3.11.7 Construction Noise

3.11.7.1 Introduction

This chapter examines the potential noise and vibration effects that would occur during the construction under the Proposed Project. Effects on community noise levels during construction would include noise from the operation of construction equipment and noise from construction and delivery vehicles traveling to and from the site. Noise and vibration levels at a given location are dependent on the type and quantity of construction equipment being operated, the acoustical utilization factor of the equipment (i.e., the percentage of time a piece of equipment is operating), the distance from the construction site, and any shielding effects (from structures such as buildings, walls, or barriers). Noise levels caused by construction activities would vary widely, depending on the stage of construction (i.e., structure rehabilitation, interior fit out, etc.) and the location of the construction activities relative to noise-sensitive receptor locations.

3.11.7.2 Principal Conclusions

3.11.7.2.1 Noise

Based on the projected construction activities associated with the Proposed Project, construction-generated noise would result in significant adverse effects at multiple receptors adjacent to construction work areas. Receptors where noise level increases were predicted to exceed the construction noise evaluation thresholds for extended durations were identified.

The construction noise analysis predicted that noise levels due to construction would exceed the construction noise impact criteria throughout the work areas, including resulting in noise levels that would be noticeable and potentially intrusive during the most noise-intensive construction activities at some receptors. While the highest levels of predicted construction noise would not persist throughout construction, and noise levels would fluctuate, resulting in noise increases that would be intermittent, these locations would experience construction noise levels of a magnitude and duration that would constitute significant adverse impacts.

The noise level increments resulting from construction would be due primarily to noise generated by on-site construction activities (rather than construction-related traffic). The construction noise analysis examined the reasonable worst-case peak hourly noise levels resulting from construction in each reach and is therefore conservative in predicting increases in noise levels. Typically, the loudest hourly noise level would not persist throughout the entire construction period.

Additionally, construction noise is regulated by the requirements of the New York City Noise Control Code (also known as Chapter 24 of the Administrative Code of the City of New York, or Local Law 113) and the DEP Notice of Adoption of Rules for Citywide Construction Noise Mitigation (also known as Chapter 28). These requirements mandate that specific construction equipment and motor vehicles meet specified noise emission standards; that construction activities be limited to weekdays between the hours of 7 AM and 6 PM; and that construction materials be handled and transported in such a manner as not to create unnecessary noise. On limited occasions when weekend or after-hour work would be necessary (e.g., overnight work in Stage 1E along Route 9A/West Street or Saturday activity for deliveries or weather catch-up; see Section 3.11.7.7.14), permits would be required, as specified in the New York City Noise Control Code. As required under the New York City Noise Control Code, a site-specific Construction Noise Mitigation Plan for the Proposed Project would be developed and implemented prior to the start of work. Additional measures that may be implemented to mitigate impacts are discussed in Chapter 4.0, "Mitigation."

3.11.7.2.2 Vibration

At all structures with the potential to experience adverse vibration effects from construction under the Proposed Project, the distance between construction equipment and receiving buildings or structures is large enough to avoid vibratory levels that would have the potential to result in architectural or structural damage. Construction may produce noticeable vibration levels (i.e., vibration levels exceeding 75 VdB) at adjacent structures during pile installation; however, this activity would only occur for limited periods of time at particular locations. Consequently, vibration resulting from construction under the Proposed Project would not rise to the level of a significant adverse impact.

3.11.7.3 Noise Fundamentals

Sound is a fluctuation in air pressure. Sound pressure levels are measured in units called decibels (dB). The particular character of the sound that we hear (a whistle compared with a French horn, for example) is determined by the speed, or "frequency," at which the air pressure fluctuates, or oscillates. Frequency defines the oscillation of sound pressure in terms of cycles per second. One cycle per second is known as 1 Hertz (Hz). People can hear over a relatively limited range of sound frequencies, generally between 20 Hz and 20,000 Hz, and the human ear does not perceive all frequencies equally well. High frequencies (e.g., a whistle) are more easily discernable and therefore more intrusive than many of the lower frequencies (e.g., the lower notes on the French horn).

3.11.7.3.1 "A"-Weighted Sound Level (dBA)

In order to establish a uniform noise measurement that simulates people's perception of loudness and annoyance, the decibel measurement is weighted to account for those frequencies most audible to the human ear. This is known as the A-weighted sound level, or "dBA," and it is the descriptor of noise levels most often used for community noise. As shown in **Table 3.11.7-1**, the threshold of human hearing is defined as 0 dBA; quiet conditions (as in a library, for example) are approximately 40 dBA; levels between 50 dBA and 70 dBA define the range of noise levels generated by normal daily activity; levels above 70 dBA would be considered noisy, and then loud, intrusive, and deafening as the scale approaches 130 dBA.

In considering these values, it is important to note that the dBA scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of perceived loudness. Thus, the background noise in an office, at 50 dBA, is perceived as twice as loud as a library at 40 dBA. For most people to perceive an increase in noise, it must be at least 3 dBA. At 5 dBA, a change in noise level will be readily noticeable.

Table 3.11.7-1
Noise Levels of Common Sources

Sound Source	SPL (dBA)
Air Raid Siren at 50 feet	120
Maximum Levels at Rock Concerts (Rear Seats)	110
On Platform by Passing Subway Train	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobiles with Mufflers	70
Typical Urban Area	60-70
Typical Suburban Area	50–60
Quiet Suburban Area at Night	40–50
Typical Rural Area at Night	30-40
Isolated Broadcast Studio	20
Audiometric (Hearing Testing) Booth	10
Threshold of Hearing	0
Source: 2021 *CEQR Technical Manual*	

3.11.7.3.2 Effects of Distance on Sound

Sound varies with distance. For example, highway traffic 50 feet away from a receptor (such as a person listening to the noise) typically produces sound levels of approximately 70 dBA. The same highway noise measures 66 dBA at a distance of 100 feet, assuming soft ground conditions. This decrease is known as "drop-off." The outdoor drop-off rate for line sources, such as traffic, is a decrease of approximately 4.5 dBA (for soft ground) for every doubling of distance between the noise source and receiver (for hard ground the outdoor drop-off rate is 3 dBA for line sources). Assuming soft ground, for point sources, such as amplified rock music, the outdoor drop-off rate is a decrease of approximately 7.5 dBA for every doubling of distance between the noise source and receiver (for hard ground the outdoor drop-off rate is 6 dBA for point sources).

3.11.7.3.3 Sound Level Descriptors

Because the sound pressure level unit of dBA describes a noise level at just one moment and few noises are constant, other ways of describing noise that fluctuates over extended periods have been developed. One way is to describe the fluctuating sound heard over a specific time period as if it had been a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and time period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted by $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1, L_{10}, L_{50}, L_{90}, and L_x, are used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively.

The relationship between L_{eq} and levels of exceedance is worth noting. Because L_{eq} is defined in energy rather than straight numerical terms, it is not simply related to the levels of exceedance. If the noise fluctuates little, L_{eq} will approximate L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus, the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}.

The $L_{eq(1)}$ is the noise descriptor recommended for use in the *CEQR Technical Manual* for vehicular traffic and construction noise impact evaluation and is used to provide an indication of highest expected sound levels. The 1-hour L_{10} is the noise descriptor used in the *CEQR Technical Manual* noise exposure guidelines. The maximum 1-hour equivalent sound level ($L_{eq(1)}$) and maximum 1-hour L_{10} were selected as the noise descriptors used in the construction noise impact evaluation.

3.11.7.4 Construction Noise Impact Criteria

Chapter 22 of the *CEQR Technical Manual* defines construction duration as “short-term” (i.e., less than two years) and “long-term” and states that construction noise is not likely to require analysis unless it “affects a sensitive receptor over a long period of time.” Consequently, the construction noise analysis considers the potential for construction of a project to create high noise levels (the “intensity”), whether construction noise would continue for an extended period of time (the “duration”), and the locations where construction has the potential to produce noise (the “receptors”) in evaluating potential construction noise effects.

The noise impact criteria described in Chapter 19, Section 410 of the *CEQR Technical Manual* serve as a screening-level threshold for potential construction noise impacts. If construction of the project would not result in any exceedances of these criteria at a given receptor, then that receptor would not have the potential to experience a construction noise impact. However, if construction of the Proposed Project would result in exceedances of the noise impact criteria, then further consideration of the intensity and duration of construction noise is warranted at that receptor. The screening level noise impact criteria for mobile and on-site construction activities are as follows:

- If the No Action noise level is less than 60 dBA $L_{eq(1)}$, a 5 dBA $L_{eq(1)}$ or greater increase would be considered significant.
- If the No Action noise level is between 60 dBA $L_{eq(1)}$ and 62 dBA $L_{eq(1)}$, a resultant $L_{eq(1)}$ of 65 dBA or greater would be considered a significant increase.
- If the No Action noise level is equal to or greater than 62 dBA $L_{eq(1)}$, or if the analysis period is a nighttime period (defined in the CEQR criteria as being between 10PM and 7AM), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$.

3.11.7.5 Construction Noise Analysis Methodology

3.11.7.5.1 General Noise Analysis Methodology

The construction noise methodology involved the following process for the Proposed Project:

1. Measure existing noise levels. A noise survey was conducted at nine locations that are representative of the noise-sensitive land uses nearest the proposed construction work areas and routes that would be used by construction trucks and workers traveling to and from the work areas. The noise level measurements consisted of a mix of 24-hour continuous and 60-minute spot measurements. At locations where 24-hour continuous measurements were not conducted, noise levels at each hour were determined by prorating the spot measurements results based on the 24-hour noise level variation at another location that shares the same dominant noise source (e.g., West Side Highway). The selected noise measurement locations are shown in **Figure 3.11.7-1**. These nine locations were selected to provide geographic coverage and represent noise receptors that may experience noise due to construction of the Proposed Project based on the alignment of the flood barrier system.

2. Select analysis hour(s) for construction noise analysis. The hour of the construction workday during which the minimum existing noise level was measured was selected as the representative hour for analysis. The minimum existing noise level on a weekday resulted in the greatest potential noise level increment from the proposed construction. While regular night and weekend construction is not expected to be required for most construction, there are certain activities that would need to be completed during night time hours, and the contractor may be required to do some work on weekends for some components of the Proposed Project. The analysis took this into account, comparing the analysis hour levels to the minimum measured night noise levels as appropriate.

3. Select receptor locations for construction noise analysis. Selected receptors represent residential, institutional, recreational, or other noise-sensitive uses potentially affected by the construction associated with the Proposed Project during operation of on-site construction equipment and/or along routes taken to and from the project site by construction trucks.

4. Establish existing noise levels at selected receptors. The measured noise levels were applied to the selected receptor locations based on geography and proximity to comparable existing noise sources (e.g., roadways, marina uses, etc.).

5. Select noise analysis periods during the construction schedule. To establish the duration of construction noise effects at each of the selected receptors, multiple construction periods throughout the anticipated construction schedule were selected for noise analysis. Each analysis period represents a portion of the overall construction period and together they comprise the entire construction duration. During each period, construction noise levels were predicted from work in multiple reaches and at the pump station site in which construction would occur simultaneously.

6. Calculate maximum construction noise levels from each reach at each receptor location. Given the on-site equipment expected during each of the analysis periods and the location of the equipment, which is based on construction logistics diagrams, a CadnaA model file including each analysis period was created. All models include each of the construction noise sources during the analysis period and hour, calculation points representing multiple locations on various façades and floors of the associated receptors previously identified, as well as the noise control measures expected to be used during construction.

7. Determine total noise levels and noise level increments during construction. For each noise receptor during each analysis period, the calculated level of construction noise from each work area was logarithmically added to the existing noise level to determine the cumulative total noise level. The existing

NORTH/WEST BATTERY PARK CITY RESILIENCY

Noise Measurement and Receptor Locations

Figure 3.11.7-1

noise level was then arithmetically subtracted from the cumulative noise level in each analysis period to determine the noise level increment projected with the Proposed Project.

8. Compare construction noise increments to impact criteria. For each analysis period and each noise receptor, the predicted noise levels due to construction were assessed using guidance from the *CEQR Technical Manual* and other incremental noise impact criteria as described below.

9. Establish construction noise duration. For each receptor, the noise level increments in each analysis period were evaluated to determine the duration during construction that the receptor would experience exceedances of impact criteria.

10. Identify potential construction noise impacts. At each existing receptor where exceedances of construction noise impact criteria were predicted, a determination was made as to whether the Proposed Project would have the potential to result in significant adverse construction noise impacts.

The effects of construction and delivery vehicles traveling to and from the site on roadways away from the construction work areas were not evaluated, because the construction-related truck traffic would not double the Noise PCEs, as would be necessary to result in a significant increase in noise levels.

3.11.7.5.2 Construction Noise Modeling

Noise effects from construction activities were evaluated using the CadnaA model, a computerized model developed by DataKustik for noise prediction and assessment. The model can be used for the analysis of a wide variety of noise sources, including stationary sources (e.g., construction equipment, industrial equipment, power generation equipment), transportation sources (e.g., roads, highways, railroad lines, busways, airports), and other specialized sources (e.g., sporting facilities). The model takes into account the reference sound pressure levels of the noise sources at a distance of 50 feet fi the attenuation with distance, as well as ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The CadnaA model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2 and is a state-of-the-art tool for noise analysis that is recommended for construction noise level prediction by the *CEQR Technical Manual*.

Geographic input data used with the CadnaA model includes CADD drawings that define site work areas, adjacent building footprints and heights, locations of streets, and locations of sensitive receptors. For each analysis period, the geographic location and operational characteristics—including equipment usage rates (percentage of time operating at full power) for each piece of construction equipment operating at the proposed development site, as well as noise control measures—will be input to the model.

Construction equipment source strength was determined by the L_{max} levels presented in Table 22-1 of the 2021 *CEQR Technical Manual.* For construction equipment not included in this table, manufacturer specifications or field measured noise levels were used.

In addition, reflections and shielding by barriers erected on the construction site and shielding from adjacent buildings were accounted for in the model. Construction-related vehicles were also assigned to the adjacent roadways. The model produced A-weighted $L_{eq(1)}$ noise levels at each receptor location for each analysis period, as well as the contribution from each noise source. The $L_{10(1)}$ noise levels were conservatively estimated by adding 3 dBA to the $L_{eq(1)}$ noise levels, as is standard practice.[1]

3.11.7.5.3 Determination of No Action and Non-Construction Noise Levels

Noise generated by construction activities is added to noise generated by non-construction traffic on adjacent roadways in order to determine the total noise levels at each receptor location. Existing noise levels were conservatively used as the baseline noise levels for determining construction-generated noise level increases. Existing noise levels were established according to the following:

- Perform noise measurements at selected noise measurement locations (as described below).
- For the daytime period (7 AM to 6 PM) and the nighttime period (6 PM to 7 AM), the lowest hourly noise level during that time period was selected to represent the existing noise levels.
- For receptor locations where the existing noise levels were not measured, apply measured levels based on geography and proximity to comparable existing noise sources (e.g., roadways, marina uses, etc.).

3.11.7.6 Noise Reduction Measures

Construction of the Proposed Project would be required to follow the requirements of the *New York City Noise Control Code* (also known as Chapter 24 of the *Administrative Code of the City of New York,* or Local Law 113) for construction noise control measures. Specific noise control measures would be incorporated in noise mitigation plan(s) required under the *New York City Noise Control Code.* These measures could include a variety of source and path controls.

In terms of source controls (i.e., reducing noise levels at the source or during the most sensitive time periods), the following measures, included under New York regulations, would be implemented:

- Equipment that meets the sound level standards specified in Subchapter 5 of the *New York City Noise Control Code* would be utilized from the start of construction. **Table 3.11.7-3** shows the noise levels for typical construction equipment that would be used for construction of the Proposed Project.
- As early in the construction period as logistics would allow, diesel- or gas-powered equipment would be replaced with electrical-powered equipment such as welders, water pumps, bench saws, and table saws (i.e., early electrification) to the extent feasible and practicable. Where electrical equipment cannot be used, diesel or gas-powered generators and pumps would be located within enclosures to the extent feasible and practicable.
- Where feasible and practicable, the construction site would be configured to minimize back-up alarm noise. In addition, all trucks would not be allowed to idle more than 3 minutes at the construction site

[1] Federal Highway Administration Roadway Construction Noise Model User's Guide, Page 15. http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf

based upon Title 24, Chapter 1, Subchapter 7, Section 24-163 of the New York City Administrative Code.

- Contractors and subcontractors would be required to properly maintain their equipment and mufflers.

In addition, source controls listed below would be implemented as PCREs beyond New York regulations for the construction of the Proposed Project:

Equipment such as generators, drill rigs, and compressors would be required to meet the noise levels specified in **Table 3.11.7-3** to be used for construction of the Proposed Project.

Table 3.11.7-3
Typical Construction Equipment Noise Emission Levels (dBA)

Equipment List	NYCDEP Typical Noise Level at 50 feet[1]
Auger Drill Rig	85
Backhoe	80
Bar Bender	80
Compactor (ground)	80
Compressor (air, greater than 350 cfm)	70[2]
Concrete Mixer Truck	85
Concrete Pump Truck	82
Concrete Saw	90
Crane	85
Dozer	85
Drill Rig Truck	84
Dump Truck	84
Dumpster/Rubbish Removal	78
Excavator	85
Excavator (Landscaping Only)	78[2]
Flat Bed Truck	84
Front End Loader	80
Generator	82
Generator (< 25 KVA, VMS signs)	70
Gradall	85
Man Lift	85
Paver	85
Pickup Truck	55
Pneumatic Tools	85
Pumps	77
Roller	85
Slurry Plant	78
Soil Mix Drill Rig	80
Tractor	84
Vacuum Street Sweeper	80
Vibratory Pile Driver	95
Welder/Torch	73
Rock Drill	85

Source:
[1] "Rules for Citywide Construction Noise Mitigation," Chapter 28, DEP, 2007.
[2] Project-specific noise emission commitment.

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

- Where logistics allow, noisy equipment, such as cranes, concrete pumps, concrete trucks, and delivery trucks, would be located away from and shielded from sensitive receptor locations.
- Noise barriers constructed from plywood or other materials would be utilized to provide shielding (e.g., the construction sites would have a minimum 8-foot-tall barrier around the perimeter).
- Sound-absorptive “blankets” would be mounted on the side of each site-perimeter noise barrier on the side facing the work area. The “blankets” would be consistent with the guidance of DEP’s *Rules for Citywide Construction Noise Mitigation*,[2] and
- Path noise control measures (i.e., portable noise barriers, panels, enclosures, and acoustical tents) for certain equipment as necessary to remain consistent with **Table 3.11.7-3**. The details to construct portable noise barriers, enclosures, tents, etc. are shown in DEP’s *Rules for Citywide Construction Noise Mitigation*.[2]

3.11.7.7 Affected Environment – Noise Measurement Results

3.11.7.7.1 Existing Noise Level Measurements

Nine noise measurement monitoring (M) locations (i.e., sites M1 to M9) were selected to determine the baseline existing noise levels. For monitoring (M) locations M1 to M4, noise levels were measured continuously over the course of a 24-hour period. Data measured during 1-hour spot measurements at Locations M5 to M9 were used in conjunction with the nearest 24-hour measurements to calculate a 24-hour sound level profile for Locations M5 to M9.

The baseline noise levels at each noise survey location are shown in **Table 3.11.7-4**, presented in terms of the minimum and maximum L_{eq} measured during daytime and nighttime periods. For Locations M1 to M4, the minimum and maximum L_{eq} were measured values; for Locations M5 to M9, the minimum and maximum L_{eq} were calculated from each 24-hour profile after scaling the one-hour spot measurement data. Full noise survey results are shown in **Appendix H**.

At Sites M3, M4, M6, and M7, the dominant noise source was vehicular traffic on West Street. At Sites M1, M2, M8, and M9, the dominant noise sources were light vehicular traffic on local adjacent streets, or noise from pedestrians and passing helicopters.

In terms of CEQR noise exposure guidelines (shown in **Table 3.11.7-2**), noise levels at Sites M1, M2, M5, M8 and M9 are in the “marginally acceptable” category, and existing noise levels at Sites M3, M4, M6, and M7 are in the “marginally unacceptable” category.

[2] As found at http://www.nyc.gov/html/dep/pdf/noise_constr_rule.pdf

Table 3.11.7-4
Existing Noise Levels at Noise Measurement Locations in dBA

Site	Location	Time Period	L_{eq}
M1	Battery Park City Pavilion at River Terrace and Warren Street	Day	60.0 to 64.7
		Night	56.4 to 63.6
M2	Rector Park between Rector Place and South End Avenue	Day	60.8 to 63.9
		Night	58.6 to 63.1
M3	BMCC Parking at North Moore Street and West Street	Day	71.6 to 75.3
		Night	64.0 to 75.7
M4	Battery Park City Ball Fields at North End Ave and West Street	Day	65.7 to 69.3
		Night	60.1 to 69.0
M5	Battery Park City Esplanade between Rector Place and West Thames Street	Day	60.8 to 63.9
		Night	58.6 to 63.1
M6	Chambers Street between North End Avenue and River Terrace	Day	62.7 to 67.5
		Night	59.2 to 66.4
M7	Vesey Street between West Street and Washington Street	Day	64.6 to 68.2
		Night	59.0 to 62.6
M8	2nd Place between Battery Place and South Cove Park	Day	60.3 to 63.5
		Night	58.1 to 62.6
M9	1st Place between Battery Place and Little West Street	Day	64.2 to 67.3
		Night	62.0 to 66.5

Note: Measurements were conducted by AKRF, Inc. on 09/28/2022, 09/29/2022, 11/02/2022, 06/06/2023, and 06/07/2023.

3.11.7.7.2 Equipment Used During Noise Survey

The continuous 24-hour measurements at Locations 1 and 2 were performed using one Brüel & Kjær Sound Level Meters (SLM) Type 2270, one Brüel & Kjær ½ inch microphone Type 4189, and a Brüel & Kjær Sound Level Calibrator Type 4231. The continuous 24-hour measurements at Locations 3 and 4 were performed using one NTi sound level meter (SLM) Type XL2 with one NTi 1/2-inch microphone and one Larson Davis Type CAL200 calibrator. The one-hour spot measurements at Locations 5, 6, 7, and 8 were performed using three Brüel & Kjær Sound Level Meters (SLM) Type 2270, 2260, and 2250, with three Brüel & Kjær ½ inch microphones Type 4189, and two Brüel & Kjær Sound Level Calibrators Type 4231. The one-hour spot measurement at Location 9 was performed using one NTi Sound Level Meter (SLM) Type XL2 with one NTi 1/2-inch microphone and one Larson Davis Type CAL200 calibrator. All SLMs used are Class 1 instruments according to ANSI Standard S1.4-1983 (R2006). The SLMs have laboratory calibration dates within one year of the measurements, as is standard practice. The microphones were mounted at a height of approximately 5 to 6 feet above the ground (or elevated surface in the case of Locations 1 and 4), and were mounted away from any large, reflecting surfaces that could affect the sound level measurements. Each SLM's calibration was field checked before and after readings using a sound level calibrator. Measurements at each location were made on the A-scale (dBA). The data were digitally recorded by each SLM and displayed at the end of the measurement period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. A windscreen was used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

3.11.7.7.3 Noise Receptor Sites

Noise receptor sites representing buildings or noise-sensitive open space locations close to the project areas were selected and are presented in **Table 3.11.7-5** and **Figure 3.11.7-1**. Measured levels were applied to the noise receptor sites based on geography and proximity to comparable existing noise sources (e.g., roadways, marina uses, etc.).

3.11.7.7.4 No Action Conditions

Under the No Action condition, there would be no major sustained construction at the Project Site. It is expected that existing condition noise levels would remain unchanged, or increase only slightly due to background growth in the volume of vehicular traffic and air traffic. Therefore, the No Action condition would not result in adverse noise or vibration impacts, and existing noise levels serve as a conservative representation of No Action noise levels.

3.11.7.7.5 Construction Conditions

Using the methodology described above, and considering the noise reduction measures for source and path controls specified above, noise analyses were performed to determine $L_{eq(1)}$ noise levels that would be expected to occur as a result of daytime construction activities under the Proposed Project. The full noise analysis results are shown in **Appendix H**.

In addition, as discussed above, the construction noise analysis was performed with the assumption of the most noise-intensive construction activities in each reach and at the pump station site occurring simultaneously, which would result in the maximum construction noise levels. The analysis conservatively assumes that these worst-case activities would represent construction noise levels throughout the duration of work in each work area. During times of less intense construction activity, construction noise levels are anticipated to be less. Furthermore, many of the loudest pieces of construction equipment, including excavators, concrete trucks, cement mixers, etc., are mobile, and move about the site throughout the days and months of construction. The construction analysis considers a reasonable worst-case scenario with all mobile equipment in the locations that would tend to generate the most noise at the adjacent receptors. Such a scenario, and the high noise levels associated with it, as have been examined in this construction noise analysis, would be likely to occur only during limited times throughout the construction period, and thus represent a highly conservative analysis.

Table 3.11.7-5
Noise Receptor Sites and Existing Noise Levels (in dBA)

Receptor	Location	Associated Measurement Location	Min Daytime L_{eq}	Min Nighttime L_{eq}
1	1 North End Ave North Facade	M1	60.0	56.4
2	1 North End Ave West Facade	M1	60.0	56.4
3	10 Little West St West Facade	M9	64.2	62.0
4	10 Little West St North Facade	M9	64.2	62.0
5	102 North End Ave	M7	64.6	59.0
6	140 West St	M7	64.6	59.0
7	148 Washington St	M7	64.6	59.0
8	2 River Terrace	M1	60.0	56.4
9	2 South End Ave	M9	60.0	56.4
10	20 River Terrace	M1	60.0	56.4
11	200 Chambers St	M4	65.7	60.1
12	200 North End Ave	M6	62.7	59.2
13	208 West St	M3	71.6	64.0
14	208 West St South	M3	71.6	64.0
15	21 South End Ave	M5	60.8	58.6
16	21 West St	M9	64.2	62.0
17	212 Warren St	M1	60.0	56.4
18	225 Liberty St West Facade North	M2	60.8	58.6
19	225 Liberty St West Facade South	M2	60.8	58.6
20	250 South End Ave	M2	60.8	58.6
21	250 Vesey St	M6	62.7	59.2
22	200 Rector Pl	M8	60.3	58.1
23	300 North End Ave	M6	62.7	59.2
24	310 Greenwich St	M3	71.6	64.0
25	310 Greenwich St South Facade	M3	71.6	64.0
26	310 Greenwich St West Facade	M3	71.6	64.0
27	320 Albany St North Facade	M5	60.8	58.6
28	320 Albany St West Facade	M5	60.8	58.6
29	320 Albany St South Facade	M5	60.8	58.6
30	345 Chambers St	M3	71.6	64.0
31	345 South End Ave North Facade	M2	60.8	58.6
32	345 South End Ave West Facade	M5	60.8	58.6
33	345 South End Ave Courtyard Facade	M5	60.8	58.6
34	377 Rector Pl	M2	60.8	58.6
35	380 Rector Pl	M5	60.8	58.6
36	387 Greenwich St	M3	71.6	64.0
37	399 Chambers St	M3	71.6	64.0
38	400 Chambers St North Facade	M6	62.7	59.2
39	400 Chambers St West Facade	M6	62.7	59.2
40	400 Chambers St East Facade	M6	62.7	59.2
41	450 North End Ave	M6	62.7	59.2
42	50 Battery Pl	M8	60.3	58.1
43	50 Battery Pl Courtyard Facade	M8	60.3	58.1
44	30 Little West St	M9	64.2	62.0
45	70 Battery Pl	M8	60.3	58.1
46	70 Battery Pl Courtyard Facade	M8	60.3	58.1
47	70 Battery Pl East Building	M9	64.2	62.0
48	99 Battery Pl	M9	64.2	62.0
49	South Cove	M8	60.3	58.1
50	South Cove	M8	60.3	58.1
51	South Esplanade	M2	60.8	58.6
52	South Esplanade	M2	60.8	58.6

Table 3.11.7-5
Noise Receptor Sites and Existing Noise Levels (in dBA)

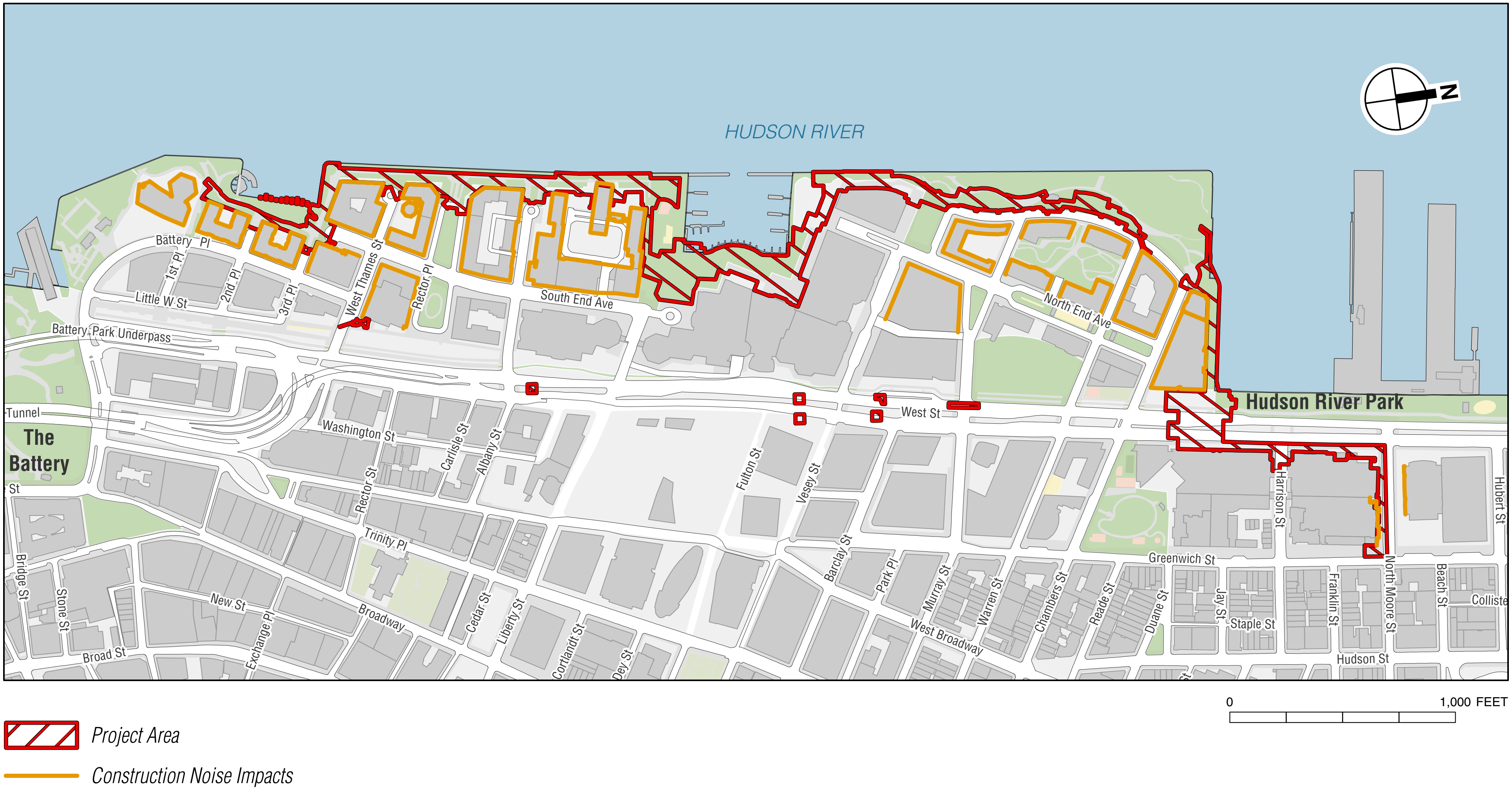
Receptor	Location	Associated Measurement Location	Min Daytime L_{eq}	Min Nighttime L_{eq}
53	South Esplanade	M2	60.8	58.6
54	South Esplanade	M2	60.8	58.6
55	North Cove	M5	60.8	58.6
56	North Cove	M5	60.8	58.6
57	North Cove	M5	60.8	58.6
58	Esplanade	M5	60.8	58.6
59	Esplanade	M1	60.0	56.4
60	North Park	M1	60.0	56.4
61	North Park	M1	60.0	56.4
62	North Esplanade	M1	60.0	56.4
63	North Esplanade	M1	60.0	56.4
64	Hudson River Park	M3	71.6	64.0
65	Greenway	M3	71.6	64.0
66	Pier 25	M3	71.6	64.0
67	Pier 26	M3	71.6	64.0

Note: Measurements were conducted by AKRF, Inc. on 09/28/2022, 09/29/2022, 11/02/2022, 06/06/2023, and 06/07/2023.

The results of the detailed construction noise analysis are summarized in **Table 3.11.7-6** and discussed further below. Construction Noise Impact locations are shown in **Figure 3.11.7-2**.

Construction of the Proposed Project is predicted to result in noticeable and at times intrusive noise level increases at noise receptors adjacent to construction work areas. Generally, the noise level increases resulting from construction would occur at buildings and open space areas while construction activity is in the vicinity of these noise receptors, and noise level increases would be lower when construction activity moves to a new section of the Project Area. Areas immediately adjacent to construction work areas would experience the highest levels of noise while construction is ongoing, whereas receptors in buildings further east of the work areas would experience somewhat less noise because of the greater distance from the on-site construction equipment and shielding from existing buildings.

7.18.24



Construction Noise Impacts

Figure 3.11.7-2

NORTH/WEST BATTERY PARK CITY RESILIENCY

Table 3.11.7-6
Daytime Construction Noise Analysis Results (in dBA)

Receptor	Existing L_{10} Noise Level	Min Total L_{10}	Max Total L_{10}	Min Total L_{10}	Max Total L_{10}
1	63.0	63.8	80.7	0.8	17.7
2	63.0	65.7	85.1	2.7	22.1
3	67.2	67.2	72.9	0.0	5.7
4	67.2	67.2	71.8	0.0	4.6
5	67.6	68.4	78.1	0.8	10.5
6	67.6	67.6	68.7	0.0	1.1
7	67.6	67.7	68.0	0.1	0.4
8	63.0	67.2	83.2	4.2	20.2
9	63.0	63.0	78.8	0.0	15.8
10	63.0	70.2	84.5	7.2	21.5
11	68.7	68.7	71.2	0.0	2.5
12	65.7	65.9	67.2	0.2	1.5
13	74.6	74.6	83.4	0.0	8.8
14	74.6	74.6	84.8	0.0	10.2
15	63.8	63.9	89.6	0.1	25.8
16	67.2	67.2	68.7	0.0	1.5
17	63.0	67.7	75.5	4.7	12.5
18	63.8	73.2	81.4	9.4	17.6
19	63.8	72.9	80.4	9.1	16.6
20	63.8	64.1	69.2	0.3	5.4
21	65.7	65.9	74.9	0.2	9.2
22	63.3	63.3	64.3	0.0	1.0
23	65.7	65.8	66.2	0.1	0.5
24	74.6	74.6	86.1	0.0	11.5
25	74.6	74.6	75.7	0.0	1.1
26	74.6	74.6	74.7	0.0	0.1
27	63.8	63.9	75.1	0.1	11.3
28	63.8	64.0	85.4	0.2	21.6
29	63.8	63.9	66.6	0.1	2.8
30	74.6	74.6	84.5	0.0	9.9
31	63.8	73.1	78.0	9.3	14.2
32	63.8	68.0	83.0	4.2	19.2
33	63.8	64.1	71.6	0.3	7.8
34	63.8	63.8	79.2	0.0	15.4
35	63.8	63.9	88.6	0.1	24.8
36	74.6	74.6	77.7	0.0	3.1
37	74.6	74.6	90.6	0.0	16.0
38	65.7	65.8	78.7	0.1	13.0
39	65.7	66.6	79.4	0.9	13.7
40	65.7	65.8	66.3	0.1	0.6
41	65.7	65.8	72.0	0.1	6.3
42	63.3	63.3	91.6	0.0	28.3
43	63.3	63.3	81.6	0.0	18.3
44	67.2	67.2	67.5	0.0	0.3
45	63.3	63.3	86.5	0.0	23.2
46	63.3	63.3	78.5	0.0	15.2
47	67.2	67.2	75.8	0.0	8.6
48	67.2	67.2	72.8	0.0	5.6
49	63.3	63.3	66.1	0.0	2.8
50	63.3	63.3	65.1	0.0	1.8
51	63.8	63.8	63.9	0.0	0.1
52	63.8	63.8	64.6	0.0	0.8
53	63.8	63.8	64.2	0.0	0.4
54	63.8	63.8	65.3	0.0	1.5

Table 3.11.7-6
Daytime Construction Noise Analysis Results (in dBA)

Receptor	Existing L_{10} Noise Level	Min Total L_{10}	Max Total L_{10}	Min Total L_{10}	Max Total L_{10}
55	63.8	63.8	63.8	0.0	0.0
56	63.8	63.8	63.8	0.0	0.0
57	63.8	63.8	63.8	0.0	0.0
58	63.8	63.8	82.1	0.0	18.3
59	63.0	63.0	71.7	0.0	8.7
60	63.0	63.0	75.3	0.0	12.3
61	63.0	63.0	70.0	0.0	7.0
62	63.0	63.0	66.0	0.0	3.0
63	63.0	63.0	68.7	0.0	5.7
64	74.6	74.6	74.6	0.0	3.9
65	74.6	74.6	74.6	0.0	4.2
66	74.6	74.7	76.4	0.1	1.8
67	74.6	74.6	75.2	0.0	0.6

At many receptors (i.e., receptors 3, 4, 6, 7, 11, 12, 13, 16, 20-23, 25, 26, 29, 30, 33, 36, 40, 41, 44, 47-57, 59, and 61-67), maximum predicted daytime construction noise level increments would be less than 10 dBA throughout construction. While such increases in noise may be noticeable at times, predicted noise level increments are moderate and experienced over a limited duration. Noise levels generated by construction at these receptors would generally be in the "acceptable" to "clearly unacceptable" categories according to the 2021 *CEQR Technical Manual* noise exposure criteria throughout construction. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at these receptors.

Open Space Receptors

At the open space receptors along the Hudson River—Receptors 49 through 67—existing noise levels range from the mid 60s to mid 70s dBA, depending on proximity and line of sight to Route 9A/West Street.

It is expected that open spaces under construction or immediately adjacent to operation of construction equipment would not be accessible, so construction noise would therefore not affect open space users in those specific areas. However, open spaces that remain open and operational during construction in nearby areas (e.g., adjacent stage or reach) would still have the potential to experience noise from construction of the Proposed Project. As such receptors representing these open spaces have been included in the construction noise analysis during the analysis periods when they would not be closed.

At open space receptors along the Esplanade north of North Cove (i.e., receptors 58, 59, and 60) and along the North Esplanade (i.e., receptor 63), construction of the Proposed Project is predicted to produce noise levels at these receptors in the high 60s to low 80s dBA. The predicted noise levels at these open space locations, up to approximately 82 dBA resulting from work in reaches other than those immediately adjacent to each open space receptor, would be noticeable and would exceed CEQR construction noise screening thresholds and the total noise levels would exceed the levels recommended by CEQR for passive open spaces (55 dBA L_{10}). It is noted that noise levels in these areas also exceed CEQR recommended values for existing and No Action conditions. Some New York City parks and open space areas located near heavily trafficked roadways and/or near construction sites experience comparable, and sometimes higher noise levels. At these receptors, noise level increases in the range of 5 to 18 dBA are predicted to occur for up to approximately 12 months under the Proposed Project. Based on the prediction of potentially disruptive noise level increments, as well as total noise levels exceeding the threshold recommended by CEQR for passive open spaces over an extended duration, these open space areas would experience a significant adverse noise impact.

Receptors Along Reach 1

Construction of the Proposed Project in Reach 1 will be completed in five stages: 1A, 1B, 1C, 1D, and 1E. Stage 1A is located along North Moore Street between Greenwich Street and Route 9A/West Street. Stages 1B, 1C, and 1D are located along Route 9A/West Street between North Moore Street the north esplanade. Stage 1E is located within Route 9A/West across from the north esplanade. For each Stage, the most noise-intensive activities would be demolition/excavation and pile installation (drilled). At Stage 1A, demolition would occur for less than one month, while drilling for pile installation would occur for approximately seven months. At Stage 1B, demolition would occur for less than one month, while drilling for pile installation would occur for approximately 13 months. At Stage 1C, demolition would occur for less than one month, while drilling for pile installation would occur for approximately six months. At Stage 1D, demolition would occur for less than one month, while drilling for pile installation would occur for approximately nine months. At Stage 1E, demolition would occur for less than one month, while drilling for pile installation would occur for approximately 12 months.

At the residential receptors at 310 Greenwich Street, receptor 24 immediately adjacent to work in Reach 1, existing noise levels are in the low 70s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors up to the mid 80s dBA, resulting in noise level increments up to approximately 12 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of approximately 48 months. However, the predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptor 24 has the potential to experience the maximum predicted construction noise levels from work in Stage 1A. As described above, the duration of the activities in Stage 1A that would result in maximum construction noise levels at these receptors would be up to approximately eight months. This residential building consists of insulated glass windows and through-wall air conditioning, and would therefore be expected to provide at least 28 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 58 dBA, i.e., approximately 13 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments as well as “clearly unacceptable” noise levels over an extended duration, construction of the Proposed Project would result in a significant adverse noise impact at façades facing construction on residential buildings in Reach 1.

At residential receptors set back from work in Reach 1—Receptors 25, 26, and 36 — existing noise levels are in the low 70s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 70s dBA, resulting in noise level increments up to approximately 3 dBA. While such increases in noise may be perceptible at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact residences set back from work in Reach 1.

At the Borough of Manhattan Community College (BMCC)—Receptors 13, 14, 25, and 26— existing noise levels are in the low 70s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 70s to mid 80s dBA, resulting in noise level increments up to approximately 10 dBA. While such increases in noise may be noticeable at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at BMCC.

Receptors Along Reach 2

Construction in Reach 2 will be completed in two stages: 2A and 2B. Stage 2A is located along the north esplanade between Route 9A/West Street and River Terrace. Stage 2B is located along the west façade of 399 Chambers Street. For each Stage, the most noise-intensive activities would be demolition/excavation and pile installation (drilled). Demolition would occur for less than two months in Stage 2A and less than one month in Stage 2B, while drilling for pile installation would occur for approximately nine months in Stage 2A and one month in Stage 2B. The proposed Pump Station construction would also occur in Stage 2A. For Pump Station construction, the most noise-intensive activities would be support of excavation (SOE), excavation, which would occur over a combined 16 months.

At Stuyvesant High School and the 399 Chambers Street residential building—Receptors 30 and 37—existing noise levels are in the low 70s dBA. These receptors are located immediately adjacent to proposed work in Reach 2, but they also have line of sight to the proposed Pump Station. Construction under the Proposed Project—including contributions from both Reach 2, Reach 1, and the Pump Station—is predicted to produce noise levels at these receptors in the low 60s to low 90s dBA, resulting in noise level increments up to approximately 16 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of approximately 33 months. However, the predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 30 and 37 have the potential to experience the maximum predicted construction noise levels from work in Stages 2A and 2B and the proposed Pump Station. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 29 combined months. These buildings consist of insulated glass windows and either through-wall conditioning and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 61 dBA, i.e., approximately 16 dBA greater than the level considered acceptable for residential or classroom use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies (e.g., those at 399 Chambers Street) would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments, as well as “clearly unacceptable” noise levels over an extended duration, construction of the

Proposed Project would result in significant adverse noise impacts at façades of Stuyvesant High School and 399 Chambers Street facing construction.

Receptors Along Reach 3

Construction in Reach 3 will be completed in two stages: 3B and 3C. Stage 3B is located along River Terrace between Warren Street and Murray Street. Stage 3C is located along River Terrace south of Murray Street. For each Stage, the most noise-intensive activities would be demolition/excavation and pile installation (drilled). At Stage 3B, demolition would occur for less than one month, while drilling for pile installation would occur for approximately five months. At Stage 3C, demolition would occur for less than one month, while drilling for pile installation would occur for approximately three months.

At residential buildings immediately adjacent to work in Reach 3—Receptors 10, 17, 38, 39, and 40—existing noise levels are in the low 70s dBA. These receptors are located immediately adjacent to proposed work in Reach 3, but they also have line of sight to work in Stage 2B. Construction under the Proposed Project, including contributions from both Reach 3 and Reach 2, is predicted to produce noise levels at these receptors in the high 60s to mid 80s dBA, resulting in noise level increments up to approximately 22 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of the entire construction period. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 10, 17, 38, 39, and 40 have the potential to experience the maximum predicted construction noise levels from work in Stage 3B. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately six months. These residential buildings consist of insulated glass windows and either through-wall or central air conditioning, and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 55 dBA, i.e., approximately 10 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments, as well as “clearly unacceptable” noise levels over an extended duration, construction of the Proposed Project would result in significant adverse noise impacts at construction-facing façades of residential buildings along Reach 3.

At residential buildings set back from the work areas in Reach 3—Receptors 11, 12, 23, and 41—existing noise levels are in the low 60s to low 70s dBA depending on proximity and line of sight to West Street. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the low 60s to low 70s dBA, resulting in noise level increments up to approximately 6 dBA. While such increases in noise may be noticeable at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at residences set back from work in Reach 3.

Receptors Along Reach 4

Construction in Reach 4 will be completed in four stages: 4A, 4B, 4B.1, and 4B.2. Stage 4A is located along North End Avenue between River Terrace and Vesey Street. Stages 4B, 4B.1, and 4B.1 are located along the Battery Park City Esplanade between Vesey Street and North Cove Marina. For each Stage, the most noise-intensive activities would be demolition/excavation, pile installation (drilled), and platform reconstruction. At Stage 4A, demolition would occur for approximately two months, while drilling for pile installation would occur for approximately three months. At Stage 4B, demolition would occur for approximately one month, drilling for pile installation would occur for approximately nine months, and platform reconstruction would occur for approximately four months. At Stage 4B.1, demolition would occur for approximately one month, drilling for pile installation would occur for approximately one month, and platform reconstruction would occur for approximately one month. At Stage 4B.2, demolition would occur for approximately one month, while drilling for pile installation would occur for approximately three months.

At residential and hotel buildings immediately adjacent to work in Reach 4—Receptors 5 and 8— existing noise levels are in the low 60s dBA. These receptors are located immediately adjacent to proposed work in Reach 4, but they also have line of sight to work in Stage 5A. Construction under the Proposed Project, including contributions from both Reach 4 and Reach 5, is predicted to produce noise levels at these receptors in the high 60s to low 80s dBA, resulting in noise level increments up to approximately 20 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of approximately 39 months. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 5 and 8 have the potential to experience the maximum predicted construction noise levels from work in Stages 4A and 4B.2. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately nine months. These residential and hotel buildings consist of insulated glass windows and central air conditioning, and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 51 dBA, i.e., approximately 6 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments, as well as “clearly unacceptable” noise levels over an extended duration, construction of the Proposed Project would result in significant adverse noise impacts at construction-facing façades of residential and hotel buildings along Reach 4.

At commercial office buildings immediately adjacent to work in Reach 4—Receptors 1, 2, and 5—existing noise levels are in the low 60s dBA. These receptors are located immediately adjacent to proposed work in Reach 4, but they also have line of sight to work in Stage 5A. Construction under the Proposed Project, including contributions from both Reach 4 and Reach 5, is predicted to produce noise levels at these receptors in the low 60s to low 80s dBA, resulting in noise level increments up to approximately 18 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of approximately 39 months. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 22 months. These commercial office buildings consist of insulated glass windows and central air conditioning, and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 49 dBA, which is less than the level considered acceptable for commercial office use according to *CEQR Technical Manual* noise exposure guidance. Based on the prediction of interior noise levels in the acceptable range for commercial office use, noise associated with the Proposed Project would not rise to the level of a significant adverse impacts at construction-facing façades of commercial office buildings along Reach 4.

At residential buildings set back from the work areas in Reach 4 —Receptor 6— existing noise levels are in the mid 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 60s dBA, resulting in noise level increments less than 3 dBA. While such increases in noise may be noticeable at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at residences set back from work in Reach 4.

Receptors Along Reach 5

Construction in Reach 5 will be completed in seven stages: 5A, 5B, 5C, 5D, 5E, 5E.1, and 5E.2. Stages 5A and 5B are located within Belvedere Plaza. Stage 5C is located along the northeastern portion of the North Cove Marina. Stage 5D is located along the southeastern portion of the North Cove Marina. Stages 5E, 5E.1, and 5E.2 are located along the southern edge of the North Cove Marina. For each Stage, the most noise-intensive activities would be demolition/excavation, pile installation (drilled), and platform reconstruction. At Stages 5A and 5B, demolition would occur for less than one month, and drilling for pile installation would occur for approximately five months. At Stage 5C, demolition would occur for approximately two months, drilling for pile installation would occur for approximately seven months, and platform reconstruction would occur for less than two months. At Stage 5D, demolition would occur for approximately two months, drilling for pile installation would occur for approximately ten months, and platform reconstruction would occur for less than two months. At Stages 5E, 5E.1, and 5E.2, demolition would occur for less than one month, and drilling for pile installation would occur for approximately six months.

At residential buildings immediately adjacent to work in Reach 5—Receptor 31—existing noise levels are in the low 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 70s dBA, resulting in noise level increments up to approximately 14 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of the entire construction period. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptor 31 has the potential to experience the maximum predicted construction noise levels from work in Stages 5D, 5E, 5E.1, and 5E.2. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 21 months. These residential buildings consist of insulated glass windows and through-wall air conditioning, and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 48 dBA, i.e., approximately 3 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments over an extended duration, construction of the Proposed Project would result in significant adverse noise impacts at construction-facing façades of residential buildings along Reach 5.

At commercial office buildings immediately adjacent to work in Reach 5—Receptors 18 and 19—existing noise levels are in the low 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid to low 80ss dBA, resulting in noise level increments up to approximately 18 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of the entire construction period. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 18 and 19 have the potential to experience the maximum predicted construction noise levels from work in Stages 5C and 5D. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 25 months. These commercial office buildings consist of insulated glass windows and central air conditioning, and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 50 dBA, i.e., not greater than the level considered acceptable for commercial office use according to *CEQR Technical Manual* noise exposure guidance. Based on the prediction of interior noise levels not exceeding the recommended level for commercial office and the limited duration of potentially disruptive noise level increments, noise associated with the Proposed Project would not rise to the level of a significant adverse impacts at construction-facing façades of commercial office buildings along Reach 5.

At residential buildings and open space set back from the work areas in Reach 5—Receptor 7—existing noise levels are in the mid 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 60s dBA, resulting in noise level increments less than 2 dBA. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact residences set back from work in Reach 5.

Receptors Along Reach 6

Construction in Reach 6 will be completed in four stages: 6A, 6B, 6C, and 6D. Stage 6A is located along the Battery Park City esplanade between Liberty Street and Albany Street. Stage 6B is located along the Battery Park City esplanade between Albany Street and Rector Place. Stage 6C is located along the Battery Park City esplanade between Rector Place and West Thames Avenue. Stage 6D is located along the Battery Park City esplanade between West Thames Avenue and Third Place. For each stage, the most noise-intensive activities would be demolition/excavation, pile installation (drilled), and platform reconstruction. At Stage 6A, demolition would occur for less than one month, drilling for pile installation would occur for approximately eleven months, and platform reconstruction would occur for approximately two months.

At Stage 6B, demolition would occur for less than one month, and drilling for pile installation would occur for approximately six months. At Stage 6C, demolition would occur for less than one month, and drilling for pile installation would occur for approximately seven months. At Stage 6D, demolition would occur for less than one month, and drilling for pile installation would occur for approximately four months.

At residential buildings immediately adjacent to work in Reach 6—Receptors 9, 15, 27, 28, 31, 32, 34, and 35—existing noise levels are in the low 60s dBA. These receptors are located immediately adjacent to proposed work in Reach 6, but they also have line of sight to work in Stage 5A. Construction under the Proposed Project, including contributions from both Reach 5 and Reach 6, is predicted to produce noise levels at these receptors in the mid 60s to high 80s dBA, resulting in noise level increments up to approximately 26 dBA.

At receptors 31 and 32, construction under the Proposed Project is predicted to produce noise levels in the mid 60s to mid 80s dBA, resulting in noise level increments up to approximately 22 dBA. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 31 and 32 have the potential to experience the maximum predicted construction noise levels from work in Stage 6A. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 14 months.

At receptors 27, 28, and 34, construction under the Proposed Project is predicted to produce noise levels in the mid 60s to mid 80s dBA, resulting in noise level increments up to approximately 22 dBA. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 27, 28, and 34 have the potential to experience the maximum predicted construction noise levels from work in Stage 6B. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately seven months.

At receptors 9, 15, and 35, construction under the Proposed Project is predicted to produce noise levels in the mid 60s to high 80s dBA, resulting in noise level increments up to approximately 26 dBA. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 9, 15, and 35 have the potential to experience the maximum predicted construction noise levels from work in Stage 6C. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately eight months.

These residential buildings consist of insulated glass windows and through-wall air conditioning, and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 60 dBA, i.e., approximately 15 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation.

A school use (i.e., Battery Park Montessori preschool) is located on the first floor of the building represented by receptor 15. Construction under the Proposed Project is predicted to produce noise levels in the mid 60s to low 80s dBA at this school, resulting in noise level increments up to approximately 16 dBA. However, the maximum predicted noise levels represent a worst-case condition for this receptor when the most noise-intensive equipment would be operating at the nearest points to the receptor. Receptor 15 has the potential to experience the maximum predicted construction noise levels from work in Stage 6C. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately eight months. Further, the façade of this building at the school consists of insulated glass windows and through-wall air conditioning and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 50 dBA, i.e., approximately 5 dBA greater than the level considered acceptable for community facility use according to *CEQR Technical Manual* noise exposure guidance.

Based on the prediction of potentially disruptive noise level increments, as well as "clearly unacceptable" noise levels over an extended duration, construction of the Proposed Project would result in significant adverse noise impacts at construction-facing façades of residential buildings along Reach 6 as well as the school use at receptor 15 (i.e., Battery Park Montessori preschool).

A school use (i.e., Metro Kids preschool) is located on the first floor of the building represented by receptor 9. Construction under the Proposed Project is predicted to produce noise levels in the mid 60s to low 70s dBA at this school, resulting in noise level increments up to approximately 11 dBA. However, the maximum predicted noise levels represent a worst-case condition for this receptor when the most noise-intensive equipment would be operating at the nearest points to the receptor. Receptor 9 has the potential to experience the maximum predicted construction noise levels from work in Stage 6C. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately eight months. Further, the façade of this building at the school consists of insulated glass windows and central air conditioning and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 42 dBA, i.e., within the range considered acceptable for community facility use according to *CEQR Technical Manual* noise exposure guidance. Based on the prediction of acceptable interior noise levels throughout the construction period, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at this school use.

A school use (i.e., Battery Park City Day Nursery) is located on the first floor of the building represented by receptor 27. Construction under the Proposed Project is predicted to produce noise levels in the mid to high 60s dBA at this school, resulting in noise level increments up to approximately 6 dBA. However, the maximum predicted noise levels represent a worst-case condition for this receptor when the most noise-intensive equipment would be operating at the nearest points to the receptor. Receptor 27 has the potential to experience the maximum predicted construction noise levels from work in Stage 6B. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately seven months. Further, the façade of this building at the school consists of insulated glass windows and through-wall air conditioning and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 40 dBA, i.e., within the range considered acceptable for community facility use according to *CEQR Technical Manual* noise exposure guidance. Based on the prediction of acceptable interior noise levels throughout the construction period, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at this school use.

A school use (i.e., NY Kids Club preschool) is located on the first floor of the building represented by receptor 31. Construction under the Proposed Project is predicted to produce noise levels in the mid 60s to low 70s dBA at this school, resulting in noise level increments up to approximately 9 dBA. However, the maximum predicted noise levels represent a worst-case condition for this receptor when the most noise-intensive equipment would be operating at the nearest points to the receptor. Receptor 31 has the potential to experience the maximum predicted construction noise levels from work in Stage 6A. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately 14 months. Further, the façade of this building at the school consists of insulated glass windows and through-wall air conditioning and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 43 dBA, i.e., within the range considered acceptable for community facility use according to *CEQR Technical Manual* noise exposure guidance. Based on the prediction of acceptable interior noise levels throughout the construction period, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at this school use.

At residential buildings and open space set back from the work areas in Reach 6 —Receptors 7, 20, 22, 29, and 48— existing noise levels are in the low 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the mid 50s to low 70s dBA, resulting in noise level increments up to approximately 6 dBA. While such increases in noise may be noticeable at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at residences set back from work in Reach 6.

Receptors Along Reach 7

Construction in Reach 7 will be completed in three stages: 7A, 7B, and 7C. Stage 7A is located along the Battery Park City Esplanade at Third Place west of South End Avenue. Stage 7B is located along the Battery Park City Esplanade between Third Place and Second Place. Stage 7C is located along the Battery Park City Esplanade between Second Place and First Place. For each Stage, the most noise-intensive activities would be demolition/excavation and pile installation (drilled). At Stage 7A, demolition would occur for less than one month, while drilling for pile installation would occur for approximately four months. At Stage 7B, demolition would occur for less than one month, while drilling for pile installation would occur for approximately four months. At Stage 7C, demolition would occur for less than one month, while drilling for pile installation would occur for approximately four months.

At residential buildings immediately adjacent to work in Reach 7—Receptors 42, 43, 45, and 46—existing noise levels are in the low 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the low 60s to low 90s dBA, resulting in noise level increments up to approximately 28 dBA. At these receptors, noise level increments exceeding 10 dBA would occur at times over the course of approximately 27 months. However, the maximum predicted noise levels represent a worst-case condition for these receptors when the most noise-intensive equipment would be operating at the nearest points to the receptors. Receptors 42, 43, 45, and 46 have the potential to experience the maximum predicted construction noise levels from work in Stages 7B and 7C. Based on the duration of the most noise-intensive construction activities as described above, the duration of maximum construction noise levels at these receptors would be up to approximately ten months. These residential buildings consist of insulated glass windows and through-wall air conditioning, and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels up to approximately 61 dBA, i.e., approximately 16 dBA greater than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. However, outdoor terraces/balconies would not benefit from the window/wall attenuation. Based on the prediction of potentially disruptive noise level increments, as well as “clearly unacceptable” noise levels over an extended duration, construction of the Proposed Project would result in significant adverse noise impacts at construction-facing façades of residential buildings along Reach 7.

At residential buildings set back from the work areas in Reach 7—Receptors 3, 4, 16, 44, and 47—existing noise levels are in the mid 60s dBA. Construction under the Proposed Project is predicted to produce noise levels at these receptors in the low 60s to mid 70s dBA, resulting in noise level increments less than 9 dBA. While such increases in noise may be noticeable at times, predicted noise level increments would be moderate and would occur over a very limited duration. Consequently, construction noise associated with the Proposed Project would not rise to the level of a significant adverse impact at residences set back from work in Reach 7.

After-Hours Construction

As described above, there are certain activities that would need to be completed outside of daytime working hours permitted by NYC Noise Control Code (i.e., 7 AM to 6 PM). Construction activity outside of these hours would require preparation of an Alternative Construction Noise Mitigation Plan, which describes the need for work outside of weekday daytime hours and the additional noise control measures that would be employed for such work, for review and approval by NYCDEP.

Specifically, work that would need to be completed during overnight hours would be work in Reach 1 for Stage 1E, which would include a work shift from 10 PM to 6 AM due to the effects on Route 9A/West Street.

Overnight construction activity in Stage 1E would occur over the course of approximately 27 months. The work area in Stage 1E at which overnight construction activity would occur is located along Route 9A/West

Street between Chambers Street and Harrison Street, although more specifically it would be in between BMCC and Stuyvesant High School. The receptors that have line of sight to this work area include the residential building at 200 Chambers Street (receptor 11), the BMCC building at 208 West Street (receptors 13 and 14), Stuyvesant High School at 345 Chambers Street (receptor 30), the residential building at 399 Chambers Street (receptor 37), P.S. 89 Liberty (receptor 41), the residential building at 450 North End Avenue (receptor 41), and open space along the North Esplanade (receptor 63) and Hudson River Park and associated greenway (receptors 64 and 65).

Of these receptors, Stuyvesant High School, BMCC, P.S. 89 Liberty, the North Esplanade, and Hudson River Park are non-residential and therefore not noise-sensitive during overnight hours.

The nearest Residential receptor that has line of sight to the Stage 1E work area would be 200 Chambers Street (receptor 11). The existing ambient noise level at this receptor is represented by measurement location 4, i.e., approximately 63 dBA. The maximum predicted construction noise level predicted at this receptor was 66.3 dBA, resulting in a total noise exposure in the low 70s dBA and a noise level increment of approximately 7 dBA. This increment would be considered barely perceptible to readily noticeable. Further, this building consists of insulated glass windows and central air conditioning, and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels less than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. Consequently, noise associated with after-hours construction in Stage 1E would not rise to the level of a significant adverse impact at 200 Chambers Street.

At 399 Chambers Street (receptor 37), the existing ambient noise level at this receptor is represented by measurement location 3, i.e., approximately 67 dBA. The maximum predicted construction noise level predicted at this receptor was 65 dBA, resulting in a total noise exposure in the low 70s dBA and a noise level increment of approximately 4 dBA. This increment would be considered barely perceptible to readily noticeable. Further, this building consists of insulated glass windows and through-wall air conditioning, and would therefore be expected to provide at least 30 dBA of window/wall attenuation, resulting in interior noise levels less than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. Consequently, noise associated with after-hours construction in Stage 1E would not rise to the level of a significant adverse impact at 399 Chambers Street.

At 450 North End Avenue (receptor 41), the existing ambient noise level at this receptor is represented by measurement location 6, i.e., approximately 62 dBA. The maximum predicted construction noise level predicted at this receptor was 49 dBA, resulting in a total noise exposure in the low 60s dBA and a noise level increment less than 1 dBA. This increment would be considered imperceptible. Further, this building consists of insulated glass windows and central air conditioning, and would therefore be expected to provide at least 32 dBA of window/wall attenuation, resulting in interior noise levels less than the level considered acceptable for residential use according to *CEQR Technical Manual* noise exposure guidance. Consequently, noise associated with after-hours construction in Stage 1E would not rise to the level of a significant adverse impact at 450 North End Avenue.

At other residential receptors further away and shielded from the Stage 1E work area, construction noise levels would be lower and have less potential to result in a significant adverse impact. Specifically, the predicted noise level increment during overnight work in Stage 1E would be less than 3 dBA at all other receptors included in the analysis. As such, noise associated with after-hours construction in Stage 1E would not rise to the level of a significant adverse impact at any other receptors.

Additionally, work may occur on an occasional basis on Saturdays to receive deliveries or catch up from weather delays. Weekend construction noise effects would be similar to the daytime effects described above, but would likely be of less magnitude due to the limited amount of work and less duration due to the relatively infrequency of Saturday construction activity. Consequently, occasional Saturday construction associated with the Proposed Project would not result in significant adverse noise impacts beyond those described above.

3.11.7.8 Construction Vibration

Construction activities have the potential to result in vibration levels that can cause structural or architectural damage, and/or annoyance or interference with vibration-sensitive activities. Vibratory levels at a receiver are a function of the source strength (which is dependent upon the construction equipment and methods utilized), the distance between the equipment and the receiver, the characteristics of the transmitting medium, and the receiver building foundation design. Construction equipment operation causes ground vibrations that transmit through the ground and decrease in strength with distance. Vehicular traffic, even in locations close to major roadways, typically does not result in perceptible vibration levels unless there are irregular road surfaces. Except for fragile and historically significant structures or buildings, construction activities generally do not reach levels that can cause architectural or structural damage but can achieve levels that are perceptible and annoying in buildings very close to a construction site. This assessment has been prepared to quantify potential vibration impacts of construction activities on structures and residences near the construction of the Proposed Project.

3.11.7.8.1 Construction Vibration Criteria

For purposes of assessing potential structural or architectural damage, the determination of a significant impact was based on the vibration impact criterion used by LPC of a peak particle velocity (PPV) of 0.50 inches/second as specified in the Department of Buildings (NYCDOB) *TPPN #10/88*.

For purposes of evaluating potential annoyance or interference with vibration-sensitive activities, vibration levels greater than 75 VdB would have the potential to result in significant adverse impacts if they were to occur for a prolonged period of time. This is the threshold above which vibration would be considered “distinctly perceptible.”[3]

[3] **Source:** *FTA Transit Noise and Vibration Impact Assessment (September 2018)*.

3.11.7.8.2 Analysis Methodology

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

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

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

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

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

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

$$L_v(D) = L_v(ref) – 30log(D/25)$$

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

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

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

Table 3.11-7-7 shows vibration source levels for typical construction equipment.

Table 3.11-7-7
Vibration Source Levels for Construction Equipment

Equipment	PPVref (in/sec)	Approximate Lv (ref) (VdB)
Pile Driver (sonic)	0.17–0.734	93-105
Clam Shovel drop (slurry wall)	0.202	94
Hydromill (slurry wall in rock)	0.017	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58
Source: FTA Transit Noise and Vibration Impact Assessment (September 2018).		

The source vibration levels shown in **Table 3.11-7-7** were projected to nearby receptors to estimate the levels of construction vibration that would occur near the Proposed Project.

3.11.7.8.3 Construction Vibration Analysis Results

The buildings and structures of most concern with regard to the potential for structural or architectural damage due to vibration would be those directly adjacent to pile installation locations, including the Stuyvesant High School, BMCC, and multiple residential buildings. Additionally, the historic bulkhead constitutes a vibration-sensitive structure of concern. Vibration levels at all of these buildings and structures would be below the 0.50 inches/second PPV limit.

Vibration monitoring would be required for all historic structures within 90 feet of the project work areas according to the project’s Instrumentation and Monitoring Plans to ensure vibration does not exceed the acceptable limit at any of these historic structures. This would include the historic bulkhead. At all other locations, the distance between construction equipment and receiving buildings or structures is large enough to avoid vibratory levels that would approach the levels that would have the potential to result in architectural or structural damage.

In terms of potential vibration levels that would be perceptible and annoying, the pieces of equipment that would have the most potential for producing levels that exceed the 75 VdB limit are vibratory pile drivers. They would produce noticeable vibration levels (i.e., vibration levels exceeding 75 VdB) at receptor locations within a distance of approximately 250 feet. However, the operation would only occur for limited periods of time at a particular location. Consequently, vibration resulting from construction under the Proposed Project would not rise to the level of a significant adverse impact.