A. INTRODUCTION

As described in Chapter 1, "Project Description," the Proposed Actions would result in a mixed-use development over the Development Site and in residential development at two Additional Housing Sites ("Tenth Avenue Site" and "Ninth Avenue Site"). The Proposed Actions at the Development Site would include the construction of a platform over a portion of the Western Rail Yard, and development of residential, commercial, community facility, and open space uses on top of the platform and on the terra firma portion of the site. The Proposed Actions at the Additional Housing Sites would include construction of a residential tower with ground-floor commercial uses at each location. This chapter describes the anticipated construction activities in connection with the Proposed Actions, evaluates the potential impacts of those construction activities, and identifies measures to minimize impacts to the surrounding community, including those on businesses, vehicular circulation, and parking.

Other developments will also be under construction in the study area while the Proposed Actions are being constructed. Those projects include: Metropolitan Transportation Authority (MTA)/New York City Transit's (NYCT) Flushing Line (No. 7) subway extension and the associated terminal station at West 34th Street and Eleventh Avenue; development of the Eastern Rail Yard (the eastern half of the Caemmerer Rail Yard); New York City Department of Environmental Protection's (DEP) Water Tunnel No. 3 Project; New York City Department of Transportation's (NYCDOT) Eleventh Avenue Project; rebuilding of City water and sewer infrastructure; and other projects. To the extent relevant to the potential cumulative construction impacts of the Proposed Actions, the environmental impacts of those construction projects are discussed in this chapter.

DEVELOPMENT SITE

The Development Site is approximately 13 acres. The northern two-thirds of the Development Site is used, in part, to store, service and repair MTA-Long Island Rail Road (LIRR) trains, while the southern third is used predominantly for (1) bus parking and servicing by a private bus operator, and (2) Department of Sanitation New York City (DSNY) vehicle storage and a DSNY household special waste recycling drop-off location.

Construction of the Proposed Actions would include the installation of a platform over the northern two-thirds of the Development Site, and the construction of four residential towers (WR-1, WR-5, WR-6, and WR-7), one commercial tower (WC-1) and public open space on the platform, and three residential towers (WR-2, WR-3, and WR-4) and community facility space (public school) adjacent to and south of the platform ("Development Site Project.")

During construction of the platform, up to four adjacent tracks would be out of service for varying periods of time while structural supports and the platform components are installed. The track outages, and platform construction, are expected to begin with the northernmost set of tracks and progress to the south. After the platform is installed over the first set of tracks, those tracks would be returned to service, and installation of the platform supports would begin with the next set of tracks to the south. When construction of the platform is sufficiently advanced, construction of the buildings would begin over completed portions of the platform, while construction of the platform continues to the south. During construction of the platform, the rail yard would continue its current operations except in the area of the track outages. After completion of the platform, construction atop the platform would not affect operations of the rail yard below.

Residential towers WR-2, WR-3, and WR-4, a public school in the base shared by residential towers WR-2 and WR-3, and additional public open space would be constructed on the southern third of the Development Site adjacent to the platform. Because the current uses of the southern third of the Development Site would be discontinued, no platform would be required there, and construction of the buildings and open space would occur at the surface. Because construction on the southern third of the Development Site does not require a platform, the southern portion of the Development Site is referred to in this Environmental Impact Statement (EIS) as "terra firma."

The Development Site would also include approximately 5.45 acres of publicly accessible open space, and up to 1,600 accessory parking spaces. The open space would provide lawns and other vegetation, lighting, benches and other park furniture and furnishings. The parking spaces would be incorporated into some or all of the buildings, and possibly under portions of the open space. Although the exact location of the proposed parking has not been determined, the terra firma portion of the site could accommodate approximately 850 parking spaces. The remaining spaces would be incorporated into the platform structure and would require review and approval by MTA and LIRR.

ADDITIONAL HOUSING SITES

NINTH AVENUE SITE

The Ninth Avenue Site, located on the east side of Ninth Avenue between West 53rd and West 54th Streets, is approximately one-half acre in size and has frontage on Ninth Avenue and West 54th Street. The site exists as a parking lot and there are no permanent structures on the site. The residential tower proposed for this site would include a basement.

TENTH AVENUE SITE

The Tenth Avenue Site is located between West 48th and West 49th Streets in the midblock between Tenth and Eleventh Avenues. The site, approximately one-quarter acre in size, would be constructed over an Amtrak rail cut, and thus would require construction of a platform over the rail cut. The site has frontage on West 48th and West 49th Streets.

More information regarding construction methods and sequencing for the Proposed Actions, including those involving construction at the Additional Housing Sites (and those that would allow Caemmerer Rail Yard operations to continue during construction), is provided below.

PRINCIPAL CONCLUSIONS

The potential environmental effects resulting from construction of the Proposed Actions have been analyzed based on a detailed assessment of likely construction activities throughout the construction period. Key findings regarding Air Quality, Noise, Vibration and Historic Resources, and Natural Resources are summarized below. The construction impact analyses determined that the Proposed Actions would not have a significant adverse impact on Land Use, Neighborhood Character, Socioeconomic Conditions, Community Facilities, Open Spaces, Infrastructure, and Hazardous Materials.

AIR QUALITY

Potential air emissions from construction activity, both on-site from construction machinery and activity, and mobile sources from material delivery and disposal, were estimated, and the maximum project increments (on-site plus off-site) and total concentrations (maximum project increments plus background values) for each pollutant of concern were calculated. Following the DEP interim guidance, the maximum $PM_{2.5}$ project increments were compared to the CEQR Significant Threshold Values (STV) for $PM_{2.5}$ and were found to be below those values. Air emissions for CO, NO_2 and PM_{10} due to construction activity associated with the Proposed Actions would not cause the pollution concentrations to exceed the National Ambient Air Quality Standards (NAAQS) and would not have significant air quality impacts.

The emission contribution from other projects in the area of the Development Site was considered for a cumulative impact analysis. Cumulative increments, when added to background levels for nitrogen dioxide (NO_2) and $PM_{10,}$ indicated that total concentrations for the Proposed Actions would not exceed the NAAQS at any of the analysis sites considered.

Emissions from construction at the Additional Housing Sites would be of short duration and would not produce significant adverse air quality impacts.

NOISE, VIBRATION, AND HISTORIC RESOURCES

Development Site

Given the scope and duration of construction activities for the Development Site, a quantified construction noise and vibration analysis was performed. The purpose of this analysis was to determine if any significant adverse noise or vibration impacts would occur during construction.

Construction-related noise impacts can result from noise generated on the Development Site by construction equipment operation, and from construction vehicles and delivery vehicles traveling to and from the site. Results of an evaluation of potential worst-case construction noise conditions for the 102-month construction period indicate that no significant adverse noise impacts would occur at any analysis location. This is because predicted noise levels would be below acceptable CEQR impact criteria. Construction operations and noise levels are also expected to comply with the New York City Construction Noise Regulations with respect to equipment noise emission levels.

A construction vibration assessment was performed for the existing elevated High Line historic rail structure. It was determined that the use of certain high-vibration-producing equipment within one foot of the High Line should be limited in order to minimize the potential of damage to the structure. Therefore, a Construction Environmental Protection Plan (CEPP) will be established for the project, as will be stipulated in a Letter of Resolution executed among the co-leads, the New York State Office of Parks, Recreation and Historic Preservation (OPRHP), and the Developer. The CEPP would meet the guidelines set forth in the DOB's *TPPN #10/88*, concerning procedures for the avoidance of damage to adjacent historic structures from nearby construction, the *Protection Programs for Landmarked Buildings* guidance document of the

LPC, and the National Park Service's *Preservation Tech Notes, Temporary Protection #3: Protecting a Historic Structure during Adjacent Construction.* The CEPP would specify measures and construction procedures, such as vibration limits and monitoring that would be implemented during construction of the Proposed Actions. With these measures, there would not be a significant adverse impact to the High Line due to construction of the Proposed Actions.

Additional Housing Sites

Construction noise associated with the Additional Housing Sites is expected to be temporary, typical of other similar construction projects in the city. While there may be short periods of high noise levels, no significant adverse impacts would be expected based on the limited duration and intensity of construction-related activities.

Historical and archaeological resources in the vicinity of the Proposed Actions include three tenement buildings located across West 54th Street from the Ninth Avenue Site at 357 West 54th Street and 824-826 Ninth Avenue. Vibration levels may be perceptible in the vicinity of the Additional Housing Sites for limited periods of time, but because of their minor intensity and limited duration, these levels would not be considered a significant adverse impact. With the use of proper construction techniques and standard protective measures, including conditions set forth in the CEPP, no significant adverse vibration impacts would and, specifically, no significant adverse impacts would occur at these historic resources.

TRAFFIC AND PARKING

Construction of the Development Site from 2011 to 2019 would result in local traffic disruptions and generate construction worker and truck traffic. Projected construction activities are not expected to result in significant adverse parking impacts. However, some significant adverse construction-related traffic impacts are anticipated as construction activities peak in late 2016. A discussion of potential mitigation measures for these impacts is presented in Chapter 24: "Mitigation."

Within the study area, 25 critical intersections were selected for detailed traffic impact analysis. These intersections were analyzed for weekday AM, weekday midday, and weekday PM conditions. Under 2016 conditions with construction, significant adverse impacts would occur at 10 locations in the weekday AM; 8 intersections in the weekday midday, and 11 intersections in the weekday PM. In terms of intersection movements, 71 movements were assessed during the weekday AM; and 70 were evaluated under weekday midday and weekday PM conditions. As a result of construction activities in 2016, 15, 11, and 17 intersection movements would have a significant adverse impact during the weekday AM, midday, and PM peak hours, respectively.

Analysis indicated that as a result of construction of the Proposed Actions, the weekday midday off-street parking shortfall in the parking study area would increase from 1,982 to 2,332 spaces and the overall parking utilization would increase from 134 to 140 percent.

TRANSIT AND PEDESTRIANS

Construction workers would commute to work either by walking, driving alone or carpooling, or using public transportation. Because typical construction hours throughout New York City begin at 7:00 AM it is expected that an eight-hour shift would begin at 7:00 AM and end at 3:30 PM. For construction of those portions of the Proposed Actions that would employ two shifts, the first shift would begin at 7:00 AM and end at 3:30 PM and the second would begin at 2:30 PM and end at 11:00 PM. In either case—one eight-hour shift or two eight-hour shifts per day—

construction workers' commutes would not coincide with the AM, midday, or PM peak hour for public transportation or the AM, midday, or PM peak hour for vehicular traffic. There would not be a significant adverse impact on pedestrian circulation due to construction of the Proposed Actions.

NATURAL RESOURCES

The western edge of the Development Site is located approximately 250 feet from the Hudson River. As such, uncontrolled construction activities could result in eolian or fluvial sediment migration from the construction site to the river. Provisions of the CEPP would specify measures to be implemented in order to prevent sediments from exiting the Development Site as well as each Additional Housing Site.

Dewatering activities would likely be necessary at the Development Site and the Additional Housing Sites. A dewatering plan would be developed as part of the CEPP to address procedures for handling groundwater encountered during construction of the Proposed Actions. A description of the methods used to collect, store, and dispose of water collected during dewatering activities would be provided. Additionally, the dewatering plan would identify the necessary permits required from either the DEP or the New York State Department of Environmental Conservation (DEC) to discharge the water into the city's sewers or surface waters, respectively. (Permit requirements are discussed below.)

The Development Site and Additional Housing Sites are situated in dense urban environs and maintain no significant biotic habitat. No state- or federal-listed Threatened or Endangered Species, nor habitat for these species, are known to inhabit the Development Site, the Additional Housing Sites or the areas surrounding these sites, and no wetlands are located on or surrounding these sites. Overall, there would not be a significant adverse impact on Natural Resources as a result of construction activities associated with the Proposed Actions.

B. METHODOLOGY

The *CEQR Technical Manual* provides guidance on the methods used to assess impacts associated with construction activities that occur as a component of a proposed action or induced as a result of a proposed action. It also provides guidance in determining the area within which analyses should be conducted. The areas that would be most affected by construction generally consist of the areas immediately bordering the construction activity. However, in some cases impacts from construction activities extend beyond the immediate area surrounding the construction site. For example, while vibration and noise resulting from bedrock excavation would affect the immediate area of the site, dispersion of emissions from on-site construction equipment may affect a larger area. The analysis of construction-related impacts focuses on approximately 14 technical analysis areas, and because the spatial extent affected by construction activity is not the same for all technical analysis areas, a study area appropriate for each resource was established according to the area potentially affected by construction activity.

This EIS assesses the range of construction methods and activities that could be required for the Proposed Actions. A reasonable worst-case approach is used in each technical analysis area to evaluate potential impacts. Accordingly, where a variety of construction techniques may be used to achieve a specific task, the method that would reasonably result in the worst potential impacts is the one selected for analysis. Additionally, because specific construction tasks occur for only a small proportion of the total construction period, the analysis of potential impacts from the specific construction task is analyzed for the period when that activity is at a maximum. Thus, an analysis period for each resource category (e.g., air quality, noise, traffic, etc.) was selected according to the period when construction activities would produce maximum effects on that resource.

The peak period selected for each technical analysis area was established by examining the schedule of construction activities and assigning, for the duration of each activity (1) the quantity of heavy construction equipment required for that activity, and (2) the number of truck trips required for the delivery of construction materials (or spoils disposal) for that activity. Further refinements were advanced by assigning equipment utilization factors (i.e., the fraction of the work day such equipment would be in operation) to each piece of construction equipment, and by determining heavy trucking movements and determining where construction equipment would be located in relation to impact receptors (e.g., schools, vibration- and noise-sensitive train control equipment, etc.).

Once the peak period for potential impacts was established for each resource category, an initial screening analysis was conducted to determine whether land uses sensitive to each of the categories were located within the area likely to be affected by various construction activities. If the screening analysis identified land uses that could be affected, further analysis followed. New York State Environmental Quality Review (SEQR) regulations and the *CEQR Technical Manual* state that the significance of a likely consequence (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected. Because the significance of an impact is in part a function of its duration, if an impact was identified in the primary peak, a secondary construction peak was identified and analyzed for each relevant resource category to determine if the impact would still be present during the lesser, secondary peak. If the impact was identified as being present only during the primary peak period and not the secondary peak, then its duration was determined to be limited to part or all of the duration of the primary peak period only. Further analysis was undertaken to determine the length, within the peak period, of the impact. If an impact was identified in the secondary peak, a third peak was analyzed, and so on, until the extent of the impact's duration could be determined.

Although the final design of the platform, buildings, and open space has not been completed, it is possible to evaluate the potential construction impacts of the Proposed Actions by assuming construction techniques that represent the reasonable worst-case conditions expected to occur during the project's construction, as discussed below.

C. CONSTRUCTION SCENARIO

OVERVIEW

Since specific construction techniques are contingent on the final design, and because the development of the exact sequence and methods of performing construction tasks would be the responsibility of the contractor (within limits specified in the contract documents), the discussion below sets forth a reasonable worst-case construction scenario for purposes of this EIS analysis.

Work shift details, construction sequencing and methodologies, and other aspects of the construction process are likely to vary according to which element of the Proposed Actions is being constructed. In order to ensure the continuous and safe operation of the Caemmerer Rail

Yard during project construction, and to protect yard infrastructure and rail cars during construction, plans for construction activities related to work at the Western Rail Yard that might, directly or indirectly, affect rail road operations would be submitted to and approved by MTA and LIRR, as provided in a construction agreement to be entered into between MTA and LIRR and the Developer.

In general terms, the sequence of construction activity on the Development Site and the Additional Housing Sites would proceed as follows. Initial geotechnical surveys would be conducted to determine ground conditions pertinent to construction, such as depth to and structural strength of bedrock, and soil constituents and chemical composition. Additional chemical analysis of the subsurface soil would be performed if deemed appropriate, and tests would be conducted to identify hazardous materials contained within buildings or other structures located on the Development Site. As noted above, construction activities at the Development Site require special approaches to ensure that the Western Rail Yard remains fully operational throughout the construction period. This includes measures to minimize and carefully manage track outages during platform construction as well as project phasing and sequencing to ensure continued access to LIRR facilities.

In order to prepare the sites for development, construction fencing would be erected, normally at the perimeter of the site. Construction fencing provides security and often is designed to reduce noise emanating from the site. Some demolition would be required on the terra firma portion of the Development Site; after that section of the site is cleared, excavation for basements and structural supports could take place there.

When the active portion of the rail yard has been prepared, platform construction would begin. Construction of the platform is proposed to take place over nine phases and would progress from north to south. During each phase, four adjacent tracks would be closed. A temporary work deck would be built at track level on and between two to four of the tracks that would be closed in each phase. Subsurface components (caissons), platform support columns, below platform elements (lighting, fire proofing and fire suppression systems, ventilation and communication systems), and the platform structure would be finished before moving to the next phase. Machinery required for construction of a caisson would require a foundation drilling rig, cranes to install casing and reinforcement front end loaders to load soil and rock spoils onto trucks, a concrete pumper, and cranes to install base plates and structural steel atop a caisson.

With the platform in place, the work of constructing the buildings would begin. Foundation forms would be reinforced with steel, and concrete poured. Structural steel and concrete is then erected forming the skeletal framework for the floors and walls. In residential and commercial towers, the skeletal framework would progress upward sequentially. Depending on the building type, either (a) steel frames, joists, and decking, or (b) two-way steel reinforcing mat would be installed to prepare for the concrete flooring slab. When the floor structural support and decking is completed, a large volume of concrete is poured over the entire floor, or a large portion of the floor, to form a consistent surface. Several levels below the floor, construction work consists of the roughing in of mechanical, electrical, and plumbing systems. Several levels below those systems, the building exterior is attached to the skeleton. Once the exterior wall is installed and the building is watertight, the interior finishes are installed, including interior walls, plumbing and electrical fixtures, flooring, woodwork, painting, etc.

As the structural skeleton of the building rises, tower cranes and material/personnel hoists are erected, either within the structure or attached to the outside of the structure. As additional levels are constructed and the building rises, additional support sections are installed to the cranes and hoists. Cranes lift the structural steel and other heavy building elements to the top of the rising building, while hoists are used to deliver workers, tools and supplies, and other lighter building elements. For the Proposed Actions at the Development Site, all tower cranes and hoists would be powered with electricity.

Machinery required for site preparation, demolition and excavation include heavy-duty diesel-powered construction equipment such as backhoes, front-end loaders and excavators, pile drilling rigs, and dump trucks. Machinery used in construction of foundation and basements includes backhoes and front-end loaders, concrete pumpers, rebar benders, rubber tire cranes, dump trucks, compressors, generators, and other equipment. Tools and machinery used for interior construction and installation of building exteriors are predominantly pneumatic, electric-powered and propane-powered, including forklifts, welding equipment, electric compressors, table saws and circular saws, drills and other hand tools. For construction on the Development Site and the Additional Housing Sites, refueling of this machinery would occur on-site.

Other construction equipment includes pneumatic tools and machinery such as jack hammers and impact wrenches; electric tools and machinery such as welding equipment, portable cement mixers, scissor lifts, table saws and hand tools, concrete vibrators and tower cranes, and material/personnel hoists. Additional tools and machinery include propane-powered fork lifts and gasoline-powered troweling machines and other light-duty equipment. (Equipment expected to be used for each element of construction on the Development Site and the Additional Housing Sites is described in greater detail later in this chapter.)

TRUCK ROUTING

Dump trucks, tractor-trailer rigs, panel trucks, and other vehicles would be required to remove demolition debris and excavation spoils from the Development Site and the Additional Housing Sites, and to deliver construction material to the sites. Although the final destination of debris and spoils, and the origin of trucks delivering materials, would be at the discretion of the contractors selected, for purposes of environmental impact analyses reasonable worst-case assumptions regarding probable truck origin/destination have been assigned according to what is being transported.

- Demolition and excavation debris would likely be trucked to destinations west of the Hudson River and thus be routed through the Lincoln Tunnel or over the George Washington Bridge.
- Concrete would likely be delivered from a batching plant in Brooklyn, New York, and thus be routed through the Brooklyn-Battery Tunnel and north on the West Side Highway.
- Diesel and gasoline fuel for on-site equipment would be delivered to the Development Site over bridges, and would likely originate from Queens or Brooklyn, New York.
- Steel would likely originate from locations west of the Hudson River and would be routed through the Lincoln Tunnel or over the George Washington Bridge.
- For purposes of impact analyses, delivery vehicles for all other construction materials, such as plumbing and electrical supplies and fixtures, drywall, and wood products were distributed evenly between trips originating from east of the Hudson River and trips originating west of the river. Half of the trips originating west of the river were assigned to the Lincoln Tunnel and half to the George Washington Bridge. Those originating east of the river were assigned routes traveling from Brooklyn across the Manhattan Bridge or the

Williamsburg Bridge, from Queens through the Queens-Midtown Tunnel, and from the Bronx across the Third Avenue Bridge.

IMPACT ASSESSMENT

In order to assess the environmental effects resulting from construction of the Proposed Actions, a number of additional estimates have been used, based on current and typical practices within the construction industry.

1. Dump trucks hauling demolition debris and excavation spoils are expected to have a capacity of 20 cubic yards.
2. Concrete delivery trucks are expected to have a capacity of 10 cubic yards.
3. Trucks delivering steel, either to or from the sites, are expected to have a capacity of 20 tons.
4. Due to expansion caused by fracturing and handling, the volume of bedrock after excavation is assumed to be 30 percent greater than the volume of the undisturbed bedrock.
5. Working hours as follows:

   Ongoing operational functions in different areas within the Western Rail Yard would dictate the daily and weekly work schedule for construction of the platform in those areas. Work performed on the temporary work deck over the four track outages could, for some periods, occur 24 hours per day and seven days per week, but would likely occur during two eight-hour shifts on weekdays and one eight-hour shift on Saturdays. Work in the area of Track 0, Track 1, and Track 2, which are used to transfer equipment into and out of the Maintenance of Equipment Shop, would be performed in accordance with the Construction Agreement between the Developer, MTA, and LIRR.

   Construction of the buildings on the Development Site and the Additional Housing Sites would likely be conducted during one eight-hour shift Monday through Saturday. However, if needed to maintain project schedule, this work may conducted during two eight-hour shifts Monday through Friday and one eight-hour shift on Saturday.

   Because of the uncertainty regarding working hours for the construction of the Development Site, the work schedule that would have the greatest potential to generate impacts for any given impact category was selected for analysis in this chapter. For example, to evaluate potential noise impacts, it was assumed that work would occur in two shifts, or for 16 hours during the day. For the evaluation of potential construction traffic impacts, it was assumed that work would be conducted during one eight-hour shift and all construction-related truck traffic would be concentrated during this eight-hour period. For the evaluation of construction-related air quality, it was assumed that equipment required for construction of the platform would be in operation for two shifts (16 hours), and equipment required for construction of the buildings would be in operation for one 8-hour shift. Since work typically begins at 7:00 AM at construction sites in New York City, it is assumed that construction workers would arrive at the Development Site prior to 7:00 AM and leave after 3:30 PM for the daytime shift. If applicable, construction workers for a second shift would arrive at the Development Site before 1:30 PM and leave after 10:00 PM.

6. Plans for the buildings on the Ninth Avenue Site and the Tenth Avenue Site have not been developed. For the purposes of impact analyses, it is assumed that an approximately 250,000 gross square foot building would be erected at the Tenth Avenue Site and an approximately 130,000 gross square foot building would be erected at the Ninth Avenue Site. The building on the Ninth Avenue Site would include a basement, and the building on the Tenth Avenue

Site would be built on a deck over the Amtrak rail cut. It is assumed that the buildings would take 36 months to construct and would be built using methods similar to those for the buildings on the Development Site.

7. Except when construction equipment would operate from the curb lane and sidewalk on the south side of West 33rd Street (the northern edge of the Development Site), all construction equipment and materials would be operated and stored within the perimeter of the Development Site or within the perimeter of the Additional Housing Sites. For construction of the Development Site, most trucks would stage within the perimeter of the site, although adjacent streets may occasionally be used for this purpose. For construction of the Additional Housing Sites, trucks would likely stage on adjacent streets.

POLLUTION CONTROL MEASURES

The components of a CEPP, incorporated in a Restrictive Declaration, would provide a detailed specification of environmental protection commitments and any other procedures to be implemented during the construction phase at the Development Site to protect sensitive resources that may be affected during construction. The CEPP would include the following control measures:

- Construction Health and Safety Plan (CHASP);
- Emission reduction program;
- Fugitive dust control plan;
- Soil erosion and sediment control plan;
- Dewatering plan;
- Noise Mitigation Plan;
- Pest management plan; and
- Maintenance and Protection of Traffic Plan (MPT).

The Restrictive Declaration will commit the Designated Developer to these measures at the Development Site. The measures to be included in the CEPP are described in more detail below and are based on an initial identification of appropriate measures prepared by the Designated Developer ("Hudson Yards Construction Activity Pollution Prevention Measures").

1. The Developer would commit to an emission reduction program. These measures would include, at a minimum, the following provisions:

   a. Vehicles and equipment used to construct the Development Site and the Additional Housing Sites would comply, at a minimum, with the United States Environmental Protection Agency (EPA) Tier III Non-road Diesel Engine Emission Standard. Once Tier IV equipment is widely available, Tier IV would become the new minimum standard.

   b. All non-road, diesel-powered construction equipment with engines generating 50 horsepower or greater would be outfitted with the best available technology to reduce diesel particulate emissions beyond the EPA Tier II and III particulate emission standards, including diesel particulate filters and diesel oxidation catalysts.

   c. All non-road, diesel-powered construction equipment would be operated with ultra-low sulfur diesel fuel.

   d. Unless the vehicle engine is used to operate a loading, unloading or processing device, idling longer than three minutes would be prohibited on the Development Site and Additional Housing Sites, and within 10 feet of the perimeter of these sites.

2. The Developer would commit to a fugitive dust control plan. These measures would include, at a minimum, the following provisions:

   a. Fugitive dust would be controlled through water spraying or use of a biodegradable dust suppressant solution;

   b. Large piles of soil, rock or sediment would be kept wet, coated with a dust suppressant and/or covered to prevent wind erosion and fugitive dust. Longer term stockpiles would be covered with a tarp weighted down with sand bags.

   c. Concrete and rock grinding, drilling and saw cutting operations would be wet blade or misted if significant dust is being generated. Such operations in an enclosed space would utilize vacuum collection or extraction fans.

   d. During loading and unloading, loose material would be stabilized or wetted if the activity is generating dust plumes. During transportation to and from the Development Site and Additional Housing Sites, this type of material would be covered.

3. The construction activity pollution prevention plan would include a soil erosion and sediment control plan:

   a. The wheels or treads of vehicles and equipment that could track soil from the Development Site and the Additional Housing Sites would be washed before leaving the sites. To reduce the use of potable water for this purpose, the wheel wash could be supplied by collecting precipitation or using water collected during dewatering operations, where practicable.

   b. Rinse water from the wheel wash would be reabsorbed into the ground or pumped into tanks holding storm water or dewatering water. The wheel wash would not be used for concrete trucks which would contaminate wash water with high alkalinity.

   c. Concrete trucks would be rinsed into watertight dedicated bins. The captured washout water would be left to evaporate, treated, or returned to the concrete manufacturer. Any concrete that forms in the concrete washout bin would be recycled.

   d. Concrete from trucks, chutes, buckets and other equipment would be removed and collected in dedicated waste bins prior to equipment rinsing. Concrete spillage on the sites would be collected in dedicated waste bins.

4. The dewatering plan would require that dewatering water be pumped into sedimentation tanks for removal of sediments prior to reuse on the sites or discharge into the City’s sewer system or the Hudson River. Water in such tanks would be tested periodically for pH and contaminants. If contaminants are identified, water would be treated prior to disposal, as per DEC, or DEP regulations, depending on point of discharge (i.e., City sewers or stormwater conveyance pipe to the Hudson River).

5. The Noise Mitigation Plan would require compliance with the City’s Local Law 113, and with Chapter 28 of the Noise Control Code, and would consider the condition of surrounding buildings, structures, infrastructure, and utilities while performing construction activities likely to cause significant noise and vibration.

6. An integrated pest management plan would be developed and implemented to control pests (unwanted vermin, insects and weeds). This plan would include provisions to:
   a. Keep the Development Site and Additional Housing Sites as clean as possible. Food waste would be segregated from construction waste and deposited in covered bins;
   b. Pump out standing water before the water becomes septic;
   c. Trim vegetation fostering vermin; and
   d. Elevate construction trailers, dumpsters, and sheds off the ground to discourage vermin from burrowing or hiding under them.

MAINTENANCE OF PEDESTRIAN AND TRAFFIC CIRCULATION

Construction activity would require temporary closure of curb lanes, and temporary closure, reduction in width, or relocation of sidewalks along segments of the streets and avenues bordering the Development Site and the Additional Housing Sites. At no time would access to occupied buildings be closed, and at no time would access to the Western Rail Yard and other Caemmerer Rail Yard facilities be closed to LIRR personnel and equipment. Although no streets would be completely closed to vehicular traffic due to construction activity on the Development Site, the segment of West 33rd Street located between Eleventh and Twelfth Avenues would be rebuilt if the Proposed Actions are approved, and that street segment would be completely closed to non-emergency vehicles during the construction period. The timing of the rebuilding work on West 33rd Street would be coordinated with the schedule and construction of the platform. In areas where temporary sidewalk closure is required, the sidewalk would be relocated to the curb lane and a barrier would be erected to separate motor vehicle traffic from pedestrian traffic. In areas where access to bordering lots is not needed—along segments of the streets and avenues bordering the Development Site—the sidewalk and/or curb lane may be closed. In such instances, pedestrians would be routed to the opposite side of the street at the nearest crosswalk. Sidewalk modification may include the construction of a protective shed over segments of sidewalk bordering construction sites. The width of any relocated or modified sidewalks would be at least five feet.

Maintenance and Protection of Traffic plans would be developed and submitted to NYCDOT. Such plan would provide diagrams of proposed temporary lane and sidewalk alterations, including the duration, and the width and length of affected segments. Provisions of the plans may include requirements for the stationing of flagmen, and may limit the hours of the day and/or days of the week when changes can be implemented. After NYCDOT has approved the Maintenance and Protection of Traffic plans, contractors would be responsible for maintaining the provisions of the plans.

CONSTRUCTION SEQUENCING: DEVELOPMENT SITE

Construction scheduling for the platform, buildings, and other elements of the Proposed Actions would be conducted in a manner that would allow building and open space construction to begin on completed portions of the platform while other portions of the platform are under construction. An overview of construction scheduling for the Development Site, under reasonable worst-case assumptions, is provided in the paragraphs below, and details of construction techniques, equipment, and other detailed information are provided later in this chapter.

Construction is anticipated to begin with the platform at the northern edge of the Development Site and proceed south. The platform would be constructed in nine phases where each phase consists of closing four adjacent tracks, installation of platform and building support caissons and columns between the tracks, construction of the platform and platform components over the closed tracks and finally reopening the tracks. Each phase of platform construction would be completed prior to beginning the next phase. Collectively, the nine phases of platform construction are expected to take approximately 30 months, beginning in July 2011 and ending in December 2014, and would require an average of between three and four months per phase.

Excavation for WR-2[1] (see Figure 21-1), located on terra firma, south of the platform structure, is proposed to begin in October 2013, after several phases of platform construction have been completed. By approximately November 2013, when the platform would be approximately half finished, construction for WC-1 would begin. Excavation and foundation work for WR-3, also located on terra firma, would begin in April 2014 after approximately seven phases of platform construction are completed. By approximately December 2014, construction work for the platform would be completed. Construction of WR-1 would begin in August 2015, followed by the start of construction for WR-6 and WR-7 in January 2016. Construction for WR-4, located on terra firma at the southwest corner of the Development Site, would begin in October 2016 and work for WR-5 would begin in January 2017. Full occupancy for WC-1 and WR-2 is expected in the Summer of 2017, while construction continues on the other buildings on the Development Site. Full occupancy for WR-3 is expected in January 2018 as construction for WR-1 is finishing, and while work for WR-4, WR-5, WR-6, and WR-7 continues. Full occupancy for WR-1 is expected in the Summer of 2018 as WR-6 nears completion and WR-4, WR-6, and WR-7 are under construction. Full occupancy for WR-6 is expected in January 2019 as construction for WR-4 and WR-7 near completion and WR-5 is under construction. Full occupancy for WR-7 and WR4 is expected in the Summer and Fall of 2019 while WR-5 is under construction, and full occupancy for WR-5 is expected at the end of 2019. Table 21-1 provides information regarding the anticipated start of construction, the end of construction and full occupancy for each of the Development Site buildings.

Table 21-1
Construction Sequencing Details – Development Site

Proposed Building	Construction Start	Construction Finish	Full Occupancy
WR-2 (Residential)	October 2013	January 2017	July 2017
WC-1 (Commercial)	November 2013	January 2017	July 2017
WR-3 (Residential)	April 2014	July 2017	January 2018
WR-1 (Residential)	August 2015	January 2018	July 2018
WR-6 (Residential)	January 2016	July 2018	January 2019
WR-7 (Residential)	January 2016	January 2019	July 2019
WR-4 (Residential)	October 2016	April 2019	September 2019
WR-5 (Residential)	January 2017	September 2019	December 2019

In accordance with Section 93-78 of the proposed zoning text (see Appendix A, "Proposed Zoning Text,") substantial completion of the open space, open and usable by the public, is required to obtain the temporary certificate of occupancy for the associated building phase.

[1] Residential buildings are designated by the letters "WR" preceding a number while the commercial building is designated by the letters "WC."

Approximate Boundary of Proposed Platform

Approximate Boundary of Terra Firma Area

Development Site
Illustrative Site Plan
Figure 21-1

While the sequence of construction for the Additional Housing Sites has not been determined at this time, construction for the Ninth Avenue site is expected to begin in 2013 and be completed in 2016. Land adjacent to the east of the Tenth Avenue Site is being used by DEP for construction of the Water Tunnel No. 3 Project. The Tenth Avenue Site would be available for development after DEP no longer needs the adjacent site. Construction on this site would likely begin in mid-2013 or 2014 and be completed in 2017 or 2018.

SITE PREPARATION

DEVELOPMENT SITE

The Development Site is part of an active rail yard that operates 24 hours per day, seven days per week. Because of commuting patterns, there are more inbound trains to New York City's Pennsylvania Station ("Penn Station") in the morning rush hour than outbound trains, and more outbound trains than inbound trains in the evening rush hour. The morning trains are stored, serviced, and repaired in the Caemmerer Rail Yard until they are needed for the evening commute. In general, weekday and weekend morning commuter trains enter Penn Station where passengers disembark. The trains then move west from the station to the Caemmerer Rail Yard and are stored there. While in the Caemmerer Rail Yard, trains are cleaned and serviced. These functions include interior cleaning and trash removal, toilet servicing, and mandated Federal Railroad Administration (FRA) inspections, as well as repair and maintenance such as air conditioning replacement, wheel truing, and running repair tasks. A majority of the repair and maintenance tasks are performed in a six-track shop facility located in the eastern portion of the Caemmerer Rail Yard. In order to perform these tasks, LIRR personnel require full access to the trains stored at the yard and the on-site structures where supplies, tools and employee facilities are located. As such, construction work at the Development Site would be programmed to allow the continual, uninterrupted operation of the yard.

Construction work performed in the Western Rail Yard would be conducted in accordance with LIRR guidelines and design/construction criteria. Additionally, persons engaged in pre-construction or construction activities located on or near the tracks, or with the potential of fouling a track in the Western Rail Yard would be required to attend the LIRR Contractor Roadway Worker and Safety Training in accordance with provisions of 48 CFR Part 214 and LIRR Rules and Regulations.

The potential to encounter subsurface hazardous materials contamination at the Development Site during demolition and soil-disturbing activities does exist. The necessary remediation associated with the known petroleum spill cases at the Development Site is expected to be completed by the MTA or LIRR in accordance with stipulated provisions of the applicable DEC Consent Order before commencement of any work associated with the Proposed Actions.

As mentioned in the general discussion of construction techniques above, site preparation for the Development Site would involve a number of elements. Initially, the location of underground utility lines would be identified by digging test pits at each caisson location, and geotechnical surveys would be conducted. Soil and groundwater tests have been conducted, but additional testing may be required to fully characterize soil constituents for disposal purposes. Surveys of structures on the site would determine if such hazardous materials as asbestos or lead-based paint were used in previous construction. Information regarding contamination on the site would be used to develop a Construction Health and Safety Plan (CHASP) which would identify procedures to be followed during subsequent construction activities (see the Hazardous Materials section later in this chapter, and Chapter 12, "Hazardous Materials").

Site preparation would also include erection of a construction fence at the perimeter of the Development Site. Typically such fences consist of concrete "jersey barriers" supporting eight-foot-tall plywood walls, which are attached to the top of the barriers. The overall height of the construction fence would be approximately 10 feet above the ground surface. Gates at various locations around the Development Site would allow truck and worker access to the site.

ADDITIONAL HOUSING SITES

As is the case for the Development Site, geotechnical and hazardous materials surveys would be conducted prior to construction activity and a CHASP would be developed specifically for each site. For the Tenth Avenue Site, the surveys would extend into the Amtrak Empire Line rail bed in coordination with Amtrak regulations and requirements. Construction fencing would be erected at the perimeter of each site, likely consisting of an eight-foot-tall plywood wall. Site preparation at the Ninth Avenue Site also includes petroleum remediation activities. NYCT is under a DEC consent order to remediate a petroleum spill on the site. Construction on the Ninth Avenue Site would be carried out in accordance with the requirements of the consent order and would be coordinated by MTA with HPD or its designated developer regarding timing of the remediation.

DEMOLITION

DEVELOPMENT SITE

Certain LIRR facilities and storage containers located in the Western Rail Yard would require relocation in order to install the platform support caissons. Three of these LIRR facilities—the interior cleaning building, the Yard Operations building, and the Transportation Building—are located along the western edge of the rail yard. The interior cleaning building, located in the northwest corner of the Western Rail Yard, contains supplies and tools used to clean the interior of trains. The Yard Operations building, located directly south of the interior cleaning building, houses tools and supplies used to maintain car appearance and also contains employee facilities. The Transportation Building, located at the southwest corner of the yard, contains offices for LIRR mechanics and offices for police. Two other MTA facilities (one maintained by LIRR and one maintained by NYCT) located on terra firma at the southeast corner of the Development Site would also be relocated. One, LIRR's Emergency Facilities building, includes equipment for fire suppression and other emergencies, an emergency electrical generator and an electrical substation, where batteries for the electric buggies are charged. These buggies are used to transport supplies and service rail car toilets. Located west of this building is an auxiliary water storage tank for fire suppression. The other MTA facility, located south of the Emergency Facilities building and under the High Line (southern one-third of the Development Site), is an equipment storage building maintained by NYCT. This facility is fenced off from the Western Rail Yard, and because it is temporary storage space, would not need to be relocated or rebuilt as part of the Proposed Actions. LIRR employees and/or their subcontractors require access to the buildings located on the Development Site (including LIRR's Emergency Facilities building, located on the terra firma portion) regularly throughout the day.

Construction of temporary space would be required to replicate some of the functions of these existing facilities. Prior to removal of the auxiliary water storage tank, and subject to approval by MTA and LIRR, a substitute fire-suppression system would be installed and functioning in accordance with all applicable fire codes. The temporary buildings would be constructed on the terra firma portion of the Development Site when practicable. Construction of the temporary facilities is expected to begin in early 2011 and be completed approximately three months later. The temporary facilities would be operational prior to demolition of the existing facilities.

Additional structures and facilities on terra firma would also be removed. These include infrastructure maintained by DSNY, including a refueling station and associated underground petroleum storage tanks and several metal structures. Soil and groundwater contamination, if present, would be treated and disposed of in accordance with all applicable regulations. Also located on terra firma and requiring removal is the infrastructure associated with a commercial bus transportation company, which is limited to small metal-sided buildings used by employees and for storage.

Prior to removal from the site, the LIRR buildings and other structures to be demolished would be vacated and stripped of internal furnishings. Pre-deconstruction activities would include the identification of utilities, building condition surveys and hazardous materials assessments. The process would include a determination of the level of potential airborne particulates from demolitions activities and an assessment of the nature of debris to be disposed. Hazardous materials present in any buildings or structures would be identified and removed prior to demolition. The DSNY refueling station and any associated petroleum storage tanks would be closed according to applicable regulations. Demolition of the structures and buildings is expected to take approximately one month, beginning in the Spring of 2011.

Following the removal of any internal contaminants, building demolition would proceed. The buildings to be demolished are one- and two-story buildings with no obvious demolition difficulties. Debris from the upper floors would be systematically lowered to a cleared space adjacent to the building or directly into waiting dump trucks. Metal components of these buildings (siding, framing, trusses, etc.) would be segregated and crushed. Debris piles and metal would be loaded into dump trucks with front-end loaders or rubber-tire cranes with clamshell attachments. Debris from demolition activities would be sprayed with water or another dust-suppression agent, as required, and debris loads on trucks would be covered. Tire washing stations, or other means of preventing soil and dust from tracking off the site, would be located at the Development Site exits. Metal components would be trucked to recycling facilities. Debris would then be hauled to landfills permitted for such debris, or to recycling facilities, as appropriate. Any contaminated materials would be disposed of in facilities permitted to accept such wastes.

Removal of facilities, buildings and pavement associated with the commercial bus operation, and located on the terra firma portion of the Development Site, is expected to begin in 2010. Construction of temporary facilities to replace the Yard Operations building, the Transportation Building, and the Emergency Facilities structures is expected to begin late in 2010. Demolition of these existing LIRR buildings is expected to begin in the Spring of 2011, after completion of the temporary replacement facilities.

A truck staging plan for the removal of demolition debris would be developed based on the location of the structure to be demolished. A typical plan would have trucks staged at the southwest corner of the Development Site. Arriving trucks would travel north on Twelfth Avenue to the staging area, while departing trucks would exit the area north on Twelfth Avenue. It is expected that approximately 35 to 45 truck trips would be required to remove the three LIRR facilities located at the western end of the Western Rail Yard.

Demolition of structures and pavement on the at-grade portion of the Development Site south of the platform structure would begin in early 2011 and continue for approximately two months. Masonry and metal-sided structures occupy this portion of the Development Site and would be dismantled similar to the LIRR facilities discussed above. Recyclable metals and masonry would be segregated and trucked to recycling facilities and debris would be hauled to recycling facilities or licensed landfills. Trucks required for the removal of debris and other demolition materials would stage within the boundaries of the Development Site and would enter and exit the site via West 30th Street or Twelfth Avenue. It is anticipated that approximately 30 truck trips would be required to remove the structures from the terra firma portion of the Development Site and an additional 250 truck trips to remove the estimated 5,000 cubic yards of pavement covering that portion (see Table 21-2).

Table 21-2
Construction Details – Development Site Preparation

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Building Metal Scrap	375 tons	April 2011 to May 2011	40 (12)
Building Debris	6,000 cy	April 2011 to May 2011	300 (20)
Paving Material	5,000 cy	Early 2010 to Spring 2010	250 (20)
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 33rd St.	At corner of Twelfth Avenue	2010 to Mid-2011	No closings; flag person when necessary
East Side Twelfth Ave.	At corner of W. 31st St. (LIRR Access Road)	2010 to Mid-2011	No closings; flag person when necessary
North Side W. 30th Street	At corner of Eleventh Avenue	2010 to Mid-2011	No closings; flag person when necessary

Note: cy = cubic yards
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Construction equipment required for the demolition and removal of these buildings and infrastructure includes back hoes, front-end loaders, diesel air compressors and jackhammers, and rubber tire cranes.

ADDITIONAL HOUSING SITES

No permanent buildings are located on either of the Additional Housing Sites. The Ninth Avenue Site is currently a gravel parking lot and no structures are present on the site. No demolition would be required at the Ninth Avenue Site. The Tenth Avenue Site is an Amtrak rail cut and development at the site would not involve demolition.

EXCAVATION

DEVELOPMENT SITE

Excavation on the Development Site would be required for installation of the platform support caissons. Because excavation for the platform support caissons would be integrated closely with caisson installation and construction of the platform, excavation for the caissons will be described under the "Platform" heading in the "Construction" section below.

Excavation would also be required for the buildings on the terra firma portion of the Development Site in order to build the basements and foundation supports. Basements for the three buildings on terra firma would extend several levels below the ground surface. (At this time, buildings WR-2 and WR-3 [see Figure 21-1] are expected to share one large basement area.) If the extent of excavation for the basements reaches sound bedrock, the building foundations would consist of spread footings bearing on bedrock. If not, building foundations would be supported by drilled or driven piles bearing on bedrock.

Excavation for basement cavities would begin with removal of soil overlaying bedrock. Some form of site retention is required in order to prevent collapse of these earthen walls into the excavation. For the Proposed Actions, site retention would likely consist of one of three types: secant piles, sheet piling or soldier piles and wood lagging. The latter involves installation of vertical soldier piles around the perimeter of the area to be excavated and installing horizontal wood lagging between the soldier piles, forming a temporary wall to prevent earth from collapsing into the excavation.

Sheet piling consists of a series of panels with interlocking connections, driven into the ground with impact or vibratory hammers to form a barrier. Sheets can be made from a variety of materials including steel and precast concrete. Sheet piling can be temporary and removed after the basement walls have been constructed, or can be left in place to become a permanent structural element of the building.

Secant piles consist of a series of interlocking concrete cylinders that form support for the structure above and a waterproof basement wall. Installation of secant piles involves the construction of guide walls, which provide an accurate alignment for the drilling auger. A drilling rig then advances an initial series of cylindrical holes to the desired depth, spaced slightly less than one pile diameter apart. The holes are filled with slow-curing, or soft, concrete to form piles. A second series of holes are drilled that intersect with piles that have just been installed. This hole, which intersects with piles on either side, is then filled with concrete and steel reinforcement.

After site retention, the basement cavity is excavated. Typically, hydraulic excavators remove the earthen material to the desired depth. The excavation spoils would either be stockpiled on-site for later removal or later reuse on-site, or be loaded directly onto waiting trucks and hauled off-site.

If the desired basement depth is below the level of bedrock, as may be the case for the buildings on the eastern end of the at-grade portion of the Development Site, further excavation would be required. Bedrock excavation for the buildings located on terra firma would be accomplished by fragmenting the bedrock by controlled blasting, chemical fracturing, or hoe ramming, and removing the fractured rock by hydraulic excavator. Controlled blasting dislodges rock from the parent material by the detonation of explosive charges placed in holes drilled into the bedrock under a prescribed regime that considers geologic factors and the number, depth, and spacing of explosive charges to maximize the fracturing effect of the blast while minimizing the strength of the charge and resultant vibration. Dislodged rock would then be removed from the excavation, and the undisturbed bedrock below is exposed. New holes are drilled and explosives are placed in the new holes and detonated. This process is repeated until the desired depth is achieved. A discussion of potential vibration impacts from construction activities, and of the methodology and procedures for measuring and minimizing vibration is provided later in this chapter.

Bedrock excavation by hoe ram involves mechanically fracturing the rock with a large impact hammer attached to a back hoe or other piece of construction equipment. The resulting bedrock fragments are removed using an excavator or front-end loader and the process is repeated. Excavated bedrock would be stockpiled on-site or loaded directly onto trucks and hauled away for reuse or disposal. Table 21-3 provides estimates of the trucking requirements for excavation on terra firma and potential street and sidewalk closures.

Table 21-3
Construction Details – At Grade Excavation South of Platform

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Excavation Spoils	32,800 cy	October 2013 to October 2014	1,640 (12)
Excavation Spoils	7,800 cy	November 2016 to May 2017	395 (12)
Soldier Pile/Lagging	-	October 2013 to November 2016	30 (2)
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
North Side W. 30th St.	Eleventh and Twelfth Avenues	July 2012 to December 2014	Sidewalk
North Side W. 30th St.	Eleventh and Twelfth Avenues	July 2012 to April 2014	Curb lane and sidewalk
North Side W. 30th St.	Eleventh and Twelfth Avenues	November 2016 to May 2017	Sidewalk

Note: cy = cubic yards
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

For the buildings located on the western end of the at-grade portion of the Development Site, bedrock is located below the level of the building's basement. Therefore, when the basement cavity has been excavated to the desired depth, installation of foundation support piles would begin. The support piles would either be drilled or driven, and would form a grid across the building footprint.

For driven piles, the piles would be driven into the earth, using cranes with pneumatic pile-driving attachments, until they reach bedrock or until they reach a depth where compression on the piles from the surrounding earth would provide the required support for the structure above the piles. Concrete or metal pile caps are installed at the top of the piles and the slab foundation is poured. After the concrete basement walls are constructed, the soldier piles and lagging used for site retention are removed.

The process for drilled piles would involve advancing a series of vertical holes in the ground using a drilling rig. As the hole is advanced, a metal casing—or caisson—is installed, following the drill head. When bedrock is reached, the drill head designed for soil is replaced with one designed for drilling rock and the hole is advanced a few feet into the bedrock. At this time the drill is removed and steel reinforcement is installed, and concrete poured, into the caisson.

ADDITIONAL HOUSING SITES

Excavation for the Ninth Avenue Site would be accomplished using a similar approach as that for the Development Site. Some form of site retention would be installed—either soldier piles and lagging, sheet piles, or secant piles, as described above. Once the desired form of site retention is installed, excavation for the basement and foundations would proceed as described above.

Excavation for the Tenth Avenue Site would be limited to that required for the installation of piles, if drilled piles are selected for platform support. For purposes of impact analyses, it is assumed that approximately 45 piles, three feet in diameter would be drilled and socketed into bedrock 20 feet below the level of the Amtrak rail cut. See Table 21-4 and Table 21-5 for information regarding excavation at the Additional Housing Sites.

Table 21-4
Construction Details – Ninth Avenue Site Excavation

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Excavation Spoils	10,890 cy	Summer 2013	545 (18)
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 54th St.	Ninth Ave. East for 150 feet	Summer 2013	Sidewalk

Note: cy = cubic yards
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Table 21-5
Construction Details – Tenth Avenue Site Excavation

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Excavation Spoils	333 cy	2014 to 2015	17 (5)
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 49th St.	Eleventh Ave. West for 130 feet	2014 to 2015	Sidewalk

Note: cy = cubic yards
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

CONSTRUCTION

PLATFORM

The proposed platform would consist of steel framing that supports a prefabricated reinforced concrete beams and slab structure. This steel framing would be supported by steel box columns (grouted solid) bearing on caissons located between the tracks. The caissons would be drilled and socketed into bedrock. The platform would be designed and constructed to meet the specifications of the New York State Building Code. The buildings on the Development Site, and any portion of the platform and platform support structures that support buildings above the platform, would comply with the New York City Building Code and the New York State Building Code.

Construction of the platform over the Development Site is anticipated to progress sequentially from north to south in nine phases. Each phase would require the temporary closure of four adjacent tracks within the Caemmerer Rail Yard for a duration of approximately four months, although some phases would be completed in as little as three months (Phase 9) and some would take as much as six months (Phase 1). Rail yard operations would be interrupted only on the four tracks to be removed from service during each phase.

For each phase of platform construction, the subsurface components (caissons), platform support columns, below-platform elements (lighting, fire proofing and fire suppression systems, ventilation and communication systems), and the platform structure would be completely finished before moving to the next phase. By scheduling and conducting the work in this manner, interruptions to rail operations in the Caemmerer Rail Yard would be minimized. Because the capacity of the Caemmerer Rail Yard to store and service trains would be reduced by continuous track outages, it is anticipated that some of the trains that would normally use the yard would be diverted during weekday periods to LIRR yard facilities located at Long Beach Yard and Shea Yard.

The caissons would be located between sets of tracks forming a grid pattern, with a greater number of caissons in the areas where buildings would be located. Depending on the vertical and horizontal loads placed on the caissons by the structures above, the distance between caissons would be between 25 and 80 feet, and the diameter of the caissons would range from approximately 36 inches to 60 inches. It is anticipated that approximately 250 caissons would be required to support the platform and buildings over that portion of the Western Rail Yard that contains LIRR tracks and yard facilities (between West 31st and West 33rd Streets). The structures located on the terra firma portion of the Development Site would be supported by steel piles with concrete caps. There would be approximately 800 of these piles on the terra firma portion of the site.

Construction of the platform would begin by closing four adjacent tracks and building a temporary, track-level work surface on which construction machinery would operate and construction materials excavation spoils would be transported. The temporary work deck, oriented parallel to the tracks, would span two, three or four adjacent tracks of the continuous outage, and would extend from the western edge of the Development Site into the Eastern Rail Yard, to the clearance marker where the tracks begin to converge. Access to the temporary work deck for construction equipment and workers would be from Twelfth Avenue and from West 30th Street, under the High Line. In order to avoid damage to LIRR tracks and the yard, all heavy construction equipment would be confined to the temporary work deck.

Installation of caissons would be accomplished by drilling 36- to 60-inch diameter holes vertically into the ground. As a hole is advanced, a metal casing—or caisson—is installed, following the drill head. When bedrock is reached the drill head designed for soil is replaced with one designed for drilling rock and the hole is advanced into the bedrock. The caissons for the platform support would be socketed between 11 and 27 feet into the bedrock. The caisson is then emptied of soil and rock debris, then steel beam reinforcement is installed and the caisson is filled with concrete.

The metal caisson for each pile would extend approximately two feet above the surface of the yard. Bolts embedded in the concrete would extend above the top of the pile in order to attach base plates to the pile. Steel box columns, attached to the base plates, would support steel girders and beams, which would support the prefabricated reinforced concrete deck.

Construction of a caisson would require a minimum of four major pieces of equipment, including a foundation drilling rig, cranes to install casing and reinforcement, a front end loader to load soil and rock spoils onto trucks, a concrete pumper, and cranes to install base plates and structural steel atop the caisson foundation. It is anticipated that multiple caisson installation operations would occur simultaneously during each phase of platform construction. As such, eight or more pieces of heavy construction equipment may occupy the temporary work deck at one time.

For the large diameter caissons (60 inches) located at the western end of the Development Site, where depth to bedrock is approximately 110 feet below the surface, as much as 90 cubic yards of concrete would be required to fill each caisson. In total, approximately 1,460 cubic yards of concrete would be delivered and installed in the caissons during each of the nine phases, requiring an average of approximately 146 deliveries for each phase (See Table 21-6). Concrete delivery would not be constant over the duration of pile installation work. Rather, each pile would be poured in one continuous operation, and would require a steady, continuous supply of concrete. As such, the rate of concrete delivery would fluctuate. It is expected that during concrete pours for caisson pile installation, a maximum of 40 concrete delivery trucks would be required in any one day, and five delivery trucks would be required in any one hour of that day.

Table 21-6
Construction Details – Platform Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Excavation Spoils	11,711 cy	2011 to 2014	585 (9)
Pile Concrete	11,711 cy	2011 to 2014	1,170 (40)
Pile Steel	4,698 tons	2011 to 2014	235 (2)
Platform Concrete	9,603 cy	2011 to 2014	960 (40)
Platform Steel	51,500 tons	2011 to 2014	2,575 (2)
Pre-fab Concrete Decking	14,100 tons	2011 to 2014	940 (2)
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 33rd St.	Eleventh and Twelfth Avenues	October 2011 to December 2011	Curb lane and sidewalk
East Side Twelfth Ave.	W. 30th and W. 33rd Streets	2011 to 2014	Curb lane and sidewalk

Note: cy = cubic yards
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Additional deliveries would be required for each phase of caisson installation, including those supplying approximately 110 tons of steel and those supplying approximately 410 tons of steel caissons. These delivery trips, totaling approximately 35 trucks trips over the duration of each phase, would occur on a regular basis. The maximum peak delivery rate for steel for caisson installation is expected to be two one-way truck trips per day, and the maximum peak rate of one one-way truck trip per hour.

After the caissons have been installed, steel shape and box columns would be attached to the tops of the caissons. Concrete would then be poured into the box columns and other elements of the platform support system. As is the case with the caisson construction, steel would be delivered on a fairly regular basis, but large volumes of concrete would be poured in a single event. Steel framing and cross bracing would then be attached to the columns and prefabricated reinforced concrete beams and decking would be attached atop the framing. It is expected that each phase of deck construction would require approximately 5,720 tons of steel (including approximately 5,400 tons of framing, 235 tons of rebar and 85 tons of formwork), delivered with 285 truck trips, with a peak rate of delivery of five truck trips per day. Additionally, for each phase of platform construction, delivery of the prefabricated concrete decking, which would occur on a fairly regular basis, would require approximately 105 truck trips with a peak rate of delivery of five truck trips per day. Approximately 1,070 cubic yards of concrete, apart from that required for the caissons, would be required for each phase of deck construction, and delivered in approximately 107 truck trips. The peak delivery rate for concrete would be 40 truck trips per day and five truck trips per hour. Table 21-6 provides information about the steel and concrete requirements for the complete deck.

Work associated with drilling and installation of the caissons would occur from the temporary work deck at track level, and would involve the installation of structural steel columns, girders and beams, and prefabricated deck members. During the first phase, cranes and other machinery would operate from the southern curb lane and sidewalk of West 33rd Street, directly north of the Development Site. From here, cranes would install steel platform elements to the tops of the caissons. Concrete delivery trucks would stage from the curb lane and concrete pumpers would pump concrete to the box columns and other platform elements. Cranes would install the prefabricated deck members into position. Concrete delivery trucks and concrete pumpers would stage from the west end of the temporary work deck, entering and exiting the area from West 33rd Street near the intersection of Twelfth Avenue.

During platform construction, staging of machinery required to install platform elements would require the closure of the curb lane and sidewalk along the south side of West 33rd Street between Eleventh and Twelfth Avenues for two or three months beginning in late 2011. Additionally, during construction of the platform, from 2011 to 2014, the eastern curb lane and sidewalk along segments of Twelfth Avenue between West 30th Street and West 33rd Street would be closed intermittently during periods when equipment is moving into and out of the Development Site, depending on which phase of platform construction is underway. If necessary, construction personnel would direct northbound traffic on Twelfth Avenue as equipment and deliveries enter and exit the Development Site.

BUILDING CONSTRUCTION

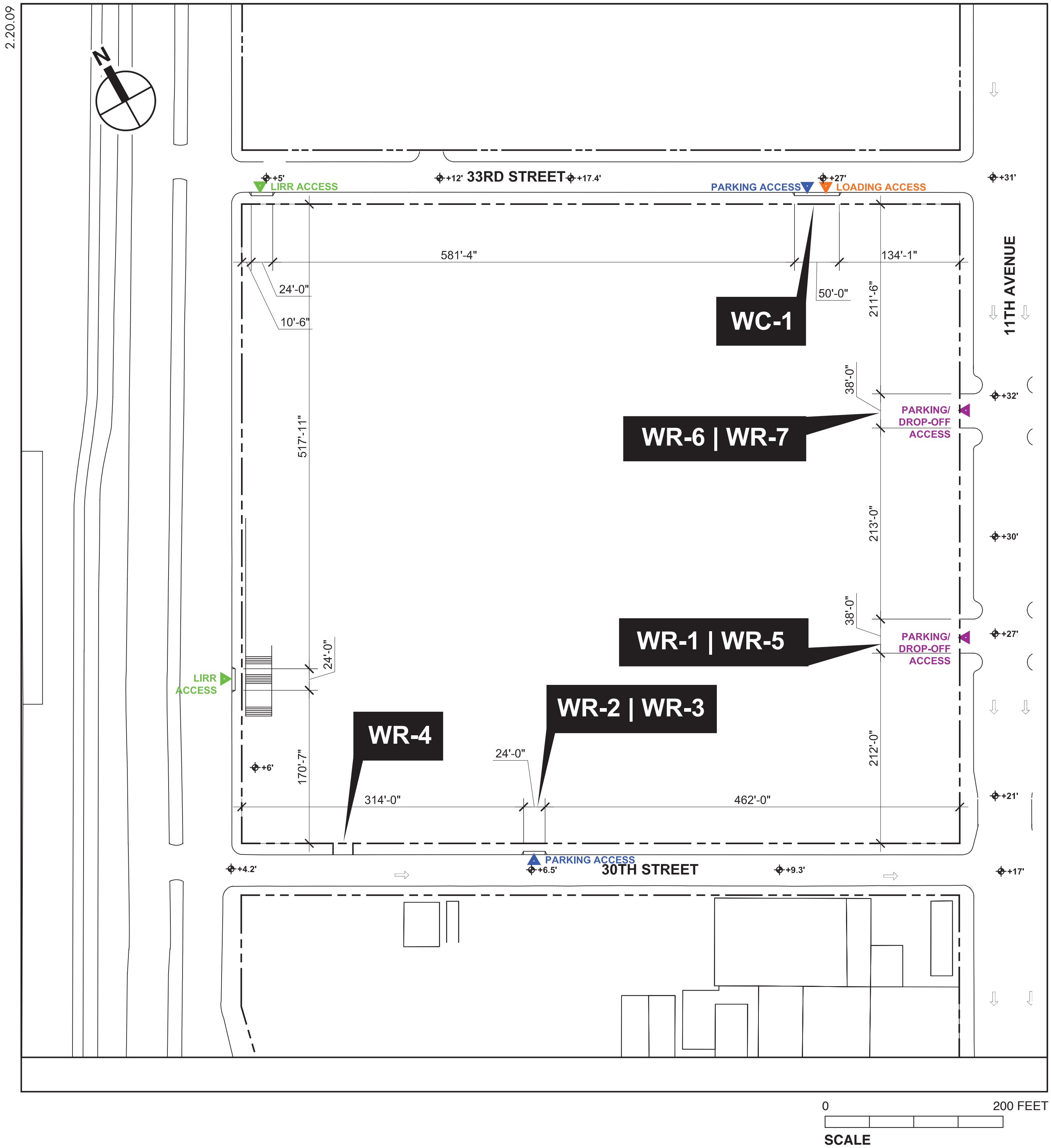
After the platform has been constructed in areas where buildings are proposed to be located, construction on those buildings would begin. Because the building foundations are incorporated into the platform, construction would begin from the platform level with the erection of structural skeleton. As described earlier, structural steel forming the skeletal framework for the floors and walls is erected sequentially, with construction of building systems, exterior walls, interior walls, and systems occurring on the floors below.

While structural steel, building system components, exterior walls and other building elements would be delivered at a fairly constant rate, concrete would be poured in large volumes, requiring a large number of concrete deliveries within a short time span. The anticipated amounts of various construction materials for each of the Development Site buildings are provided below in Tables 21-7 through 21-16, in the order in which the buildings are proposed to be developed. As reflected in these tables below, commercial towers typically use greater quantities of steel and less concrete than residential towers. The commercial tower proposed for the Development Site would use curtain wall systems for building exteriors. The residential buildings proposed for the Development Site would use either curtain wall or window wall systems for building exteriors.

Because buildings WR-4, to be located on terra firma, and WR-5, located on the platform, are the last to be constructed, it is expected that the areas where these buildings are to be located would provide areas for material laydown, equipment refueling, and truck staging as needed. Trucks with a destination of the area where building WR-5 would be located would enter the Development Site from Eleventh Avenue and traverse the site to the west. Trucks with a destination of the area where building WR-4 would be located would enter the Development Site from West 30th Street between Eleventh and Twelfth Avenues. Figure 21-2 illustrates anticipated entrance/exit points for construction material deliveries for the Development Site during the construction period for 2015 and later, after the platform has been completed.

Building WR-2

Building WR-2 would be built on terra firma and would thus require excavation and subgrade elements (basements and foundations). Excavation for WR-2 would begin in the Fall of 2013, and construction would be completed in the Spring of 2017. Foundation work would start in late 2013 and continue until late 2014, for a duration of 12 months. Construction of the structural elements of the building would begin in October 2014, followed by construction of the building exteriors and interior construction (Table 21-7).



WESTERN **RAIL YARD**

Development Site
Construction Access Points - 2014 and Later
Figure 21-2

Table 21-7
Construction Details – WR-2 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Concrete (Foundations)	450 cy	Oct. 2013 to Sep. 2014	45 (5)
Steel (Foundations)	5,550 tons	Oct. 2013 to Sep. 2014	280 (2)
Steel (Structural)	11,115 tons	Oct. 2014 to April 2016	560 (3)
Concrete (Structural)	35,000 cy	Oct. 2014 to April 2016	3,500 (30)
Façade	5,475 tons	Aug. 2015 to May 2016	365 (2)
Interior Construction†	-	Dec. 2015 to Mar. 2017	5,866 (21)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
North Side W. 30th St.	Eleventh and Twelfth Avenue	Oct. 2013 to Apr. 2016	Curb lane and sidewalk

Note: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WC-1

Building WC-1 would be incorporated with the platform and would thus not require excavation and subgrade elements. Construction of structural elements of the building would begin in November 2013 and be complete in October 2015. Construction of the exterior elements of the building would occur between January 2015 and September 2016, while interior construction would occur between January 2015 and July 2017 (Table 21-8).

Table 21-8
Construction Details – WC-1 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Steel (Structural)	46,500 tons	Nov. 2013 to Oct. 2015	2,325 (5)
Concrete (Structural)	18,770 cy	Nov. 2013 to Oct. 2015	1,877 (30)
Façade	5,475 tons	Jan. 2015 to Sep. 2016	365 (2)
Interior Construction†	-	Jan. 2016 to July. 2017	5,866 (21)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 33rd St.	Eleventh and Twelfth Avenues	Nov. 2013 to Mar. 2017	Sidewalk
West Side Eleventh Ave.	W. 33rd St. and South 150 feet	Nov. 2013 to Mar. 2017	Curb lane and sidewalk

Note: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WR-3

Building WR-3 would be built on terra firma and would thus require excavation and subgrade elements. Excavation for WR-3 would likely coincide with that for building WR-2. Construction for the building would be completed at the end of 2017. Construction of the structural elements of the building would begin in April 2015, followed by construction of the building exteriors and interior construction (Table 21-9).

Table 21-9
Construction Details – WR-3 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Concrete (Foundations)	450 cy	Apr. 2014 to Apr. 2015	45 (5)
Steel (Foundations)	5,550 tons	Apr. 2014 to Apr. 2015	280 (2)
Steel (Structural)	9,915 tons	Apr. 2015 to Sep. 2016	4500 (2)
Concrete (Structural)	31,200	Apr. 2015 to Sep. 2016	3,120 (30)
Façade	4,875 tons	Jan. 2016 to Dec. 2016	325 (2)
Interior Construction†	-	June 2016 to Oct. 2017	5,254 (20)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
North Side W. 30th St.	Eleventh and Twelfth Avenues	Apr. 2014 to Oct. 2017	Curb lane and sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WR-1

Building WR-1 would be built on the platform and would thus not require excavation and subgrade elements. Construction of the structural elements of the building would begin in August 2015, followed by construction of the building exteriors and interior construction (Table 21-10). Construction is expected to be completed in early 2018.

Table 21-10
Construction Details – WR-1 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Steel (Structural)	10,155 tons	Aug. 2015 to Mar. 2017	510 (3)
Concrete (Structural)	31,940 cy	Apr. 2015 to Sep. 2016	3,194 (30)
Façade	4,980 tons	June 2016 to May 2017	325 (2)
Interior Construction†	-	Mar. 2016 to Feb. 2018	5,775 (22)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
West Side Eleventh Ave.	West 31st St. and 32nd Streets	Apr. 2015 to Feb. 2018	Curb lane and sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, trash hauling, landscaping, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WR-6

Building WR-6 would be built on the platform and would thus not require excavation and subgrade elements. Construction of the structural elements of the building would begin in January 2016, followed by construction of the building exteriors and interior construction (Table 21-11). Construction is expected to be completed in November 2018.

Table 21-11
Construction Details – WR-6 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Steel (Structural)	9,400 tons	Jan. 2016 to Sep. 2017	470 (3)
Concrete (Structural)	29,500 cy	Jan. 2016 to Sep. 2017	2,950 (30)
Façade	4,600 tons	Oct. 2016 to Nov. 2017	307 (2)
Interior Construction†	-	Mar. 2016 to Nov. 2018	4,797 (20)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 33rd St.	Eleventh Ave. and Twelfth Ave.	Jan. 2016 to Nov. 2018	Sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, trash hauling, landscaping, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WR-7

Building WR-7 would be built on the platform and would thus not require excavation and subgrade elements. Construction of the structural elements of the building would begin in January 2016, followed by construction of the building exteriors and interior construction (Table 21-12). Construction is expected to be complete June 2019.

Table 21-12
Construction Details – WR-7 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Steel (Structural)	8,340 tons	Jan. 2016 to Apr. 2018	420 (3)
Concrete (Structural)	26,250 cy	Aug. 2015 to Apr. 2018	2,625 (30)
Façade	4,980 tons	Mar. 2017 to June 2018	273 (1)
Interior Construction†	-	Mar. 2016 to June 2019	5,016 (19)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 33rd St.	Eleventh Ave. and Twelfth Ave.	Aug. 2015 to June 2019	Sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, trash hauling, landscaping, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Building WR-4

Building WR-4 would be built on terra firma and would thus require excavation and subgrade elements (basements and foundations). Excavation for WR-4 would begin in the Fall of 2016 and be completed by approximately Spring of 2017. Construction of the structural elements of the building would begin in December 2017, followed by construction of the building exteriors and interior construction (Table 21-13). Construction is expected to be complete in April 2019.

Building WR-5

Building WR-5 would be built on the platform and would thus not require excavation and subgrade elements. Construction of the structural elements of the building would begin in January 2017, followed by construction of the building exteriors and interior construction (Table 21-14). Construction is expected to be completed in December 2019.

Table 21-13
Construction Details – WR-4 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Concrete (Foundations)	450 cy	Oct. 2016 to Sep. 2017	556 (3)
Steel (Foundations)	5,550 tons	Oct. 2016 to Sep. 2017	280 (2)
Steel (Structural)	11,115 tons	Oct. 2017 to Apr. 2019	560 (3)
Concrete (Structural)	35,000 cy	Oct. 2017 to Apr. 2019	3,500 (30)
Façade	5,475 tons	Aug. 2018 to Feb. 2019	365 (2)
Interior Construction†	-	Dec. 2018 to Apr. 2019	5,866 (21)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
North Side W. 30th St.	Eleventh Ave. and Twelfth Ave.	Oct. 2016 to Sep. 2017	Sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, trash hauling, landscaping, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Table 21-14
Construction Details – WR-5 Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Steel (Structural)	5,400 tons	Dec. 2017 to Dec. 2018	270 (2)
Concrete (Structural)	22,360 cy	Dec. 2017 to Dec. 2018	2,236 (30)
Façade	3,495 tons	Aug. 2018 to Feb. 2019	233 (1)
Interior Construction†	-	Aug. 2018 to Dec. 2019	4,322 (18)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Open Space

Development of the open space on the Development Site would occur in areas surrounding completed buildings that are no longer needed for construction material laydown or other construction purposes, and where the welfare of users of the open space would not be compromised by nearby construction activity. By approximately 2017 it is anticipated that the central open space area, and a plaza located at the northeast corner of the site would be completed and safe for users. If parking were to be integrated into the open space, the parking structure would be located within the platform and the open space would be on top of the platform. The parking structure would most likely be constructed of steel reinforced concrete. Construction of vegetated open space for the Proposed Actions would involve installation of a waterproof barrier directly above the platform surface and parking structure, as appropriate, and a matrix of drainage piping above the barrier, followed by importing a layer of aggregate material, such as gravel, to facilitate drainage. Clean earthen fill material would then be placed above the drainage system and sculpted to form geographic relief over the open space area. Vegetation would then be planted and park furniture installed. Non-vegetated open space would involve installation of a waterproofing and drainage system and installation of pavements and park furnishings. No lane or sidewalks are expected to be closed in order to construct open space for the Proposed Actions, and the truck trips and equipment usage required for the construction of open space have been accounted for in the material and equipment requirements of the buildings proposed for the Development Site.

Ninth Avenue Site

The building on the Ninth Avenue Site would require excavation and subgrade elements. Excavation would begin in the Spring of 2013, and construction would be completed at the end of 2016. Construction of the structural elements of the building would begin in April 2014, followed by construction of the building exteriors and interior construction (Table 21-15). For the first year of construction, it is anticipated that the sidewalk would be shifted to the curb lane along the south side of West 54th Street from Ninth Avenue east for approximately 150 feet. During the initial stages of construction, for excavation, foundation and basement work, trucks would enter and exit the site from West 54th Street or Ninth Avenue.

Table 21-15
Construction Details – Ninth Avenue Site Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Concrete (Foundations)	150 cy	Oct. 2013 to Jan. 2014	15 (5)
Steel (Foundations)	1,805 tons	Oct. 2013 to Jan. 2015	90 (2)
Steel (Structural)	3,612 tons	Jan. 2015 to Sep. 2015	185 (2)
Concrete (Structural)	11,375 cy	Apr. 2015 to Feb. 2016	1,137 (15)
Façade	1,780 tons	June 2015 to Dec. 2015	120 (2)
Interior Construction†	-	Aug 2016 to Oct. 2017	1,900 (10)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 54th St.	Ninth Ave. East for 150 feet	2015 to 2016	Curb lane and sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

Tenth Avenue Site

The building on the Tenth Avenue Site would involve building a platform that would extend between West 48th Street and West 49th Street over the Amtrak Empire Line rail cut. Although plans for the building and the platform have not been developed, for purposes of impact analyses, it is assumed that the platform would be supported by piles driven to bedrock or drilled caisson piles, socketed into bedrock, similar to those used for the Western Rail Yard. Machinery used to install the platform support piles would operate from West 49th Street west of Tenth Avenue. Pile installation would begin late in 2014, and construction would be completed in late 2017 or early 2018. Construction of the structural elements of the building would begin in approximately 2016, followed by construction of the building exteriors and interior construction (Table 21-16). Construction would be complete in early 2018.

Table 21-16
Construction Details – Tenth Avenue Site Construction

Materials	Amount	Approximate Activity Period	Truck Trips (Peak Daily Rate)
Concrete (Caissons)	333 cy	Jan. 2014 to Jan. 2015	33 (3)
Steel (Platform)	1,620 tons	Feb. 2015 to Oct. 2015	81 (2)
Prefabricated Decking	465 tons	Sep. 2015 to Feb. 2016	31 (1)
Steel (Structural)	4,490 tons	Jan. 2016 to Jan. 2017	225 (2)
Concrete (Structural)	14,110	Jan. 2016 to Jan. 2017	1,410 (30)
Façade	1,200 tons	Sep. 2016 to June 2017	150 (2)
Interior Construction†	-	Jan. 2017 to Mar. 2018	3,260 (15)*
Street and/or Sidewalk Closure			
Location	**Between**	**Approximate Closure Period**	**Affecting**
South Side W. 49th St.	Eleventh Ave. West for 130 feet	Jan. 2014 to Mar. 2018	Curb lane and sidewalk

Notes: cy = cubic yards
† includes interior walls, building systems, paint, fixtures, etc.
* includes heavy duty trucks, light trucks, and vans.
Source: Bovis Lend Lease; The Louis Berger Group, 2008.

D. THE FUTURE WITHOUT THE PROPOSED ACTIONS

As described in Chapter 3, “Land Use, Zoning, and Public Policy,” in the Future without the Proposed Actions no material changes would occur on the Development Site by 2019. As such, the Development Site would remain in use as an open rail yard with no development above. It is also anticipated that the bus operations and DSNY facilities would remain on the terra firma portion of the Site.

Development in the immediate vicinity of the Development Site under the Future without the Proposed Actions is expected to include construction of a platform over the Eastern Rail Yard that would support five high-rise buildings containing office, retail, community facility, residential, and hotel uses, approximately five acres of publicly accessible open space and accessory parking. This a portion of the High Line that would be transformed into publicly accessible open space along West 30th Street between Tenth and Eleventh Avenues. Other planned developments in the vicinity include: the first phase of Hudson Park and Boulevard, located between Tenth and Eleventh Avenues from West 33rd to West 36th Streets; two high-rise mixed-use buildings located along the east side of Eleventh Avenue between West 33rd and West 35th Streets, totaling approximately 3.5 million square feet; the Flushing Line (No. 7) subway extension and the associated terminal station at West 34th Street and Eleventh Avenue.

Chapter 3, “Land Use, Zoning, and Public Policy,” provides additional information regarding the projects considered for analysis under the Future without the Proposed Actions.

It is anticipated that construction activity for these projects would take place essentially from within the footprint of each site. However, temporary lane closures for removal of excavation spoils and deconstruction debris and delivery of construction materials would likely be required, as well as partial or full closure of adjacent sidewalks. Sidewalks and/or curb lanes adjacent to the Eastern Rail Yard would likely be closed for some period during construction of the platform and buildings over the yard; however closure on any one side would not likely be concurrent with closure on the other side. Sidewalks and/or curb lanes along the east side of Eleventh Avenue between West 33rd and West 35th Streets, and along the north side of West 33rd and the south side of West 35th Streets, would likely be closed during some period during construction of projects located on lots adjacent to these streets.

In addition to lane closures resulting from the construction of these projects, construction-related truck traffic from these projects would likely traverse the area surrounding the Development Site. The crosstown streets most likely to be utilized by these vehicles would be West 31st, West 33rd, and West 34th Streets. Northbound traffic would likely utilize Eleventh and Twelfth Avenues, while southbound traffic would likely utilize Ninth and Twelfth Avenues. As a consequence of lane closures and increased truck traffic, impacts to traffic, air quality, and noise receptors could occur, particularly near construction activities and along truck routes.

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

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

E. PROBABLE IMPACTS OF THE PROPOSED ACTIONS

LAND USE

DEVELOPMENT SITE

Construction activities would temporarily and unavoidably affect land use on the Development Site by changing the land use currently on the site to land use characterized by construction activity. However, with the exception of the four-track outages, the rail yard would function as it currently does. Furthermore, all construction staging and laydown areas for the construction of the platform, buildings, and open space would occur either within the footprint of the various construction sites or within portions of sidewalks and curb and travel lanes of city streets adjacent to the construction sites. Adherence to provisions of the building code, such as the erection of construction fencing, would reduce potentially undesirable views of construction activity and buffer noise emitted from the sites (see later sections of this chapter). No significant adverse impacts to land use due to construction at the Development Site are anticipated.

ADDITIONAL HOUSING SITES

Construction of the residential buildings at the Additional Housing Sites would temporarily change the existing land use at the two sites (an Amtrak rail cut at the Tenth Avenue Site, and a parking lot at the Ninth Avenue Site) into land use characterized by construction activity. All construction staging and laydown areas for the construction of the two residential buildings would occur either within the footprint of the sites or within portions of sidewalks and curb lanes of city streets adjacent to the construction sites. Adherence to provisions of the building code, such as the erection of construction fencing, would reduce potentially undesirable views of construction activity and buffer noise (see later sections of this chapter) emitted from the sites. No significant adverse impacts to land use due to construction of the Additional Housing Sites are anticipated.

NEIGHBORHOOD CHARACTER

DEVELOPMENT SITE

Construction activities at the Development Site would be visible and audible from areas surrounding the Western Rail Yard, and as such, are expected to temporarily affect the character of the neighborhood. Construction equipment and structures under construction would be visible from the nearby Jacob K. Javits Convention Center ("Convention Center"), the upper floors of residential and commercial buildings in the immediate vicinity and from the Hudson River and Hudson River Park. Construction activity would also be apparent at portions of the Eastern Rail Yard site. Neighborhood character would temporarily be affected by the presence of construction equipment such as cranes, excavators, trucks, loaders and other construction equipment. Construction activities would not result in a significant adverse impact with respect to neighborhood character.

ADDITIONAL HOUSING SITES

For the Additional Housing Sites located at Ninth and Tenth Avenue, construction would temporarily affect neighborhood character by adding additional noise and traffic, and creating potentially undesirable views due to construction fencing and heavy equipment. These effects are expected to last the duration of the construction period and would vary in intensity depending on the stage of and distance from construction.

SOCIOECONOMIC CONDITIONS

DEVELOPMENT SITE

Aside from paid parking facilities and the Convention Center, few businesses exist in the immediate vicinity of the Development Site. Although sidewalk and lane closures are anticipated adjacent to the Development Site, at no time during the construction period would sidewalk or lanes be closed in front of any business. The Proposed Actions would not inhibit access to or affect the viability of businesses located in the vicinity of the Development Site, and therefore, is not expected to have any significant adverse impacts on these businesses.

Positive effects are expected as the Proposed Actions would bring construction workers to the areas surrounding the Development Site, workers who would patronize local eating and drinking establishments, convenience stores, neighborhood services, and other local businesses.

ADDITIONAL HOUSING SITES

Construction at the Ninth Avenue Site would, at times, require relocation of the sidewalk to the adjacent curb lane along Ninth Avenue and along West 54th Street, immediately adjacent to the site. These sidewalk diversions would not extend to the area in front of the four and six story residential buildings with ground floor businesses that are located directly south of the site, nor would they extend to the area in front of the NYCT facility immediately east of the site.

Construction activity at the Tenth Avenue Site would, at times, require relocation of the sidewalk to the curb lane along the north side of West 48th Street and the south side of West 49th Street, immediately adjacent to the Amtrak rail cut. These sidewalk diversions would not extend to the area in front of the American Red Cross facility located directly west of the site on West 49th Street nor would sidewalk diversions block the parking lot to that facility. No other businesses are located in the vicinity of the Tenth Avenue Site.

As is expected for the Development Site, positive effects of construction are expected at the Additional Housing Sites from construction workers who would patronize local eating and drinking establishments, convenience stores, neighborhood services and other local businesses. No significant adverse impact due to construction of the Proposed Actions is anticipated.

COMMUNITY FACILITIES

Construction activities are not expected to significantly impact community facilities in the study area. There are no public schools, hospital facilities, or public libraries within the area surrounding the Development Site or the Additional Housing Sites. The public school proposed to be located on the Development Site would not be open until after construction at the site is completed. There would not be a significant adverse impact on community facilities due to construction of the Proposed Actions are anticipated.

OPEN SPACE

Hudson River Park, including the Route 9A bikeway/walkway, is located within the vicinity of the Development Site. Hudson River Park extends along the waterfront from West 59th Street to Battery Park Place and includes a waterfront esplanade, landscaping, and other amenities. The Route 9A bikeway/walkway allows users to stroll, bike, jog, or rollerblade along the Hudson River. Although construction activity would be visible from portions of this open space, it would not be directly affected by construction of the Proposed Actions.

A substantial amount of open space is expected to be constructed in the vicinity of the Development Site. The Eastern Rail Yard project will be located adjacent to the Development Site to the east and would contain approximately six acres of open space (when accounting for a portion of the High Line). Hudson Park and Boulevard, a broad open space and boulevard system located midblock between Tenth and Eleventh Avenues, would extend from West 33rd to West 36th Streets. These open spaces are expected to be completed by 2017. Construction activity associated with the Proposed Actions would not directly affect either of these open spaces.

The Proposed Actions would also include approximately 5.45 acres of open space within the Development Site, with approximately 1.63 acres to be completed by 2017 and the remainder to be completed by 2019.

The Hudson River Park/Route 9A bikeway, Hudson Park and Boulevard, the open space associated with the Eastern Rail Yard, and the open space proposed for the Development Site would likely experience increased levels of noise, and under dry and windy conditions during the early stages of construction, dust from demolition and excavation activities associated with construction of the Development Site. These conditions would be temporary, and with implementation of measures discussed in the Noise and Air Quality sections below, are not anticipated to be significant and adverse.

A neighborhood park is located along the east side of Tenth Avenue between West 47th and West 48th Streets, approximately 250 feet from the Tenth Avenue Site. The open space has basketball courts, playground equipment, and park furniture. Construction at the Tenth Avenue Site may at times be audible at the park, but would not cause significant adverse impacts.

HISTORIC RESOURCES

The High Line, which extends along the West 30th Street and Twelfth Avenue frontages of the Development Site, is eligible for listing on the State and National Registers of Historic Places. Construction on the Development Site would require the development and implementation of a CEPP in coordination with, among other entities, OPRHP and the New York City Landmarks Preservation Commission (LPC) to avoid any adverse physical, construction-related impacts to the High Line, such as those from ground-borne vibrations, falling objects, dewatering, flooding, subsidence, collapse, or damage from construction machinery. Therefore, as described in Chapter 8, "Historic Resources," an LOR will be executed among the co-leads, OPRHP, and the Developer, which will stipulate the development and implementation of a CEPP.

Appropriate components of the CEPP would follow the guidelines set forth in LPC's *Guidelines for Construction Adjacent to a Historic Landmark* and *Protection Programs for Landmark Buildings* and the National Park Service's *Preservation Tech Notes, Temporary Protection #3: Protecting a Historic Structure during Adjacent Construction*. The CEPP would also follow the requirements established in *TPPN #10/88*, concerning procedures for the avoidance of damage to adjacent historic structures from nearby construction activities, in addition to the guidelines set forth in Section 523 of the *CEQR Technical Manual*. Construction procedures to protect the foundations and structures of the High Line would be developed and monitored by structural and foundation engineers. The CEPP would:

- Describe in detail the excavation and construction procedures that would occur on the development parcel;
- Provide for the inspecting and reporting of existing conditions;
- Establish protection procedures. (This would include establishing the types and locations of barriers that will be used to project the High Line during construction, as it is located on the Development Site);
- Establish a monitoring program to measure vertical and lateral movement and vibration;
- Establish and monitor construction methods to limit vibrations; and
- Establish methods and materials to be used for any repairs.

Under the CEPP, the structural and foundation engineers would be empowered to issue "stop work" orders to prevent damage to the High Line. Restarting work following a "stop work" order would require approval of LPC.

TRAFFIC

Construction of the Development Site Project from 2011 to 2019 would result in local traffic disruptions and generate construction worker and truck traffic. A detailed evaluation of construction sequencing and worker/truck projections was therefore undertaken to assess potential transportation-related impacts associated with construction. As demonstrated below, projected construction activities are not expected to result in significant adverse parking impacts. However, some significant adverse construction-related traffic impacts are anticipated as construction activities accelerate peak in late 2016.

CONSTRUCTION TRAFFIC PROJECTIONS

Average daily construction worker and truck activities by month, quarter, and rolling annual average were projected for the eight years of construction. These projections were further refined to account for worker modal splits and vehicle occupancy, arrival and departure distribution, and the passenger car equivalent (PCE) factor for truck traffic (i.e., each truck is considered to be the equivalent of two passenger cars).

Daily Workforce and Truck Deliveries

For a reasonable worst-case analysis of potential transportation-related impacts during construction, the average of the daily workforce and truck trip projections in the peak quarter was used as the basis for estimating peak hour construction trips. Based on construction commencing in the Spring of 2011, the combined construction worker and truck traffic peak would occur in the fourth quarter of 2016. The daily average numbers of construction workers and truck deliveries during this construction peak quarter were estimated at 1,623 workers and 92 truck deliveries per day. These estimates of construction activities are further discussed below.

Construction Worker Modal Splits

According to the U.S. Census reverse journey-to-work (RJTW) data, commuting to work via auto in New York City is more prevalent among construction and excavation personnel than for workers in most other occupations. According to the census data, approximately 40 percent of construction workers commute to construction sites via auto, with an average auto-occupancy of 1.23.

Recent experience and surveys conducted at actual construction sites however have shown that carpooling has become more prevalent, particularly at large construction sites. The likely reasons for this trend include: (1) more opportunities 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 in the price of gasoline and parking. For these reasons, a higher auto-occupancy of 1.90, as used in the construction traffic analysis for the Atlantic Yards Arena and Redevelopment Project FEIS (2006) and the First Avenue Properties FEIS (2008) was used for this analysis.

Peak Hour Construction Worker Vehicle and Truck Trips

Site activities would mostly take place during the typical construction shift of 7:00 AM to 3:30 PM. However, some construction tasks, such as foundation and superstructure work, would extend to 6:00 PM, requiring a portion of the construction workforce to remain for an extended shift. A nominal number of truck deliveries may also be expected during these later hours.

Construction truck trips would be made throughout the day (with more trips made during the early morning), and most trucks would remain in the area for short durations. On the other hand, construction worker travel would typically take place during the hours before and after the work shift. For analysis purposes, each worker vehicle was assumed to arrive in the morning and depart in the afternoon or evening; whereas, each truck delivery was assumed to result in two truck trips during the same hour. Furthermore, in accordance with the *CEQR Technical Manual*, each truck was assumed to have a PCE of 2. Hence, a truck delivery to the construction site would result in an equivalent of four vehicle trips (two entering and two exiting) during the same analysis hour.

The estimated daily vehicle trips were distributed throughout the workday based on projected work shift allocations and conventional arrival/departure patterns of construction workers and trucks. For construction workers, the majority (80 percent) of the arrival and departure trips would take place during the hour before and after each shift (6:00-7:00 AM for arrival and 3:30-4:30 PM for departure on a normal day shift or 6:00 -7:00 PM for days with extended shifts). For construction trucks, deliveries would occur throughout the day when the construction site is active. However, to avoid traffic congestion, construction truck deliveries would also often peak during the hour before the regular day shift (25 percent of shift total), overlapping with construction worker arrival traffic. Based on these assumptions, the peak hour construction traffic was estimated for the entire construction period. The peak construction hourly trip projections for the fourth quarter of 2016 are summarized in Table 21-17.

Table 21-17
Development Site: Peak Construction Trip Projections—Fourth Quarter of 2016

Hour Ending	Workers				Truck Trips		Total Vehicle Trips		
	Person Trips		Auto Trips						
	In	Out	In	Out	In	Out	In	Out	Total
7:00 AM	1,298	0	280	0	24	24	304	24	328
8:00 AM	325	0	70	0	9	9	79	9	88
9:00 AM	0	0	0	0	9	9	9	9	18
10:00 AM	0	0	0	0	9	9	9	9	18
11:00 AM	0	0	0	0	9	9	9	9	18
12:00 PM	0	0	0	0	9	9	9	9	18
1:00 PM	0	0	0	0	9	9	9	9	18
2:00 PM	0	0	0	0	9	9	9	9	18
3:00 PM	0	162	0	35	5	5	5	40	45
4:00 PM	0	1,298	0	280	0	0	0	280	280
5:00 PM	0	162	0	35	0	0	0	35	35
6:00 PM	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0
	1,623	**1,623**	**350**	**350**	**92**	**92**	**442**	**442**	**884**

TRAFFIC

Vehicles generated by construction activities were assigned to the street network to determine the location of critical intersections. Traffic volumes from 6:00 to7:00 AM are approximately 15 percent less than traffic volumes during the 8:00-9:00 AM peak hour. In order to be conservative, the 8:00 to 9:00 AM peak hour existing traffic volumes were used to analyze the 6:00 to 7:00 AM peak hour for construction traffic. Traffic volumes from 3:30 to 4:30 PM are approximately equivalent to the 5:00-6:00 PM peak hour. The 5:00-6:00 PM peak hour existing traffic volumes were used to analyze the 3:30 to 4:30 PM peak hour for construction traffic.

During construction from 2015 through 2017, West 33rd Street will be closed to all but emergency vehicles between Eleventh and Twelfth Avenues. In addition, a number of traffic lanes and sidewalks will be closed at different times, and for different durations, in the study area as a result of Development Site construction and other projects. These closures, which are reflected in the 2016 analysis where appropriate, are summarized in Table 21-18.

Table 21-18
Lane and Sidewalk Closures for Development Site and Proximate Projects

Project	On	Between	From	To	Portion Street Closed	Sidewalk
Western Rail Yard	E side 12 Ave	30th & 33rd St.	June 2010	Dec 2013	Curb Lane	Closed
Western Rail Yard	N side 30th	11 & 12 Ave	July 2011	April 2013	Curb Lane	Closed
Western Rail Yard	S side 33rd St	11 & 12 Ave	July 2013	April 2013	-	Closed
Western Rail Yard	W side 11 Ave	32nd & 33rd St	2013	2014	Curb Lane	Closed
Western Rail Yard	N side 30th St	12 Ave & 200' East	Mar 2012	July 2012	Curb Lane	Closed
Western Rail Yard	N side 30th St	11 & 12 Ave	July 2012	April 2013	Curb Lane	Closed
Western Rail Yard	W side 11 Ave	30th & 33rd St.	July 2013	Jan 2016	Curb Lane	Closed
Eastern Rail Yard	S side 33rd	10 & 11 Ave	Jan 2010	Jan 2011	Curb Lane	Closed
Eastern Rail Yard	E side 11 Ave	30th & 33rd St.	Jan 2012	Mar 2013	Two Lanes	Closed
DOT S. Viaduct	W side 11 Ave	30th & 33rd St.	Early 2009	Late 2009	Three (of Six) Closed	Closed
DOT S. Viaduct	E side 11 Ave	30th & 33rd St.	Late 2009	Late 2010	Three (of Six) Closed	Closed
No. 7 Subway Line	W Side 11 Ave	27th & 29th St	2009	2011	Two Lanes	Open
MTA/DOT Viaduct	36th St.	11 Ave & Empire Line	2011	2013	Entire St.	Both Closed
MTA/DOT Viaduct	W side 11 Ave	35th & 37th St.	2011	2012	Three Lanes	Closed
MTA/DOT Viaduct	E side 11 Ave	35th & 37th St.	2012	2013	Three Lanes	Closed
DOT	E side 11 Ave	33rd & 35th St.	2014	Mid-2015	Three Lanes	Closed
DOT	W side 11 Ave	33rd & 35th St.	Mid-2015	2016	Three Lanes	Closed
DDC Rebuild	33rd St	10 & 11 Ave	2010	2012	Entire St.	Open
DOT Rebuild	33rd St	11 & 12 Ave	2014	2016	Entire St.	Open
DOT	34th St	10 & 11 Ave	2014	2016	One Lane either direction	Open
DOT	34th St	11 & 200' West	2014	2016	One Lane either direction	Closed
DDC Street Connections to 3rd Water Tunnel	10 Ave	28th & 33rd St.	2009	2013	Alternating ½ Street	Open
Private Utilities Rebuild	12 Ave	29th & 36th St.	2012	2016	One Lane; two lanes off-peak	Open
ARC	S side 29th St.	12 Ave & 350' East	2010	2017	Curb Lane	Moved to Curb Lane
ARC	N side 33rd St	Dyer Ave & 250' East	2012	2013	Curb Lane	Moved to Curb Lane
Extell ID #2	N side 33rd St	Hudson Park & 11 Ave	2013	2016	Curb Lane	Moved to Curb Lane
Related ID #7	S side 30th St	10 Ave & 250' West	2010	2011	Curb Lane	Moved to Curb Lane
Moinian ID #4	S side 35th St	11 Ave & 200' East	2013	2016	Curb Lane	Moved to Curb Lane
Block 675	N side 29th St.	12 Ave & 200' East	2018	2021	Curb Lane	Moved to Curb Lane

Traffic volumes in the 2016 conditions in the Future without the Proposed Actions and Future without the Proposed Actions are included in Appendix H. Traffic operations were analyzed at 25 critical intersections in the vicinity of the Development Site within an area extending from West 26th Street in the south to West 37th Street in the north, and from Tenth Avenue in the east to Twelfth Avenue in the west. Under 2016 conditions with construction, significant adverse impacts would occur at 10 locations in the 8:00-9:00 AM peak hour; 8 intersections midday, and 11 intersections in the 5:00-6:00 PM peak hour as summarized in Tables 21-19. A summary of potential mitigation measures for these impacts is presented in Chapter 24, "Mitigation."

Table 21-19
2016 Construction Year Summary of Movements Intersections With Significant Adverse Impacts

	Movements/Intersections Analyzed	Movements/Intersections With No Significant Impacts	Movements/Intersections with Impacts
Weekday AM	71/25	56/15	15/10
Weekday Midday	70/25	69/17	11/8
Weekday PM	70/25	53/14	17/11

Figures 21-3, 21-4, and 21-5 present these results for the morning, midday and evening peak hours, respectively. Traffic Level of Service summary tables are included in Appendix H1, "Construction: Traffic." Morning significant adverse impacts would be located at:

- West 35th Street at Tenth Avenue
- West 34th Street at Twelfth, Eleventh and Tenth Avenues
- West 33rd Street at Tenth and Twelfth Avenues
- West 31st Street at Tenth Avenue
- West 30th Street at Twelfth, Eleventh and Tenth Avenues
- West 29th Street at Twelfth Avenue

Midday significant adverse impacts would be located at:

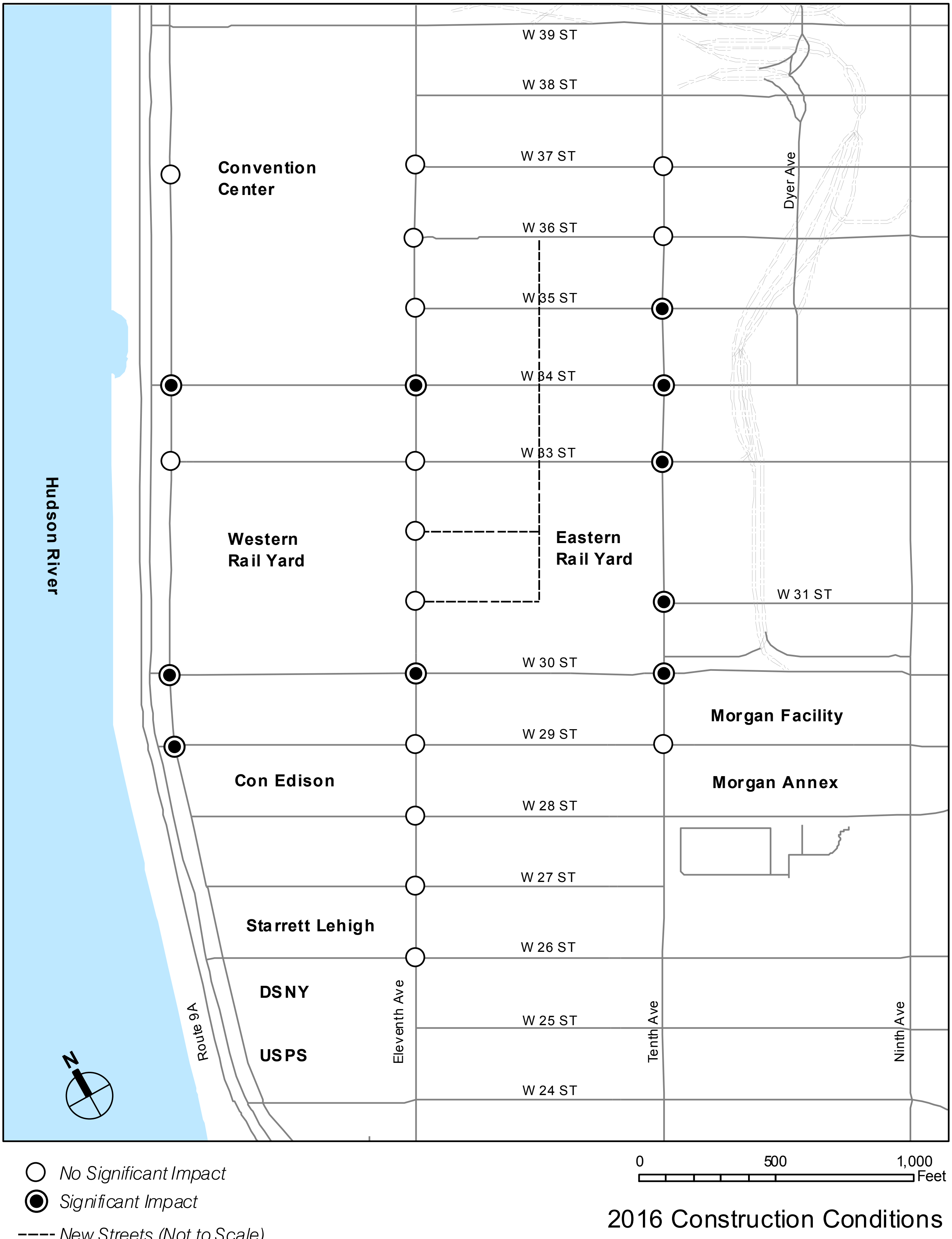
- West 34th Street at Twelfth, Eleventh and Tenth Avenues
- West 33rd Street at Tenth Avenue
- West 30th Street at Twelfth, Eleventh and Tenth Avenues
- West 29th Street at Twelfth Avenue

Evening significant adverse impacts would be located at:

- West 37th Street at Tenth Avenue
- West 36th Street at Tenth Avenue
- West 35th Street at Tenth Avenue
- West 34th Street at Twelfth, Eleventh and Tenth Avenues
- West 33rd Street at Tenth Avenue
- West 31st Street at Tenth Avenue
- West 30th Street at Eleventh and Tenth Avenues
- West 29th Street at Twelfth Avenue

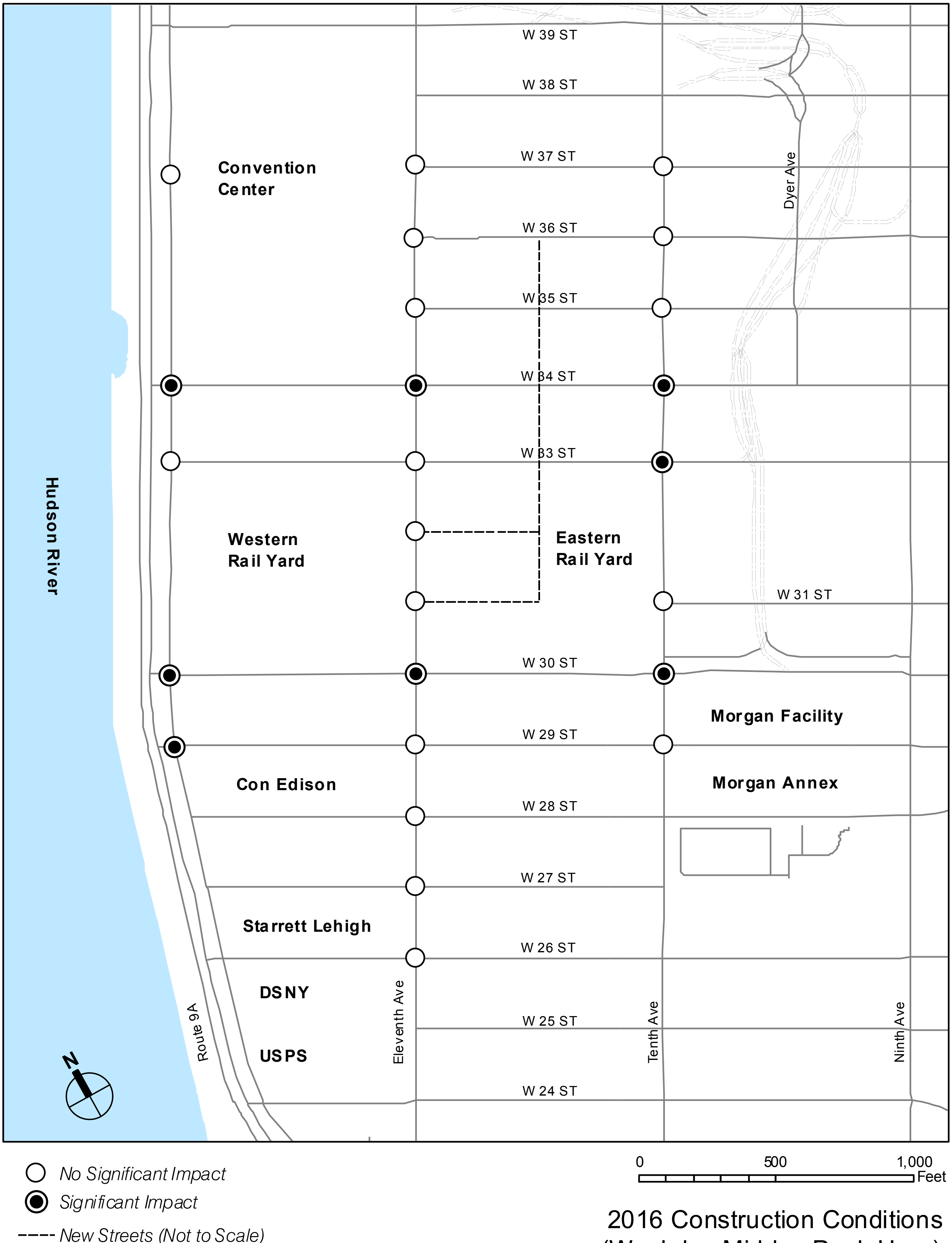
DELIVERIES

Some trucks approaching the construction area would be prohibited from using certain bridge or tunnel crossings into Manhattan—such as the Queens-Midtown, Lincoln, and Holland Tunnels—due to vehicle height restrictions. Commercial carriers would be advised to avoid specific routes, including local cross-town streets in Midtown Manhattan that prohibit large vehicles, and cross-town streets that do not provide direct through passage to the development



2016 Construction Conditions
(Weekday AM Peak Hour)

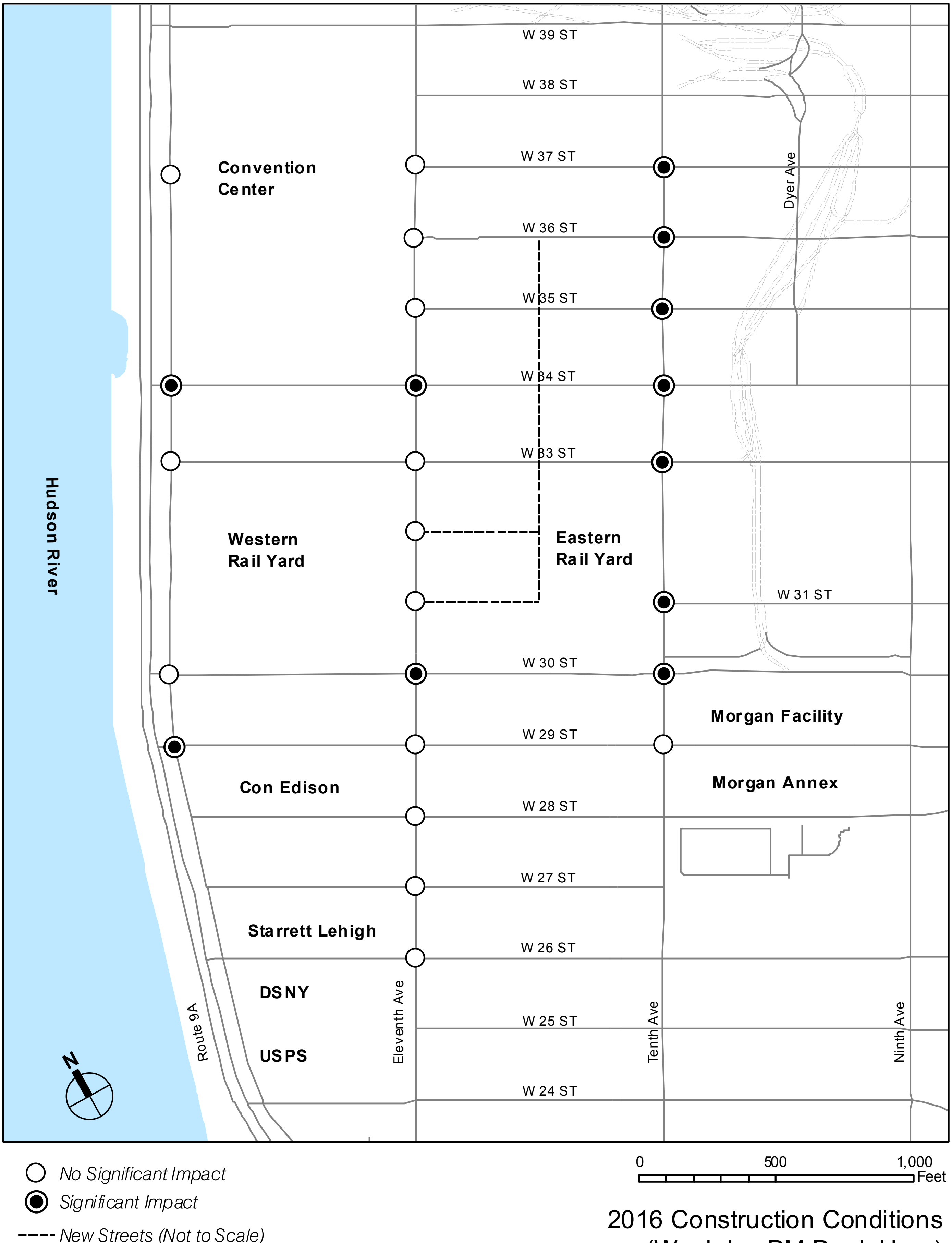
Figure 21-3



WESTERN **RAIL YARD**

2016 Construction Conditions
(Weekday Midday Peak Hour)

Figure 21-4



2016 Construction Conditions (Weekday PM Peak Hour)

Figure 21-5

site. Trucks would be required to use DOT-designated truck routes. At the project sites, flaggers would manage the access and movements of trucks. Limited site deliveries may occur along the perimeters of the construction sites within delineated closed-off areas for concrete pour or steel delivery.

CURB LANE CLOSURES AND STAGING

Based on the current construction plan, curb lane and/or sidewalk closures are anticipated adjacent to the Development Site, as summarized previously in Table 21-18. Sidewalk protection or temporary sidewalks would be provided to maintain pedestrian access. Staging areas would be required from the start of foundation work until the hoists are completely removed at the completion of the core and shell stage. Because the majority of construction activities would be accommodated on-site, construction trucks would be staged primarily within the development site.

Maintenance and protection of traffic plans would be developed for all anticipated curb lane and sidewalk closures. Approval of these plans and implementation of all temporary sidewalk and curb lane closures during construction would be coordinated with DOT's Office of Construction Mitigation and Coordination (OCMC). Where temporary bus stop and layover relocations are required, approvals would also be obtained from the New York City Transit (NYCT).

PARKING

Construction Worker Auto Parking—Future with Construction in 2009

Construction worker auto trips were assigned to off-street parking facilities located within ½ mile of the Development Site. As shown in Table 21-20, during the weekday midday period, overall parking utilization would increase from 134 to 140 percent and the parking shortfall would increase from 1,982 to 2,332 spaces.

Table 21-20
Development Site: Peak Construction Parking Projections—Third Quarter of 2016

Analysis Period	Total Capacity	Demand	Utilization Rate	Available Spaces
Weekday Midday	5,869	8,201	140%	(2,332)

TRANSIT AND PEDESTRIANS

The number of construction workers associated with the Proposed Actions would vary throughout the duration of construction activities. The peak for on-site construction workers is well defined, of short duration, and coincides with the period when seven of the eight buildings on the Development Site are under construction, and six of the eight buildings are at a stage of construction where large numbers of workers are needed (carpentry, painting, plumbing and electric trades, and heating, ventilation and air conditioning trades).

In the early stages of construction—from early 2011 to late 2013—the number of workers at the Development Site is expected to be fewer than 400 per day. From late 2013 through approximately August 2015 the number of construction workers is expected to fluctuate between 400 and 800. From August 2015 the number of workers is expected to increase steadily to a peak of approximately 1,600 in December 2016 and January 2017 and from there, drop rapidly until construction is completed in late 2019.

The peak period for construction workers, when slightly more than 1,600 are expected, is anticipated to last two months—December 2016 and January 2017. Prior to June 2016 and after April 2017 fewer than 1,400 construction workers are expected, and prior to December 2015 and after July 2017, fewer than 1,000 workers are expected. As a point of reference, the number of pedestrians generated after completion of the Proposed Actions would total more that 10,000 during the mid-day peak hour (see Chapter 18, "Transit and Pedestrians").

Construction workers would commute to work either by walking, driving alone or carpooling, or using public transportation. Because typical construction hours throughout New York City begin at 7:00 AM it is assumed that an eight-hour shift would begin at 7:00 AM and end at 3:30 PM. For construction of those portions of the Proposed Actions that would employ two shifts, the first shift begin at 7:00 AM and end at 3:30 PM and the second would begin at 2:30 PM and end at 11:00 PM. In either case—one eight-hour shift or two eight-hour shifts per day—construction workers' commute would not coincide with the AM or PM peak hour for public transportation or the AM or PM peak hour for vehicular traffic. There would not be a significant adverse impact on pedestrian circulation due to construction of the Proposed Actions.

AIR QUALITY

DEVELOPMENT SITE

Potential air quality impacts of the construction from the construction of the Development Site and Additional Housing Sites include emissions generated by on-site activities (i.e., demolition, excavation activities, spoil and rock removal, construction equipment, and truck movement) and off-site activities (mobile source-traffic effects due to truck trips and lane closures) activities related to the construction activities at the Development Site.

This section includes a description of the measures that would be incorporated into the Development Site's construction contracts to minimize air quality impacts, an estimation of the applicable air pollutant emission rates generated by both diesel-powered construction equipment and dust generating activities anticipated during construction-phase, and an analysis (using dispersion modeling) to estimate the potential air quality impacts of these construction-phase emissions.

The analysis of the potential air quality impacts of construction-phase activities includes:

- An estimate of both on-site and on-road construction-related sources of air emissions;
- An estimate of the potential air quality impacts of emissions from construction activities;
- An estimate of the potential overall combined impacts of both source types, where applicable; and
- An estimate of the cumulative impacts of the combined effects of Development Site construction activities and construction activities anticipated to occur on nearby properties during the evaluation period.

Pollutants for Analysis

In general, construction equipment engines of air quality concern are diesel-powered, which generate emissions that could cause relatively high, localized levels of nitrogen dioxide (NO_2) and particulate matter (PM). Construction activities also generate fugitive dust particles, which are very small, and liquid and solid particles that originate primarily from the soil and are suspended in the air. Although diesel engines emit relatively small amounts of carbon monoxide

(CO), the large size and number of these engines could also lead to elevated CO concentrations, and impacts from local traffic could increase mobile-source-related emissions of CO as well. Therefore, the pollutants analyzed for the construction phase analysis are NO_2, CO, particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), and particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$).

Since ultra-low-sulfur diesel fuel (ULSD) would be used in all of construction-phase diesel engines used at the Development Site, the small quantity of sulfur oxide emissions generated by them would not result in a significant addition to the background concentrations of sulfur dioxide (SO_2), and a quantitative analysis of the potential impacts of this pollutant was not warranted.

See Chapter 19, "Air Quality and Greenhouse Gas Emissions," for more details on the applicable air pollutants for the Proposed Actions.

Emission Reduction Measures

The main component of diesel exhaust identified as having a potentially adverse effect on human health is $PM_{2.5}$. To ensure that the construction of the Development Site would result in the lowest practicable diesel PM emissions, the Developer has committed to implementing a state-of-the-art emissions reduction program for all of its construction activities at the Development Site. The commitments, which will be included in the Restrictive Declaration, include:

1. *Diesel Equipment Reduction.* Contractors on the site would minimize the use of diesel engines and maximize, to the extent practicable, the use of electric engines operating on grid power. Construction contracts would specify the use of electric engines where practicable and ensure the distribution of power connections throughout the Development Site as needed. Equipment that would use grid power instead of diesel engine power would include, but would not be limited to: tower cranes, personnel/material hoists, and small compressors. Emissions from some generators that would normally be used for construction equipment would also be eliminated. All forklifts would be either electrically powered or powered by natural gas.

2. *Clean Fuel.* ULSD fuel would be used exclusively for all diesel engines throughout the construction phase. This would enable the use of tailpipe reduction technologies (see below) and would directly reduce PM and sulfur oxide emissions.

3. *Best Available Tailpipe Reduction Technologies*. Nonroad diesel engines with a power rating of 50 horsepower (hp) or greater would utilize the best available tailpipe technology for reducing diesel PM emissions. The construction contracts would specify that all diesel nonroad engines rated at 50 hp or greater would utilize diesel particle filters (DPFs) (either original equipment manufacturer [OEM] or retrofit technology) that would result in emission reductions of diesel PM of at least 90 percent when compared with equivalent uncontrolled diesel engines.

4. *Utilization of Tier 2 or Newer Equipment.* In addition to the tailpipe controls commitments, the Development Site's construction program would mandate the use of Tier 2[1] or later

[1] The first federal regulations for new nonroad diesel engines were adopted by the EPA in 1994 (Tier 1 for engines greater than 50 hp). The 1998 regulations introduce Tier 1 emissions standards for engines smaller than 50 hp and phases in the increasingly stringent Tier 2 and Tier 3 standards for equipment manufactured from 2000 through 2008. Tier 4 standards for nonroad engines introduced in 2004 apply to

construction equipment for non-road diesel engines for construction equipment with a power output of 50 hp or greater. As Tiers 3 and 4 engines become available, these would be required for contracts that start work in later years. Tier 3 engines would require retrofits with DPFs, as particulate emissions under Tier 3 are significantly higher than under Tier 4. The use of a Tier 2 or Tier 3 engine with a DPF is equivalent to the use of Tier 4 engines. Gasoline-powered non-road engines would also be required to meet the latest emissions standards for newly manufactured engines.

The use of newer engine models with cleaner emissions standards, such as 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). Each Tier emissions standard is less polluting than the previous one for all criteria pollutants, including PM. Additionally, while all engines undergo some deterioration over time, newer (as well as better maintained) engines will emit less PM than their older Tier or unregulated counterparts.

5. *Idling Limitations.* To reduce pollutant emissions during construction activities (in accordance with all applicable laws, regulations, and building codes), vehicle idle time on-site and within 10 feet from the site perimeter vehicle idle time will be limited to three minutes for all vehicles that are not using the engine to operate a loading, unloading, or processing device (e.g., concrete mixing trucks).
6. *Source Location.* To minimize potential air quality impacts on nearby sensitive land uses, large emissions sources, such as concrete truck activities and pumping operations, would be located, to the extent practicable, away from residential buildings, schools, and playgrounds.
7. *Dust Control.* Strict fugitive dust control plans would be required as part of contract specifications. For example, areas would be established for washing dust off of the wheels of all trucks that exit the large construction areas. Truck routes within the construction areas would be either watered as needed or, in cases where such routes would remain in the same place for extended periods, the soil on these roadways would be stabilized, covered with gravel, or temporarily paved to avoid the re-suspension of dust.

   All trucks hauling loose material would be equipped with tight fitting tailgates and covered prior to leaving the sites. In addition to regular cleaning by the City, area roads adjacent to the sites would be cleaned at greater frequencies to minimize dust emissions. Chutes would be used for material drops during demolition. An on-site vehicular speed limit of 5 miles per hour would be imposed. Water sprays would be used for all excavation, demolition, and transfer of spoils to ensure that materials are dampened as necessary to avoid the suspension of dust into the air. Loose materials would be watered, stabilized with a biodegradable suppressing agent, or covered.

Assessment Methodology

Air Quality Standards and Significant Impact Thresholds

Chapter 19, “Air Quality and Greenhouse Gas Emissions,” includes a discussion of national and local ambient air quality standards, New York State and New York City significant threshold

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equipment manufactured between 2008 and 2015. The Tier 1 through 4 standards regulate the EPA criteria pollutants, including particulate matter (PM), hydrocarbons (HC), oxides of nitrogen (NO_x) and carbon monoxide (CO). Prior to 1994, emissions from nonroad diesel engines were unregulated. These engines are typically referred to as Tier 0.

values, applicable background concentrations, and the methodologies for conducting stationary and mobile source air quality analyses for the construction phase of the Development Site Project.

Emission Estimates and Critical Year for Impact Analysis

Construction-phase emission rates were estimated for CO, NO_x, PM_{10}, and $PM_{2.5}$ for each of the various stages and types of construction activities associated with the Proposed Actions (see Appendix H2, “Construction: Air Quality”). These estimates were developed based on a schedule that has construction activities starting in 2011 and ending in 2019.

Emission rates of each pollutant from all sources of that pollutant were estimated for each major construction phase to determine time periods with the highest emission generation potential. Peak working day and annual average emission rates were estimated for each year of the eight-year construction period. The sizes, types, and number of construction equipment were estimated based on the anticipated construction schedule.

Emission factors for nitrogen oxides (nitrogen oxide and NO_2, collectively referred to as NO_x), CO, PM_{10}, and $PM_{2.5}$ from on-site construction engines were developed using the EPA’s NONROAD2005 Emission Model (NONROAD). The model is based on source inventory data accumulated for specific categories of nonroad equipment. Emission factors for each type of equipment were calculated from the NONROAD output files (i.e., calculated from regional emissions estimates). Construction period of this project spans years when implementation of the new EPA “Clean Air Non-road Diesel Rule” (which includes mandated use of cleaner diesel fuel and application of more stringent emission controls for diesel engines) would take effect, and the emission reductions associated with this rule were included in the emission estimates for the appropriate years.

With respect to trucks, emission rates for $NO_{X,}$ CO, PM_{10}, and $PM_{2.5}$ were developed using the EPA MOBILE6.2 Emission Model (MOBILE6). Fugitive dust emission factors for demolition, excavation, truck loading, and re-entrained dust were based on the equations recommended in the EPA’s AP-42 report entitled, “Compilation of Air Pollutant Emission Factors.”

In order to assess the possible cumulative effect of other construction projects in the area; emissions anticipated to be generated from the construction of adjacent projects in the study area were considered, including the construction of the following projects were considered:

- New Jersey Transit’s Access to the Region’s Core (ARC) Project;
- The Flushing Line (No. 7) subway extension and the associated terminal station at West 34th Street and Eleventh Avenue; and
- Individual development sites in the Hudson Yards area adjacent to the Development Site (Extell, Moinian, and Eastern Rail Yard development sites).

Emission data for the construction of these projects were obtained from the most currently approved EISs (or assessments) of each project.

Peak daily, monthly and annual emission rates were estimated for each year of the 8-year Development Site construction phase. Table 21-21 provides the estimated annual emission rates of each applicable pollutant during each year of the construction phase. While this table presents annual emission rates, the impact modeling analyses were based on both peak yearly and peak daily emission rates for each pollutant for each year in which construction would occur.

Table 21-21
Annual Emissions from Construction Equipment and Activities (Future with the Proposed Actions)

Pollutant	Emissions (Tons/Year)								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
CO	5.4	9.3	12.7	30.0	31.8	**60.8**	52.2	39.8	7.9
NO_x	21.9	**41.9**	40.3	41.5	4.9	7.6	6.1	4.2	1.4
PM_{10}	0.9	2.2	2.6	**3.5**	0.1	0.9	0.2	0.1	0.01
$PM_{2.5}$	0.2	0.5	0.5	**0.8**	0.1	0.3	0.1	0.1	0.02

Note: Bold indicates highest emission levels for each pollutant.

On-Site Construction Activity Impact Assessment

Atmospheric dispersion analyses were conducted to estimate pollutant levels at nearby sensitive air quality receptor sites (i.e., points at or beyond the Development Site Project's fence line). The EPA's AERMOD air quality dispersion model was used for this analysis along with five years (2002 through 2006) of meteorological data from LaGuardia Airport.

Separate analyses were conducted to estimate short-term (1-hour, 8-hour and 24-hour) pollutant levels and long-term (annual average) pollutant levels. Short-term emission estimates were based on peak period (daily) activity levels at the site; long-term estimates were based on annual average activity levels.

All construction-related emissions within the construction site itself, as well as from other nearby construction sites, were modeled using the area source algorithm incorporated into the AERMOD model. Receptors were placed at the nearest areas of public access, sidewalks and at the windows of the residential buildings, as applicable.

The results of this analysis, presented in Table 21-22, determine the incremental effects of all Development Site emission sources combined at each receptor location. In order to compare the resulting air quality levels from the modeling analyses to the applicable standards, estimated impacts were added to applicable background concentrations (as discussed below) to obtain total pollutant concentrations. Because the background concentrations in the study area exceed the $PM_{2.5}$ 24-hour and annual standards and following the DEP interim guidance (see Chapter 19, "Air Quality and Greenhouse Gas Emissions"), the project $PM_{2.5}$ impacts were compared to the applicable STV.

Table 21-22
Maximum Predicted On-Site Increments—Development Site

Pollutant	Averaging Period	Max Project Increment	Applicable STV
CO (ppm)	1-Hour	2.4	
	8-Hour	0.6	
NO_2 (µg/m^3)	Annual	10.5	
PM_{10} (µg/m^3)	24-Hour	6.8	
$PM_{2.5}$ (µg/m^3)	24-Hour	1.73	2 to 5
	Annual Neighborhood*	0.03	0.1
	Annual Max	0.26	0.3

Notes: STV = significant threshold values
* Impacts were estimated following DEP procedures for a "neighborhood" level analysis for comparison with applicable DEP STV.

Analysis of Off-Site (Mobile Source) Construction Activities

The analysis of off-site mobile source impacts include the impacts of construction-phase vehicles on the roadway network as well as the effects of anticipated changes in street configurations as a result of lane closures during the peak construction year. The most critical year for the mobile source analysis represents the scenario with the highest level of construction-related truck deliveries, since it has the largest emission generation potential. The highest volume of construction-related truck traffic is expected in 2017.

The following intersections around the Development Site with the highest incremental construction-related truck traffic volume were selected:

- Twelfth Avenue at West 33rd and West 30th Streets;
- Eleventh Avenue at West 33rd and West 30th Streets; and
- Tenth Avenue and West 34th Street.

The CAL3QHC dispersion model was applied for the CO analysis, and the CAL3QHCR version applied for both the PM_{10} and $PM_{2.5}$ analyses (see Appendix H2, "Construction: Air Quality"). Analysis was conducted for both conditions in the Future with and without the Proposed Actions to estimate the increments due to off-site construction activities. The modeling procedures and assumption for this analysis follow the mobile source air quality analysis methodology described in Chapter 19, "Air Quality and Greenhouse Gas Emissions."

Off-site increments of construction-related activities (i.e., off-site trucking and vehicular driving activities), which are presented in Table 21-23**,** reflect the effects of changes in traffic conditions (i.e., traffic effects due to trucking activity, employee driving, and lane closings). The peak traffic construction year was identified as 2017, which is when the largest increment of construction related truck activity would occur.

Table 21-23
Maximum Predicted Off-Site Increments[1]

Pollutant	Averaging Period	Maximum Increment	Applicable STV
CO (ppm)	1-Hour	0.2	
	8-Hour	0.15	
PM_{10} (µg/m^3)	24-Hour	6.74	
$PM_{2.5}$ (µg/m^3)	24-Hour	1.32	2 to 5
	Annual Neighborhood[2]	0.092	0.1

Notes: STV = significant threshold values
1. The off-site increments are the result of differences in future traffic conditions with and without construction activities.
2. Impacts were estimated following DEP procedures for a "neighborhood" level analysis for comparison with applicable DEP STV.

Analysis Results

Construction-Related Impacts from On-Site and Off-Site Sources

The potential impacts from the nearby off-site intersection were combined with the results of the on-site analysis to estimate total on-site and off-site construction phase impacts at each area.

Maximum increments (on-site plus off-site) and total concentrations (maximum increments plus background values) for each pollutant of concern are shown in Table 21-24**.**

Table 21-24
Maximum Predicted Increments and Total Concentrations—Development Site On-Site and Off-Site Sources

Pollutant	Averaging Period	Highest Predicted Increments and Total Concentrations		Applicable NAAQS	Applicable STV
		Maximum Increments[1]	Maximum Total Concentration[2]		
CO (ppm)	1 Hour	2.6	6.4	35	
	8 Hours	0.8	3.7	9	
NO_2 (µg/m^3)	Annual	10.5	81.5	100	
PM_{10} (µg/m^3)	24 Hours	7.3	67.3	150	
$PM_{2.5}$ (µg/m^3)	24 Hours	1.97	41.1	35	2 to 5
	Annual Neighborhood[3]	0.07	15.9	15	0.1

Notes: STV = significant threshold values
1. Maximum on-site plus off-site levels.
2. Maximum on-site plus off-site levels plus background values.
3. Impacts were estimated following DEP procedures for a “neighborhood” level analysis for comparison with applicable DEP STV.

NA = not applicable (only impacts are considered quantitatively, not total concentrations).

Total concentrations resulting from the Development Site emissions at the most critical (highest impact) sites would not exceed the NAAQS or applicable thresholds for all pollutants analyzed. The $PM_{2.5}$ results are conservatively based on existing monitored data and do not reflect any future reductions pursuant to attainment measures required by law. As such, the potential impacts of these emissions are not considered to be significant.

Cumulative Construction-Related Impacts from Development Site and Adjacent Construction Sites

In order to determine the cumulative effect of the Development Site’s peak construction activities, and the concurrent activities at adjacent future No Build development sites during the critical year, analyses were conducted that estimated the potential impacts of the construction-related emissions of the proposed project together with emissions generated during construction of nearby projects. Emissions from on-site and off-site activities were included in these analyses.

Total pollutant concentrations of NO_2 and PM_{10} were considered in this analysis. CO concentrations were not considered because the construction impacts of proposed project on CO concentrations were minor (i.e., total concentrations are less than 50 percent of the standard) and the $PM_{2.5}$ increments associated with the construction of the proposed project were already estimated.

Emissions from the construction of the following projects are included in this analysis:

- Eastern Rail Yard, which is located between West 30th and West 33rd Streets and Tenth and Eleventh Avenues;
- ARC construction site, which is located between West 29th and West 28th Streets and Twelve and Eleventh Avenues;
- Flushing Line (No. 7) subway extension and the associated terminal station at West 34th Street and Eleventh Avenue; and
- Individual development sites in the Hudson Yards area adjacent to the Development Site (Extell and Moinian development sites)

The result of this analysis, which is shown in Table 21-24, is that the total concentrations from the cumulative impacts of all of these projects, together with the Proposed Actions, will not cause an exceedance of the NAAQS at any of the analysis sites considered. As such, the impacts of these impacts are not considered to be significant. In addition, as the construction impacts of a construction project occur mostly near the construction site, the locations of these maximum cumulative concentrations (Table 21-25) are different from the locations of maximum impacts of the Development Site construction alone (Table 21-24), and the Development Site construction contribution to the total concentrations may be minor.

Table 21-25
Maximum Predicted Increments and Total Concentrations—Cumulative Effects of Development Site and Adjacent Sites: On-Site and Off-Site Sources

Pollutant	Averaging Period	Highest Predicted Increments and Total Concentrations		Applicable NAAQS
		Maximum Increments[1]	Maximum Total Concentration[2]	
NO_2 (µg/m^3)	Annual	11.8	82.8	100
PM_{10} (µg/m^3)	24 Hours	24.5	84.5	150
$PM_{2.5}$ (µg/m^3)[4]	24 Hours	1.94	41.1	35
	Annual Neighborhood[3]	0.07	15.9	15

Notes:
1. Maximum on-site, off-site and adjacent sites impact.
2. Maximum on-site, off-site and adjacent sites impact plus background level.
3. Impacts were estimated following DEP procedures for a "neighborhood" level analysis for comparison with applicable DEP STV.
4. Maximum PM2.5 total concentrations include on-site, off-site and representative monitored levels.

The $PM_{2.5}$ results are conservatively based on existing monitored data and do not reflect any future reductions pursuant to attainment measures required by law.

Consistency with PlaNYC

The Developer has committed to utilizing the most effective emission reduction measures that are consistent with the requirements of PlaNYC, as listed above under Emission Reduction Measures. PlaNYC intends construction projects to abide by all applicable New York City, State and local construction requirements in order to reduce on-site and off-site construction-related emissions.

ADDITIONAL HOUSING SITES

Potential air quality impacts of construction of the proposed Additional Housing Sites include emissions generated by on-site and off-site construction activities. The on-site emissions would relate to excavation and buildings construction and would include fugitive dust from earth-moving operations and emissions from diesel-fueled construction equipment. The off-site emissions are effects of delivery truck trips and possible lane closures. All appropriate control measures to minimize the impacts on the surrounding active uses would be employed. The control measures may include:

- Wet suppression with or without approved binding agents, used on-site on a routine basis with hoses or a sprinkler system during deconstruction and material handling activities aiming at a 10 percent moisture content in the ground;
- Wet spray power vacuum street sweeper used on paved roadways;
- Use of calcium chloride instead of wet suppression when freezing conditions exist;
- Use of solid wood 10-foot barriers around the perimeter of each construction site;
- Use of covered sidewalks when the sidewalk is partially used as part of the construction site;

- Use of wheel-wash stations or crushed stone at construction ingress/egress areas;
- Covering dump trucks during material transport on public roadways;
- Limiting unnecessary idling times on diesel-powered engines to three minutes; and
- Limiting truck speed within the site at less than 5 mph.

In addition, ULSF fuel would be used for all construction equipment and delivery trucks.

Construction at the Additional Housing Sites would last less than three years. All feasible New York State and City emission reduction measures would be applied. It is therefore expected that emissions from the Additional Housing Sites construction would be of short duration and would not have significant adverse air quality impacts.

NOISE

DEVELOPMENT SITE

Potential noise and vibration impacts associated with construction operations would vary dramatically based on the type of equipment working in the field, the activities being performed, the locations where the work may be occurring, and the ground conditions. Noise and vibration conditions for each phase of construction (i.e., on-site noise), as well as noise from delivery and dump trucks using the proposed haul routes (i.e., mobile noise), were analyzed in accordance with impact criteria, as per the *CEQR Technical Manual* guidelines for assessing impacts from mobile and on-site construction activities. Construction operations and noise conditions are also required expected to also comply with the New York City *Construction Noise Regulations* with respect to equipment noise emission levels, the use of noise mitigation barriers, and the development of, and adherence to a Noise Mitigation Plan.

CEQR Construction Noise 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." Based on CEQR construction noise criteria, 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 noise impact criteria for vehicular sources, using existing noise levels as the baseline, should be used for assessing construction impacts. The CEQR construction noise criteria allow for an increase of less than 3, 4, or 5 decibels above the existing noise conditions depending on measured ambient hourly L_{eq} noise levels at each receptor.

Predicted project-generated construction noise levels are added logarithmically to the existing measured noise levels in order to determine total noise levels at each receptor location. The total noise is considered when applying the CEQR impact criteria rather than just the noise contribution activities, is considered when applying the CEQR noise impact criteria.

The *CEQR Technical Manual* construction noise guidelines state that:

- During the daytime hours of 7:00 AM to 10:00 PM, if the existing ambient noise level is 60 dBA $L_{eq(h)}$ or less, a 5 dBA or greater change would be considered to be an impact;
- If the ambient noise level is 61 dBA $L_{eq(h)}$, the maximum incremental increase would be 4 dBA, which would be considered an impact;

- If the ambient noise level is 62 dBA $L_{eq(h)}$ or more, a 3 dBA or greater change would be considered to be an impact; and
- During the nighttime hours of 10:00 PM to 7:00 AM, a change of 3 dBA would be considered to be an impact regardless of the ambient level.

New York City Construction Noise Regulation

New York City Local Law 113 mandates to create a new set of construction noise regulations (i.e., Rules) for inclusion in the New York City Noise Code, Section 24-219, Title 15, of the Rules of the City of New York. As a result, revisions to Chapter 28 of the Rules of the City of New York were revised to specifically address construction noise and to provide requirements for proactive avoidance and options for mitigation. The new construction noise regulations went into effect on July 1, 2007 and apply to any and all work occurring within New York City's five boroughs.

The new Construction Noise Regulations of the New York City Noise Code apply emission limits to individual pieces of equipment (expressed as L_{eq} levels at a distance of 50 feet in dBA Slow) as opposed to noise receptor locations (see Table 21-26).

Table 21-26
Construction Equipment Noise Emission Levels (dBA)

Equipment List	DEP & FTA Typical Noise Level at 50 feet[1]
Asphalt Paver	85
Asphalt Roller	85
Backhoe/Loader	80
Compressors	80
Concrete Pump	82
Concrete Trucks	85
Cranes	85
Cranes (Tower Cranes)	85
Delivery Trucks	84
Drill Rigs	84
Dump Trucks	84
Excavator	85
Excavator with Ram Hoe	90
Fuel Truck	84
Generators	82
Hoist	85
Impact Wrenches	85
Jack Hammer	85
Mortar Mixer	80
Power Trowel	85
Powder Actuated Device	85
Pump (Spray On Fire Proof)	82
Pump (Water)	77
Rebar Bender	80
Rivet Buster	85
Rock Drill	85
Saw (Chain Saw)	85
Saw (Concrete Saw)	90
Saw (Masonry Bench)	85
Saw (Circular & Cut off)	76
Saw (Table Saw)	76
Sledge Hammers	85
Street Cleaner	80
Tractor Trailer	84
Vibratory Plate Compactor	80
Welding Machines	73

Source: Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007. Transit Noise and Vibration Impact Assessment, FTA, May 2006

Construction associated with the Proposed Actions must adhere to the following requirements:

- Develop and follow a Noise Mitigation Plan;
- Erect 18 foot noise barriers around the perimeter of the construction site;
- Use equipment whose noise emission levels comply with those found in the Federal Highway Administration (FHWA) Roadway Construction Noise Model;
- Provide laborer training for quieter work methods;
- Inform the affected public about work schedule and mitigation plans;
- Use quieter-type adjustable backup alarms on equipment post 2008; and
- Select from a menu list of additional mitigation options for particularly noisy work involving pile driving, hoe-ramming, jackhammering, or blasting.

If construction work would occur "after hours" (i.e., from 6:00 PM to 7:00 AM), an Alternative Noise Mitigation Plan must be developed and submitted to DEP for approval before work can commence. At a minimum, 18 foot noise barriers must be used around the work site; noise predictions must be done using the emission levels contained in the Roadway Construction Noise Model; and additional mitigation must be applied for particularly noisy devices, as necessary.

Finally, there are no noise criteria limits applied at receptor locations in the new Construction Noise Regulations. The only decibel limits in the Rules are those applied to emission levels of individual equipment, expressed as L_{max} levels at a distance of 50 feet in dBA Slow, for any and all equipment working on-site.

On-Site Construction Noise

The construction equipment expected for use in building the platform over the rail yard includes typical heavy equipment such as cranes, caisson drill rigs, excavators, loaders, pneumatic tools and compressors. Construction of the buildings would include the use of cranes and lifts, excavators, concrete pouring, concrete saws, pneumatic tools, bar benders, tampers and rollers, and pile drivers in two locations. Of the noisier types of equipment, an impact pile driver is expected for occasional use at buildings WR-3 and WR-4, and a hoe-ram would likely be used only at building WR-2. Additionally, jackhammers, pavement cutters, and impact wrenches are expected to be used during construction of all buildings. Finally, dump trucks and delivery trucks are expected to service the site on an intermittent basis as needed. All of these noise sources were taken into account in this analysis, in accordance with the equipment and trucking schedule provided by Bovis Lend Lease, the construction management team.

Based on the project's construction schedule, work would take place in a sequential but intermittent manner from July 2011 until December 2019 (102 months). For purposes of this evaluation, it was assumed that work would, at times, consist of two eight-hour work shifts during the weekdays ranging from 7:00 AM to 11:00 PM, and occasionally on Saturdays from 8:00 AM to 4:30 PM. Consequently, construction noise levels were evaluated for weekday, evening/night and weekend periods.

If, for scheduling reasons, some construction work activities eventually need to be performed at night or on Sundays, then the contractor would have to prepare and submit an Alternative Noise Mitigation Plan in accordance with the requirements contained in the *Construction Noise Regulations of the New York City Noise Code*. The Alternative Noise Mitigation Plan would identify the expected work operations and equipment to be used "after hours," and would evaluate potential compliance with CEQR noise criteria. If exceedances are expected, the

Alternative Noise Mitigation Plan must clearly identify and commit to implementing suitable noise mitigation measures. The Alternative Noise Mitigation Plan would need to be approved by DEP prior to the work's commencing.

Off-Site Construction Noise

A traffic noise study was also conducted to assess potential noise consequences associated with delivery and dump trucks using haul routes to and from the Development Site. Access gates to the site are expected to be located on both Eleventh Avenue and West 30th Street.

The analysis, in accordance with CEQR traffic noise guidelines, focused on potential worst-case (i.e., loudest) traffic noise conditions along the routes. It was determined that a maximum of seven trucks per hour are expected on any given roadway segment during the peak construction year 2017. The daily schedule of trucks expected to enter and exit the site during morning, mid-day, afternoon and Saturday time periods were considered in this analysis. However, consistent with the conservative approach used in this study, the mobile noise results for the loudest hour were assumed to occur during entire weekday, evening, and weekend timeframes.

It is projected that project-related truck noise would be indistinguishable from prevailing traffic noise. Noise emissions from heavy trucks are equivalent to approximately 47 passenger vehicles each (per CEQR), it would require dozens of trucks per hour to substantially increase what are already relatively high ambient noise levels near the affected roadways. With no more than seven project-related trucks anticipated per hour, it is expected that mobile trucking noise would not substantively add to the noise generated by on-site construction equipment. However, to fully comply with CEQR guidelines, the mobile noise analysis included the changes in traffic noise levels attributable to these trucks at receptor sites located along the haul routes.

Noise Receptors

In consultation with DEP and DCP, 15 receptors at various locations in the area surrounding the Development Site were selected to evaluate noise from on-site construction activities. These are existing or future sensitive noise locations with either a direct line-of-sight to the construction site, or they could potentially be affected by construction-related truck traffic on designated haul routes. Each receptor represents an area of similarly affected buildings. Based on the CEQR procedures, no distinction is made to include or exclude potential receptors based on their current land uses. This is because the noise criteria approach used by CEQR is applied equally to any type of building, structure, or property. The approach also recognizes that a given receptor's land use may change over time. The receptor locations and land uses considered in this analysis are shown in Figure 21-6 and are summarized in Table 21-27.

Ambient Noise Levels

Ambient noise levels were measured at the 15 receptor locations (see Table 21-28) to identify existing noise conditions and to evaluate construction noise in accordance with CEQR noise guidelines. Hourly L_{eq} noise levels were measured during daytime, evening/night and weekend periods using a Brüel & Kjær (B&K) Model 2231 Precision Sound Level Meter. The B&K 2231 satisfies ANSI Standard S1.4 for Type 1 (precision) accuracy. A three-inch windscreen was used to reduce wind noise on the microphone, and the Sound Level Meter was affixed to a tripod to avoid the influence of the operator's body. The Sound Level Meter's laboratory calibration was verified in the field with a B&K Model 4231 Reference Acoustical Calibrator prior to use. All the noise data were measured in A-weighted decibels using an RMS Slow time response.

Construction Noise Receptor Locations
Figure 21-6

Table 21-27
Construction Noise Receptor Description

Construction Receptor Site No.	Location	Land Use
R1	Twelfth Avenue (between West 33rd St. and West 34th St.)	Hudson River Park (Open Space and Outdoor Recreation, Average of 1 story tall)
R2	West 34th Street (between Eleventh Ave. and Twelfth Ave.)	Convention Center (Average of 3 stories tall)
R3	West 28th Street (between Eleventh Ave. and Twelfth Ave.)	Industrial and Warehouse Buildings (Average of 5 stories tall)
R4	Eleventh Avenue (between West 35th St. and West 36th St.)	Former Javits Plaza (Average of 1 story tall)
R5	Eleventh Avenue (between West 34th St. and West 35th St.)	Commercial and Office Buildings (Average of 4 stories tall)
R6	Eleventh Avenue (between West 33rd St. and West 34th St.)	Commercial and Office Buildings (Average of 5 stories tall)
R7	Eleventh Avenue (between West 31st St and West 33rd St)	Transportation and Utility (Average of 1 story tall)
R8	Eleventh Avenue (between West 29th St. and West 30th St.)	Industrial and Manufacturing (Average of 6 stories tall)
R9	Eleventh Avenue (between West 28th St. and West 29th St.)	Transportation and Utility (Average of 4 stories tall)
R10	West 33rd Street (between Tenth Ave. and Eleventh Ave.)	Commercial and Office Buildings (Average of 5 stories tall)
R11	West 30th Street (between Tenth Ave. and Eleventh Ave.)	Transportation and Utility (Average of 6 stories tall)
R12	Tenth Avenue (between West 31st St. and West 33rd St.)	Commercial and Office Buildings (Average of 5 stories tall)
R13	Tenth Avenue (between West 30th St. and West 31st St.)	Under Construction (Average of 5 stories tall)
R14	Tenth Avenue (between West 33rd St. and West 34th St.)	Commercial and Office Buildings (Average of 4 stories tall)
R15	Tenth Avenue (between West 29th St. and West 30th St.)	Commercial and Office Buildings (Average of 5 stories tall)

Table 21-28
Ambient Noise Measurements

Construction Receptor Site No.	Location	Ambient Noise Level, $L_{eq(h)}$ in dBA		
		Weekday	Night	Weekend
R1	Twelfth Avenue (between West 33rd St. and West 34th St.)	78	72	72
R2	West 34th Street (between Eleventh Ave. and Twelfth Ave.)	72	71	71
R3	West 28th Street (between Eleventh Ave. and Twelfth Ave.)	69	64	66
R4	Eleventh Avenue (between West 35th St. and West 36th St.)	74	69	72
R5	Eleventh Avenue (between West 34th St. and West 35th St.)	74	70	71
R6	Eleventh Avenue (between West 33rd St. and West 34th St.)	73	72	73
R7	Eleventh Avenue (between West 31st St and West 33rd St)	74	74	72
R8	Eleventh Avenue (between West 29th St. and West 30th St.)	73	70	72
R9	Eleventh Avenue (between West 28th St. and West 29th St.)	72	69	68
R10	West 33rd Street (between Tenth Ave. and Eleventh Ave.)	69	67	65
R11	West 30th Street (between Tenth Ave. and Eleventh Ave.)	72	69	68
R12	Tenth Avenue (between West 31st St. and West 33rd St.)	75	75	75
R13	Tenth Avenue (between West 30th St. and West 31st St.)	76	75	75
R14	Tenth Avenue (between West 33rd St. and West 34th St.)	75	75	75
R15	Tenth Avenue (between West 29th St. and West 30th St.)	76	75	75

The ambient noise data were collected at random times from May 28 to December 6, 2008. Weather conditions during noise monitoring periods were noted as follows: wind speed under 15 mph, relative humidity under 80 percent, and air temperatures in the range of 65 to 90°F and with no heavy precipitation. L_{eq} levels are reported because they are only descriptor relevant to CEQR noise guidelines.

Based on the hourly ambient noise data collected at each of the 15 receptor locations, Table 21-27 provides the weekday, evening/night and weekend noise criteria limits for each receptor in accordance with CEQR construction noise guidelines.

Predicted Noise Levels

CadnaA Construction Noise Model

Construction noise levels from on-site equipment were modeled at receptor locations using the CadnaA noise model developed by DataKustik. The CadnaA model implements ISO Standard 9613-2 for environmental noise sources and outdoor sound propagation. It is a comprehensive three-dimensional model in which noise sources are assembled from point, line and/or area components, each emitting sound power in octave bands or broadband A-weighted format.

Distance losses, ground attenuation, wind effects, building shielding, and barrier/berm effects are computed in the CadnaA model, and the resulting noise levels are predicted at any number of receptor locations of interest.

A construction equipment schedule was provided by Bovis Lend Lease showing the construction equipment anticipated for each phase of work on a monthly basis. Horizontal area sound sources were entered in the CadnaA model to represent the work associated with building the platforms over the rail yard. Eight vertical area sound sources were configured in the model to account for the ground-based equipment necessary to build each of the eight development buildings. A single-point source was also located on the top floor of each building to account for smaller hand tools and tower cranes being used as the buildings are erected. In this manner, the equipment expected for use during every month of the construction period was entered into the CadnaA model for each phase of work.

The equipment noise levels entered into the CadnaA model were in the form of A-weighted sound power levels derived from the sound pressure emission levels contained in the FHWA Roadway Construction Noise Model. Noise emission levels for dozens of generic types of heavy equipment are contained in a database in the Roadway Construction Noise Model. The equipment noise emission levels in this model are expressed as A-weighted L_{max} levels at 50 feet using an RMS Slow time response. The model also provides typical acoustical usage factors, or the percentage of time equipment may operate at full power, thus allowing for an estimate of L_{eq} sound pressure levels and equivalent sound power levels to be computed for each piece of equipment. The new DEP Construction Noise Regulations use these same levels to establish equipment noise criteria limits in the field.

The eight proposed development buildings were entered into the model in their designated locations, as shown on Figure 21-7. This was done because the buildings themselves provide acoustic shielding as noise propagates in various directions away from its source. It was assumed that each building would require approximately 3 to 6 months to begin construction, and then the heights of the buildings were entered into the model as they grew taller on a monthly basis.

Finally, the CadnaA model was used to generate noise contour lines (isopleths) on a base map showing how noise radiates from the sources and is attenuated by intervening structures and terrain (see Figure 21-8). The noise contour lines are useful for presenting the results in a graphical format that can be easily interpreted to estimate the noise level at a location of interest. In this case, in accordance with DEP and DCP guidelines, noise levels were modeled exterior to each floor, not just the ground floor, for each of the 15 receptor locations.

TNM Traffic Noise Model

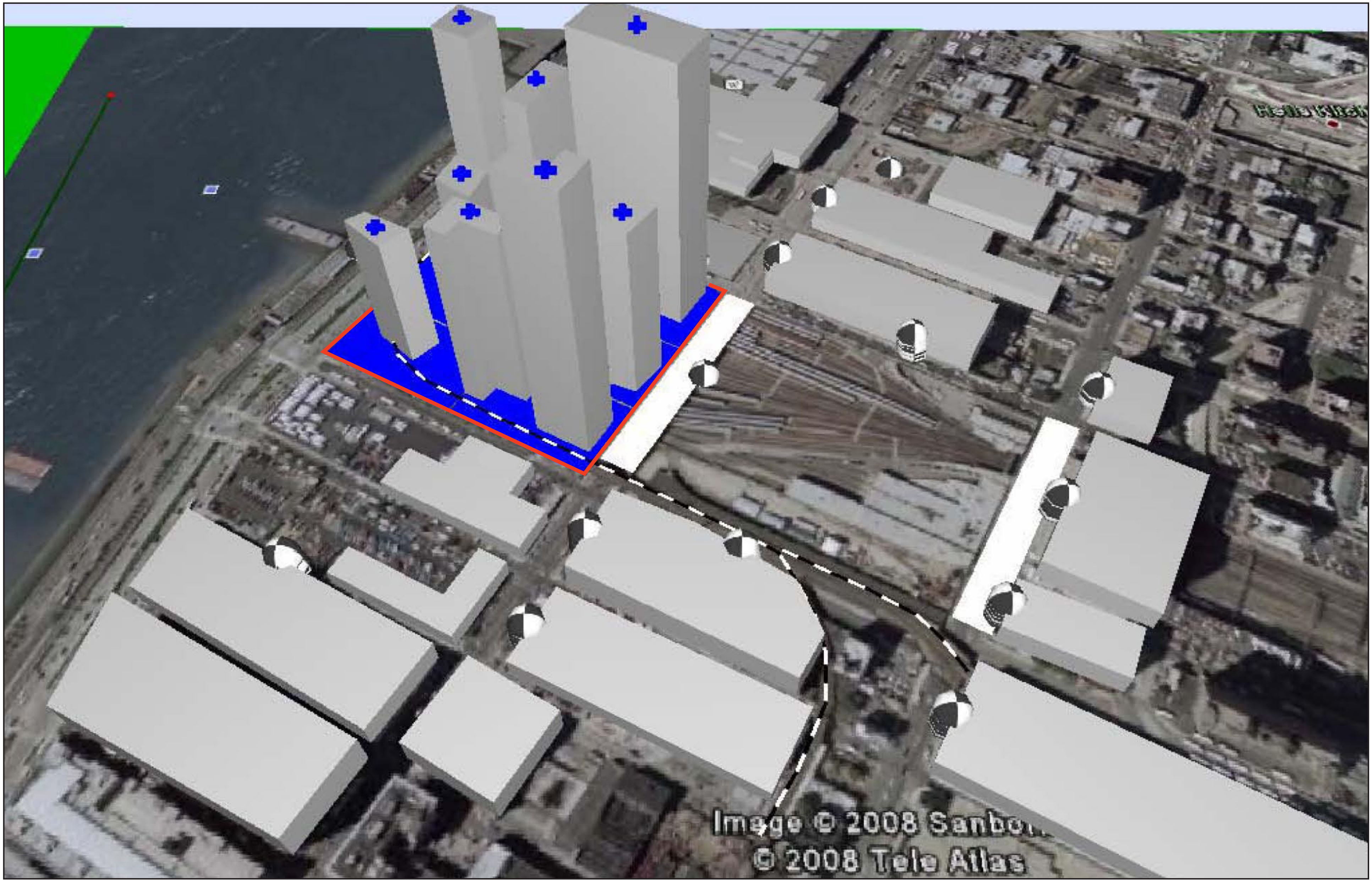
The FHWA TNM traffic noise model was used to evaluate mobile noise from construction-related traffic on adjacent and nearby streets and roadways. A description of the methodology is included in Chapter 20, “Noise.”

Results

Using the methodologies described above, noise analyses were performed to determine maximum predicted total noise levels, which are the sum of noise due to on-site construction activities and noise due to construction-generated traffic on the adjacent streets.

On-Site Construction Noise Results

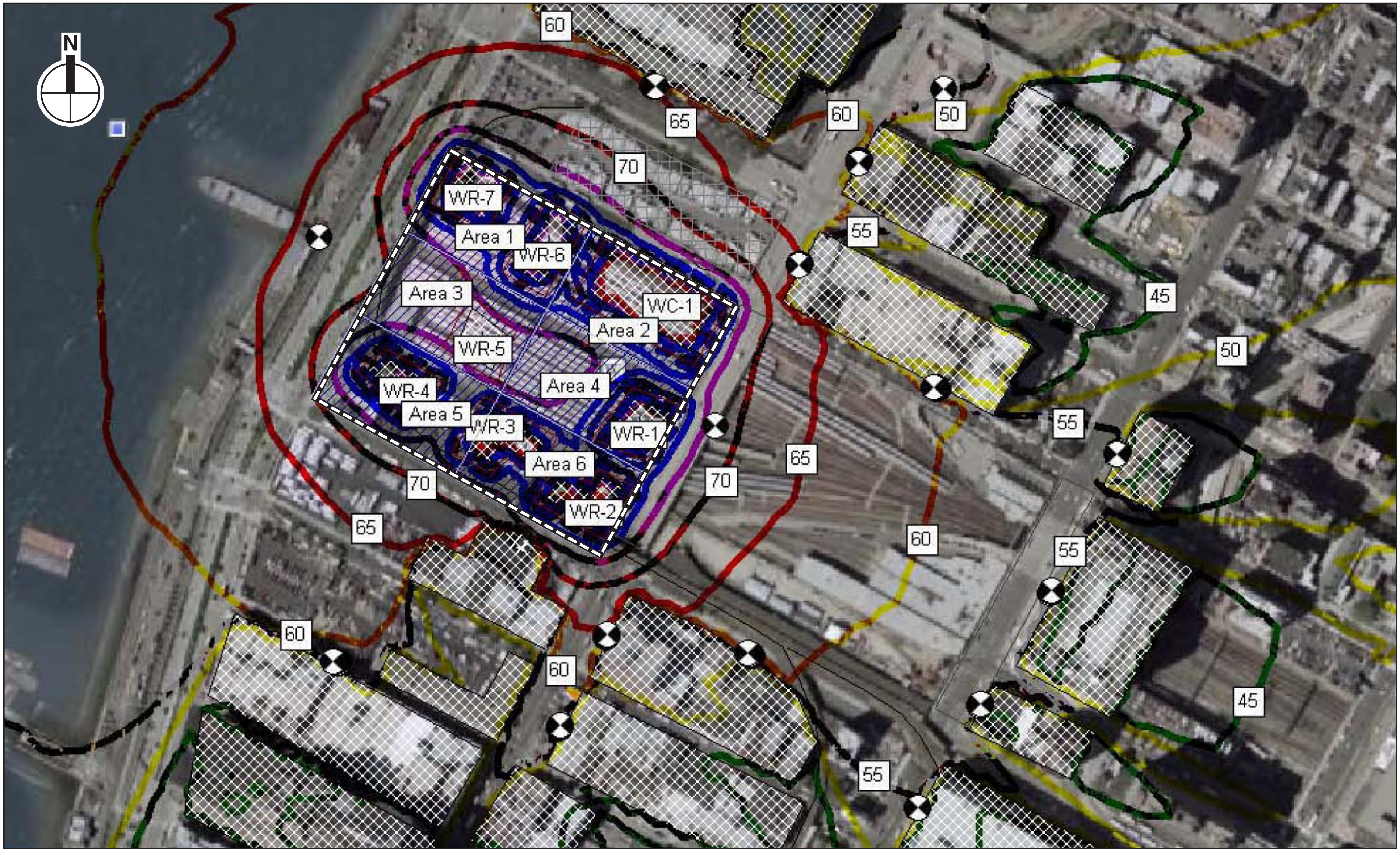
Worst-case results of the construction noise analysis are shown in Table 21-29 for the weekday, evening/night and weekend time periods. The reported results indentify only the loudest predicted conditions and/or highest increases above the CEQR impact criteria at each receptor



Development Site

Noise Receptor

CadnaA Model Input (typical)
Figure 21-7



Development Site

Noise Receptor Location

CadnaA Model Output (typical)

Figure 21-8

site. The loudest noise levels are expected to occur at the upper-most floors of the receptor buildings. Because lower floors are better shielded by other buildings, and ground conditions play more of an attenuating role. All of these predicted noise levels and CEQR impact criteria are intended to address outdoor noise conditions and they may overstate the potential noise consequences at upper floor locations because the building inhabitants would be indoors. It is generally accepted that outdoor-to-indoor noise levels can be expected to be reduced by 25 to 30 decibels through facades with closed double-glazed windows, and reduced by 10 decibels if the windows are open.

The results in Table 21-29 represent worst-case potential noise conditions which assume that all of the equipment and phases of work disclosed by Bovis Lend Lease for a given month are occurring simultaneously. Actual noise levels will vary dramatically from day-to-day and hour-to-hour, with noise levels perhaps fluctuating by 20 to 40 decibels during quieter periods of work. Even with this conservative approach, the worst-case predicted noise levels are expected not to exceed the CEQR impact criteria of 3 dBA above ambient levels for two consecutive years (see Appendix H3, "Construction: Noise").

An example output result from the CadnaA model is shown on Figure 21-8, showing the typical results for one of the more active months, November 2017, during which time seven of the eight buildings would be under construction. In total, 102 separate CadnaA files were produced, covering the alternating equipment, phases, and building conditions for each month of the project.

Noise contours are shown on Figure 21-8, along with their corresponding decibel labels. These results shown on Figure 21-8 represent the noise due to construction activities only (i.e., without mobile trucking noise levels or ambient noise levels included).

Off-site Construction Noise Results

TNM traffic noise model results are shown in Table 21-30. Future baseline traffic noise levels were computed using projected 2017 Future without the Proposed Actions traffic volumes and fleet mix data for automobiles, medium trucks, heavy trucks and buses. The Future with the Proposed Actions construction noise levels were then predicted using the projected 2017 Future with the Proposed Actions construction traffic volumes, which included the number of construction-related delivery and dump trucks associated with the project.

As a result of the relatively high baseline traffic noise conditions found in the city, the results indicate that noise levels will increase by less than one decibel at any of the receptor locations along the haul routes. These results comply with applicable CEQR traffic noise guidelines, which allow for an increase of up to three decibels. As such, people living and working along the haul routes should not notice any increase in traffic noise levels attributable to project-related trucking. Consequently, no significant adverse noise impact is predicted, in accordance with CEQR guidelines, and therefore construction mobile noise mitigation measures are therefore not necessary.

Table 21-29
On-Site Construction Noise Results

Receptor Site No.	Maximum Weekday Results, $L_{eq(h)}$ in dBA: Ambient Noise	Constr. Noise	Total Noise	Increase dBA	Total Noise (L_{10})	Maximum Night Results, $L_{eq(h)}$ in dBA: Ambient Noise	Constr. Noise	Total Noise	Increase dBA	Maximum Weekend Results, $L_{eq(h)}$ in dBA: Ambient Noise	Constr. Noise	Total Noise	Increase dBA
R1	78	69	78	0	81	72	69	74	2	72	69	74	2
R2	72	70	74	2	77	71	70	74	3	71	70	73	2
R3	69	68	72	3	75	64	63	67	3	66	63	68	2
R4	74	56	74	0	77	69	56	69	0	72	56	72	0
R5	74	66	74	0	77	70	66	71	1	71	66	72	1
R6	73	70	75	2	78	72	70	74	2	73	70	75	2
R7	74	74	77	3	80	74	74	77	3	72	69	74	2
R8	73	70	75	2	78	70	70	73	3	72	70	74	2
R9	72	63	73	1	78	69	63	70	1	68	63	69	1
R10	69	66	71	2	74	67	66	70	3	65	61	66	1
R11	72	67	74	2	77	69	67	72	3	68	67	71	3*
R12	75	62	75	0	78	75	62	75	0	75	62	75	0
R13	76	62	77	1	80	75	62	76	1	75	62	75	0
R14	75	62	75	0	78	75	62	75	0	75	62	75	0
R15	76	60	77	1	80	75	60	76	1	75	60	75	0

* Does not occur continuously for 2 or more consecutive years.

Table 21-30
TNM Mobile Noise Results

Site	Receptor Description	2017 No-Build Traffic Noise $L_{eq(h)}$,dBA	2017 Build Traffic Noise With Trucks $L_{eq(h)}$,dBA	Increase dBA	2017 Build Traffic Noise With Trucks (L_{10}) dBA
R1	Twelfth Avenue (between West 33 St. and West 34 St.)	67.1	67.2	0.1	70.2
R2	West 34 Street (between Eleventh Ave. and Twelfth Ave.)	71.5	71.5	0	74.5
R3	West 28 Street (between Eleventh Ave. and Twelfth Ave.)	64.3	64.2	-0.1	67.2
R4	Eleventh Avenue (between West 35 St. and West 36 St.)	68.1	68.1	0	71.1
R5	Eleventh Avenue (between West 34 St. and West 35 St.)	80.3	80.4	0.1	83.4
R6	Eleventh Avenue (between West 33 St. and West 34 St.)	74.1	74.1	0	77.1
R7	Eleventh Avenue (between West 31 St and West 33 St)	70.8	70.7	-0.1	73.7
R8	Eleventh Avenue (between West 29 St. and West 30 St.)	69.9	70.0	0.1	73.0
R9	Eleventh Avenue (between West 28 St. and West 29 St.)	69.1	69.2	0.1	72.2
R10	West 33 Street (between Tenth Ave. and Eleventh Ave.)	71.7	72.0	0.3	75.0
R11	West 30 Street (between Tenth Ave. and Eleventh Ave.)	74.4	74.5	0.1	77.5
R12	Tenth Avenue (between West 31 St. and West 33 St.)	70.9	70.9	0	73.9
R13	Tenth Avenue (between West 30 St. and West 31 St.)	72.2	72.3	0.1	75.3
R14	Tenth Avenue (between West 33 St. and West 34 St.)	73.1	72.7	-0.4	75.7
R15	Tenth Avenue (between West 29 St. and West 30 St.)	69.1	69.2	0.1	72.2

Note: All traffic noise levels are rounded to the nearest whole decibel.

Cumulative Noise Results

Maximum results of the on-site noise generated by construction activities were logarithmically added to the noise generated by construction vehicles on haul routes traveling to and from the project site during the hour which generated the maximum number of construction vehicles together with ambient noise to determine the "total" noise at each receptor location attributable to the Development Site construction (see Appendix H3, "Construction: Noise"). The results indicate that maximum predicted incremental noise levels at all sensitive receptor locations would not exceed than the CEQR noise impact criteria for two consecutive years or more and therefore no significant adverse noise impacts would occur.

Building-On-Building Assessment

Based on the project's anticipated development plan, construction activities for some of the buildings will occur while other residential and commercial units in other buildings will be occupied. As such, the potential construction noise impacts on the Development Site's newly created commercial and residential receptors were considered as well.

Based on the anticipated occupancy schedule described earlier (Table 21-1), the first buildings expected to be constructed, WC-1 (commercial) and WR-2 (residential), are expected to be occupied by July 2017. As a result, occupants of these buildings could be exposed to noise from the construction of WR-5, which is scheduled for completion in September 2019. However, based on the proposed construction schedule for WR-5, all exterior work for both the podium and the tower would be completed by February 2019, a period of less than two years, and all further construction activities (i.e., from February through September 2019), would be limited to the building's interior and this interior noise would be attenuated by the exterior walls of the development buildings. The windows specified for WR-2 and WC-1 will provide 30 decibels of attenuation, the resulting noise levels inside WR-2 and WC-1 are expected to be below the CEQR interior noise criterion of 45 dBA. As such, there would not be a significant adverse noise impact as per CEQR guidance.

ADDITIONAL HOUSING SITES

The operation of construction equipment on the Additional Housing Sites, as well as construction vehicles and delivery vehicles traveling to and from those sites, could increase noise and vibration levels in the community during the construction period.

The City's Noise Control Code requires the adoption and implementation of a noise mitigation plan for each construction site, limits construction to weekdays between the hours of 7 AM and 6 PM, and sets noise limits for certain specific types of construction equipment. Construction activities occurring after hours may be authorized by the Commissioner of DEP under certain exceptional circumstances.

Construction noise associated with the Additional Housing Sites is expected to be temporary, typical of other similar construction projects in the city. While there may be short periods of increased noise, it is not expected that construction noise would exceed CEQR noise guidelines for more than two continuous years. Therefore, no significant adverse impacts would be expected to result from the construction of the Additional Housing Sites.

VIBRATION

DEVELOPMENT SITE

Construction Vibration Analysis for the High Line

A construction vibration assessment was conducted to evaluate potential structural consequences for the existing elevated High Line rail structure. The High Line is an approximately 80-year-old elevated steel and concrete rail viaduct—not in use today—which runs along the southern and western edges of the Development Site. The High Line structure is expected to remain in place during construction of the Development Site. Therefore, an analysis was undertaken of the potential adverse effects of construction vibration on this structure. The vibration assessment computes the “critical distances,” or the distances within which the use of certain construction equipment may be expected to cause damage to the High Line structure.

For this study, an analytical/empirical vibration prediction model was used to estimate the vibration levels that might propagate from high-vibration-producing-equipment such as pile drivers, hoe rams and drills. The model is based on a combination of several previous works including measured equipment vibration emission data from the Federal Transit Administration (FTA) and the Central Artery/Tunnel Project in Boston, and ground propagation relationships found in Charles H. Dowding’s reference textbook *Construction Vibrations*. In consultation and agreement with DCP and DEP, site-specific vibration measures were not required for construction associated with the Development Site because no high-vibration-producing sources are anticipated.

For purposes of assessing potential structural or architectural damage and potential annoyance or interference with vibration sensitive activities, the following formula was used:

$$PPV_f = PPV\ i / (18.46716^{\wedge}(\log(D_f / D_i)))$$

where:

PPV_f = Peak Particle Velocity at final location

PPV_i = Peak Particle Velocity at initial (or reference) location (i.e., at 100 feet)

D_f = Distance, in feet, from the source to the final position

D_i = Distance, in feet, from the source to the initial (or reference) location

(i.e., at 100 feet)

Table 21-31 shows vibration source levels for typical construction equipment.

Vibration Criteria

Several vibration criteria guidelines were considered in this case, all of which were applied as conservatively as possible in order to yield cautious results. The criteria include those published by the FTA for minor cosmetic damage of fragile structures, the Central Artery/Tunnel Project’s Vibration Design Policy for potential damages to extremely susceptible buildings, and the Swiss Standard 640-312, which also addresses extremely susceptible buildings. More tolerant damage criteria were also considered, such as those from the U.S. Bureau of Mines and NYCDOB under their *TPPN #10/88*.

Table 21-31
Vibration Source Levels for Construction Equipment

Equipment	Device Type	PPV_{ref} (in/sec)
Description	M-steady, S-transient	@ 100 ft
Auger Drill Rig	Steady	0.011
Backhoe	Steady	0.011
Compactor	Steady	0.030
Concrete Mixer	Steady	0.010
Concrete Pump	Steady	0.010
Crane	Steady	0.001
Dozer	Steady	0.011
Dump Truck	Steady	0.010
Excavator	Steady	0.011
Flat Bed Truck	Steady	0.010
Front End Loader	Steady	0.011
Gradall	Steady	0.011
Grader	Steady	0.011
Horizontal Boring Hydr. Jack	Steady	0.003
Hydra Break Ram	Transient	0.050
Impact Pile Driver	Transient	0.200
Insitu Soil Sampling Rig	Steady	0.011
Jackhammer	Steady	0.003
Mounted Hammer hoe ram	Transient	0.190
Paver	Steady	0.010
Pickup Truck	Steady	0.010
Scraper	Steady	0.0004
Slurry Trenching Machine	Steady	0.002
Soil Mix Drill Rig	Steady	0.011
Tractor	Steady	0.010
Vibratory Pile Driver	Steady	0.150
Vibratory Roller (large)	Steady	0.059
Vibratory Roller (small)	Steady	0.022
Blasting	Transient	0.750
Clam Shovel	Transient	0.025
Rock Drill	Steady	0.011
3-ton truck at 35 mph	Steady	0.0002

Vibration levels may be quantified using several different metrics depending on the issue being evaluated. Vibration is mechanical energy in oscillatory motion and can, therefore, be evaluated in terms of instantaneous or average acceleration, velocity or displacement. For structures, it is most common to evaluate the vibration velocity component. The results can be expressed in units of velocity such as inches per second. The peak particle velocity (PPV) is the preferred metric for evaluating potential damages to structures, and its results are also expressed in units of inches per second. Alternatively, vibration velocity levels can be expressed in decibel units (VdB) where the PPV level is logarithmically compared to a reference velocity level of 1 micro-inch per second after having been adjusted to account for the root-mean-square quantity. The PPV represents the highest (or worst-case) instantaneous vibration level, and vibration levels expressed in VdB represent a time and energy-averaged vibration level. Therefore, potential damages to structures are usually evaluated in terms of PPV whereas the annoyance of vibration as perceived by human beings is usually evaluated in terms of VdB.

As mentioned above, there are vibration criteria intended to prevent major structural damage to buildings. These vibration limits are much higher than those used to evaluate minor cosmetic damage or human annoyance. For reference, major structural damage criteria limits of about 1.9 to 2.0 PPV inch/sec are intended to avoid significant damage that could weaken a structure's integrity. Minor structural damage criteria limits are set much lower and are intended to avoid cosmetic damages such as hairline cracking of plaster or concrete. Minor structural damage vibration criteria for fragile historic structures ranges from about 0.12 PPV inch/sec for continuous or steady vibration sources, to 0.30 PPV inch/sec for transient or impulsive vibration sources.

Results

Based on the vibration emission levels produced by certain equipment, the critical distance, or distance (in feet) within which vibration levels might exceed relevant criteria, can be computed. Table 21-32 summarizes six typical high-vibration-producing-equipment found on construction sites and provides the computed critical distances for each piece of equipment with respect to major and minor structural damage criteria.

Table 21-32
Construction Equipment Vibration Critical Distances for High Line

Construction Equipment	Reference Vibration Emission Level PPV at 100 feet	Vibration Critical Distance		
		Major Structural Damages	Minor Damages From Impulsive Sources	Minor Damages From Steady Sources
Clam Shovel Drop	0.025 PPV inch/sec	4 feet	15 feet	N/A
Auger Drill Rig	0.011 PPV inch/sec	2 feet	N/A	16 feet
Jackhammer	0.003 PPV inch/sec	1 foot	N/A	6 feet
Mounted Hoe Ram	0.190 PPV inch/sec	17 feet	70 feet	N/A
Vibratory Pile Driver	0.150 PPV inch/sec	14 feet	N/A	120 feet
Impact Pile Driver	0.200 PPV inch/sec	17 feet	73 feet	N/A

Based on the results shown in Table 21-33 it can be concluded that vibration impacts to the existing elevated High Line rail structure can be avoided provided certain high-vibration-producing equipment are not used within the critical distances stated in the table, as feasible for project construction. Thus, jackhammers, drills, and clam shell buckets should not be used within 1 to 4 feet of the High Line, and hoe rams and pile drivers should not be used within 14 to 17 feet. Jackhammers, drills and clam shell buckets should not be used within 6 to 16 feet of the High Line, and hoe rams and pile drivers should not be used within 70 to 120 feet of the High Line, in order to avoid potential minor structural damages.

Vibration Mitigation Measures

However, it may be likely that project construction can not feasibly follow the recommended critical distances described above. Therefore, in the event that high-vibration-producing equipment would be used in close proximity to the High Line structure, vibration mitigation options would be considered. Potential vibration mitigation measures for hoe rams might include the use of rock drills combined with hydraulic jack or chemical splitters, or the use of carefully controlled blasting, to demolish large rock or concrete obstacles. Pile driving mitigation options would include the use of a hydraulic pile pushing system, the use of slurry walls dug out by a hydromill, or pre-trenching the piles with a backhoe or water jet. Further, a program would be established to monitor vibration levels and any construction effects on the High Line from vibration. As described above, under "Historic Resources," a CEPP would be established for the project, as will be stipulated in the LOR and as required by the NYCDOB under *TPPN #10/88* (and integrated along with other commitments in the Restrictive Declaration). The CEPP would meet the guidelines set forth in *TPPN #10/88*, concerning procedures for the avoidance of damage to adjacent historic structures from nearby construction, the *Protection Programs for Landmarked Buildings* guidance document of the LPC, and the National Park Service's *Preservation Tech Notes, Temporary Protection #3: Protecting a Historic Structure during Adjacent Construction.* The CEPP would specify measures and construction procedures, such as vibration limits and monitoring, that would be implemented during construction of the Proposed Actions. According to *TPPN 10/88*, PPV due to construction-related vibration must not exceed 0.5 inch/sec. The program would monitor PPV and activities that create vibration at historic structures in excess of established limits would be terminated. Alternative construction methods that produce vibration within established limits would be used. It would also empower the structural and foundation engineers to issue "stop work" orders to prevent damage to the High Line. With these measures, there would not be a significant adverse impact on the High Line due to construction of the Proposed Actions.

ADDITIONAL HOUSING SITES

Vibration levels would be perceptible in the vicinity of the Additional Housing Sites for limited periods of time, especially during the early phases of construction that would include any ground clearing, demolition and excavation activities. Because of their minor intensity and limited duration, these levels would not be considered significant adverse impacts. By using proper construction techniques and standard protective measures, no significant adverse vibration impacts are expected. With the use of proper construction techniques and standard protective measures, including conditions set forth in the CEPP, no significant adverse vibration impacts would and, specifically, there would not be a significant adverse impact on these historic resources.

NATURAL RESOURCES

BIOTA

As described in Chapter 11, "Natural Resources," the Development Site does not contain significant biotic habitat. The Tenth Avenue Site is currently open air space above a below-grade Amtrak rail cut. The Ninth Avenue Site is a gravel parking lot with no significant biotic habitat. No State- or federal-listed Threatened or Endangered Species, nor habitat for these species, are known to inhabit the Development Site, the Additional Housing Sites, or the areas surrounding these sites (see Chapter 11, "Natural Resources"). No wetlands are located on or near the Additional Housing Sites, and no wetlands are located on the Development Site. With the exception of the Hudson River, located approximately 250 feet west and separated from the site by Route 9A, no wetlands are in the vicinity of the Development Site.

WATER RESOURCES

Construction activities, such as excavation for caissons and for basements that occur below the water table, generally incorporate techniques for reducing or stemming infiltration of groundwater. For elements of the Proposed Actions that do not incorporate these techniques, and for situations where groundwater infiltrates during construction of retaining walls, dewatering would be necessary.

A dewatering plan would be developed to address procedures for handling groundwater encountered during construction of the Proposed Actions. The dewatering plan would provide a description of the methods used to collect, store, and dispose of contaminated water generated during dewatering activities. Additionally, the dewatering plan would identify the permits required from the DEP and/or the DEC to discharge the water into either the City's sewers or surface waters, respectively. Depending on disposal methods selected by the contractor, DEP permits could include Dewatering Permits, Sanitary Sewer Discharge Permits, Storm Connection Sewer Permit, and DEC permits could include a New York State Pollution Discharge Elimination System permit. Prior to obtaining DEP or DEC discharge permits, groundwater would be sampled and analyzed to characterize its physical and chemical properties. The results of the analyses (i.e., the identification of contaminants) would determine the type of treatment require (if any) prior to discharge. Alternatively, contaminated groundwater could be left untreated and disposed of in a facility licensed to accept such material.

Both DEC and DEP permits require that contaminated sediments suspended in groundwater are removed prior to discharge. This would be achieved, for example, through the use of settling tanks and possibly the injection of a flocculant, causing suspended sediments to settle out of the water. (A flocculant is a chemical or physical agent added to a volume of fluid to induce suspended particles to coalesce and settle to the bottom.) The sediments would be analyzed to determine if contaminants are present and, depending on the type and concentrations of contaminants, disposed of accordingly.

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

Prior to implementing any treatment system or discharge of groundwater, samples would be collected and analyzed, a treatment system would be designed, and the information would be included in the DEC or DEP permit applications. Approval from the responsible regulatory agency, in the form of a permit, would be obtained prior to construction activities. Depending on the quantity of water to be discharged, the permits require sampling on a regular basis to confirm that the treatment is effective. Discharging activities would be performed in accordance with the terms and conditions specified by the permit, including the discharge rate, the sampling frequency, and duration. For more information regarding contaminated groundwater encountered during construction, see Chapter 12, "Hazardous Materials."

The Development Site is located within the Federal Emergency Management Agency's 100-year flood hazard zone. New York State requires that in order to locate projects within the 100-year flood hazard zone, no reasonable alternative exists. Development of the Western Rail Yard could not be constructed outside this zone and continue to meet the goals of the action. Both Additional Housing Sites are located outside the 100-year flood hazard zone.

The Hudson River could be affected by sediments contained in runoff from the Development Site, if uncontrolled. Containment of runoff sedimentation would be controlled by the development and implementation of a soil erosion and sediment control plan included in construction documents. Such a plan would identify sediment control measures, including sediment barriers, truck tire wash, and on-site catchment basins.

With the development and implementation of measures and controls discussed above, no significant adverse impacts to natural resources due to construction of the Proposed Actions are anticipated.

INFRASTRUCTURE

Construction activities at the Development Site and Additional Housing Sites are not anticipated to affect infrastructure (potable water, sanitary sewer service, natural gas, electricity and communications). Temporary, short-term disruptions of some of these services within the Development Site may be necessary during construction and when making utility connections to buildings on the site, but in such instances, would be coordinated with LIRR. Temporary, short-term disruptions to utility service may also occur in the immediate vicinity of the Additional Housing Sites while making utility connections to the buildings. Because of the temporary and short-term nature of these possible disruptions, no significant adverse impacts to infrastructure are anticipated.

HAZARDOUS MATERIALS

No significant adverse hazardous materials impacts are anticipated through construction of elements of the Proposed Actions because appropriate measures would be taken to limit exposure to hazardous materials. Chapter 12, “Hazardous Materials,” provides a detailed examination of these issues. Hazardous materials within soil, soil gas, groundwater, and building materials could be encountered during construction related to the Proposed Actions. Hazardous materials could include VOCs, semi-volatile organic compounds, PCBs, and metals. Hazardous building materials, including asbestos containing material, lead-based paint, and PCB-containing equipment could be present in structures located on the Development Site.

In order to address hazardous materials and other contaminants encountered during construction activities at the Development Site and the Additional Housing Sites, a CHASP would prepared to address both the known contamination issues and contingency items (e.g., finding unexpected petroleum storage tanks or petroleum-contaminated soil). When implemented, provisions of the CHASP would ensure that hazardous materials would be managed, isolated, and/or removed during construction, thus preventing impacts during the constructional and operational phases of the Proposed Actions. Provisions of the CHASP, subject to review and approval by the DEP, DEC, and New York State Department of Labor, would be developed and implemented for the construction of each component of the Proposed Actions. The CHASP would include provisions to prevent hazardous materials exposures to workers and the general public, and would define the handling, storage, transportation, and disposal of hazardous materials during construction. Elements of each CHASP would address health and safety, and would include management plans for soil, soil gas, groundwater, petroleum storage tanks, asbestos containing materials, lead-based paint, and PCB-containing equipment. If appropriate, the CHASP would identify measures to be taken to address contaminated material that would not be removed as part of construction, and would therefore remain in place. Such measures include the implementation of impermeable barriers to achieve isolation from contaminants such as semi-volatile organic compounds. The provisions of the CHASPs would be mandatory for contractors and subcontractors engaged in on-site construction activities. Thus, there would not be a significant adverse hazardous materials impact during construction of the project. ✷