4 | C | -- | -- | -- | -- | -- | -- | |
| | SB T | 0.61 | 10.8 | B | 0.62 | 10.9 | B | -- | -- | -- | -- | -- | -- | |
| 12th Avenue @ W. 37th Street | EB LR | 0.07 | 51.6 | D | 0.07 | 51.6 | D | -- | -- | -- | -- | -- | -- | |
| | EB R | 0.07 | 51.9 | D | 0.07 | 51.9 | D | -- | -- | -- | -- | -- | -- | |
| | NB L | 0.07 | 62.9 | E | 0.07 | 62.9 | E | -- | -- | -- | -- | -- | -- | |
| | NB T | 0.49 | 19.0 | B | 0.53 | 19.8 | B | -- | -- | -- | -- | -- | -- | |
| | SB TR | 0.61 | 15.5 | B | 0.61 | 15.7 | B | -- | -- | -- | -- | -- | -- | |

Notes:
EB-Eastbound, WB-Westbound, NB-Northbound, SB-Southbound
L-Left, T-Through, R-Right, Dfl-Analysis considers a Defacto Left Lane on this approach
V/C Ratio - Volume to Capacity Ratio, sec. - Seconds
LOS - Level of Service
* -Denotes Impacted Location
(1) -Total approach delay (provided due to changes in lane configuration)
Analysis is based on the 2000 Highway Capacity Manual methodology (HCS+, version 5.4)

*This table has been revised for the FSEIS.*

*CONSTRUCTION TRUCK MOVEMENTS*

Over the periods of construction, the construction site would have dedicated gates, driveways, or ramps for delivery vehicle access. Flaggers are expected to be present at these active driveways to manage the access and movements of trucks. Some of the site deliveries would also occur along the perimeters of the construction site within delineated closed-off areas for concrete pour or steel delivery. As with other major construction projects in New York City, these activities would take place in accordance with NYCDOT-approved MPT plans and would be managed by on-site flag-persons.

## PARKING

The construction traffic impact analysis conservatively assumes that all construction traffic, both construction worker vehicles and deliveries, would use the project site as the destination and origin for arrivals and departures, respectively. However, with very few exceptions, construction workers would have to use off-site parking for the duration of the construction of the Proposed Project. In addition, it should be noted that vehicles currently parking on the project site would be displaced during the construction period. (A portion of these vehicles may again be accommodated on-site upon completion of the Proposed Project's parking garage.) **Table 20-7** compares the parking demand for the peak construction period (reflecting construction worker demand and capacity displaced from the project site) with No Build conditions.

As shown in **Table 20-7,** during the peak construction period, construction worker parking demand would total approximately 515 parking spaces in each of the weekday AM and midday peak periods, and 26 spaces in each of the pre-theater and overnight periods. In addition, approximately 2,350 existing parking spaces would be displaced from the project site. Overall, there would be insufficient capacity within a quarter-mile radius of the project site to accommodate peak parking demand during the AM and midday peak period (i.e., a shortfall of approximately 500 spaces during the AM period and approximately 967 spaces during the midday period), and sufficient capacity in the pre-theater and overnight periods. However, as shown in **Table 20-7**, sufficient capacity would be available within a half-mile radius of the project site to accommodate all construction worker and displaced on-site parker demand. Therefore, significant adverse parking impacts during the peak construction period are not anticipated.

## TRANSIT

As previously discussed, nearly 50 percent of the construction workers are projected to travel via auto, with most if not all of the remaining construction workers traveling to and from the project site via transit. During the peak 2012 construction period, this modal distribution would represent approximately 600 workers traveling by subway or bus. With 80 percent of these workers arriving or departing during the peak construction hours (6:00-7:00 AM arrival and 3:00-4:00 PM departure), the total estimated number of transit trips in any one peak hour would total approximately 480.

Approximately 140 of each peak hour's transit trips would be expected to be via bus. During the construction peak hours, the project-generated demand on local bus routes serving the project site would therefore not be expected to exceed 200 riders, the *CEQR Technical Manual* threshold below which significant adverse transit impacts are considered unlikely to occur. Significant adverse bus impacts are therefore not anticipated as a result of construction worker bus trips.

**Table 20-7**

**Parking Conditions During Peak Construction Period**

| | AM | MD | Pre Theater | Overnight |
|---|---|---|---|---|
| **'Construction' Capacity (1/4 mile radius)** | 4,060 | 4,060 | 4,060 | 4,060 |
| **No Build Demand** | 4,045 | 4,512 | 3,911 | 3,556 |
| **Construction Worker Demand** | 515 | 515 | 26 | 26 |
| **Spaces Available During Construction (1/4 mile radius)** | -500 | -967 | 123 | 478 |
| **Construction Capacity (1/2 mile radius)** | 6,702 | 5,116 | 5,896 | 6,753 |
| **Spaces Available During Construction (1/2 mile radius)** | 2,142 | 89 | 1,959 | 3,171 |

Note:

1 - Capacity data taken from Fordham Lincoln Center FEIS, April 2009 and PHA Parking Garage Survey 2010.

*This table has been revised for the FSEIS.*

The remaining approximately 340 peak hour transit trips would be construction worker subway trips. While the demand would be higher than the 200-trip *CEQR Technical Manual* threshold, it would be substantially lower that the subway transit demand created by the Proposed Project (937 and 1,299 trips in the AM and PM peak hours, respectively). As discussed in Chapter 17, “Transit and Pedestrians,” project-generated subway demand is not expected to result in significant adverse impacts at the 59th Street-Columbus Circle subway station in the 2018 Build scenario. Since the construction subway demand would be substantially less than that of the Proposed Project, the construction demand would not be expected to result in significant adverse subway impacts with regard to any station elements analyzed.

## PEDESTRIANS

The construction worker pedestrian trips would occur primarily outside of the peak hours for the study area street system and would be distributed among numerous sidewalks and crosswalks in the area. Therefore, significant adverse pedestrian impacts attributable to the projected construction worker trips are not anticipated.

During construction, where sidewalk closures are required, adequate protection or temporary sidewalks would be provided in accordance with NYCDOT requirements.

## AIR QUALITY

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, much of the heavy equipment used in construction has diesel-powered engines and produces relatively high levels of nitrogen oxides and particulate matter. Gasoline engines produce relatively high levels of carbon monoxide. Construction activities also generate fugitive dust emissions. In addition, increased traffic from construction-related vehicles traveling to and from the project site could affect mobile source-related emissions at nearby intersections. As a result, the air pollutants analyzed for the construction activities include nitrogen dioxide ($NO_2$), particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers ($PM_{10}$), particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), and carbon monoxide (CO).

As stated above, construction activity in general and large-scale construction in particular, has 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 particulates. To ensure that the construction of Riverside Center results in the lowest feasible diesel particulate matter (DPM) emissions, an emissions reduction program for all construction activities at the project site would be implemented and would consist of the following components:

1. *Diesel Equipment Reduction*. The construction of Riverside Center would minimize the use of diesel engines and use electric engines (which may operate on grid power to the extent practicable). To that end, the construction manager for the Proposed Project would contact Con Edison to seek the connection of grid power to the sites by the time the structural phase of construction reaches the fourth floor. Construction contracts would specify the maximum

feasible use of electric engines. Power connections would be distributed as needed, subject to availability.

2. *Clean Fuel*. Ultra-low sulfur diesel fuel (ULSD) would be used exclusively for diesel engines throughout the Riverside Center development sites. This would enable the use of tailpipe reduction technologies (see below) and would directly reduce DPM and sulfur oxides ($SO_x$) emissions.

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, such as concrete mixing and pumping trucks) would utilize the best available tailpipe technology for reducing DPM emissions. Diesel particle filters (DPFs) have been identified as being the tailpipe technology currently proven to have the highest reduction capability. The construction contracts would specify that all diesel nonroad engines rated at 50 hp or greater would utilize DPFs, either original equipment manufacturer (OEM) or retrofit technology that would result in emission reductions of DPM of at least 90 percent (when compared with equivalent uncontrolled diesel engines). Ninety percent reduction has been verified by a study of actual reductions of $PM_{2.5}$ emissions from comparable engines used at a New York City construction site. Controls may include active DPFs,[1] if necessary.

4. *Utilization of Tier 2 or Newer Equipment.* In addition to the tailpipe controls commitments, the construction program would mandate the use of Tier 2[2] or later construction equipment for nonroad diesel engines greater than 50 hp. The use of “newer” engines, especially Tier 2, is expected to reduce the likelihood of DPF plugging due to soot loading (i.e., clogging of DPF filters by accumulating particulate matter); the more recent the “Tier”—the higher the number—the cleaner the engine for all criteria pollutants, including PM. Additionally, while all engines undergo some deterioration over time, “newer” as well as better maintained engines emit less particulate matter (PM) than their older Tier or unregulated counterparts. Therefore, restricting site access to equipment with lower engine-out PM emission values would enhance this emissions reduction program and implementation of DPF systems as well as reduce maintenance frequency due to soot loading (i.e., less downtime for construction equipment to replace clogged DPF filters). In addition, to minimize hourly emissions of $NO_2$ to the maximum extent practicable, non-road diesel powered vehicles and construction equipment meeting the EPA Tier 3 Non-road Diesel Engine Emission Standard would be used in construction, and construction equipment meeting Tier 4 would be used

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[1] There are two types of DPFs currently in use: passive and active. Most DPFs currently in use are the “passive” type, 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” DPFs 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).

[2] The first federal regulations for new nonroad diesel engines were adopted in 1994, and signed by EPA into regulation in a 1998 Final Rulemaking. The 1998 regulation introduces Tier 1 emissions standards for all equipment 50 hp and greater and phases in the increasingly stringent Tier 2 and Tier 3 standards for equipment manufactured in 2000 through 2008. In 2004, The EPA introduced Tier 4 emissions standards with a phased-in period of 2008 to 2015. The Tier 1 through 4 standards regulate the EPA criteria pollutants, including particulate matter (PM), hydrocarbons (HC), oxides of nitrogen ($NO_x$) and CO. Prior to 1998, emissions from nonroad diesel engines were unregulated. These engines are typically referred to as Tier 0.

where conforming equipment is widely available, and the use of such equipment is practicable.

In addition, in order to minimize their effects, some emissions sources such as concrete trucks and pumps, would be located away from sensitive land uses to the extent practicable. Fugitive dust control plans would be required as part of contract specifications. For example, stabilized truck exit areas would be established for washing off the wheels of all trucks that exit the large construction sites. Trucks entering and leaving the site with excavated or other materials would be covered. Truck routes within the sites would be either watered as needed or, in cases where such routes would remain in the same place for an extended period the routes would be stabilized, covered with gravel, or temporarily paved to avoid the resuspension of dust. In addition to regular cleaning by the city, area roads would be cleaned as frequently as needed.

Additional measures would be taken to reduce pollutant emissions during construction of the Proposed Project in accordance with all applicable laws, regulations, and building codes. These include the restriction of on-site vehicle idle time for all vehicles that are not using the engine to operate a loading, unloading, or processing device (e.g., concrete mixing trucks). Overall, this program is expected to reduce DPM emissions more than the measures required by New York City Local Law 77 of 2003 alone.

### *CONSTRUCTION AIR QUALITY ANALYSIS METHODOLOGIES*

The following sections delineate additional details relevant only to the construction air quality analysis methodology. For a review of the applicable regulations, standards and criteria, and benchmarks for stationary and mobile source air quality analyses refer to Chapter 18, “Air Quality and Greenhouse Gas Emissions.” In addition, as part of the review and discussion of the effect of the new 1-hour $NO_2$ NAAQS on the Proposed Project, an assessment of potential 1-hour average $NO_2$ impacts from construction activities is presented in that chapter.

#### *Stationary Sources*

A stationary source air quality analysis was conducted to evaluate potential construction impacts at the project site. Construction at the site would include a number of activities, such as excavating, materials handling, concrete pouring, and erecting of the proposed buildings. Any nonroad equipment that would remain in a stationary position (e.g., generators) for the workday is modeled as a point source and any equipment that would move around within the construction site (e.g., excavators) is modeled as an area source. Air emission sources include exhausts on fuel-burning equipment, fugitive dust from excavation/transfer activities, and road dust. The analysis was performed following EPA and *CEQR Technical Manual* procedures and analytical tools, as further discussed below, to determine source emission rates. The estimated emission rates were then used as input to an air quality dispersion model to determine the potential impacts.

##### *Construction Activity Assessment*

Overall, construction of the proposed project is expected to occur over a period of eight years. To determine which construction periods constitute the worst-case periods for the pollutants of concern, 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, because as compared to 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 follow $PM_{2.5}$ emissions, since most pollutant emissions are proportional to diesel engines by horse power. 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 and 8-hour) averaging periods. A graphical depiction of the multi-year profiles is presented in **Figures 20-4 and 20-5**.

Dispersion of the relevant air pollutants from the site during the worst-case periods was quantified using computer models, and the highest resulting concentrations are presented in the sections discussing air quality impacts. Broader conclusions regarding potential concentrations during other construction periods, which were not modeled explicitly, are discussed as well, based on the multi-year emissions profiles and the worst-case period results.

*Analysis Periods*

The construction analyses used an emission estimation method and a modeling approach that has been previously used for evaluating air quality impacts of construction projects in New York City. Because the level of construction activities would vary from month to month, the approach includes a determination of worst-case emission periods based on the number of each equipment type, rated horsepower of each unit, and a monthly construction work schedule which assumes a daily operating schedule of 7:00 AM to 3:30 PM (one 8-hour shift per day). In addition, the concentration of emission sources and the distances between sources and receptors were considered in selecting a worst case scenario because of the shifting locations of construction activities throughout the project site and over time.

As previously described, construction sequencing may follow two different approaches regarding the excavation and foundation tasks: the podium approach and the individual basements approach. The approach with the highest short-term and annual emissions profile is the site-wide podium approach. Therefore, the bulk of the analysis was performed using the podium construction approach. However, the individual basements approach includes a limited period where construction activities are concentrated near a sensitive receptor. As a result, both approaches were considered for quantitative analysis on a short-term basis for the pollutant, $PM_{2.5}$. Analysis periods for each approach are discussed below.

Based on the $PM_{2.5}$ emissions profile (discussed above), the worst-case short-term emissions (e.g., maximum daily emissions) for the podium approach were found to occur in the following monthly timeframe:

- Podium short-term analysis period—June 2012 (corresponds to the construction of the podium and Building 2)

For the individual basement approach, the following monthly timeframe was analyzed:

- Individual basement short-term analysis period—November 2015 (corresponds to the construction of Buildings 1, 3 and 4).

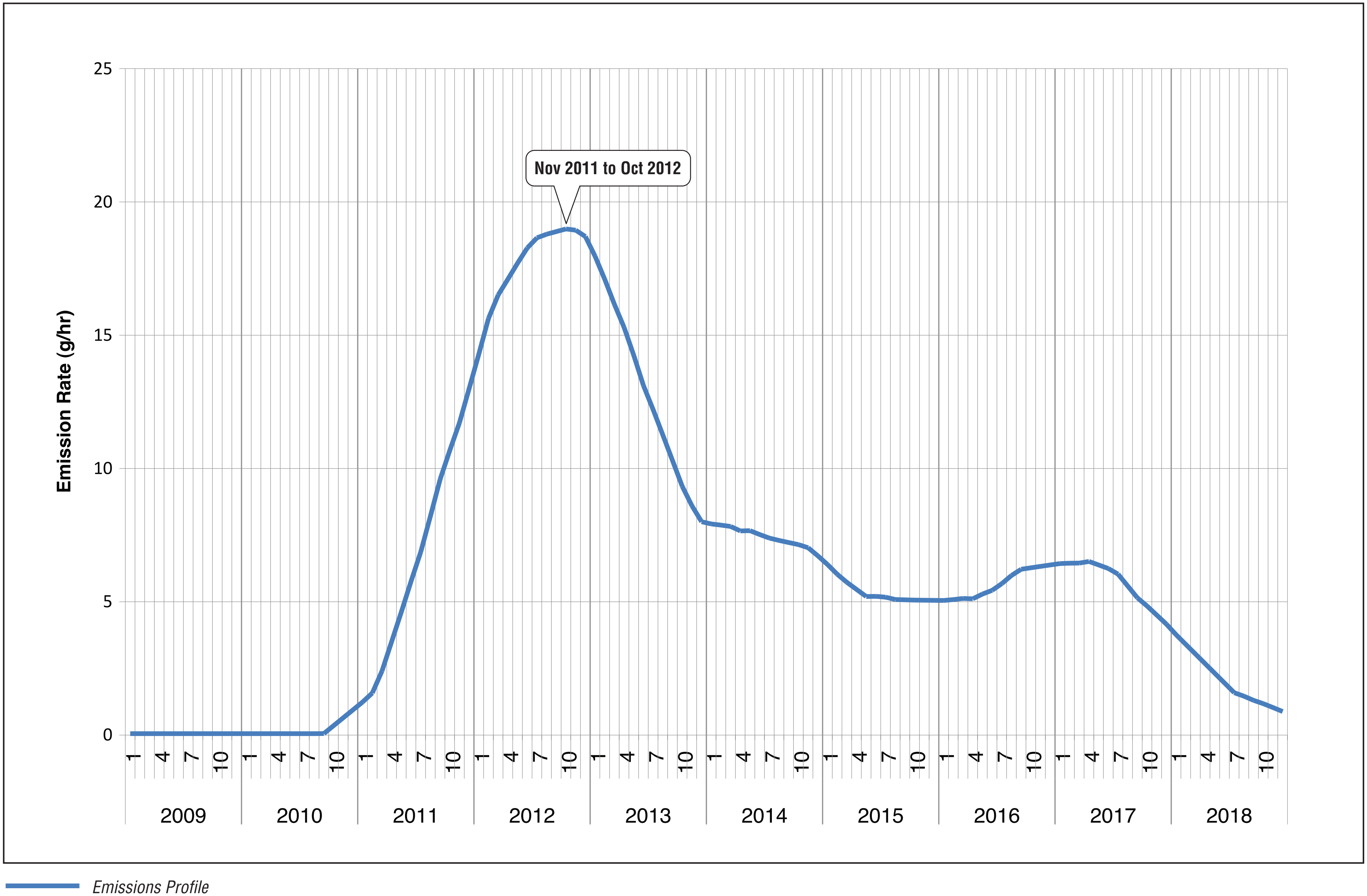
The maximum annual emissions were found to occur during the following 12 month time period (based on a 12 month rolling average):

- Podium: Annual period—November 2011 to October 2012

*Construction Data*

The specific construction information used to calculate air pollutant emissions generated by the construction activities includes, but is not limited to, the following:


Riverside Center Peak (24-hour Average)
Construction $PM_{2.5}$ Emissions Profile
Figure 20-4




Riverside Center Annual (Moving 12-Month Average)
Construction $PM_{2.5}$ Emissions Profile
Figure 20-5

- The number of units and fuel-type of construction equipment to be used;
- Rated horsepower for each piece of equipment;
- Hours of operation on-site;
- Excavation and processing rates;
- Average speed of dump trucks; and
- Average distance traveled on-site by dump trucks.

The air emissions can be classified into two categories; engine exhaust emissions and fugitive dust emissions. These classifications are discussed below.

*Engine Exhaust Emissions*

The sizes, the types, and the number of construction equipment were based on the construction activities schedule. Emission factors for $NO_X$, $PM_{10}$, $PM_{2.5}$, and CO from the combustion of ULSD fuel for on-site construction equipment were developed using the latest EPA NONROAD Emission Model (Version 2005a). The model is based on source inventory data accumulated for specific categories of off-road equipment. The emission factors for each type of equipment were calculated from the output files for the NONROAD model (i.e., calculated from regional emissions estimates). However, these emission factors were not applied to trucks. Emission rates from combustion of fuel for on-site dump trucks, concrete trucks, and other heavy trucks were developed using the EPA MOBILE6.2 Emission Model. New York City restrictions placed on idling times were employed for the dump trucks and other heavy trucks. For analysis purposes, it was assumed that the concrete trucks would operate continuously. Short-term and annual emission rates were adjusted from the peak hour emissions by applying usage factors for each equipment unit. Usage factors were determined using the construction equipment schedule.

The air quality analysis also took into account the application of available pollutant control technologies committed to by the Proposed Project's sponsors. Estimated PM emission rates for non-road equipment were reduced to account for add-on DPF control technologies. The control efficiency assumed for the DPFs is 90 percent.

*Fugitive Emission Sources*

Road dust emissions from vehicle travel were calculated using equations from EPA's AP-42, Section 13.2.2 for unpaved roads. $PM_{10}$ emissions were estimated for dump trucks traveling in and out of the excavation area. Average vehicle weights (i.e., unloaded going in and loaded going out) were used in the analysis and a reasonably conservative round trip distance was estimated for on-site travel. In addition, the contractor would be required to implement a dust control plan. For example, stabilized truck exit areas would be established for washing off the wheels of all trucks that exit the large construction sites. Trucks entering and leaving the site with excavated or other materials would be covered. Truck routes within the sites would be either watered as needed or, in cases where such routes would remain in the same place for an extended duration, the routes would be stabilized, covered with gravel, or temporarily paved to avoid the resuspension of dust. In addition to regular cleaning by the city, area roads would be cleaned as frequently as needed (i.e., in the case of a significant amount of dirt trackout from the construction site, the contractor would provide some type of street sweeping to keep the roads clean). These control measures would provide at least a 50 percent reduction in $PM_{10}$ emission. Also, since on-site travel speeds would be restricted to 5 miles per hour, on-site travel for trucks would not be a significant contributor to $PM_{2.5}$ fugitive emissions.

Particulate matter emissions could also be generated by material handling activities (i.e., loading/drop operations for excavated soil and rock). Estimates of $PM_{10}$ and $PM_{2.5}$ emissions from these activities were developed using EPA's AP-42 Sections 13.2.4. Excavation rates used for the analysis were based on information provided by the construction manager.

*Dispersion Modeling*

Potential impacts from on-site construction equipment were evaluated using the EPA/AMS AERMOD dispersion model (version 07026), which became the EPA and NYSDEC preferred model on December 9, 2006. The AERMOD model was designed as a replacement to the EPA Industrial Source Complex (ISC3) model and is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions. The AERMOD model calculates pollutant concentrations based on hourly meteorological data.

*Source Simulation*

During construction, various types of construction equipment would be used at different locations throughout the site. Some of the equipment is mobile and would operate throughout the site while some would remain stationary on-site at distinct locations during short-term periods (i.e., daily and hourly). Stationary emission sources include (but are not limited to) air compressors, generators, and concrete pumps. These sources were considered to be point sources and were placed at fixed locations in the modeling analysis. The input data for point sources included stack heights that were equivalent to the height of engine exhaust points or tailpipes and an exhaust temperature of 250° Celsius (a temperature within the normal operating range of most diesel engines). Based on estimated fuel consumption rates per 100 hp and potential pressure drops with diesel particulate filters on the exhaust, a stack velocity of 17.2 feet per second (or 5.24 meters per second) per 100 hp was used for each exhaust point along with a diameter of six inches (or 0.1524 meters).

Equipment such as excavators, pavers, and dump trucks would operate throughout the site. In the short-term periods, these sources were simulated as area sources for the purpose of the modeling analysis, and their emissions were distributed evenly across the construction site. In the modeled annual period, all sources were simulated as area source emissions.

*Receptor Locations*

AERMOD was used to predict maximum pollutant concentrations at nearby locations of likely public exposure ("receptors"). Discrete receptors were placed along sidewalks and residential buildings and in other general public use areas such as parks and open space. Receptors were also placed along the sidewalks surrounding the construction sites that would be publicly accessible. Residential receptors were placed at the nearest windows and facades facing the construction site.

*Meteorological Data*

The meteorological data set consisted of the latest five years of data that are available: surface data collected at LaGuardia Airport (2003-2007) and upper air data collected at Brookhaven, New York (2003-2007).

*Background Concentrations*

Where needed to determine potential air quality impacts from the construction of the project, background ambient air quality data for criteria pollutants were added to the predicted off-site concentrations. The background data were obtained from nearby NYSDEC monitoring stations that best represented the area surrounding the site. Those monitoring years were 2004 through 2008. These background concentrations are provided below in **Table 20–8**. Short-term concentrations (i.e., 24- and 8-hour averages) represent the second highest concentration of the five year data set, with the exception of $PM_{10}$, which is based on three years of data, consistent with current DEP guidance (2006-2008). The annual concentration represents the maximum value of the five year data set. For $PM_{2.5}$, background concentrations are not considered, since impacts are determined on an incremental basis only.

**Table 20-8**
**Background Pollutant Concentrations**

| Pollutant | Monitoring Station | Averaging Period | Background Concentration ($\mu g/m^3$) | Ambient Standard ($\mu g/m^3$) |
|---|---|---|---|---|
| $NO_2$ | PS 59 | Annual | 67.7 | 100 |
| CO | PS 59 | 1-hr | 2,978 | 40,000 |
| | | 8-hr | 2,290 | 10,000 |
| $PM_{10}$ | PS 59 | 24-hr | 60 | 150 |
| **Source:** New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2003–2007. | | | | |

*Mobile Sources*

The prediction of vehicle-generated emissions and their dispersion in an urban environment incorporates meteorological phenomena, traffic conditions, and physical configurations (e.g., street widths, sidewalk locations). Air pollutant dispersion models mathematically simulate how traffic, meteorology, and source-receptor geometry combine to affect pollutant concentrations. The mathematical expressions and formulations contained in the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions and it is necessary to predict the reasonable worst-case condition, most of these dispersion models predict conservatively high concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analyses for the project employ models approved by EPA and that have been widely used for evaluating air quality impacts of projects in New York City, other parts of New York State, and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels resulting in a conservatively high estimate of anticipated concentrations that could ensue from mobile sources associated with the Proposed Project.

The following sections provide an overview of the analytical tools used to determine mobile source impacts.

*Dispersion Model for Microscale Analyses*

Maximum CO concentrations adjacent to streets near the project site, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0 (last updated on August 31, 2004). The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site–specific traffic parameters, such as signal timing and delay calculations (from the 2000 Highway Capacity Manual traffic forecasting model), saturation flow rate, vehicle arrival type, and signal actuation (i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model, CAL3QHCR, is employed if maximum predicted future CO concentrations are greater than the applicable ambient air quality standards or when *de minimis* thresholds are exceeded using the first level of CAL3QHC modeling. The CAL3QHCR model will also be employed in the modeling of $PM_{2.5}$ concentrations.

*Meteorology*

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability. Wind direction influences the accumulation of pollutants at a particular location (receptor), and atmospheric stability accounts for the effects of vertical mixing in the atmosphere.

*Analysis Year*

An air quality analysis was performed for the year 2012, the worst case analysis year for traffic (i.e., project increments). The future analysis was performed for both the future without the Proposed Project and with the Proposed Project. In the future without the Proposed Project, no construction activities associated with the No Build scenarios were assumed to be occurring on the project site.

*Vehicle Emissions Data*

*Engine Emissions.* Vehicular engine emission factors were computed using the EPA mobile source emissions model, MOBILE6.2 (last updated in October 2002). This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway types, number of starts per day, engine soak time, and various other factors that influence emissions, such as inspection maintenance programs. Idle emission factors were used when vehicles were queuing and free flow emission factors were based on vehicle travel speeds when traffic was moving. The inputs and use of MOBILE6.2 for this analysis are consistent with the most current guidance available from NYSDEC and DEP.

Vehicle classification data were based on field studies outlined in the traffic section (including project generated traffic). Appropriate credits were used to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require inspections of automobiles and light trucks to determine if pollutant emissions from the vehicles exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State. All construction-worker generated vehicles were simulated as hot stabilized for arrivals and cold starts for departures. An ambient temperature of 50.0° Fahrenheit (F) was used for the analysis.

*Traffic Data.* Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the Proposed Project (see “Traffic and Parking,” above) for the peak traffic year of 2012. Traffic data for the future with and without the Proposed Project were employed in the respective air quality modeling scenarios. Weekday AM (6:00 to 7:00 AM) and PM (3:00 to 4:00 PM) peak hour periods were used for microscale CO analysis. These time periods were selected because they produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

*Background Concentrations*. Background concentrations for mobile sources are those pollutant concentrations not accounted for through the modeling analysis, which directly accounts for vehicle-generated emissions on the streets within 1,000 feet and line-of-sight of the receptor location. Background concentrations must be added to mobile source modeling results to obtain total pollutant concentrations at a study location.

The 8-hour average background CO concentration used in this analysis was 2.0 ppm for the 2012 predictions. This value is representative for the mobile source receptor locations in the future year. For $PM_{2.5}$, background concentrations are not considered, since impacts are determined on an incremental basis only.

*Mobile Source Analysis Sites*

Three intersections were used in the analysis for the assessment of CO impacts (see **Table 20-9**). These intersections were selected based on levels of project–generated (incremental) traffic in the project study area and overall traffic conditions, including total volumes and levels of service. They are located where the greatest air quality impacts and maximum changes in concentrations would be anticipated. In addition, analysis Site 2 was selected for the modeling of concentrations of $PM_{10}$ and $PM_{2.5}$.

**Table 20-9**
**Mobile Source Analysis Intersection Locations**

| Analysis Site | Location |
|---|---|
| 1 | West End Avenue & West 59th Street |
| 2 | West End Avenue & West 61st Street |
| 3 | Twelfth Avenue & West 57th Street |

*Receptor Locations.* Multiple receptors (i.e., precise locations at which concentrations are predicted by the model) were modeled along the approach and departure links of the selected intersection at spaced intervals. The receptor locations included sidewalks and roadside locations near intersections with continuous public access.

*EXISTING CONDITIONS*

A review of the existing monitored air quality conditions can be found in Chapter 18, "Air Quality and Greenhouse Gas Emissions."

*THE FUTURE WITHOUT THE PROPOSED PROJECT*

*Background Air Quality*

In the future without the Proposed Project, air quality is anticipated to be similar to that described for existing conditions. Land uses are expected to remain generally the same in this neighborhood in midtown Manhattan. Since air quality regulations mandated by the Clean Air Act are anticipated to maintain or improve air quality in the region, it can be expected that air quality conditions in the future without the Proposed Project would be no worse than those that presently exist.

*Concurrent Project Sites*

Construction of Riverside South, Buildings K1 and K2 is expected to occur during the time period that encompasses the construction schedule for the proposed Riverside Center development. Potential air quality impacts from the construction of K1 and K2 were included as part of a cumulative impacts analysis with the Riverside Center construction. Methodologies used to determine emission rates for construction activities at K1 and K2, as well as subsequent inclusion in the modeling analyses, were the same as those methodologies discussed above for the proposed Riverside Center construction.

*Mobile Source Impacts*

*CO*

CO concentrations without the Proposed Project were determined for the 2012 analysis year using the methodology previously described. **Table 20-10** shows the future maximum predicted 8-hour average CO concentration without the Proposed Project (i.e., 2012 No Build values) at the analysis intersection in the project study area. The values shown are the highest predicted concentrations for the receptor locations at the intersection. As indicated in Table 20-10, the predicted 8-hour concentrations of CO, including background, are below the corresponding ambient air quality standard.

**Table 20-10**
**No Build (2012) Maximum Predicted 8-Hour Carbon Monoxide Concentrations (parts per million)**

| Site | Location | Time Period | No Build 8-Hour Concentration (ppm) |
|---|---|---|---|
| 1 | West End Avenue & West 61st Street | Weekday AM | 2.8 |
| | | Weekday PM | 3.1 |
| 2 | West End Avenue & West 59th Street | Weekday AM | 2.9 |
| | | Weekday PM | 3.5 |
| 3 | Twelfth Avenue & West 57th Street | Weekday AM | 4.2 |
| | | Weekday PM | 5.5 |

**Notes:**
8-hour CO standard is 9 ppm.
An adjusted ambient background concentration of 2.0 ppm is included in the no build values presented above.

*PM*

Concentrations of $PM_{10}$ and $PM_{2.5}$ from mobile sources without the Proposed Project were also determined for the 2012 analysis year at the intersection of West End Avenue and West 59th Street. Concentrations of $PM_{10}$ included a 24-hour averaging period and $PM_{2.5}$ included the 24-hour and annual averaging periods. Including a background concentration of 60 $\mu g/m^3$, the maximum $PM_{10}$ 24-hour No Build concentration is predicted to be approximately 91.6 $\mu g/m^3$, and is below the applicable NAAQS of 150 $\mu g/m^3$. Note that $PM_{2.5}$ concentrations without the Proposed Project are not presented, since impacts are assessed on an incremental basis.

*PROBABLE IMPACTS OF THE PROPOSED PROJECT*

This section provides a summary of the projected air quality impacts from the construction activities of the Proposed Project. The most likely cause of impacts on local air quality during construction activities would result from:

- Engine emissions generated by on-site construction equipment, and trucks entering/leaving the site during construction;
- Fugitive dust emissions generated by soil excavation and other construction activities; and
- Mobile source emissions generated by project-related construction trucks and worker vehicles traveling to and from the site on local roads.

An analysis of the potential for air quality impacts from on-site construction sources was performed using the methodology described above under "Stationary Sources." As discussed in the methodology, the peak periods (by stage of construction) from the $PM_{2.5}$ emissions profile were used to determine what time periods would be used for the short-term and annual impacts in the modeling analysis.

An analysis of the potential for air quality impacts from project induced traffic was also performed using the methodology described above under "Mobile Sources." The peak period used in this modeling analysis was the 2013 construction year.

The results of both stationary and mobile source modeling analyses are summarized below. The modeling analyses demonstrated that no significant adverse impacts from construction sources are expected at the closest receptors during the peak emission periods. Since the predicted concentrations were modeled for periods that represent the highest site-wide air emissions, and at the closest sensitive receptors, the increments and total predicted concentrations during other stages of construction and at other locations are also not expected to have any significant adverse impacts.

*Stationary Source (Construction Equipment) Impacts*

A dispersion modeling analysis was performed to estimate the maximum off-site pollutant concentrations (and where applicable, on-site pollutant concentrations when project buildings are operational during construction activities) at nearby sensitive receptors, associated with emissions produced by on-site construction activities on the project site. A reasonably worst case scenario was used to generate the project emissions (see the Air Quality Analysis Methodologies section above). The modeling analyses were conducted using the AERMOD dispersion model and were performed in accordance with EPA and DEP guidance regarding the use of dispersion models for regulatory purposes. The predicted ambient concentrations of criteria pollutants have been used to demonstrate compliance with applicable air quality standards and the city's interim guidance values. Presented below are the results of the analyses for both the podium and the individual basements approaches.

**Table 20-11** presents the maximum predicted total concentration (including background) of three criteria pollutants for each applicable model averaging period due to the proposed construction activities using the site-wide podium approach. Since the worst case period for the site-wide podium construction approach occurs concurrently with the construction activities at Riverside South, Buildings K1 and K2, the modeling was performed for a cumulative source impact that included emissions from K1 and K2 construction activities. The maximum impacts were predicted to occur at receptors nearest the project site. As indicated in Table 20-12 the maximum predicted total concentrations of $NO_2$, $PM_{10}$, and CO would not result in any concentrations that exceed the NAAQS. This was true for all averaging periods, both short-term and annual, and for each pollutant modeled in the analysis using worst case emissions. Therefore, no significant adverse air quality impacts are predicted from the on-site construction sources due to these pollutants.

**Table 20-11**
**Podium with K1 and K2**
**Maximum Predicted Total Concentrations for Construction Activities**

| Pollutant | Averaging Period | Background Conc. (µg/m³) | Predicted Concentration (µg/m³) | Total Max Predicted Conc. (µg/m³) | Ambient Standard (µg/m³) |
|---|---|---|---|---|---|
| $NO_2$ | Annual | 67.7 | 8.4 | 76.1 | 100 |
| $PM_{10}$ | 24-hour | 60 | 28 | 88 | 150 |
| CO | 1-hour | 2,978 | 9,063 | 12,041 | 40,000 |
| | 8-hour | 2,290 | 3,117 | 5,407 | 10,000 |
| Micrograms per cubic meter—µg/m³ | | | | | |

*Podium Approach $PM_{2.5}$ Impacts*

*Introduction.* The air quality analysis was also performed to predict the concentrations of $PM_{2.5}$ from construction activities for the podium approach. Concentrations of $PM_{2.5}$ were modeled for the 24-hour averaging period (a measure of daily exposure) and the annual averaging period (a measure of long-term exposure). Annual concentrations were modeled at both discrete locations and on a neighborhood-scale.

*Short-term Analysis Period.* The maximum predicted 24-hour average (i.e., short term) $PM_{2.5}$ incremental concentration from the proposed construction activities was modeled for comparison with the city's 24-hour average interim guidance criteria for a discrete receptor location. The 24-hour $PM_{2.5}$ construction impact assessment considered the potential frequency and extent of the predicted off-site $PM_{2.5}$ incremental impacts, especially at locations where 24-hour exposure could occur.

The modeling analysis was conducted for the worst-case short-term period occurring during the month of June in the year 2012. As expected, the maximum predicted 24 hour average $PM_{2.5}$ incremental concentration occurred at a protected sidewalk location immediately adjacent to the construction fence. This value was equal to 2.2 $\mu g/m^3$ and is above the city's interim guidance value of 2 $\mu g/m^3$ but below the city's interim guidance value of 5 $\mu g/m^3$ (see a discussion of interim guidance values in Chapter 18, "Air Quality and Greenhouse Gas Emissions"). At receptor locations placed at sidewalks across the street of the construction site, the maximum predicted 24-hour incremental concentration was equal to 0.9 $\mu g/m^3$. At sensitive locations with a potential for 24-hour exposure such as the nearby parks and residential receptors, the maximum predicted $PM_{2.5}$ incremental concentrations range between 0.3 and 0.8 $\mu g/m^3$. As indicated, all residential receptors would be below the current 24-hour interim guidance criteria of 2 $\mu g/m^3$ for the maximum predicted value.

The maximum frequency of predicted concentrations above 2.0 $\mu g/m^3$ on any single receptor would only be one occurrence in five years of meteorological data. (As indicated above, this would occur at a protected sidewalk location immediately adjacent to the construction fence). The maximum predicted concentrations are probably overstated because the model did not include the effects of the noise reduction wall along the site perimeter that would be between sensitive receptors and the source of the emissions. The location of the maximum 24-hour average increments would vary based on the location of the sources, which would move throughout the site over time. Therefore, continuous daily exposures would not be likely to occur at any one location.

*Annual Analysis Period.* In addition to the 24 hour average short term concentrations discussed above, an analysis was also performed to predict annually averaged $PM_{2.5}$ concentrations. These concentrations were modeled for comparison to the city's annual average interim guidance values for discrete and neighborhood-scale receptors.

The modeling analysis was conducted for the worst-case annual period occurring during the 12 month timeframe of November 2011 through October 2012. As expected, the maximum predicted annual average $PM_{2.5}$ incremental concentration for a discrete receptor occurred at a protected sidewalk location immediately adjacent to the construction fence. This value was equal to 0.07 $\mu g/m^3$ and is below the city's interim guidance value of 0.3 $\mu g/m^3$ (see a discussion of interim guidance values in Chapter 18 "Air Quality and Greenhouse Gas Emissions"). At receptor locations placed at sidewalks across the street of the construction site, the maximum predicted incremental concentration was equal to 0.05 $\mu g/m^3$. At sensitive locations with a potential for annual exposure such as the nearby parks and residential receptors, the maximum predicted $PM_{2.5}$ incremental concentrations range between 0.02 and 0.03 $\mu g/m^3$. As indicated, all residential receptors would be below the current annual interim guidance criteria of 0.3 $\mu g/m^3$ for the maximum predicted value at a discrete receptor.

The maximum predicted annual $PM_{2.5}$ incremental concentration from the proposed construction activities was modeled for comparison with the city's annual average neighborhood-scale interim guidance criterion of 0.1 $\mu g/m^3$. The annual average neighborhood-scale concentration increment from the construction activities was predicted to be 0.003 $\mu g/m^3$, which is well below the city's interim guidance criterion of 0.1 $\mu g/m^3$.

*Individual Basements Approach $PM_{2.5}$ Impacts*

*Introduction.* The air quality analysis was also performed to predict the concentrations of $PM_{2.5}$ from construction activities that occur with the individual basement approach. Concentrations of $PM_{2.5}$ were modeled for the 24-hour averaging period (a measure of daily exposure) only.

*Short-term Analysis Period.* The maximum predicted 24-hour average (i.e., short term) $PM_{2.5}$ incremental concentration from the proposed construction activities was modeled for comparison with the city's 24-hour average interim guidance criteria for a discrete receptor location. The 24-hour $PM_{2.5}$ construction impact assessment considered the potential frequency and extent of the predicted off-site $PM_{2.5}$ incremental impacts, especially at locations where 24-hour exposure could occur.

The modeling analysis was conducted for the worst-case short-term period occurring during the month of February in the year 2015. This analysis included receptors on Building 2, as this building would be complete and occupied in 2015. As expected, the maximum predicted 24 hour average $PM_{2.5}$ incremental concentration occurred at a protected sidewalk location immediately adjacent to the construction fence. This value was equal to 1.3 $\mu g/m^3$ and is below the city's interim guidance value of 2 $\mu g/m^3$. At receptor locations placed at sidewalks across the street of the construction site, the maximum predicted incremental concentration was equal to 1.2 $\mu g/m^3$. At sensitive locations with a potential for 24-hour exposure such as the nearby parks and residential receptors, the maximum predicted $PM_{2.5}$ incremental concentrations range between

0.1 and 0.4 µg/m$^3$. As indicated, all residential receptors would be below the current 24-hour interim guidance criteria of 2 µg/m$^3$ for the maximum predicted value.

*$PM_{2.5}$ Conclusions*

As stated in Chapter 18, "Air Quality and Greenhouse Gas Emissions," actions under CEQR that would increase $PM_{2.5}$ concentrations more than the city's interim guidance criteria would be considered to have potential significant adverse impacts, depending upon the probability of occurrence, the projected duration of such impacts, the extent of the area and the potential number of people affected. While the dispersion model determined that the maximum predicted incremental concentrations of $PM_{2.5}$ (using a worst-case emissions scenario) exceed the applicable city interim guidance criteria of 2 µg/m$^3$ at a few non-residential discrete receptor locations, it should be noted that the likelihood of prolonged exposure is very low. The occurrences of elevated 24-hour average concentrations for $PM_{2.5}$ at non-residential receptors are very limited in duration and are only slightly above the interim guidance thresholds. Therefore, after taking into the account the temporary nature of construction, the variability of $PM_{2.5}$ emissions over time (which are often considerably less than those used in the modeling analysis), the limited frequency of 24 hour impacts, and the limited area-wide extent of the 24 hour and annual discrete location impacts (the neighborhood scale analysis had $PM_{2.5}$ concentrations well below the city's interim guidance criteria), it was concluded that no significant adverse air quality impacts for $PM_{2.5}$ are expected from the on-site construction sources.

*Mobile Source Impacts*

A mobile source air quality analysis was conducted for the project during construction activities at the site for the peak construction traffic year, 2013. Localized pollutant impacts from the vehicles queuing at the selected intersection were analyzed for CO for the 8-hour averaging period. $PM_{10}$ was analyzed for the 24-hour averaging period and $PM_{2.5}$ was analyzed for the 24-hour and annual averaging periods.

*CO*

CO concentrations with the Proposed Project (build) were determined for the 2012 analysis year using the methodology previously described. **Table 20-12** shows the future maximum predicted 8-hour average CO concentration with the Proposed Project at the analysis intersection in the project study area.

**Table 20-12**
**Build (2012) Maximum Predicted 8-Hour**
**Carbon Monoxide Concentrations (parts per million)**

| Site | Location | Time Period | Project Build 8-Hour Concentration (ppm) | *De minimis* Criteria (ppm) |
|---|---|---|---|---|
| 1 | West End Avenue & West 61st Street | Weekday AM | 2.9 | 5.9 |
| | | Weekday PM | 3.2 | 6.0 |
| 2 | West End Avenue & West 59th Street | Weekday AM | 2.8 | 6.0 |
| | | Weekday PM | 3.4 | 6.2 |
| 3 | Twelfth Avenue & West 57th Street | Weekday AM | 4.2 | 6.6 |
| | | Weekday PM | 5.5 | 7.2 |

**Notes:**
8-hour CO standard is 9 ppm.
Adjusted ambient background concentration of 2.5 ppm is included in project build values presented above.

The values shown are the highest predicted concentrations for the time period analyzed. Also shown in the table is a Not-to-Exceed value based on the *de minimis* criteria used to determine the significance of the incremental increase in CO concentrations that would result from the Proposed Project. The *de minimis* criteria are derived using procedures outlined in the *CEQR Technical Manual* (2001) that set a minimum allowable change in 8-hour average CO concentrations due to the Proposed Project (i.e., the No Action concentration plus half the difference between No Action concentration and the 9.0 ppm standard).

The results in **Table 20-14** indicate that in the future with the Proposed Project, there would be no significant adverse mobile source air quality impacts (i.e., *de minimis* criteria were not exceeded). In addition, with or without the Proposed Project in 2012, maximum predicted CO concentrations in the study area of the Proposed Project would be less than the corresponding ambient air quality standards.

*PM*

The maximum predicted concentration of $PM_{10}$ for the 24-hour averaging period at the intersection of West End Avenue and West 59th Street is approximately 92.3 $\mu g/m^3$. This concentration is below the applicable standard of 150 $\mu g/m^3$.

The maximum predicted incremental concentrations of $PM_{2.5}$ were modeled for the 24-hour and annual averaging periods, also at the intersection of West End Avenue and West 59th Street. The predicted incremental concentrations are 0.02 $\mu g/m^3$ for the 24-hour averaging period and 0.004 $g/m^3$ for the annual averaging period. Both of these values are below the applicable city interim guidance criteria for $PM_{2.5}$.

*COMBINED STATIONARY AND MOBILE SOURCE IMPACTS*

A mobile source analysis of CO and PM impacts for the intersection of West End Avenue & West 59th St. (the closest signalized intersection to the construction site) indicated that a maximum predicted concentration would occur at receptors placed along the sidewalks adjacent to this intersection in the year 2012. Modeled impacts from the stationary source construction activities in the year 2012 included a maximum predicted fence-line CO concentration of 4.7 ppm (including background). Total cumulative concentrations of CO for both mobile and stationary sources (conservatively combining two different peak analysis periods) is estimated to be 6.1 ppm, which is less than the applicable air quality standard of 9 ppm. Therefore, no significant adverse air quality impacts for CO are expected to occur due to the combined impacts of mobile and construction sources.

The maximum predicted concentration of $PM_{10}$ from stationary sources of construction is 88 $\mu g/m^3$, including background. Cumulative concentrations from mobile and stationary (conservatively combining two different peak analysis periods) is estimated to be 120 $\mu g/m^3$ and would not exceed the applicable air quality standard of 150 $\mu g/m^3$.

For $PM_{2.5}$, the mobile source concentrations were an order of magnitude or more lower than the stationary source concentrations, and would therefore have no significant affect when combined with the stationary source concentration contribution. Therefore, no significant adverse air quality impacts for either $PM_{10}$ or $PM_{2.5}$ would occur due to the combined impacts of mobile and stationary sources.

## NOISE AND VIBRATION

### *INTRODUCTION*

Impacts on community noise levels during construction of the Proposed Project could result from noise due to construction equipment operation and from noise due to 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 at full power), 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. The most significant construction noise sources are expected to be impact equipment such as jackhammers, excavators with ram hoes, drill rigs, rock drills, impact wrenches, tower cranes, and paving breakers, as well as the movements of trucks, and possible blasting.

Noise from construction activities and some construction equipment is regulated by the New York City Noise Control Code and by EPA. 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 7:00 AM and 6:00 PM, and sets noise limits for certain specific pieces of construction equipment. Construction activities occurring after hours (weekdays between 6:00 PM and 7:00 AM, and on weekends) may be authorized in the following circumstances: (1) emergency conditions; (2) public safety; (3) construction projects by or on behalf of city agencies; (4) construction activities with minimal noise impacts; and (5) where undue hardship is demonstrated resulting from unique site characteristics, unforeseen conditions, scheduling conflicts and/or financial considerations. EPA 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 it was likely that 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.

### *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.” This has been interpreted to mean that such impacts would occur only at sensitive receptors where the activity with the potential to create high noise levels would occur continuously for approximately two years or longer. In addition, the *CEQR Technical Manual* states that the impact criteria for vehicular sources, using existing noise levels as the baseline, should be used for assessing construction impacts. (See Chapter 19, “Noise,” for an explanation of noise measurement and sound levels.) That impact criteria is as follows:

- If the existing noise levels are less than 60 decibels, A-weighted equivalent sound level for one hour (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 10:00 PM and 7:00 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 threshold would reflect an incremental increase of be 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold.)

The impact criteria contained in the *CEQR Technical Manual* were used for assessing impacts from construction activities.

*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 below show the effects of construction activities (i.e., noise due to both on-site construction equipment and construction-related vehicles operation) and the total cumulative impacts due to operational effects (caused by project-generated vehicular trips) and construction effects (as construction proceeds on uncompleted components of the project).

Noise from 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 level 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 at full power;
- The distance between the piece of equipment and the receptor;
- Topography and ground effects; and
- Shielding.

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

- The noise emission levels of the type of vehicle (e.g., 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.

*Construction Noise Modeling*

Noise effects from construction activities were evaluated using the CadnaA model, 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 (e.g., construction equipment, industrial equipment, power generation equipment, etc.), transportation sources (e.g., roads, highways, railroad lines, busways, airports, etc.), and other specialized sources (e.g., sporting facilities, etc.). The model takes into account the reference sound pressure levels of the noise sources at 50 feet, attenuation with distance, ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The CadnaA 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 (ANSI) as an American Standard. The CadnaA model is a state-of-the-art tool for noise analysis.

Geographic input data used with the CadnaA model included CAD drawings that defined site work areas, adjacent building footprints and heights, locations of streets, and locations of sensitive receptors. For each analysis period, the geographic location and operational characteristics, including equipment usage rates (percentage of time equipment with full-horse power 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 and shielding by barriers erected on the construction site, and shielding from both adjacent buildings and project buildings as they are constructed, were accounted for in the model. 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.

*Non-Construction Noise Modeling*

Non-construction (i.e., operational) noise levels were calculated using the methodology discussed in Chapter 19. As discussed in that chapter, operational noise was calculated using the Federal Highway Administration's (FHWA) *Traffic Noise Model* version 2.5 (TNM) to calculate noise from traffic on adjacent and nearby streets and roadways.

*Analysis Approaches and Years*

As described previously, the below-grade space of the Proposed Project could be constructed using either the podium approach or the individual basements approach. Both approaches are assumed to have the same construction sequence (i.e., Buildings 2, 5, 1, 3, and 4). Under the podium approach, the busiest construction activity (i.e., the excavation, foundations, and below-grade construction) would occur during the first few years of construction. Under the individual basements approach, the busiest construction activity would occur when excavation, foundation, and superstructure for the separate buildings overlap. It is difficult to categorically determine which of these approaches would be the worst case scenario with respect to potential noise impacts, and as a result both approaches were analyzed.

A screening analysis was performed to determine an analysis quarter (i.e., 3-month period) during each year of the construction period (i.e., between 2010 and 2018) when the maximum potential for significant noise impacts would occur for each sequencing approach. The screening analysis was based on a construction schedule showing the number of workers, types and number of pieces of equipment, and number of construction vehicles anticipated to be operating during each quarter of the construction period. To be conservative, the detailed construction noise analysis assumed: the analysis quarter with the maximum potential for producing significant impacts for each year of construction for each sequencing approach; that these peak on-site construction activity conditions occurred for the entire year; and that both peak on-site construction activities and peak construction-related traffic conditions occurred simultaneously.

*Noise Reduction Measures*

The construction noise analysis assumes that the project sponsor commits to a proactive approach to minimize noise during construction activities. This approach employs a wide variety of measures that greatly exceeded standard construction practices, but the implementation of which was deemed feasible and practicable to minimize construction noise and reduce potential noise impacts. These measures would be implemented and described in the Construction Noise

Mitigation Plan required by the New York City Noise Control Code[1]. This program includes: source controls and path controls.

In terms of source controls (i.e., reducing noise levels at the source), the following measures for construction, which go beyond typical construction techniques, would be implemented:

- A wide range of equipment, which produce lower noise levels than typical construction equipment required by the New York City Noise Control Code would be utilized. **Table 20-13** shows the noise levels for typical construction equipment and the noise levels for the equipment that would be used for construction of the proposed project. Additional details of the construction equipment noise emission levels are presented in Appendix G-2a.
- Where feasible and practicable, construction procedures and equipment (such as bulldozer, cement mixer, compressor, concrete pump, truck, crane, excavator, generator, pump, roller, and trailer) that produce noise levels below the requirements of the New York City Noise Control Code would be used.
- As early in the construction period as practicable, electrical-powered equipment would be selected for certain noisy equipment, such as concrete vibrator, saws, paver cutter, and hoist (i.e., early electrification).
- Where practicable and feasible, construction sites would be configured to minimize back-up alarm noise. In addition, trucks would not be allowed to idle more than three minutes at the construction site based upon New York City Local Law.
- Only necessary equipment would be on-site.
- Contractors and subcontractors would be required to properly maintain their equipment and have quality mufflers installed.

In terms of path controls (e.g., placement of equipment, implementation of barriers or enclosures between equipment and sensitive receptors), the analysis assumes that the following measures would be implemented:

- Noisy equipment, such as cranes, concrete pumps, concrete trucks, and delivery trucks, would be located away from and shielded from sensitive receptor locations. For example, during the early construction phases of work, delivery and dump trucks, as well as many construction equipment operations, would be located and take place below grade to take advantage of shielding benefits. Once building foundations are completed, delivery trucks would operate behind noise barriers, where possible.
- Noise barriers would be utilized to provide shielding (e.g., the construction sites would have a minimum 8-foot barrier, with a 15-foot barrier adjacent to residential and other sensitive locations, and, where possible, truck deliveries would take place behind these barriers once building foundations are completed).

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[1] New York City Noise Control Code (i.e., Local Law 113). Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007.

**Table 20-13**
**Construction Equipment Noise Emission Levels (dBA)**

| Equipment List | DEP & FTA Typical Noise Levels at 50 feet[1] | Project Equipment Noise Levels at 50 feet[2] | Noise Reduction with Path Controls[3] | Actual Noise Level at 50 feet |
|---|---|---|---|---|
| Asphalt Laying Equipment | 85 | 85 | | 85 |
| Bulldozer | 85 | 77 | | 77 |
| Cement Mixer | 75 | 63 | | 63 |
| Compressor | 80 | 67 | | 67 |
| Concrete Pump | 82 | 79 | | 79 |
| Concrete Truck | 85 | 79 | | 79 |
| Concrete Vibrator | 76 | 76 | 10 | 66 |
| Crane | 85 | 77 | | 77 |
| Crane (Tower Crane) | 85 | 85 | 10 | 75 |
| Delivery Trucks | 84 | 79 | | 79 |
| Dump Truck | 84 | 79 | | 79 |
| Excavator | 85 | 77 | | 77 |
| Fuel Truck | 84 | 79 | | 79 |
| Forklift | 75 | 75 | | 75 |
| Generator | 82 | 68 | | 68 |
| Hoist | 75 | 75 | 10 | 65 |
| Impact Wrench | 85 | 85 | 10 | 75 |
| Jack Hammer | 85 | 71 | | 71 |
| Line Drill | 85 | 85 | 10 | 75 |
| Paver Cutter | 85 | 71 | | 71 |
| Pile Rig | 84 | 84 | 10 | 74 |
| Pump (Water) | 77 | 76 | | 76 |
| Rebar Bender | 80 | 80 | | 80 |
| Roller | 85 | 74 | | 74 |
| Saw (Circular) | 76 | 76 | | 76 |
| Saw (Table Saw) | 76 | 76 | | 76 |
| Scissor Lift | 75 | 75 | | 75 |
| Slurry supply system | 82 | 82 | | 82 |
| Sprayer | 75 | 75 | | 75 |
| Tamper | 83 | 83 | 10 | 73 |
| Tractor Trailer | 84 | 79 | | 79 |
| Trailer | 84 | 79 | | 79 |
| Trash hauling | 85 | 77 | | 77 |
| Troweling machine | 85 | 85 | 10 | 75 |
| Welding Equipment | 73 | 73 | | 73 |

**Notes:**
[1] Sources: Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007; Transit Noise and Vibration Impact Assessment, Federal Transit Administration (FTA), May 2006.
[2] Noise levels for project construction equipment would be are achieved by using quieter equipment, better engine mufflers, and refinements in fan design and improved hydraulic systems, and noise levels for typical equipment (jack hammer, paver cutter, and trash hauling) must meet the sound level standards specified in Subchapter 5 of the New York City Noise Control Code.
[3] Path controls include noise barriers, enclosures, acoustical panels, and curtains, whichever feasible and practical, and 10 dBA of reduction was assumed.

- Path noise control measures (i.e., portable noise barriers, panels, enclosures, and acoustical tents, where feasible) were assumed to be used for certain dominant noise equipment, i.e., concrete vibrator, tower crane, hoist, impact wrench, line drill, pile rig, temper, and trowel machine. The details to construct noise barriers, enclosures, tents, etc. are based upon the instructions of DEP’s Chapter 28 Citywide Construction Noise Mitigation.

- Acoustical curtains were assumed for internal construction activities in the construction buildings, to break the line-of-sight and provide acoustical shielding between noise sources and sensitive receptors.

*Receptor Sites*

Twenty-seven (27) receptor locations close to the project site were selected as discrete noise receptor sites for the construction noise analysis. These receptors are either located directly adjacent to the project site or streets where construction trucks would be passing by. Each receptor site is the location of a residence or other noise sensitive use. At receptor location buildings, noise receptors were selected at multiple elevations. At open space locations, receptors were placed at ground level. **Figure 20-6** shows the location of the 27 noise receptor sites, and **Table 20-14** lists the noise receptor sites and their associated land uses. The receptor sites selected for detailed analysis are representative of other noise receptors in the immediate project area, and are the locations where maximum project impacts due to construction noise would be expected.

**Table 20-14**
**Construction Noise Receptor Locations**

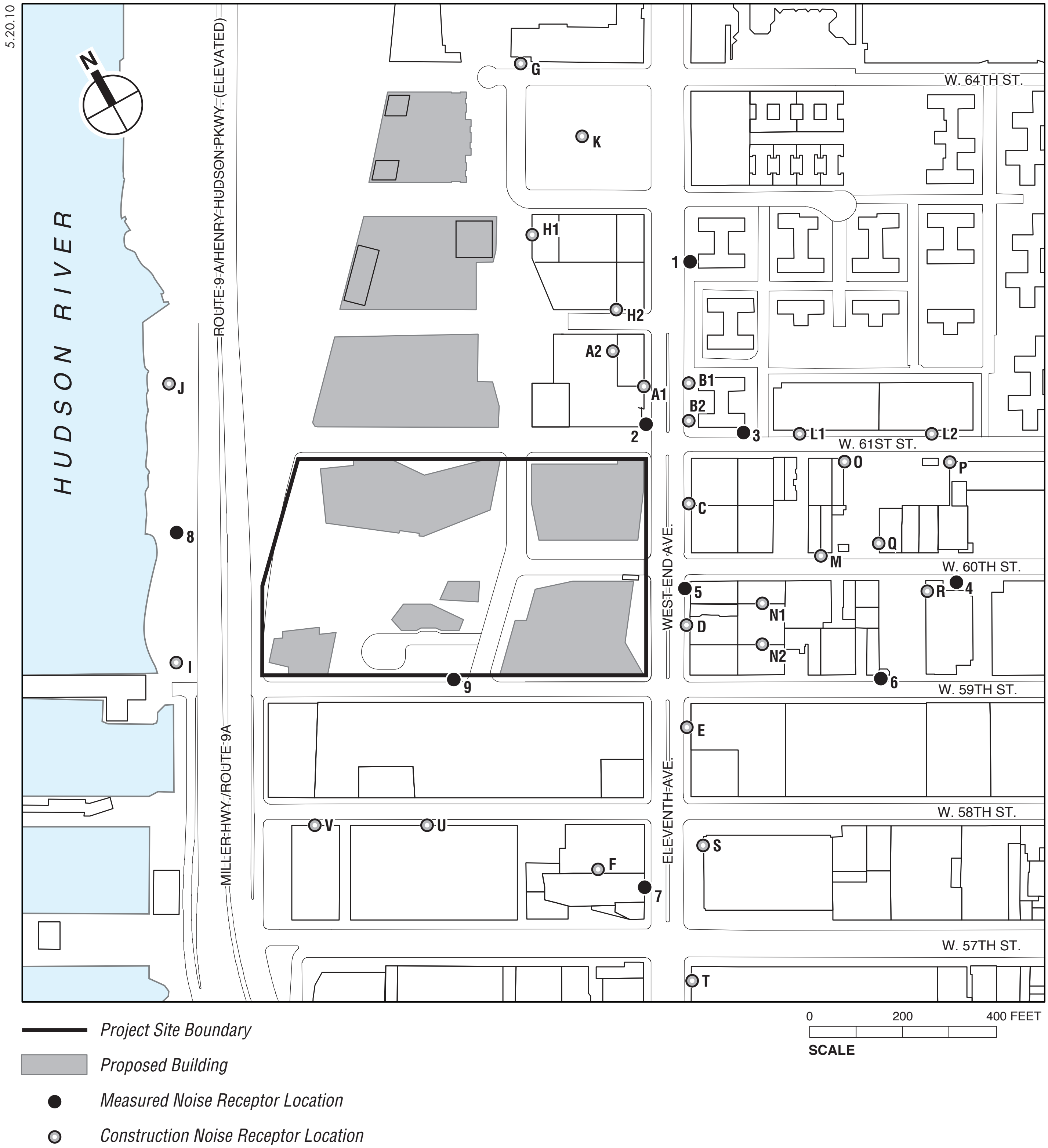
| Receptor | Location | Associated Land Use |
|---|---|---|
| A1[1],A2 | 33 West End Avenue | Residential With Ground Floor Retail |
| B1,B2 | 249 West 61st Street | Residential (Amsterdam Houses) |
| C | 20 West End Avenue | Residential and Institution (Heschel School) |
| D | 10 West End Avenue | Residential and Commercial |
| E | 521 West 58th Street | Institution (John Jay College) |
| F | 847 West End Avenue | Residential and Commercial |
| G | 101 West End Avenue | Residential With Ground Floor Retail |
| H1, H2 | 75 West 63rd Street | Residential With Ground Floor Retail |
| I, J | Route 9A between W. 59th and 62nd Streets | Open Space (Riverside Park) |
| K | West End Avenue between W. 63rd and 64th Streets | Open Space (River School Park) |
| L1, L2 | 227 West 61st Street | Institution (Beacon School) |
| M | 243 West 60th Street | Residential (Adagio Condos) |
| N1, N2 | 555 West 59th Street | Residential (Element Condos) |
| O | 234 West 61st Street | Residential (Adagio Condos) |
| P | 20 Amsterdam Avenue | Institution (P.S. 191) |
| Q | 225 West 60th Street | Residential and Institute (Lander College) |
| R | 517 West 59th Street | Residential |
| S | 555 West End Avenue | Commercial |
| T | 530 West End Avenue | Commercial |
| U | 614 West 58th Street | Commercial (Durst Commercial Project) |
| V | 631 West 57th Street | Commercial (Durst Site) |

**Notes:** [1] This receptor represents Is set back to the residential tower of the building, as the ground floor contains only retail uses.

In addition to the 27 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 and are presented in Appendix G-2b.

*DETERMINING EXISTING NOISE LEVELS*

The TNM model and the CadnaA model were used to determine existing noise levels at the 27 construction receptor sites. For at-grade receptor locations, existing $L_{eq(1)}$ noise levels were calculated using the TNM model based on existing traffic components and baseline measured values at monitoring receptor locations. Noise monitoring sites and their measured noise levels are the same as those used in the operational noise analysis (see Chapter 19, “Noise”). To be conservative, the AM peak period which would reflect the peak hour for the construction trucks and the use of large equipment on-site was selected for this analysis. For elevated receptor locations,




Construction Noise Receptor Locations

Figure 20-6

noise levels were calculated using the CadnaA model based on existing traffic components. The difference in noise levels between at-grade floor and elevated floor locations was used to determine elevation adjustment factors. Finally, existing $L_{eq(1)}$ noise levels at elevated locations were determined by adding the adjustment factors to noise levels at-grade floor. Summary tables showing the detailed calculations for existing noise levels are provided in Appendix G-2c.

*CONSTRUCTION NOISE ANALYSIS RESULTS*

Using the methodology described above, and considering the noise abatement measures for source and path controls specified 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.

This FSEIS presents the results of further refinements to the analysis presented in the DSEIS. These refinements consisted of examining the locations where significant impacts were predicted to occur in the DSEIS, and performing additional analyses for the quarters (i.e., 3-month time periods) before and after the time when the significant noise level increases were predicted to occur to determine whether the impacts identified in the DSEIS would occur continually for at least two or more consecutive years. If the additional analysis time periods identified that construction noise impacts would not be expected to occur continuously for at least two consecutive years, then a significant impact would not be expected to occur. If the additional analysis indicated that construction noise impacts identified in the DSEIS would occur continually for at least two or more consecutive years, then the potential impacts identified in the DSEIS would be considered a significant noise impact. These additional analyses results showed that the exceedances of the 3-5 dBA impact criteria for two or more years would not occur continuously at the following sites which were identified in the DSEIS:

- Podium Approach—Receptor sites H2, L2, and M
- Individual Basement Approach—Receptor sites A1, B2, F, H1, H2, L2, M, O, Q, and R.

Accordingly, noise related to project construction activities would not cause significant adverse impacts at these locations.

In addition, analyses were performed to determine whether it would be feasible to implement additional mitigation measures to reduce or eliminate the impacts at the other receptor sites identified in the DSEIS. Those analyses indicated that there were not additional feasible mitigation measures that would significantly reduce or eliminate the predicted impacts at the locations where significant adverse impacts were predicted to occur.

*Podium Approach Analysis Results*

**Table 20-15** shows the following for the podium approach (see Appendix G-2d for the complete list of results for details):

- Existing noise levels;
- Maximum predicted total noise levels (i.e., cumulative noise levels), which are the sum of noise due to construction activities[1] and noise due to traffic on the adjacent street; and

[1] The maximum predicted noise level due to construction activities alone includes the noise generated by on-site construction activities, assuming maximum construction activity 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.

- Maximum predicted increases in noise levels based upon comparing the total noise levels with existing noise levels.

**Table 20-15**
**Construction Noise Analysis Results for the Podium Approach Values in dBA**

| Noise Receptor | Receptor Height (in stories) | Existing dBA | 2010 | | 2011 | | 2012 | | 2013 | | 2014 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change |
| A1 | 1 | 69.9 | 70.1 | 0.2 | 70.3 | 0.4 | 71.0 | 1.1 | 70.9 | 1.0 | 70.7 | 0.8 |
| | Top floor | 65.3 | 65.6 | 0.3 | 65.9 | 0.6 | 70.2 | **4.9** | 69.4 | **4.1** | 66.8 | 1.5 |
| A2 | 1 | 59.9 | 60.1 | 0.3 | 60.4 | 0.5 | 61.6 | 1.8 | 61.2 | 1.4 | 61.5 | 1.7 |
| | Top floor | 61.7 | 65.4 | **3.7** | 65.5 | **3.8** | 70.0 | **8.3** | 64.3 | 2.6 | 64.3 | 2.6 |
| B1 | 1 | 68.0 | 68.4 | 0.4 | 68.8 | 0.8 | 70.4 | 2.4 | 69.6 | 1.6 | 69.0 | 1.0 |
| | Top floor | 68.1 | 68.4 | 0.3 | 68.8 | 0.7 | 71.1 | 3.0 | 70.5 | 2.4 | 69.3 | 1.2 |
| B2 | 1 | 69.2 | 69.6 | 0.4 | 69.9 | 0.7 | 72.0 | 2.8 | 71.1 | 1.9 | 70.2 | 1.0 |
| | Top floor | 69.0 | 69.4 | 0.4 | 69.7 | 0.7 | 73.3 | **4.3** | 72.9 | **3.9** | 70.4 | 1.4 |
| C | 1 | 69.1 | 69.6 | 0.5 | 69.6 | 0.5 | 72.0 | 2.9 | 70.3 | 1.2 | 69.5 | 0.4 |
| | Top floor | 61.9 | 64.2 | 2.3 | 64.3 | 2.4 | 72.4 | **10.5** | 70.8 | **8.9** | 67.5 | **5.6** |
| D | 1 | 69.6 | 70.0 | 0.4 | 70.1 | 0.5 | 71.4 | 1.8 | 71.7 | 2.1 | 70.4 | 0.8 |
| | 35 | 62.6 | 64.6 | 2.0 | 64.6 | 2.0 | 71.3 | **8.7** | 72.3 | **9.7** | 70.3 | **7.7** |
| E | 1 | 71.8 | 72.0 | 0.2 | 72.4 | 0.6 | 72.8 | 1.0 | 73.4 | 1.6 | 72.9 | 1.1 |
| | Top floor | 65.5 | 66.5 | 1.0 | 66.7 | 1.2 | 72.0 | **6.5** | 75.7 | **10.2** | 73.8 | **8.3** |
| F | 1 | 72.1 | 72.2 | 0.1 | 72.3 | 0.2 | 72.3 | 0.2 | 72.5 | 0.4 | 72.4 | 0.3 |
| | 10 | 56.9 | 58.4 | 1.5 | 57.9 | 1.0 | 62.3 | **5.4** | 64.0 | **7.1** | 60.8 | 3.9 |
| G | 1 | 59.9 | 59.9 | 0.1 | 60.0 | 0.1 | 60.8 | 0.9 | 60.5 | 0.7 | 60.2 | 0.3 |
| | Top floor | 60.7 | 60.8 | 0.2 | 60.9 | 0.3 | 63.8 | 3.2 | 63.1 | 2.5 | 63.3 | 2.6 |
| H1 | 1 | 59.9 | 59.9 | 0.1 | 59.9 | 0.1 | 62.1 | 2.3 | 62.2 | 2.3 | 61.2 | 1.4 |
| | Top floor | 61.1 | 61.5 | 0.4 | 61.5 | 0.4 | 66.6 | **5.6** | 65.7 | **4.7** | 65.2 | **4.1** |
| H2 | 1 | 62.6 | 63.7 | 1.1 | 63.5 | 0.9 | 64.9 | 2.3 | 64.1 | 1.5 | 63.9 | 1.3 |
| | Top floor | 63.6 | 66.2 | 2.6 | 66.3 | 2.7 | 70.0 | **6.4** | 65.3 | 1.7 | 65.5 | 1.9 |
| I | At-grade | 66.8 | 67.0 | 0.2 | 67.2 | 0.4 | 68.4 | 1.6 | 69.3 | 2.5 | 68.7 | 1.9 |
| J | At-grade | 66.8 | 67.3 | 0.5 | 67.1 | 0.3 | 68.1 | 1.3 | 68.9 | 2.1 | 67.6 | 0.8 |
| K | At-grade | 63.0 | 63.1 | 0.1 | 63.2 | 0.2 | 63.3 | 0.3 | 63.2 | 0.2 | 63.1 | 0.1 |
| L1 | 1 | 67.0 | 67.5 | 0.5 | 67.5 | 0.5 | 69.2 | 2.2 | 68.5 | 1.5 | 67.9 | 0.9 |
| | Top floor | 66.6 | 67.1 | 0.5 | 67.1 | 0.5 | 69.0 | 2.4 | 68.4 | 1.8 | 67.7 | 1.1 |
| L2 | 1 | 66.2 | 66.5 | 0.3 | 66.6 | 0.4 | 67.8 | 1.6 | 67.8 | 1.6 | 67.2 | 1.0 |
| | Top floor | 63.0 | 63.5 | 0.5 | 63.6 | 0.6 | 66.1 | **3.1** | 65.8 | 2.8 | 64.6 | 1.6 |
| M | 1 | 62.2 | 62.2 | 0.0 | 62.3 | 0.1 | 63.0 | 0.8 | 64.0 | 1.8 | 63.1 | 0.9 |
| | Top floor | 62.5 | 62.8 | 0.3 | 62.8 | 0.3 | 65.3 | 2.8 | 65.8 | **3.3** | 64.4 | 1.9 |
| N1 | 1 | 63.8 | 63.9 | 0.1 | 63.9 | 0.1 | 64.5 | 0.7 | 65.5 | 1.7 | 64.7 | 0.9 |
| | 20 | 58.6 | 61.1 | 2.5 | 61.0 | 2.4 | 67.3 | **8.7** | 66.1 | **7.5** | 64.8 | **6.2** |
| N2 | 1 | 69.2 | 69.3 | 0.1 | 69.8 | 0.6 | 70.1 | 0.9 | 71.5 | 2.3 | 70.8 | 1.6 |
| | 5 | 62.6 | 62.9 | 0.3 | 63.9 | 1.3 | 66.8 | **4.2** | 69.8 | **7.2** | 68.6 | **6.0** |
| O | 1 | 65.7 | 65.9 | 0.2 | 66.0 | 0.3 | 67.4 | 1.7 | 67.6 | 1.9 | 67.0 | 1.3 |
| | 20 | 62.9 | 63.5 | 0.6 | 63.7 | 0.8 | 67.6 | **4.7** | 67.8 | **4.9** | 64.8 | 1.9 |
| P | 1 | 65.9 | 66.1 | 0.2 | 66.2 | 0.3 | 67.7 | 1.8 | 67.5 | 1.6 | 67.0 | 1.1 |
| | Top floor | 65.0 | 65.3 | 0.3 | 65.4 | 0.4 | 66.6 | 1.6 | 66.8 | 1.8 | 66.1 | 1.1 |
| Q | 1 | 62.3 | 62.4 | 0.1 | 62.4 | 0.1 | 63.7 | 1.4 | 64.2 | 1.9 | 64.3 | 2.0 |
| | Top floor | 61.0 | 62.4 | 1.4 | 62.3 | 1.3 | 66.3 | **5.3** | 65.9 | **4.9** | 64.5 | 3.5 |
| R | 1 | 63.5 | 63.5 | 0.0 | 63.6 | 0.1 | 64.3 | 0.8 | 65.8 | 2.3 | 65.2 | 1.7 |
| | 35 | 61.5 | 62.2 | 0.7 | 62.3 | 0.8 | 65.7 | **4.2** | 65.4 | **3.9** | 64.3 | 2.8 |
| S | 1 | 72.6 | 72.7 | 0.1 | 72.8 | 0.2 | 72.8 | 0.2 | 73.1 | 0.5 | 72.8 | 0.2 |
| | Top floor | 67.7 | 68.1 | 0.4 | 68.1 | 0.4 | 70.0 | 2.3 | 70.0 | 2.3 | 68.7 | 1.0 |
| T | 1 | 73.1 | 73.1 | 0.0 | 73.2 | 0.1 | 73.2 | 0.1 | 73.4 | 0.3 | 73.3 | 0.2 |
| | Top floor | 71.1 | 71.2 | 0.1 | 71.3 | 0.2 | 71.3 | 0.2 | 71.5 | 0.4 | 71.3 | 0.2 |
| U | 1 | 65.6 | 65.7 | 0.1 | 65.7 | 0.1 | 65.9 | 0.3 | 66.0 | 0.4 | 66.1 | 0.5 |
| | Top floor | 61.4 | 62.4 | 1.0 | 62.1 | 0.7 | 65.7 | **4.3** | 67.3 | **5.9** | 64.6 | 3.2 |
| V | 1 | 68.6 | 68.7 | 0.1 | 68.8 | 0.2 | 68.9 | 0.3 | 68.9 | 0.3 | 69.0 | 0.4 |
| | Top floor | 63.9 | 65.4 | 1.5 | 65.3 | 1.4 | 69.6 | **5.7** | 70.2 | **6.3** | 70.3 | **6.4** |

**Table 20-15 (cont'd)**
**Construction Noise Analysis Results for the Podium Approach Values in dBA**

| Noise Receptor | Receptor Height (in stories) | Existing dBA | 2015 | | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change |
| A1 | 1 | 69.9 | 70.7 | 0.8 | 70.8 | 0.9 | 70.9 | 1.0 | 71.0 | 1.1 |
| | Top floor | 65.3 | 66.7 | 1.4 | 66.9 | 1.6 | 66.9 | 1.6 | 66.4 | 1.1 |
| A2 | 1 | 59.9 | 61.1 | 1.2 | 61.2 | 1.4 | 61.3 | 1.4 | 61.3 | 1.5 |
| | Top floor | 61.7 | 62.9 | 1.3 | 63.3 | 1.6 | 63.1 | 1.4 | 63.1 | 1.5 |
| B1 | 1 | 68.0 | 69.2 | 1.2 | 69.3 | 1.3 | 69.4 | 1.4 | 69.5 | 1.5 |
| | Top floor | 68.1 | 69.4 | 1.3 | 69.5 | 1.4 | 69.5 | 1.4 | 69.6 | 1.5 |
| B2 | 1 | 69.2 | 70.2 | 1.0 | 70.2 | 1.0 | 70.3 | 1.1 | 70.4 | 1.2 |
| | Top floor | 69.0 | 70.1 | 1.1 | 70.0 | 1.0 | 70.1 | 1.1 | 70.1 | 1.1 |
| C | 1 | 69.1 | 69.4 | 0.3 | 69.4 | 0.3 | 69.4 | 0.3 | 69.4 | 0.3 |
| | Top floor | 61.9 | 67.6 | **5.7** | 67.2 | **5.3** | 65.2 | **3.3** | 62.6 | 0.7 |
| D | 1 | 69.6 | 70.2 | 0.6 | 70.2 | 0.6 | 70.3 | 0.7 | 70.3 | 0.7 |
| | 35 | 62.6 | 66.7 | **4.1** | 65.5 | 2.9 | 64.5 | 1.9 | 63.6 | 1.0 |
| E | 1 | 71.8 | 72.7 | 0.9 | 72.7 | 0.9 | 72.7 | 0.9 | 72.7 | 0.9 |
| | Top floor | 65.5 | 67.9 | 2.4 | 68.3 | 2.8 | 67.7 | 2.2 | 66.8 | 1.3 |
| F | 1 | 72.1 | 72.4 | 0.3 | 72.5 | 0.4 | 72.5 | 0.4 | 72.6 | 0.5 |
| | 10 | 56.9 | 61.3 | 4.4 | 61.5 | 4.6 | 58.0 | 1.1 | 57.4 | 0.5 |
| G | 1 | 59.9 | 60.0 | 0.2 | 60.3 | 0.4 | 60.0 | 0.1 | 59.9 | 0.0 |
| | Top floor | 60.7 | 61.4 | 0.8 | 62.1 | 1.4 | 61.2 | 0.5 | 60.8 | 0.1 |
| H1 | 1 | 59.9 | 60.3 | 0.4 | 60.3 | 0.4 | 60.0 | 0.1 | 59.9 | 0.0 |
| | Top floor | 61.1 | 62.7 | 1.6 | 62.7 | 1.7 | 61.8 | 0.7 | 61.1 | 0.1 |
| H2 | 1 | 62.6 | 63.8 | 1.2 | 64.0 | 1.4 | 64.1 | 1.5 | 64.2 | 1.6 |
| | Top floor | 63.6 | 64.8 | 1.2 | 65.0 | 1.4 | 65.1 | 1.5 | 65.2 | 1.6 |
| I | At-grade | 66.8 | 69.8 | **3.0** | 68.7 | 1.9 | 68.3 | 1.5 | 67.7 | 0.9 |
| J | At-grade | 66.8 | 68.1 | 1.3 | 67.9 | 1.1 | 67.7 | 0.9 | 67.4 | 0.6 |
| K | At-grade | 63.0 | 63.1 | 0.1 | 63.1 | 0.1 | 63.1 | 0.1 | 63.1 | 0.1 |
| L1 | 1 | 67.0 | 67.8 | 0.8 | 67.8 | 0.8 | 67.9 | 0.9 | 68.0 | 1.0 |
| | Top floor | 66.6 | 67.6 | 1.0 | 67.4 | 0.8 | 67.5 | 0.9 | 67.6 | 1.0 |
| L2 | 1 | 66.2 | 67.5 | 1.3 | 67.8 | 1.6 | 67.5 | 1.3 | 67.3 | 1.1 |
| | Top floor | 63.0 | 64.3 | 1.3 | 64.1 | 1.1 | 64.1 | 1.1 | 64.1 | 1.1 |
| M | 1 | 62.2 | 63.0 | 0.8 | 63.3 | 1.1 | 62.7 | 0.5 | 62.4 | 0.2 |
| | Top floor | 62.5 | 63.8 | 1.3 | 64.0 | 1.5 | 63.4 | 0.9 | 62.8 | 0.3 |
| N1 | 1 | 63.8 | 64.5 | 0.7 | 64.9 | 1.1 | 64.5 | 0.7 | 64.3 | 0.5 |
| | 20 | 58.6 | 63.5 | 4.9 | 62.5 | 3.9 | 61.2 | 2.6 | 59.2 | 0.6 |
| N2 | 1 | 69.2 | 70.6 | 1.4 | 70.9 | 1.7 | 70.6 | 1.4 | 70.5 | 1.3 |
| | 5 | 62.6 | 65.5 | 2.9 | 66.3 | **3.7** | 65.4 | 2.8 | 64.2 | 1.6 |
| O | 1 | 65.7 | 66.9 | 1.2 | 66.7 | 1.0 | 66.7 | 1.0 | 66.7 | 1.0 |
| | 20 | 62.9 | 64.5 | 1.6 | 64.1 | 1.2 | 63.9 | 1.0 | 64.0 | 1.1 |
| P | 1 | 65.9 | 67.0 | 1.1 | 66.9 | 1.0 | 67.0 | 1.1 | 67.1 | 1.2 |
| | Top floor | 65.0 | 66.1 | 1.1 | 66.0 | 1.0 | 66.1 | 1.1 | 66.2 | 1.2 |
| Q | 1 | 62.3 | 63.7 | 1.4 | 63.2 | 0.9 | 62.9 | 0.6 | 62.6 | 0.3 |
| | Top floor | 61.0 | 63.3 | 2.3 | 63.9 | 2.9 | 62.5 | 1.5 | 61.6 | 0.6 |
| R | 1 | 63.5 | 64.4 | 0.9 | 65.4 | 1.9 | 64.9 | 1.4 | 63.8 | 0.3 |
| | 35 | 61.5 | 63.4 | 1.9 | 63.8 | 2.3 | 62.7 | 1.2 | 62.0 | 0.5 |
| S | 1 | 72.6 | 72.8 | 0.2 | 72.8 | 0.2 | 72.8 | 0.2 | 72.8 | 0.2 |
| | Top floor | 67.7 | 68.4 | 0.7 | 68.5 | 0.8 | 68.0 | 0.3 | 67.9 | 0.2 |
| T | 1 | 73.1 | 73.2 | 0.1 | 73.2 | 0.1 | 73.3 | 0.2 | 73.3 | 0.2 |
| | Top floor | 71.1 | 71.3 | 0.2 | 71.3 | 0.2 | 71.3 | 0.2 | 71.3 | 0.2 |
| U | 1 | 65.6 | 66.1 | 0.5 | 66.2 | 0.6 | 66.2 | 0.6 | 66.1 | 0.5 |
| | Top floor | 61.4 | 65.4 | **4.0** | 64.5 | 3.1 | 62.7 | 1.3 | 62.0 | 0.6 |
| V | 1 | 68.6 | 69.1 | 0.5 | 69.2 | 0.6 | 69.2 | 0.6 | 69.2 | 0.6 |
| | Top floor | 63.9 | 69.7 | **5.8** | 70.5 | **6.6** | 67.0 | **3.1** | 64.8 | 0.9 |

**Note:** Locations where predicted noise levels exceed the CEQR impact criteria are shown in bold.

Representative elevated receptor information is provided in Table 20-15 for each of the receptor location buildings. However, construction effects have been analyzed for a large number of elevated receptor locations on each building, and the values shown are only representative values of noise levels at-grade floor and the highest noise levels at each building. (Additional details of the construction analysis are presented in Appendix G-2d.)

In **Table 20-15**, locations where construction activities result in noise levels which would exceed the CEQR impact criteria (i.e., increase by more than 3-5 dBA comparing the total noise level with existing noise level) are shown in bold. The noise analysis results show that predicted noise levels would exceed the 3-5 dBA CEQR impact criteria during two or more consecutive years at receptor sites A1, A2, B2, C, D, E, F, H1, N1, N2, O, Q, R, U, and V. At all of these locations, the exceedance of the 3-5 dBA CEQR impact criteria would be due principally to noise generated by on-site construction activities.

Where exceedances of the 3-5 dBA CEQR impact criteria are predicted to occur at elevated locations on the buildings cited above, exceedances would also be expected to occur at other locations on the buildings that have a direct line-of-sight to one or more construction sites.

For impact determination purposes, the significance of adverse noise impacts is determined based on whether predicted incremental noise levels at sensitive receptor locations would be greater than the impact criteria suggested in the *CEQR Technical Manual* for two consecutive years or more. While increases exceeding the CEQR impact criteria for one year or less may be noisy and intrusive, they are not considered to be significant adverse noise impacts.

For the podium approach, construction activities would be expected to result in significant adverse noise impacts at the following locations[1]:

- Receptor A1 (Residential & Retail, the south and east façades of 33 West End Avenue), at the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor A1 was 4.9 dBA and would be expected to occur at the top floor in 2012;
- Receptor A2 (Residential & Retail, the west façade of 33 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the 10th floor to the top floor during the years 2010 through 2012. The maximum predicted increase in noise levels at Receptor A2 was 8.3 dBA and would be expected to occur at the top floor in 2012;
- Receptor B2 (Amsterdam Houses, the west and south façades of 249 West 61st Street), at locations that have a direct line-of-sight to construction sites, from the fifth floor to the sixth floor (the top floor) on the west façade during the years 2012 through 2013, at the top floor on the south façade during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor B2 was 4.3 dBA and would be expected to occur at the top floor in 2012 (Additional details of the construction analysis are presented in Appendix G-2f);
- Receptor C (Heschel School & Residential, the west façade of 20 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the fifth floor to the top floor during the years 2012 to 2013, from the 10th floor to the top floor during the year 2014, from the 20th floor to the top floor during the year 2015, from the 25fth floor to the top floor during the year 2016 and at the top floor during the year 2017. The maximum predicted increase in

[1] The DSEIS indicated a potential significant impact at Receptors H2, L2, and M. However, a refined analysis that examined additional analysis periods indicated that the 3-5 dBA increase in noise levels predicted to occur due to construction activities at these receptor locations would not occur continuously over a 2 year time period, and there would not be any significant noise impacts at these receptor locations. The refined analysis results for these additional time periods are contained in the tables provided in Appendix G-2d.

noise levels at Receptor C was 10.5 dBA and would be expected to occur at the top floor in 2012;

- Receptor D (Residential & Commercial, the west façade of 10 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the fifth floor to the top floor during the years 2012 through 2013, from the 10th floor to the top floor during the year 2014, and from the 20th floor to the top floor during the year 2015. The maximum predicted increase in noise levels at Receptor D was 9.7 dBA and would be expected to occur at the 35th floor in 2013;
- Receptor E (John Jay College, the west and north façades of 521 West 58th Street), from the fifth floor to the top floor during the years 2012 through 2014. The maximum predicted increase in noise levels at Receptor E was 10.2 dBA and would be expected to occur at the top floor in 2013.
- Receptor F (Residential & Commercial, the north façade of 847 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the 10th floor to the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor F was 7.1 dBA and would be expected to occur at the 10th floor in 2013.
- Receptor H1 (Residential & Retail, the west and south façades of 75 West 63rd Street), at locations that have a direct line-of-sight to construction sites, from the 15th floor to the top floor during the years 2012 to 2013, and at the top floor during the year 2014. The maximum predicted increase in noise levels at Receptor H1 was 5.6 dBA and would be expected to occur at the top floor in 2012.
- Receptor N1 (Residential, the west and north façades of 555 West 59th Street), at the fifth floor during the years 2012 to 2013, and from the 20th floor to the top floor during the years 2012 through 2014. The maximum predicted increase in noise levels at Receptor N1 was 8.7 dBA and would be expected to occur at the 20th floor in 2012.
- Receptor N2 (Residential, the west and south façades of 555 West 59th Street), at the fifth floor during the year 2012, and from the third floor to the fifth floor during the years 2013 through 2014. The maximum predicted increase in noise levels at Receptor N2 was 7.2 dBA and would be expected to occur at the fifth floor in 2013.
- Receptor O (Residential, the west and north façades of 234 West 61st Street), from the 10th floor to the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor O was 4.9 dBA and would be expected to occur at the 20th floor in 2013.
- Receptor Q (Residential & Lander College, the west and south façades of 225 West 60th Street), from the 15th floor to the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor Q was 5.3 dBA and would be expected to occur at the top floor in 2012.
- Receptor R (Residential, the west and north façades of 517 West 59th Street), from the 25th floor to the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor R was 4.2 dBA and would be expected to occur at the 35th floor in 2012.
- Receptor U (Commercial, the north façade of 614 West 58th Street), at locations that have a direct line-of-sight to construction sites, at the top floor during the years 2012 through 2013. The maximum predicted increase in noise levels at Receptor U was 5.9 dBA and would be expected to occur at the top floor in 2013.

- Receptor V (the north façade of 631 West 57th Street), from 15th floor to the top floor during the years 2012 through 2016, and at the top floor during the year 2017. The maximum predicted increase in noise levels at Receptor V was 6.6 dBA and would be expected to occur at the top floor in 2016.

Construction activities at the other receptor sites in the study area would at times produce noise levels which would be noisy and intrusive, but due to their limited duration, they would not produce significant noise impacts.

During the construction period, the buildings to the north of the project site between Freedom Place and Riverside Boulevard (buildings K1 and K2 from the Riverside South development) would experience noise levels that would be noisy and intrusive, but would not result in a significant impact due to the limited duration of the high noise levels at this location. Furthermore, as specified in the 1992 Riverside South FEIS, these buildings would be required to provide at least 30 dBA of window/wall attenuation, which would result in acceptable interior noise levels at the buildings with the exception of some limited time periods in which particularly loud construction activities would occur. See Appendix G-2b for contour maps showing construction noise levels at these buildings.

*Individual Basement Approach Analysis Results*

**Table 20-16** shows the following for the individual basements approach (see Appendix G-2e for the complete list of results for details):

- Existing noise levels;
- Maximum predicted total noise levels (i.e., cumulative noise levels), which are the sum of noise due to construction activities[1] and noise due to traffic on the adjacent street; and
- Maximum predicted increases in noise levels based upon comparing the total noise levels with existing noise levels.

Representative elevated receptor information is provided in **Table 20-16** for each of the receptor location buildings. However, construction effects have been analyzed for a large number of elevated receptor locations on each building, and the values shown are only representative values of noise levels at-grade floor and the highest noise levels at each building. (Additional details of the construction analysis are presented in Appendix G-2e.)

In **Table 20-16**, locations where construction activities result in noise levels which would exceed the CEQR impact criteria (i.e., increase by more than 3-5 dBA comparing the total noise level with existing noise level) are shown in bold. The noise analysis results show that predicted noise levels would exceed the 3-5 dBA CEQR impact criteria during two or more consecutive years at receptor sites A2, C, D, E, N1, N2, U, and V. At all of these locations, the exceedance of the 3-5 dBA CEQR impact criteria would be due principally to noise generated by on-site construction activities.

[1] The maximum predicted noise level due to construction activities alone includes the noise generated by on-site construction activities, assuming maximum construction activity 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.

## Table 20-16
## Construction Noise Analysis Results for the Individual Basements Approach
## Values in dBA

| Noise Receptor | Receptor Height (in stories) | Existing dBA | 2010 Total Leq(1) | 2010 Change | 2011 Total Leq(1) | 2011 Change | 2012 Total Leq(1) | 2012 Change | 2013 Total Leq(1) | 2013 Change | 2014 Total Leq(1) | 2014 Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 1 | 69.9 | 70.1 | 0.2 | 70.3 | 0.4 | 70.4 | 0.5 | 70.9 | 1.0 | 70.7 | 0.8 |
| | Top floor | 65.3 | 65.6 | 0.3 | 67.1 | 1.8 | 67.2 | 1.9 | 69.0 | **3.7** | 66.8 | 1.5 |
| A2 | 1 | 59.9 | 60.1 | 0.3 | 60.5 | 0.6 | 61.3 | 1.4 | 61.2 | 1.4 | 61.3 | 1.4 |
| | Top floor | 61.7 | 65.4 | **3.7** | 65.6 | **4.0** | 69.2 | **7.5** | 64.2 | 2.5 | 64.3 | 2.7 |
| B1 | 1 | 68.0 | 68.4 | 0.4 | 68.9 | 0.9 | 69.0 | 1.0 | 69.6 | 1.6 | 69.0 | 1.0 |
| | Top floor | 68.1 | 68.4 | 0.3 | 69.5 | 1.4 | 69.6 | 1.5 | 70.5 | 2.4 | 69.3 | 1.2 |
| B2 | 1 | 69.2 | 69.6 | 0.4 | 70.1 | 0.9 | 70.5 | 1.3 | 70.8 | 1.6 | 70.3 | 1.1 |
| | Top floor | 69.0 | 69.4 | 0.4 | 71.3 | 2.3 | 71.4 | 2.4 | 73.0 | **4.0** | 70.4 | 1.4 |
| C | 1 | 69.1 | 69.6 | 0.5 | 70.0 | 0.9 | 70.2 | 1.1 | 70.2 | 1.1 | 69.5 | 0.4 |
| | Top floor | 61.9 | 64.2 | 2.3 | 69.1 | **7.2** | 69.6 | **7.7** | 70.4 | **8.5** | 67.5 | **5.6** |
| D | 1 | 69.6 | 70.0 | 0.4 | 70.3 | 0.7 | 70.5 | 0.9 | 71.7 | 2.1 | 70.4 | 0.8 |
| | Top floor | 62.1 | 64.2 | 2.1 | 67.7 | **5.6** | 68.2 | **6.1** | 71.4 | **9.3** | 70.2 | **8.1** |
| E | 1 | 71.8 | 72.0 | 0.2 | 72.5 | 0.7 | 72.6 | 0.8 | 73.3 | 1.5 | 72.9 | 1.1 |
| | Top floor | 65.5 | 66.5 | 1.0 | 69.0 | **3.5** | 69.0 | **3.5** | 75.1 | **9.6** | 73.8 | **8.3** |
| F | 1 | 72.1 | 72.2 | 0.1 | 72.3 | 0.2 | 72.4 | 0.3 | 72.5 | 0.4 | 72.4 | 0.3 |
| | 10 | 56.9 | 58.4 | 1.5 | 59.6 | 2.7 | 60.2 | 3.3 | 62.0 | **5.1** | 60.9 | 4.0 |
| G | 1 | 59.9 | 59.9 | 0.1 | 60.0 | 0.2 | 60.6 | 0.7 | 60.3 | 0.5 | 60.1 | 0.3 |
| | Top floor | 60.7 | 60.8 | 0.2 | 61.2 | 0.5 | 63.1 | 2.5 | 62.1 | 1.5 | 62.4 | 1.7 |
| H1 | 1 | 59.9 | 59.9 | 0.1 | 60.2 | 0.3 | 61.9 | 2.0 | 61.8 | 1.9 | 61.2 | 1.3 |
| | Top floor | 61.1 | 61.5 | 0.4 | 62.4 | 1.3 | 65.4 | **4.3** | 64.5 | 3.4 | 65.0 | 3.9 |
| H2 | 1 | 62.6 | 63.7 | 1.1 | 63.9 | 1.3 | 64.7 | 2.1 | 64.0 | 1.4 | 63.8 | 1.2 |
| | Top floor | 63.6 | 66.2 | 2.6 | 66.4 | 2.8 | 69.4 | **5.8** | 65.3 | 1.7 | 65.5 | 1.9 |
| I | 1 | 66.8 | 67.0 | 0.2 | 67.4 | 0.6 | 67.7 | 0.9 | 68.1 | 1.3 | 68.8 | 2.0 |
| J | 1 | 66.8 | 67.3 | 0.5 | 67.4 | 0.6 | 67.8 | 1.0 | 67.6 | 0.8 | 67.9 | 1.1 |
| K | 1 | 63.0 | 63.1 | 0.1 | 63.2 | 0.2 | 63.2 | 0.2 | 63.2 | 0.2 | 63.1 | 0.1 |
| L1 | 1 | 67.0 | 67.5 | 0.5 | 67.8 | 0.8 | 68.6 | 1.6 | 68.2 | 1.2 | 67.9 | 0.9 |
| | Top floor | 66.6 | 67.1 | 0.5 | 67.4 | 0.8 | 68.2 | 1.6 | 68.0 | 1.4 | 67.7 | 1.1 |
| L2 | 1 | 66.2 | 66.5 | 0.3 | 66.7 | 0.5 | 67.2 | 1.0 | 67.5 | 1.3 | 67.2 | 1.0 |
| | Top floor | 63.0 | 63.5 | 0.5 | 64.2 | 1.2 | 64.5 | 1.5 | 65.8 | 2.8 | 64.6 | 1.6 |
| M | 1 | 62.2 | 62.2 | 0.0 | 62.5 | 0.3 | 62.6 | 0.4 | 63.9 | 1.7 | 63.3 | 1.1 |
| | Top floor | 62.5 | 62.8 | 0.3 | 63.9 | 1.4 | 64.3 | 1.8 | 65.7 | **3.2** | 64.3 | 1.8 |
| N1 | 1 | 63.8 | 63.9 | 0.1 | 64.3 | 0.5 | 64.6 | 0.8 | 65.3 | 1.5 | 64.7 | 0.9 |
| | 20 | 58.6 | 61.1 | 2.5 | 65.5 | **6.9** | 65.8 | **7.2** | 66.0 | **7.4** | 64.8 | **6.2** |
| N2 | 1 | 69.2 | 69.3 | 0.1 | 69.9 | 0.7 | 70.0 | 0.8 | 71.2 | 2.0 | 70.8 | 1.6 |
| | 5 | 62.6 | 62.9 | 0.3 | 64.1 | 1.5 | 64.2 | 1.6 | 69.3 | **6.7** | 68.6 | **6.0** |
| O | 1 | 65.7 | 65.9 | 0.2 | 66.3 | 0.6 | 66.4 | 0.7 | 67.5 | 1.8 | 67.0 | 1.3 |
| | 20 | 62.9 | 63.5 | 0.6 | 65.0 | 2.1 | 65.5 | 2.6 | 67.7 | **4.8** | 64.8 | 1.9 |
| P | 1 | 65.9 | 66.1 | 0.2 | 66.5 | 0.6 | 67.1 | 1.2 | 67.6 | 1.7 | 67.0 | 1.1 |
| | Top floor | 65.0 | 65.3 | 0.3 | 65.7 | 0.7 | 65.9 | 0.9 | 66.8 | 1.8 | 66.1 | 1.1 |
| Q | 1 | 62.3 | 62.4 | 0.1 | 62.8 | 0.5 | 62.9 | 0.6 | 64.1 | 1.8 | 64.3 | 2.0 |
| | Top floor | 61.0 | 62.4 | 1.4 | 64.6 | 3.6 | 64.9 | 3.9 | 65.7 | **4.7** | 64.3 | 3.3 |
| R | 1 | 63.5 | 63.5 | 0.0 | 63.8 | 0.3 | 63.8 | 0.3 | 65.6 | 2.1 | 65.2 | 1.7 |
| | 30 | 61.5 | 62.2 | 0.7 | 64.1 | 2.6 | 64.3 | 2.8 | 65.4 | **3.9** | 64.3 | 2.8 |
| S | 1 | 72.6 | 72.7 | 0.1 | 72.8 | 0.2 | 72.8 | 0.2 | 73.1 | 0.5 | 72.8 | 0.2 |
| | Top floor | 67.7 | 68.1 | 0.4 | 68.9 | 1.2 | 68.9 | 1.2 | 69.5 | 1.8 | 68.7 | 1.0 |
| T | 1 | 73.1 | 73.1 | 0.0 | 73.2 | 0.1 | 73.2 | 0.1 | 73.4 | 0.3 | 73.3 | 0.2 |
| | Top floor | 71.1 | 71.2 | 0.1 | 71.3 | 0.2 | 71.4 | 0.3 | 71.5 | 0.4 | 71.3 | 0.2 |
| U | 1 | 65.6 | 65.7 | 0.1 | 65.7 | 0.1 | 65.8 | 0.2 | 66.0 | 0.4 | 66.1 | 0.5 |
| | Top floor | 61.4 | 62.4 | 1.0 | 63.1 | 1.7 | 63.6 | 2.2 | 65.7 | **4.3** | 65.3 | **3.9** |
| V | 1 | 68.6 | 68.7 | 0.1 | 68.8 | 0.2 | 68.8 | 0.2 | 68.9 | 0.3 | 69.0 | 0.4 |
| | Top floor | 63.9 | 65.4 | 1.5 | 66.9 | **3.0** | 67.0 | **3.1** | 69.1 | **5.2** | 70.3 | **6.4** |

**Table 20-16(cont'd)**
**Construction Noise Analysis Results for the Individual Basements Approach**
**Values in dBA**

| Noise Receptor | Receptor Height (in stories) | Existing dBA | 2015 | | 2016 | | 2017 | | 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change | Total Leq(1) | Change |
| A1 | 1 | 69.9 | 70.7 | 0.8 | 70.8 | 0.9 | 70.9 | 1.0 | 71.0 | 1.1 |
| | Top floor | 65.3 | 67.0 | 1.7 | 66.9 | 1.6 | 66.9 | 1.6 | 66.4 | 1.1 |
| A2 | 1 | 59.9 | 61.3 | 1.5 | 61.2 | 1.4 | 61.3 | 1.4 | 61.3 | 1.5 |
| | Top floor | 61.7 | 64.0 | 2.4 | 63.3 | 1.6 | 63.1 | 1.4 | 63.1 | 1.5 |
| B1 | 1 | 68.0 | 69.2 | 1.2 | 69.3 | 1.3 | 69.4 | 1.4 | 69.5 | 1.5 |
| | Top floor | 68.1 | 69.4 | 1.3 | 69.5 | 1.4 | 69.5 | 1.4 | 69.6 | 1.5 |
| B2 | 1 | 69.2 | 70.3 | 1.1 | 70.2 | 1.0 | 70.3 | 1.1 | 70.4 | 1.2 |
| | Top floor | 69.0 | 70.2 | 1.2 | 70.0 | 1.0 | 70.1 | 1.1 | 70.1 | 1.1 |
| C | 1 | 69.1 | 69.4 | 0.3 | 69.4 | 0.3 | 69.4 | 0.3 | 69.4 | 0.3 |
| | Top floor | 61.9 | 67.8 | **5.9** | 67.2 | **5.3** | 65.2 | **3.3** | 62.6 | 0.7 |
| D | 1 | 69.6 | 70.3 | 0.7 | 70.2 | 0.6 | 70.3 | 0.7 | 70.3 | 0.7 |
| | Top floor | 62.1 | 67.1 | **5.0** | 65.1 | 3.0 | 64.1 | 2.0 | 63.2 | 1.1 |
| E | 1 | 71.8 | 72.6 | 0.8 | 72.7 | 0.9 | 72.7 | 0.9 | 72.7 | 0.9 |
| | Top floor | 65.5 | 67.9 | 2.4 | 68.3 | 2.8 | 67.7 | 2.2 | 66.8 | 1.3 |
| F | 1 | 72.1 | 72.4 | 0.3 | 72.5 | 0.4 | 72.5 | 0.4 | 72.6 | 0.5 |
| | 10 | 56.9 | 61.6 | 4.7 | 61.5 | 4.6 | 58.0 | 1.1 | 57.4 | 0.5 |
| G | 1 | 59.9 | 60.1 | 0.3 | 60.3 | 0.4 | 60.0 | 0.1 | 59.9 | 0.0 |
| | Top floor | 60.7 | 62.8 | 2.2 | 62.1 | 1.4 | 61.2 | 0.5 | 60.8 | 0.1 |
| H1 | 1 | 59.9 | 60.8 | 0.9 | 60.3 | 0.4 | 60.0 | 0.1 | 59.9 | 0.0 |
| | Top floor | 61.1 | 63.8 | 2.8 | 62.7 | 1.7 | 61.8 | 0.7 | 61.1 | 0.1 |
| H2 | 1 | 62.6 | 64.0 | 1.4 | 64.0 | 1.4 | 64.1 | 1.5 | 64.2 | 1.6 |
| | Top floor | 63.6 | 65.4 | 1.8 | 65.0 | 1.4 | 65.1 | 1.5 | 65.2 | 1.6 |
| I | 1 | 66.8 | 70.0 | **3.2** | 68.7 | 1.9 | 68.3 | 1.5 | 67.7 | 0.9 |
| J | 1 | 66.8 | 68.2 | 1.4 | 67.9 | 1.1 | 67.7 | 0.9 | 67.4 | 0.6 |
| K | 1 | 63.0 | 63.2 | 0.2 | 63.1 | 0.1 | 63.1 | 0.1 | 63.1 | 0.1 |
| L1 | 1 | 67.0 | 67.8 | 0.8 | 67.8 | 0.8 | 67.9 | 0.9 | 68.0 | 1.0 |
| | Top floor | 66.6 | 67.6 | 1.0 | 67.4 | 0.8 | 67.5 | 0.9 | 67.6 | 1.0 |
| L2 | 1 | 66.2 | 67.5 | 1.3 | 67.8 | 1.6 | 67.5 | 1.3 | 67.3 | 1.1 |
| | Top floor | 63.0 | 64.5 | 1.5 | 64.1 | 1.1 | 64.1 | 1.1 | 64.1 | 1.1 |
| M | 1 | 62.2 | 63.3 | 1.1 | 63.3 | 1.1 | 62.7 | 0.5 | 62.4 | 0.2 |
| | Top floor | 62.5 | 64.1 | 1.6 | 64.0 | 1.5 | 63.4 | 0.9 | 62.8 | 0.3 |
| N1 | 1 | 63.8 | 64.7 | 0.9 | 64.9 | 1.1 | 64.5 | 0.7 | 64.3 | 0.5 |
| | 20 | 58.6 | 63.9 | **5.3** | 62.5 | 3.9 | 61.2 | 2.6 | 59.2 | 0.6 |
| N2 | 1 | 69.2 | 70.6 | 1.4 | 70.9 | 1.7 | 70.6 | 1.4 | 70.5 | 1.3 |
| | 5 | 62.6 | 65.6 | 3.0 | 66.3 | **3.7** | 65.4 | 2.8 | 64.2 | 1.6 |
| O | 1 | 65.7 | 67.1 | 1.4 | 66.7 | 1.0 | 66.7 | 1.0 | 66.7 | 1.0 |
| | 20 | 62.9 | 64.6 | 1.7 | 64.1 | 1.2 | 63.9 | 1.0 | 64.0 | 1.1 |
| P | 1 | 65.9 | 67.1 | 1.2 | 66.9 | 1.0 | 67.0 | 1.1 | 67.1 | 1.2 |
| | Top floor | 65.0 | 66.2 | 1.2 | 66.0 | 1.0 | 66.1 | 1.1 | 66.2 | 1.2 |
| Q | 1 | 62.3 | 64.2 | 1.9 | 63.2 | 0.9 | 62.9 | 0.6 | 62.6 | 0.3 |
| | Top floor | 61.0 | 63.9 | 2.9 | 63.9 | 2.9 | 62.5 | 1.5 | 61.6 | 0.6 |
| R | 1 | 63.5 | 64.6 | 1.1 | 65.4 | 1.9 | 64.9 | 1.4 | 63.8 | 0.3 |
| | 30 | 61.5 | 63.9 | 2.4 | 63.8 | 2.3 | 62.7 | 1.2 | 62.0 | 0.5 |
| S | 1 | 72.6 | 72.8 | 0.2 | 72.8 | 0.2 | 72.8 | 0.2 | 72.8 | 0.2 |
| | Top floor | 67.7 | 68.5 | 0.8 | 68.5 | 0.8 | 68.0 | 0.3 | 67.9 | 0.2 |
| T | 1 | 73.1 | 73.2 | 0.1 | 73.2 | 0.1 | 73.3 | 0.2 | 73.3 | 0.2 |
| | Top floor | 71.1 | 71.3 | 0.2 | 71.3 | 0.2 | 71.3 | 0.2 | 71.3 | 0.2 |
| U | 1 | 65.6 | 66.1 | 0.5 | 66.2 | 0.6 | 66.2 | 0.6 | 66.1 | 0.5 |
| | Top floor | 61.4 | 65.7 | **4.3** | 64.5 | 3.1 | 62.7 | 1.3 | 62.0 | 0.6 |
| V | 1 | 68.6 | 69.1 | 0.5 | 69.2 | 0.6 | 69.2 | 0.6 | 69.2 | 0.6 |
| | Top floor | 63.9 | 70.4 | **6.5** | 70.5 | **6.6** | 67.0 | **3.1** | 64.8 | 0.9 |

**Note:** Locations where predicted noise levels exceed the CEQR impact criteria are shown in bold.

Where exceedances of the 3-5 dBA CEQR impact criteria are predicted to occur at elevated locations on the buildings cited above, exceedances would also be expected to occur at other locations on the buildings that have a direct line-of-sight to one or more construction sites.

For impact determination purposes, the significance of adverse noise impacts is determined based on whether predicted incremental noise levels at sensitive receptor locations would be greater than the impact criteria suggested in the *CEQR Technical Manual* for two consecutive years or more. While increases exceeding the CEQR impact criteria for one year or less may be noisy and intrusive, they are not considered to be significant adverse noise impacts.

For the individual basements approach, construction activities would be expected to result in significant noise impacts at the following locations[1]:

- Receptor A2 (Residential & Retail, the west façade of 33 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the fifth floor to the top floor during the years 2010 to 2012. The maximum predicted increase in noise levels at Receptor A2 was 7.5 dBA and would be expected to occur at the top floor in 2012;
- Receptor C (Heschel School & Residential, the west façade of 20 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the fifth floor to the top floor during the years 2011 through 2013, from the 10fth floor to the top floor during the year 2014, from the 20fth floor to the top floor during the year 2015, from the 25fth floor to the top floor during the year 2016, and at the top floor during the year 2017. The maximum predicted increase in noise levels at Receptor C was 8.5 dBA and would be expected to occur at the top floor in 2013;
- Receptor D (Residential & Commercial, the west façade of 10 West End Avenue), at locations that have a direct line-of-sight to construction sites, from the 10th floor to the top floor during the years 2011 to 2014, and from the 20th floor to the top floor during the year 2015. The maximum predicted increase in noise levels at Receptor D was 9.3 dBA and would be expected to occur at the top floor in 2013;
- Receptor E (John Jay College, the west and north façades of 521 West 58th Street), at locations that have a direct line-of-sight to construction sites, at the top floor during the years 2011 to 2012, and from the fifth floor to the top floor during the years 2013 through 2014. The maximum predicted increase in noise levels at Receptor E was 9.6 dBA and would be expected to occur at the top floor in 2013.
- Receptor N1 (Residential, the west and north façades of 555 West 59th Street), from the 15th floor to the top floor during the years 2011 through 2012, from the 20th floor to the top floor during the years 2013 through 2014, and from the 20th floor to the 25th floor during the year 2015. The maximum predicted increase in noise levels at Receptor N1 was 7.4 dBA and would be expected to occur at the 20th floor in 2013.
- Receptor N2 (Residential, the west and south façades of 555 West 59th Street), from the third floor to the fifth floor during the years 2013 through 2014. The maximum predicted increase in noise levels at Receptor N2 was 6.7 dBA and would be expected to occur at the fifth floor in 2013.

[1] The DSEIS indicated a potential significant impact at Receptors A1, B2, F, H1, H2, L2, M, O, Q, and R. However, a refined analysis that examined additional analysis periods indicated that the 3-5 dBA increase in noise levels predicted to occur due to construction activities at these receptor locations would not occur continuously over a 2 year time period, and there would not be any significant noise impacts at these receptor locations. The refined analysis results for these additional time periods are contained in the tables provided in Appendix G-2e.

- Receptor U (Commercial, the north façade of 614 West 58th Street), at locations that have a direct line-of-sight to construction sites, at the top floor during the years 2013 through 2015. The maximum predicted increase in noise levels at Receptor U was 4.3 dBA and would be expected to occur at the top floor in 2013.
- Receptor V (the north façade of 631 West 57th Street), at locations that have a direct line-of-sight to construction sites, at the top floor during the years 2011 through 2012, from 15th floor to the top floor during the years 2013 and 2016, from 10th floor to the top floor during the years 2014 through 2015, and at the top floor during the year 2017. The maximum predicted increase in noise levels at Receptor V was 6.6 dBA and would be expected to occur at the top floor in 2016.

Construction activities at the other receptor sites in the study area would at times produce noise levels which would be noisy and intrusive, but due to their limited duration, they would not produce significant noise impacts.

During the construction period, the buildings to the north of the project site between Freedom Place and Riverside Boulevard (buildings K1 and K2 from the Riverside South development) would experience noise levels that would be noisy and intrusive, but would not result in a significant impact due to the limited duration of the high noise levels at this location. Furthermore, as specified in the 1992 Riverside South FEIS, these buildings would be required to provide at least 30 dBA of window/wall attenuation, which would result in acceptable interior noise levels at the buildings with the exception of some limited time periods in which particularly loud construction activities would occur. See Appendix G-2b for contour maps showing construction noise levels at these buildings.

*Discussion of Analysis Results*

With the exception of Receptor B2 (the corner building of Amsterdam Houses at West End Avenue and West 61st Street), all of the buildings where significant adverse noise impacts were predicted to occur have or, (in the case of No Build buildings) would be expected to have, both double-glazed windows and some form of alternative ventilation (i.e., central air conditioning or packaged terminal air conditioner [PTAC] units). (Note: Significant impacts are predicted to occur at Receptor B2 only for the podium scenario and not for the individual building scenario.) Consequently, even during warm weather conditions, interior noise levels would be approximately 30-35 dBA less than exterior noise levels. Although these locations would be considered to be impacted significantly based on the CEQR construction noise impact criteria, the double-glazed windows and alternative ventilation at these residential structures would provide a significant amount of sound attenuation, and would result in interior noise levels during much of the time when construction activities are taking place that are below 45 dBA $L_{10(1)}$ (the CEQR acceptable interior noise level criteria).

Receptor site B2 (i.e., the corner building at Amsterdam Houses), has double-glazed windows and some tenants have installed air conditioning units on some windows. Based on the criteria described above, these locations would experience significant adverse construction-related noise impacts. Mitigation measures to address these impacts are discussed in Chapter 22, "Mitigation."

With regard to the residential terrace locations (i.e., receptors A1, A2, D, F, H1, N1, and N2), the highest $L_{10(1)}$ noise levels would range from approximately 73 to 79 dBA during some peak periods of construction activity. Without construction activities, noise levels at these terraces would exceed the CEQR acceptable range (55 dBA $L_{10(1)}$) for an outdoor area requiring serenity and quiet. During the weekday daytime time periods identified above when construction activities are predicted to significantly increase noise levels, construction activities would exacerbate these exceedances and result in significant adverse noise impacts at the terraces at these identified buildings.[1] As discussed further in Chapter 22, "Mitigation," there are no feasible mitigation measures that could be implemented to eliminate the significant noise impacts at these locations.

*VIBRATION*

*Introduction*

Construction activities have the potential to result in vibration levels that may in turn 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 and possibly historically significant structures or buildings, generally construction activities do not reach the levels that can cause architectural or structural damage, but can achieve levels that may be perceptible and annoying in buildings very close to a construction site. An assessment has been prepared to quantify potential vibration impacts of construction activities on structures and residences near the project site.

*Construction Vibration Criteria*

For purposes of assessing potential structural or architectural damage, the determination of a significant impact was based on the vibration impact criterion used by LPC of a peak particle velocity (PPV) of 0.50 inches/second. 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 vibration decibels (VdB) would have the potential to result in significant adverse impacts 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:

[1] It should be noted that all or most of the buildings where these residential terraces are located did not exist at the time that the 1992 Riverside South FEIS was prepared, and consequently the significant impacts at these locations were not identified in that document.

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

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 20-17** shows vibration source levels for typical construction equipment.

**Table 20-17**
**Vibration Source Levels for Construction Equipment**

| Equipment | $PPV_{ref}$ (in/sec) | Approximate $L_v$ (ref) (VdB) |
|---|---|---|
| Pile Driver (sonic)* | 0.170 | 93 |
| Clam Shovel drop (slurry wall) | 0.202 | 94 |
| Hydromill (slurry wall in rock) | 0.017 | 75 |
| 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 |

**Note:** * Sonic rather than impact pile drivers will be utilized.
**Source:** *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, May 2006.

*Construction Vibration Analysis Results*

The buildings and structures of most concern with regard to the potential for structural or architectural damage due to vibration are 40 Riverside Blvd, 301 West 61st Street, 33 West End Avenue, Amsterdam Houses, Heschel School, 10 West End Avenue, and the Consolidated Edison Power House, all of which are adjacent to the project construction sites. Vibration levels at all of these buildings and structures would be well below the 0.50 inches/second PPV limit. Since the Proposed Project would result in new construction within 90 feet of the Consolidated Edison Power House, the project sponsor would implement a monitoring program as part of the CPP for the Proposed Project to avoid architectural or structural damage to this structure due to vibration. At all other locations, the distance between construction equipment and receiving buildings or structures is large enough to avoid vibratory levels that would approach the levels that would have the potential to result in architectural or structural damage.

In terms of potential vibration levels that would be perceptible and annoying, the three pieces of equipment that would have the most potential for producing levels which exceed the 65 VdB limit are pile drivers, the clam shovel drop, and vibratory roller. They would produce perceptible vibration levels (i.e., vibration levels exceeding 65 VdB) at receptor locations within a distance of approximately 230 feet (see Appendix G-3). However, the operation would only occur for limited periods of time at a particular location and therefore would not result in any significant adverse impacts. Any blasting that may occur would be expected to produce vibrations less perceptible than those from the operation of the three pieces of equipment cited above. In no case are significant adverse impacts from vibrations expected to occur.

## PUBLIC HEALTH

See Chapter 21, "Public Health."

## RODENT CONTROL

Construction contracts would include provisions for a rodent (mouse and rat) control program. Before the start of construction, the contractor would survey and bait the appropriate areas and provide for proper site sanitation. During construction the contractor would carry out a maintenance program, as necessary. Signage would be posted, and 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. ✷