16. Noise and Vibration

This chapter documents the Proposed Project's potential effect on noise and vibration levels within the study area, along with any potential noise mitigation measures that would be recommended as part of the Proposed Project. The analysis assesses the change in noise and vibration levels caused by the additional Metro-North service that would operate on the existing Hell Gate Line (HGL). Chapter 19, "Construction and Construction Impacts," discusses potential noise and vibration effects during construction and measures to minimize any adverse effects of the proposed construction activities.

16.1 KEY CONCLUSIONS

Key conclusions from this noise and vibration analysis include the following:

- Existing average daily day-night noise levels range from 62 to 81 decibels for the HGL Corridor.
- The Proposed Project would increase ambient noise levels by one to four decibels over existing day-night noise levels and create severe noise impacts at 17 buildings (34 dwelling units) and moderate impacts at 270 buildings (765 dwelling units) along the existing HGL Corridor.[1]
- MTA identified severe noise impacts within the Segment 3 portion of the corridor. MTA will abate properties exposed to severe noise impacts to moderate impacts by installing noise barriers (noise walls) where space is available for installation. At other properties with severe impacts, where there is insufficient space for installing a noise wall, MTA will replace the existing windows of the homes facing the transit corridor with high quality soundproof windows, subject to the property owners' approval.
- In study Segments 3 and 4, the Proposed Project would generate vibration impacts at 40 buildings (84 dwelling units) along the HGL Corridor. In all cases, MTA will abate vibration impacts by using under-rail pads and resilient fasteners in track construction.

16.2 METHODOLOGY

16.2.1 Definitions

To understand the assessment of noise and vibration impacts it is important to first define how noise and vibration are measured and perceived.

Noise is defined as "unwanted sound." By this definition, the perception of noise is subjective and depends upon a number of factors. Several factors affect the actual level and quality of sound (or noise) as perceived by the human ear and can generally be described in terms of loudness, pitch (or frequency), and time variation. The loudness, or magnitude, of noise determines its intensity and is measured in decibels that can range from below 40 decibels (e.g., the rustling of leaves) to more than 100 decibels (e.g., a rock concert). Pitch describes

1 "Severe" and "moderate" are terms used to categorize noise impacts, in accordance with the *FTA Transit Noise and Vibration Impact Assessment Manual*. "Severe" is equivalent to a significant impact and "moderate" would be considered adverse but less than significant.

the character and frequency content of noise, such as the very low "rumbling" noise of stereo subwoofers or the very high-pitched noise of a piercing whistle. Finally, the time variation of noise sources can be characterized as continuous (such as with a building ventilation fan), intermittent (such as for trains passing by) or impulsive (such as pile-driving activities during construction).

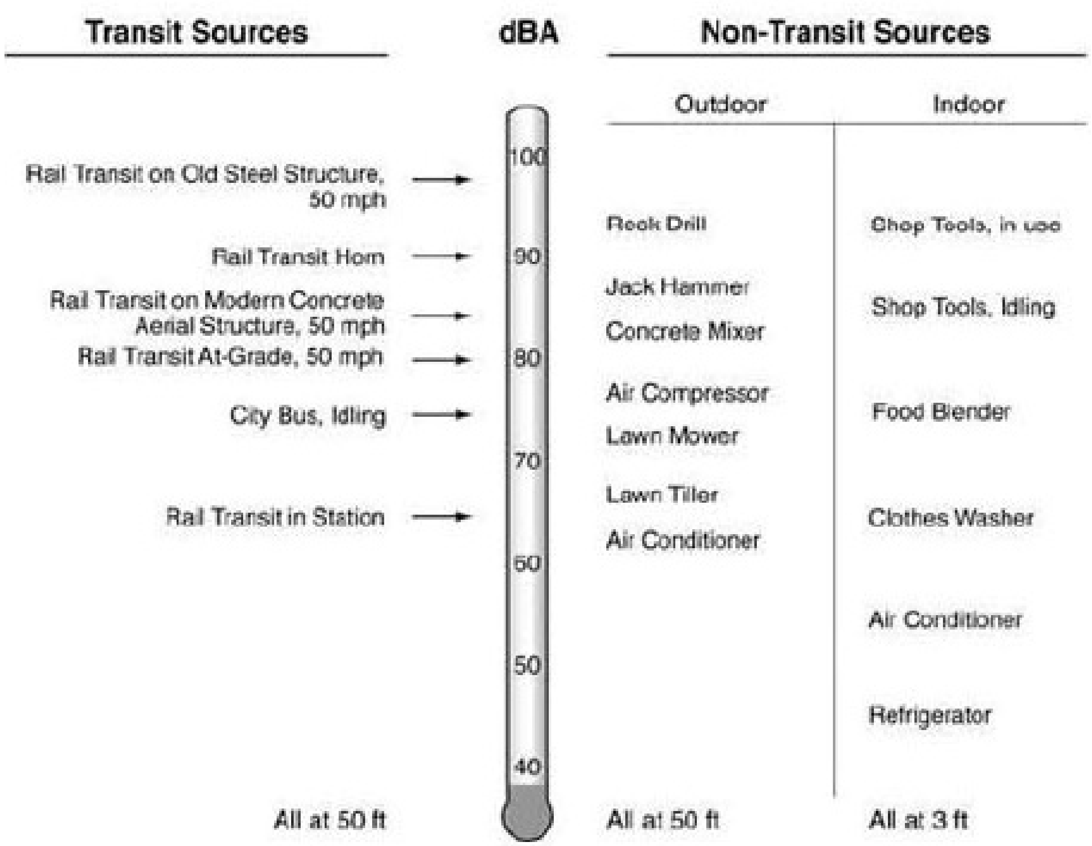
Various metrics are used to quantify noise, including its loudness, duration, and tonal character. For example, the A-weighted decibel (dBA) is commonly used to describe the overall noise level because it more closely matches the human ear's response to audible frequencies. As presented in Table 16-1, since the dBA scale is logarithmic, a 10 dBA increase in a noise level is generally perceived as a doubling of loudness, while a 3 dBA increase in a noise level is just barely perceptible to the human ear. Figure 16-1 shows the typical dBA sound levels from transit, traffic and other common sources.

Table 16-1. Average Ability to Perceive Changes in Noise Levels

Change in dBA	Human Perception
2 to 3	Barely Perceptible
5	Readily noticeable
10	A doubling or "halving" of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt, Beranek and Newman, Inc., Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703. Prepared for the Federal Highway Administration, June 1973.

Figure 16-1. Typical A-Weighted Decibel Levels for Transit and Non-Transit Noise Sources



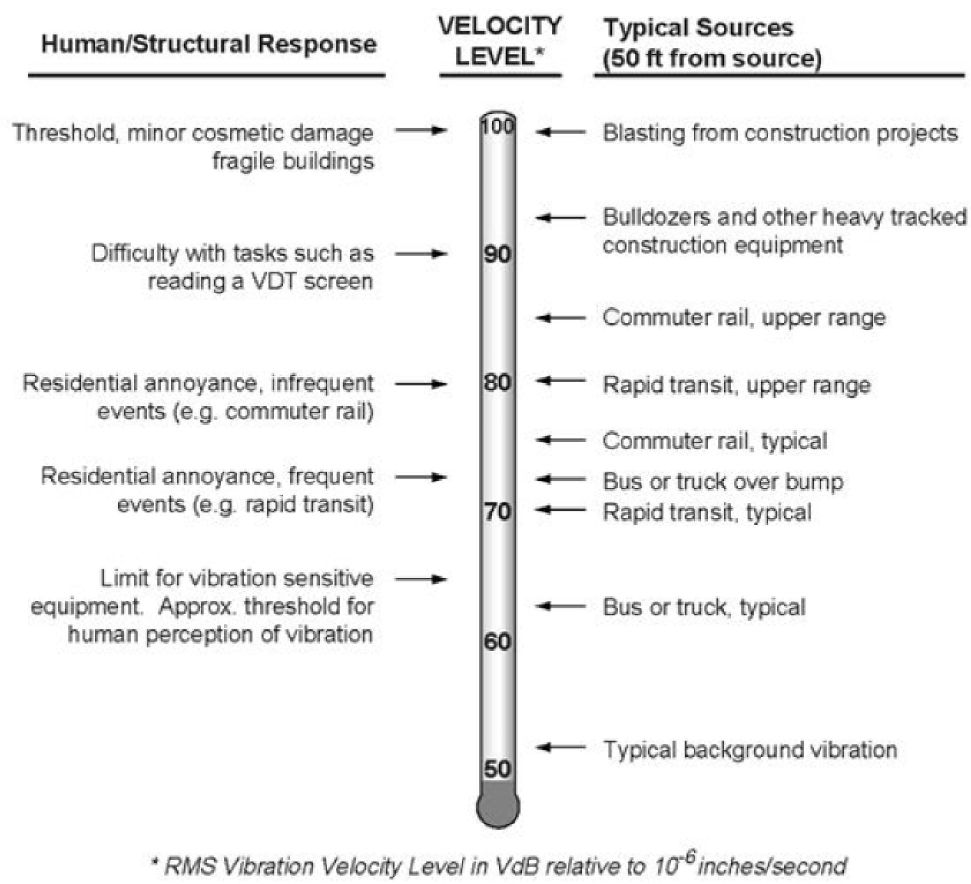
Source: Federal Transit Administration, 2018

Several dBA noise metrics are used to assess impacts from transit-related sources:

- Maximum Noise Level (Lmax) represents the maximum noise level that occurs during an event such as a bus or train pass-by.
- Average Hourly Equivalent Noise Level (Leq) represents a level of constant noise with the same acoustical energy as the fluctuating noise levels observed during an hour (Leq(h)).
- Average 24-hour Day/Night Noise Level (Ldn) represents a level of noise observed for a 24-hour period and includes a 10 decibel penalty for all nighttime activity between 10:00 p.m. and 7:00 a.m.

Vibration is ground-borne displacement of energy associated with vehicle movements. By this definition, vibration results where there is interaction between the ground and vehicle movement. Examples include train wheels rolling off a joint in the rail (causing rail movement), untrued train wheels ("flats") hitting the rail repeatedly (creating a vibration pattern), or a bus wheel hitting a pothole or any uneven surface. Figure 16-2 shows the typical ground-borne vibration levels from transit and other common sources.

Figure 16-2. Typical Ground-Borne Vibration Levels for Transit and Non-Transit Sources



Source: Federal Transit Administration, 2018

Unlike noise, which travels through the air, transit vibration typically travels along the surface of the ground. Depending on the geological properties of the terrain and the type of structures exposed to the vibration, the propagation of that vibration can be more or less efficient. Buildings with a solid foundation set in bedrock are "coupled" more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings located in sandier soils. Heavier buildings (such as masonry structures) are less susceptible to vibration than wood-framed buildings because they can absorb more of the vibration energy. Vibration induced by passing vehicles can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments are most accurately described with velocity. Therefore, for transit projects the vibration velocity level is used to assess vibration impacts.

To describe the human response to vibration, the average vibration amplitude (called the root mean square [RMS] amplitude) is used to assess impacts. The RMS velocity level is expressed in inches per second or vibration velocity decibels (VdB). All VdB vibration levels are referenced to one micro-inch per second (µips). To simplify, these measurements are brought to a standard scale (Figure 16-2) to make evaluation more easily understood.

16.2.2 Assessment Methodology

The Federal Transit Administration *Transit Noise and Vibration Impact Assessment Manual* (FTA Report No. 0123, September 2018) presents the basic concept of transit noise and vibration, methods for assessment, and criteria for evaluating the extent and severity of noise and vibration impacts from transit operations. MTA analyzed the dwelling units within the HGL Corridor right-of-way up to the distance that there were no noise or vibration impacts and assessed transit noise impacts based on land-use categories and sensitivity to noise from transit sources under the FTA guidelines. Table 16-2 shows FTA land-use categories and required noise descriptors used for impact assessment.

Table 16-2. Land-Use Categories and Noise Metrics

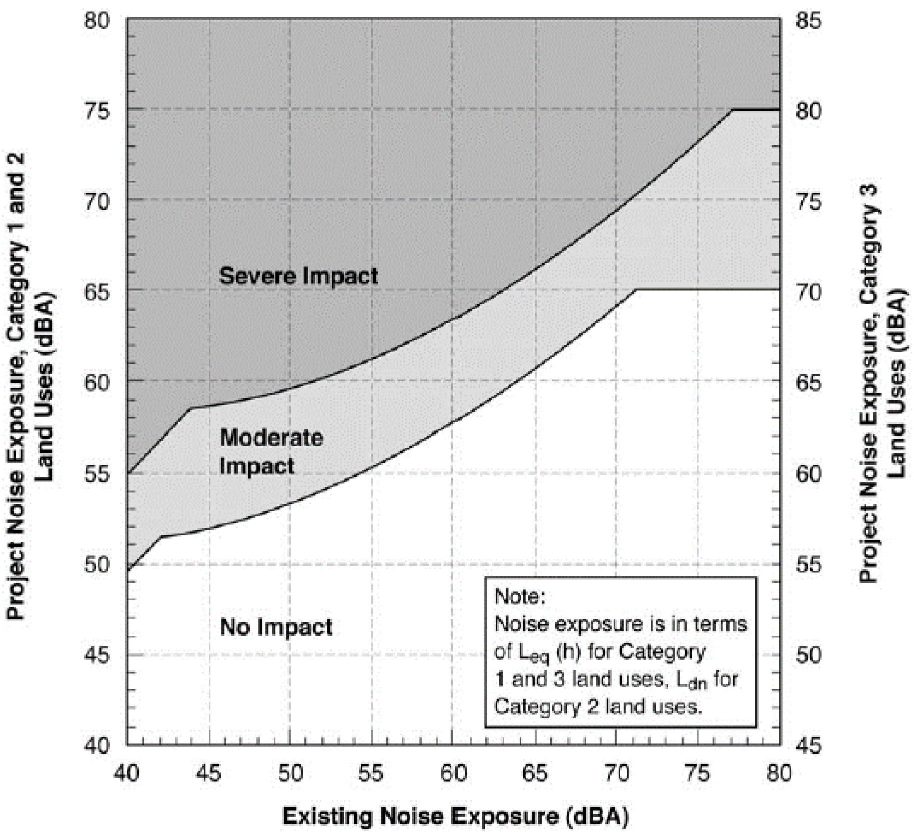
Land-Use Category	Noise Metric	Description
1	Leq(h)	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions and historic landmarks.
2	Ldn	Buildings used for sleeping such as residences, hospitals, hotels and other areas where nighttime sensitivity to noise is of utmost importance.
3	Leq(h)	Institutional land uses with primarily daytime and evening uses including schools, libraries, churches, museums, cemeteries, historic sites, parks, and certain recreational facilities used for study or meditation.

Source: Federal Transit Administration, 2018

As shown in Figure 16-3, two curves depict FTA noise impact criteria, which allow increasing transit project noise levels as existing noise increases up to a point, beyond which an impact is determined based on the project noise alone. These impacts are shown for each of the three land-use categories.

FTA noise impact thresholds are delineated into "no impact," "moderate impact," and "severe impact." The moderate impact threshold defines areas where the change in noise is noticeable but may not be sufficient to cause an adverse community reaction. The severe impact threshold defines the noise level above which a substantial percentage of the surrounding population would be highly annoyed by new noise. MTA determine the level of impact at any location along the HGL Corridor by comparing the predicted Proposed Project-generated noise level against the existing noise level at the receptor location and then assessing for potential impacts per the appropriate land-use category shown in Figure 16-3. For example, for a Land Use Category 2 receptor (with a measured existing noise level of 60 Ldn), and using the left side vertical scale from Figure 16-3, a moderate noise impact would occur at the receptor location if the project-generated noise level would be between 58 and 63 dBA. Moreover, if a project generated noise-exposure level would be above 63 Ldn, then a severe impact would result at this receptor location. Lastly, if a project-generated noise level would be less than 58 Ldn at a receptor location, then no impact would occur.

Figure 16-3. Noise Impact Exposure Criteria for Categories 1, 2, and 3 Land Uses



Source: Federal Transit Administration, 2018

Table 16-3 shows FTA vibration criteria for evaluating ground-borne vibration impacts from train pass-by events at nearby sensitive receptors. These criteria are related to ground-borne vibration levels that are expected to result in human annoyance and are expressed in decibels (VdB).

Table 16-3. Ground-Borne Root Mean Square Vibration Criteria

Land Use Category	Description	Frequent Events (VdB)	Occasional Events (VdB)	Infrequent Events (VdB)
1	Buildings where low vibration is essential for interior operations	65	65	65
2	Residences and buildings where people normally sleep	72	75	80
3	Institutional land uses with primarily daytime uses	75	78	83

Source: Federal Transit Administration, 2018

FTA criteria divides vibration impacts into three event frequency groups to distinguish the likelihood of vibration being noticed by a community (e.g., the more often something occurs, the more likely it is to be noticed). In general, the threshold of human perception of vibration is 65 VdB. MTA expects the HGL Corridor to have more than 70 new pass-by events under the Proposed Project. Therefore, MTA assessed Proposed

Project-generated vibration levels for impacts under the "Frequent Events" threshold values as shown in Table 16-3.

MTA divided the Proposed Project into four study area segments. Each segment defined a unique geographic and land use area, which in most cases included one or more proposed station locations along the HGL Corridor. MTA further refined the HGL Corridor into subsegments, allowing noise and vibration impacts to be better organized, and identified noise and vibration impacts within an individual community by the number of dwelling unit impacts and by street address. Appendix J, "Noise and Vibration" provides these impacts in detailed summary tables.

MTA evaluated the Proposed Project's four segments for existing and future (2025) noise and vibration and calculated the existing noise-exposure level (Ldn) based on the existing combined Amtrak and CSX hourly operations (service levels, train speeds) over a typical 24-hour weekday period along the HGL (Table 16-4).

Table 16-4. Hell Gate Line Rail Service and Average Speeds (Existing)

Rail Operator	Service Type	Average Speed (miles per hour)	Daily Number of Trains
Amtrak	Acela Express	65	19
	Regional	60	22
Metro-North	Commuter Rail	N/A	0
CSX	Freight	30	2

Source: Metropolitan Transportation Authority, 2018

Based on existing operations along the HGL, Table 16-6, Table 16-7, Table 16-8, and Table 16-9 show existing noise-exposure levels (Ldn) within each of the segments.

MTA selected representative measurement sites along the HGL Corridor using the commuter rail portion of FTA Transit Noise and Vibration Impact Assessment Manual, Table 7. Noise exposure was estimated to correspond to a general potential noise impact zone of approximately 250 feet of unobstructed distance from the centerline of the existing train tracks. MTA chose the measurement sites for their ability to represent a neighborhood cluster with similar building characteristics along the right-of-way within that 250-foot centerline distance. Ambient noise levels were monitored at each selected location, recorded in units of 1-hour equivalent noise level [Leq (1-hr) dBA]. MTA continuously collected noise measurements for a minimum duration of 24 hours at the identified sites to determine the day-night noise level (Ldn).

MTA determined future noise-level exposure using the Proposed Project weekday service plan as outlined in Chapter 2, "Project Alternatives" and derived train speeds from train performance simulation results performed for the Proposed Project (Table 16-5). The FTA general noise-exposure analysis calculation procedures determined the future noise-level estimates.

Table 16-5. Hell Gate Line Rail Service and Forecast Speeds: Proposed Project

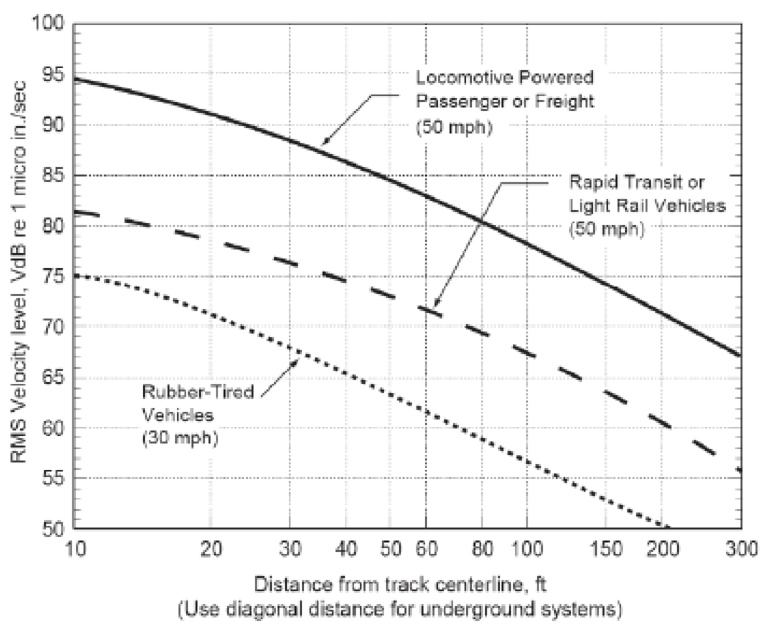
Rail Operator	Service Type	Forecast Average Speed (miles per hour)	Proposed Project Daily Number of Trains
Amtrak	Acela Express	65	28
	Regional	55	32
Metro-North	Commuter Rail	45	102
CSX	Freight	30	2

Source: Metropolitan Transportation Authority, 2020

MTA determined estimated future noise exposure from the Proposed Project operations using FTA impact threshold limits defined for "no impact," "moderate impact," and "severe impact" and reports the future noise exposure for each representative receptor by segment. If a moderate or severe impact has been noted, then MTA identified the other similar land-use buildings adjacent to the representative receptor site as having similar impacts. If a severe impact was identified at any of the representative noise-sensitive receptors, MTA performed a noise-abatement evaluation, focusing on establishing the feasibility of installing a noise barrier along that section of the corridor.

MTA estimated vibration levels generated from Proposed Project operations at each of the representative noise-monitoring locations using the Generalized Ground-Surface Vibration Curves from the FTA Transit Noise and Vibration Impact Assessment Manual as shown in Figure 16-4. For the Proposed Project, MTA applied vibration levels generated for the Rapid Transit or Light Rail Vehicle dashed curve in Figure 16-4 for trains moving at 50 miles per hour because the Metro-North trains would be electric multiple-units and not locomotive hauled. Vibration levels were determined for the receptors based on the centerline distance from the railroad right-of-way and were adjusted to account for the varying train traveling speeds on the corridor referenced to a steel-wheel train traveling at 50 miles per hour. MTA then assessed the potential for impact from the estimated Proposed Project-related vibration levels against FTA-based ground-borne vibration impact criteria for frequent pass-by events (Table 16-3).

Figure 16-4. Generalized Ground-Surface Vibration Curves



Source: Federal Transit Administration, 2018

Lastly, MTA did not specifically assess increased noise levels from vehicular traffic that the Proposed Project would generate because the Proposed Project-related traffic volume movements at the new stations would not be large enough to cause a perceptible change in noise levels along the main roadways to each proposed station. In general, a minimum doubling of the volume of passenger-car equivalents[2] would be necessary to create a perceptible increase (3 dBA) in traffic noise levels.

2 Passenger-car equivalents are the representation of all types of vehicular traffic as automobiles to provide a comparable traffic statistic in traffic analyses.

16.3 EXISTING CONDITIONS

MTA identified representative sensitive receptors within each study area segment to determine where the Proposed Project might produce noise and vibration impacts. Receptors were considered representative when they possessed similar characteristics to prevailing land uses within the segment in relation to the HGL. That is, MTA considered a single-family residence within 50 feet of the HGL as representative of other single-family residences at a similar distance from the existing railroad right-of-way.

16.3.1 Segment 1 (Corridor)

Because the HGL rises to cross the East River, the railroad right-of-way within Segment 1 is generally elevated above the surrounding neighborhoods. Within Segment 1, MTA identified 11representative sensitive receptors (primarily residences). Table 16-6 presents the existing noise level (Ldn) for each sensitive receptor

Table 16-6. Representative Sensitive Receptors (Existing Conditions): Segment 1 (Corridor)

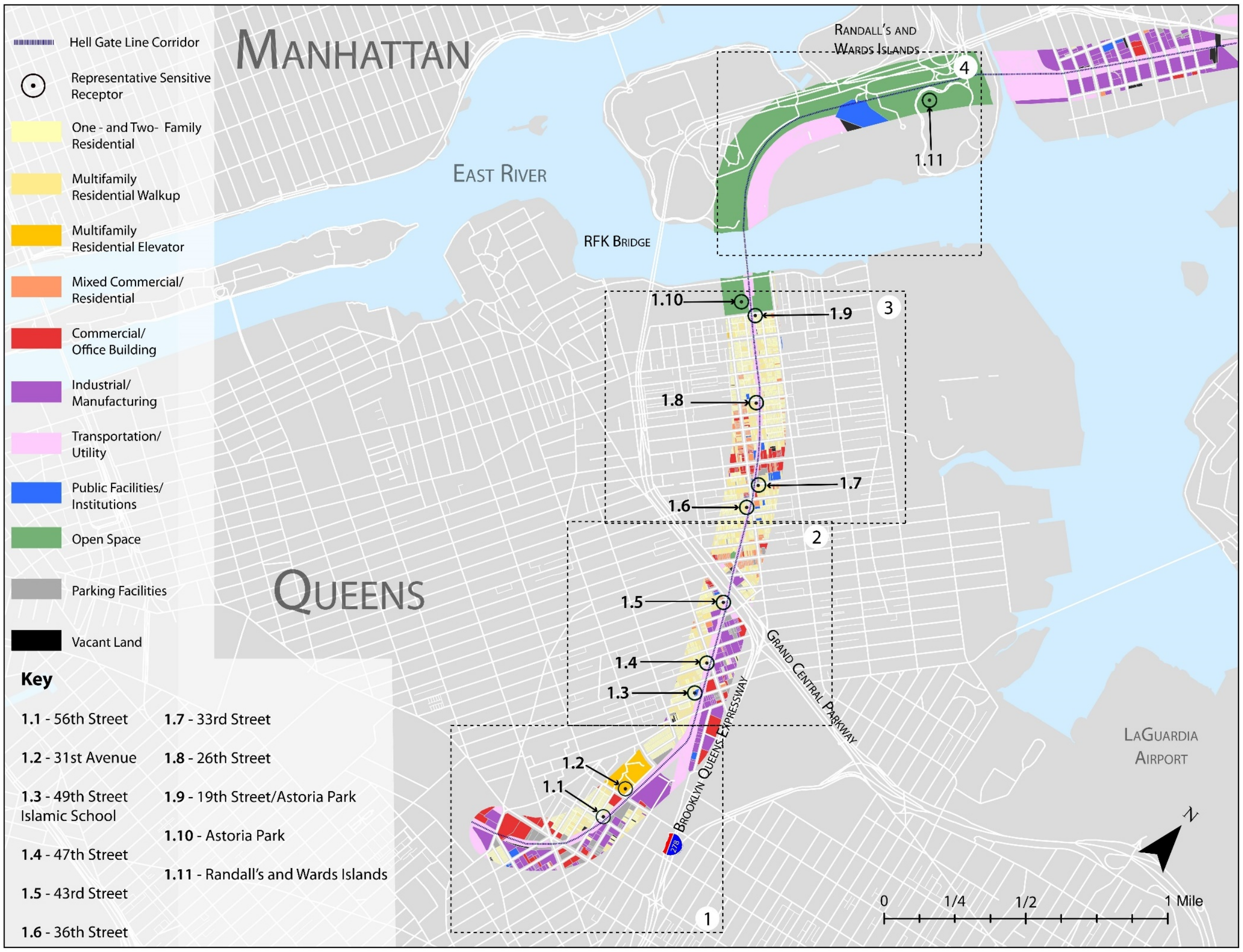
Map ID	Description	Location	Land Use	FTA Receptor Category	Adjacency of Receptor to Right-of-Way	Existing Noise Level (dBA)[1]
1.1	Residential Neighborhood	56th Street, Queens/HGL right-of-way	Residential	2	Below; southern side	75
1.2	Residential Neighborhood	31st Avenue, Queens/HGL right-of-way	Residential	2	Below; southern side	74
1.3	School	49th St. Islamic School, Queens/HGL right-of-way	Institutional	3	Below; southern side	77
1.4	Residential Neighborhood	47th Street, Queens/HGL right-of-way	Residential	2	Below; southern side	81
1.5	Residential Neighborhood	43rd Street, Queens/HGL right-of-way	Residential	2	Below; southern side	81
1.6	Residential Neighborhood	33rd Street, Queens/HGL right-of-way	Residential	2	Below; northern side	76
1.7	Residential Neighborhood	36th Street, Queens/HGL right-of-way	Residential	2	Below; southern side	76
1.8	Residential Neighborhood	26th Street, Queens/HGL right-of-way	Residential	2	Below; southern side	76
1.9	Residential Neighborhood	19th Street, Queens/HGL right-of-way	Residential	2	Significantly below; northern side	76
1.10	Astoria Park	19th Street, Queens/HGL right-of-way	Park	3	Significantly below; on both sides	73
1.11	Randall's and Wards Islands	East River/HGL right-of-way	Park	3	Significantly below; on both sides	70

Source: WSP, 2020

1. Existing day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown depending on FTA receptor category.

Figure 16-5 shows the sensitive receptors within Segment 1 by their Map ID, and Figure 16-6 through Figure 16-9 show magnified illustrations depicting one or more receptors. In Segment 1, most representative receptors are residential land uses (FTA Receptor Category 2). In addition, several recreational/institutional uses (FTA Receptor Category 3) within close proximity of the corridor were added, including a school at 49th Street, Astoria Park, and Randall's and Wards Islands. Figure 16-5 depicts the 11 receptors within Segment 1 by their Map ID. The measured existing noise levels within Segment 1 are quite high, which is typical of a dense urban environment exposed to high-volume vehicle transportation corridors, such as the Brooklyn-Queens Expressway and Grand Central Parkway and rail transit pass-by noise.

Figure 16-5. Representative Sensitive Receptors: Segment 1 (Corridor)



Source: New York City Department of City Planning and WSP, 2020

Figure 16-6. Representative Sensitive Receptors 1.1 and 1.2: Segment 1 (Corridor)

Source: New York City Department of City Planning and WSP, 2020

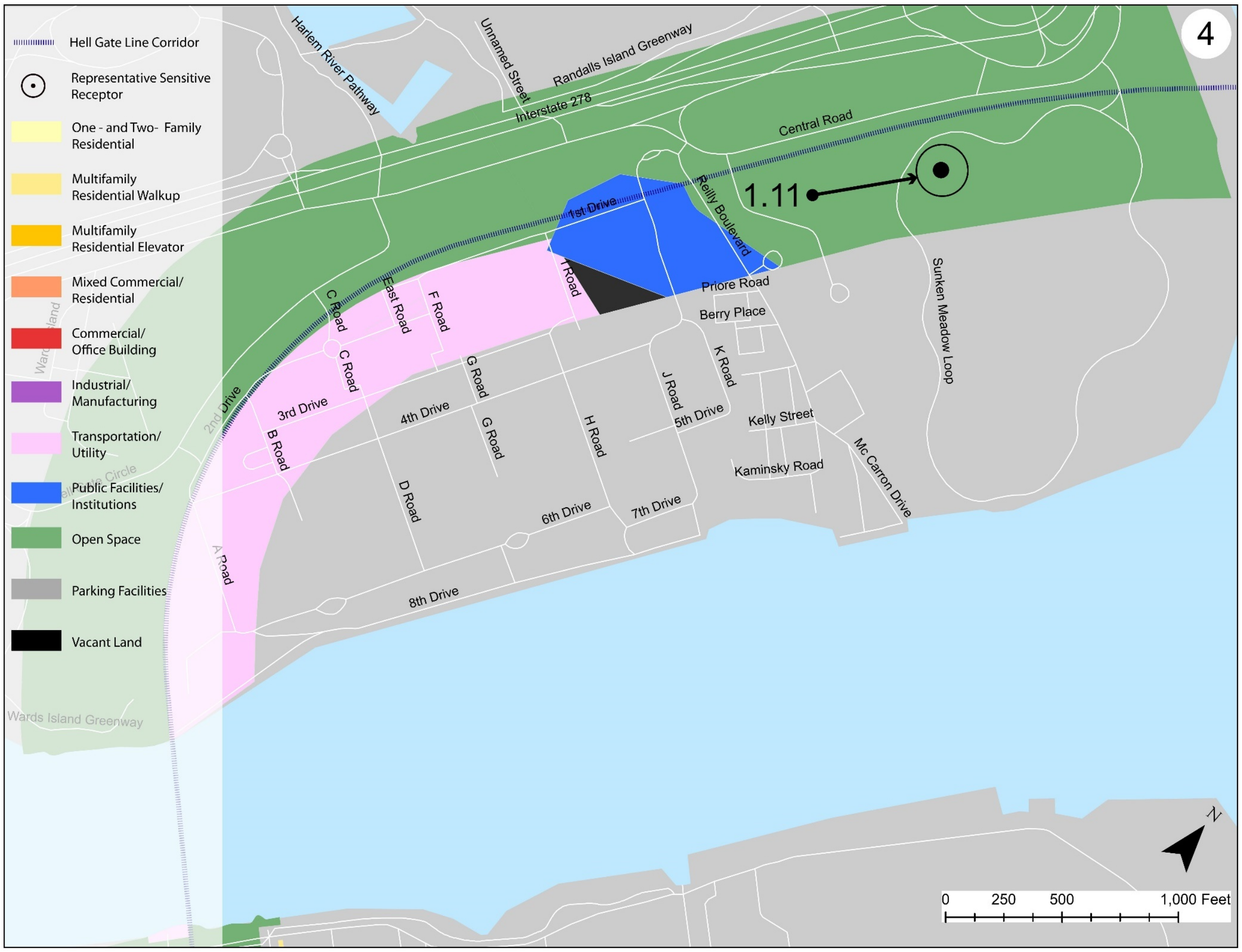
Figure 16-7. Representative Sensitive Receptors 1.3, 1.4 and 1.5: Segment 1 (Corridor)

Source: New York City Department of City Planning and WSP, 2020

Figure 16-8. Representative Sensitive Receptors 1.6, 1.7, 1.8, 1.9, and 1.10: Segment 1 (Corridor)

Source: New York City Department of City Planning and WSP, 2020

Figure 16-9. Representative Sensitive Receptor 1.11: Segment 1 (Corridor)



Source: New York City Department of City Planning and WSP, 2020

16.3.2 Segment 2 (Corridor and Hunts Point Station Area)

Segment 2 land uses are principally commercial and light industrial. The railroad right-of-way is below the street grid in an open cut, with the Bruckner/Sheridan Expressway to the west. The elevated expressway viaduct blocks exposure from the rail right-of-way to the community on the west. The one sensitive receptor in Segment 2 is Concrete Plant Park, located at-grade to the east of the railroad right-of-way. Figure 16-10 shows the general Segment 2 study area, and Figure 16-11 shows a more detailed magnified illustration of the receptor site. To the north of the park, the No. 6 subway passes overhead along Westchester Avenue. As noted in Table 16-7, measured existing peak-hour noise levels at Concrete Plant Park reached 72 dBA. The traffic noise generated from the nearby Sheridan Expressway to the west, Bruckner Expressway to the south, and to a lesser extent the No. 6 subway to the north affects the park.

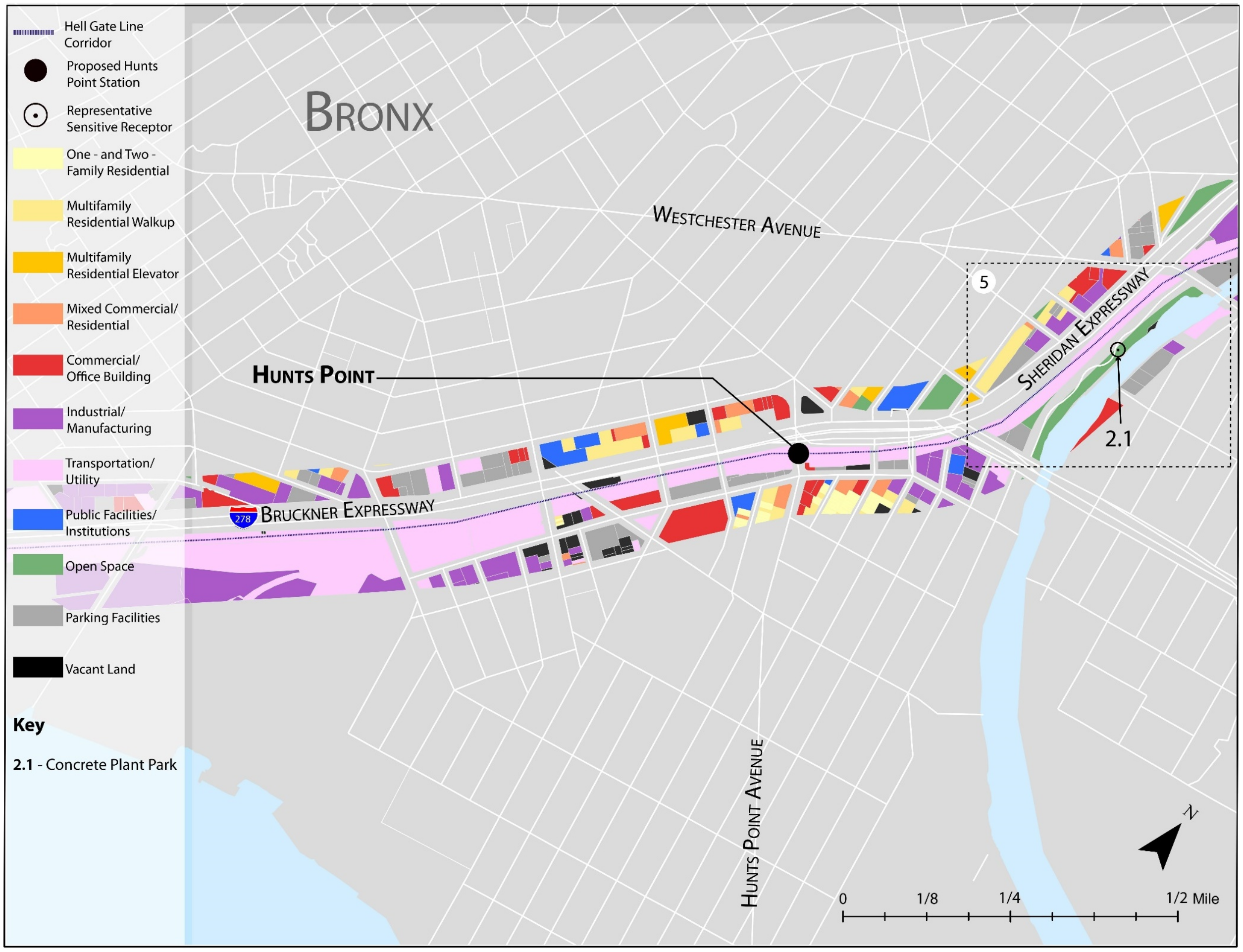
Table 16-7. Representative Sensitive Receptor (Existing Conditions): Segment 2 (Corridor and Proposed Hunts Point Station Area)

Map ID	Description	Location	Land Use	FTA Receptor Category	Adjacency of Receptor to Right-of-way	Existing Noise Level (dBA)1
2.1	Concrete Plant Park	Bronx River and HGL right-of-way	Park	3	At-grade; southern side	72

Source: WSP, 2020

1. Existing day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown depending on FTA receptor category.

Figure 16-10. Representative Sensitive Receptor: Segment 2 (Corridor and Proposed Hunts Point Station Area)



Source: New York City Department of City Planning and WSP, 2020

Figure 16-11. Representative Sensitive Receptor 2.1: Segment 2 (Corridor and Proposed Hunts Point Station Area)

Source: New York City Department of City Planning and WSP, 2020

16.3.3 Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Segment 3 contains a few parks, many commercial/light industrial properties, a power substation, a medical center, and single- and multi-family residential neighborhoods on either side of the HGL right-of-way. MTA selected nine representative sensitive receptors to assess within the segment. Table 16-8 describes each measurement site and summarizes the measured existing noise levels. Figure 16-12 shows the location of each of the receptors within Segment 3 by their Map ID, and Figure 16-13 through Figure 16-16 show detailed, magnified illustrations depicting one or more receptors. Most of the FTA Category 2 representative residential receptors within Segment 3 are adjacent to the existing track right-of-way and have direct exposure to railroad pass-by noise, resulting in high rail-noise exposure. On the other hand, background noise exposure at several FTA Category 3 sites, such as Starlight and Pelham Bay Parks, consists of a combination of rail and traffic noise sources. Starlight Park is near the Sheridan Expressway and Pelham Bay Park is near the New England Thruway (I-95).

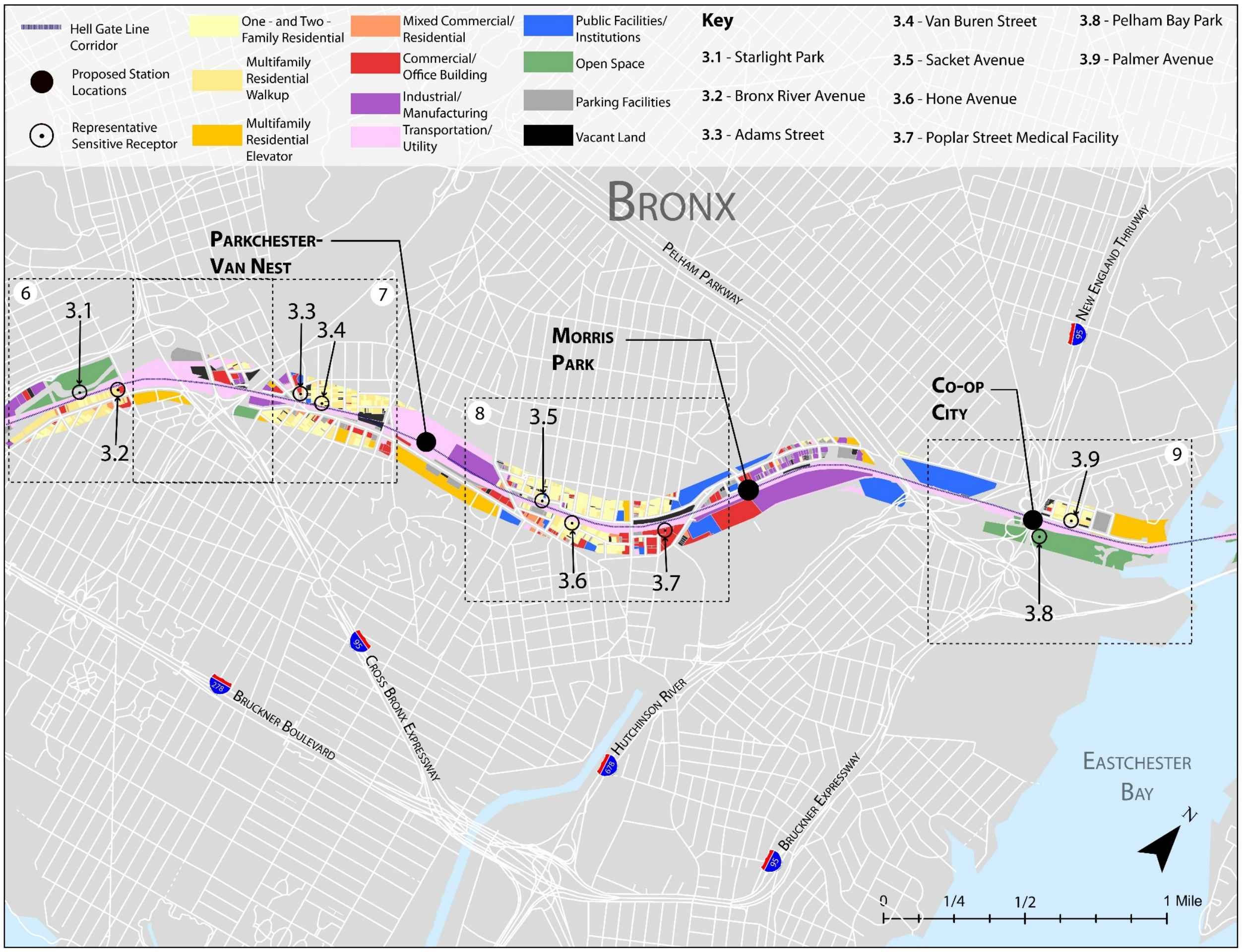
Table 16-8. Representative Sensitive Receptors: Segment 3 (Corridor and Proposed Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Map ID	Description	Location	Land Use	FTA Receptor Category	Adjacency of Receptor to Right-of-Way	Existing Noise Level (dBA)1
3.1	Starlight Park	174th Street, Bronx and HGL right-of-way	Park	3	At-grade; northern side	72
3.2	Residential Neighborhood	Bronx River Avenue, Bronx and HGL right-of-way	Residential	2	Above; southern side	76
3.3	Residential Neighborhood	Adams Street, Bronx and HGL right-of-way	Residential	2	At-grade; northern side	74
3.4	Residential Neighborhood	Van Buren Street, Bronx and HGL right-of-way	Residential	2	At-grade; northern side	75
3.5	Residential Neighborhood	Sacket Avenue, Bronx and HGL right-of-way	Residential	2	At-grade; northern side	67
3.6	Residential Neighborhood	Hone Avenue, Bronx and HGL right-of-way	Residential	2	At-grade/below; southern side	68
3.7	Medical Facility	Poplar Street, Bronx and HGL right-of-way	Institutional	3	Below; southern side	67
3.8	Pelham Bay Park	I-95, Pelham Parkway and HGL right-of-way	Park	3	At-grade; southern side	65
3.9	Residential Neighborhood	Palmer Avenue at Erskine Place, Bronx	Residential	2	At-grade; northern side	64

Source: WSP, 2020

1. Existing day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown depending on FTA receptor category.

Figure 16-12. Sensitive Receptors: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)



Source: New York City Department of City Planning and WSP, 2020

Figure 16-13. Sensitive Receptors 3.1 and 3.2: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Source: New York City Department of City Planning and WSP, 2020

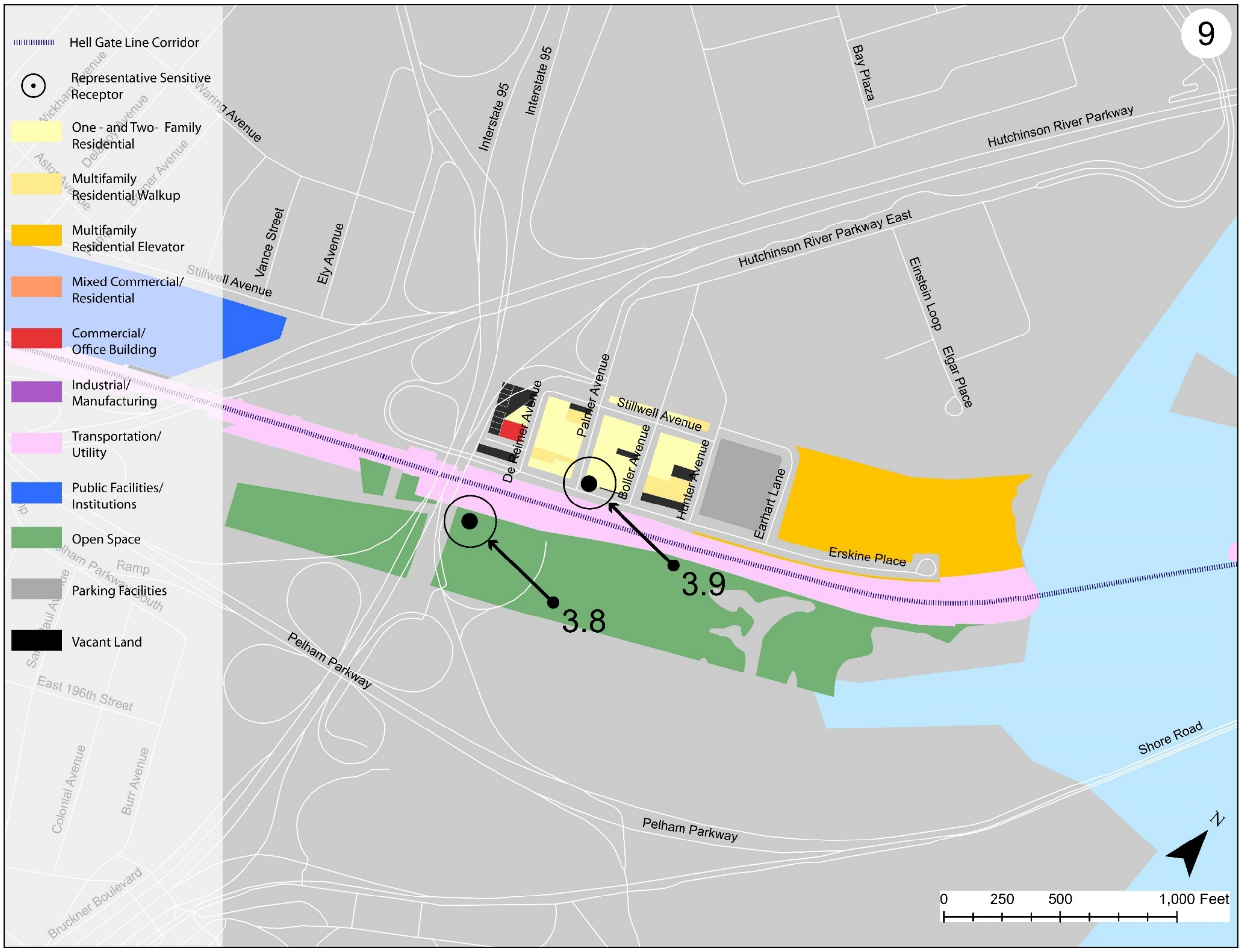
Figure 16-14. Sensitive Receptors 3.3 and 3.4: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Source: New York City Department of City Planning and WSP, 2020

Figure 16-15. Sensitive Receptors 3.5, 3.6 and 3.7: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Source: New York City Department of City Planning and WSP, 2020

Figure 16-16. Sensitive Receptors 3.8 and 3.9: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)



Source: New York City Department of City Planning and WSP, 2020

16.3.4 Segment 4 (Corridor)

Segment 4 is generally bounded from North Avenue in New Rochelle (Westchester County, New York) to the north and Pelham Bay and Split Rock Golf Courses (Bronx County, New York) to the south. This segment contains large active/passive open spaces, single-family residential neighborhoods, and urban commercial/light industrial land uses. In addition, I-95 (the New England Thruway) parallels the railroad right-of-way for approximately two miles within Segment 4. As noted in Chapter 7, "Public Open Space and Recreation," the right-of-way bisects the two golf courses within Pelham Bay Park: Pelham Bay and Split Rock. Segment 4 contains three representative receptors: the Pelham Bay/Split Rock Golf Courses, Forest Road at Beech Tree Lane (the Pelham Manor residential neighborhood along Forest Road in Westchester County) and another residential area toward the end of the northern terminus of the study area at the intersection of Cliff and Birch Streets in Westchester County. Both residential areas are adjacent to the shared Metro-North/Amtrak outbound track.

Figure 16-17 depicts the three representative locations selected for assessment within Segment 4 by their Map ID. Figure 16-18 through Figure 16-20 show detailed, magnified illustrations depicting one or more receptors. Table 16-9 describes each measurement site and summarizes the measured existing noise levels. The two FTA Category 2 residential Receptor Sites 4.2 and 4.3 are exposed to relatively high background noise levels consisting of both rail transit noise and traffic noise from the adjacent New England Thruway (I-95). Day-night noise levels at these two representative residential properties ranged from 72 to 75 dBA.

Table 16-9. Representative Sensitive Receptors: Segment 4 (Corridor)

Map ID	Description	Location	Land Use	FTA Receptor Category	Adjacency of Receptor to Right-of-way	Existing Noise Level (dBA)[1]
4.1	Pelham Bay/Split Rock Golf Courses	Hutchinson River Ext and right-of-way	Recreation	3	Below; both sides[2]	62
4.2	Residential Neighborhood	Forest Road at Beech Tree Lane, Pelham Manor	Residential	2	Below; southern side	723
4.3	Residential Neighborhood	Birch Street at Cliff Street, New Rochelle	Residential	2	Below; southern side	75[3]

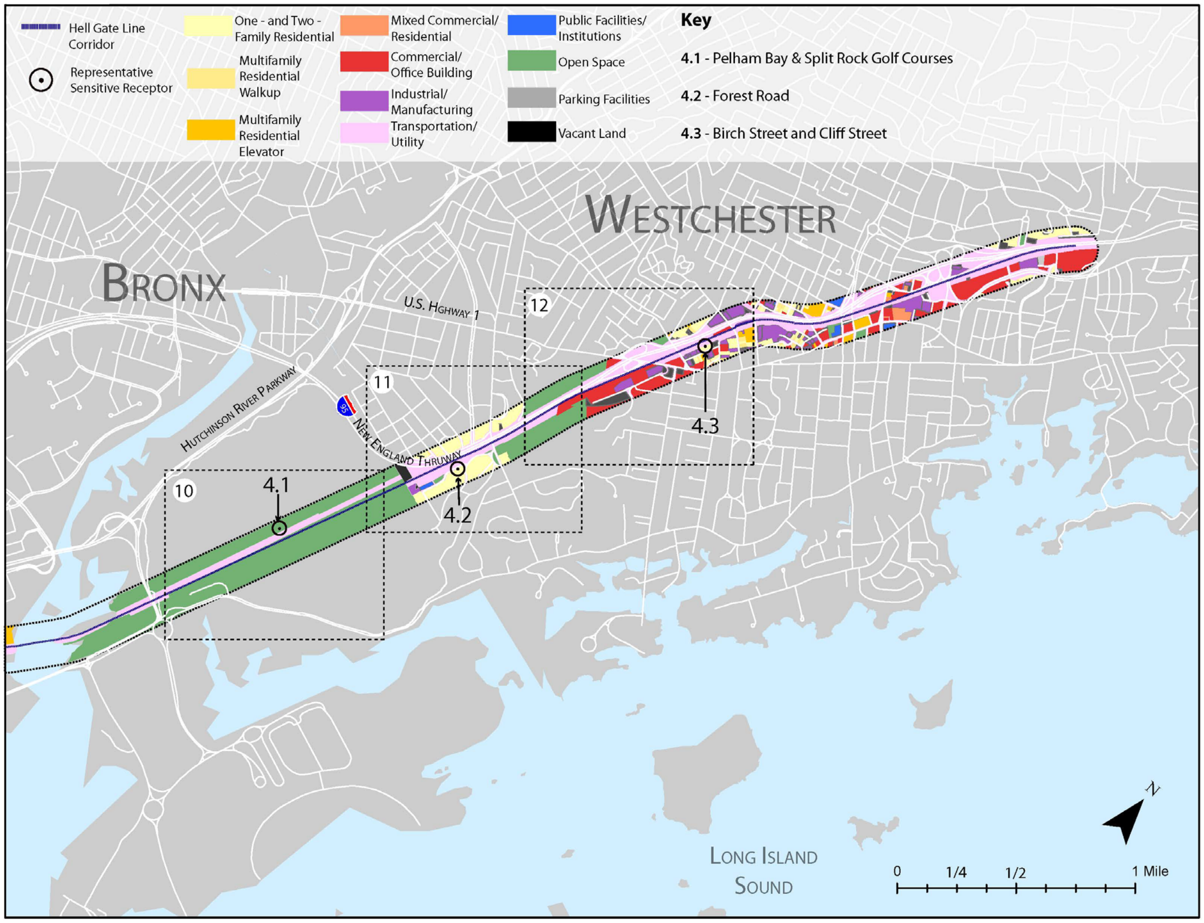
Source: WSP, 2020

[1] Existing day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown depending on FTA receptor category.

[2] Measurement taken on 18th hole of Split Rock Course (north side) closest to the right-of-way.

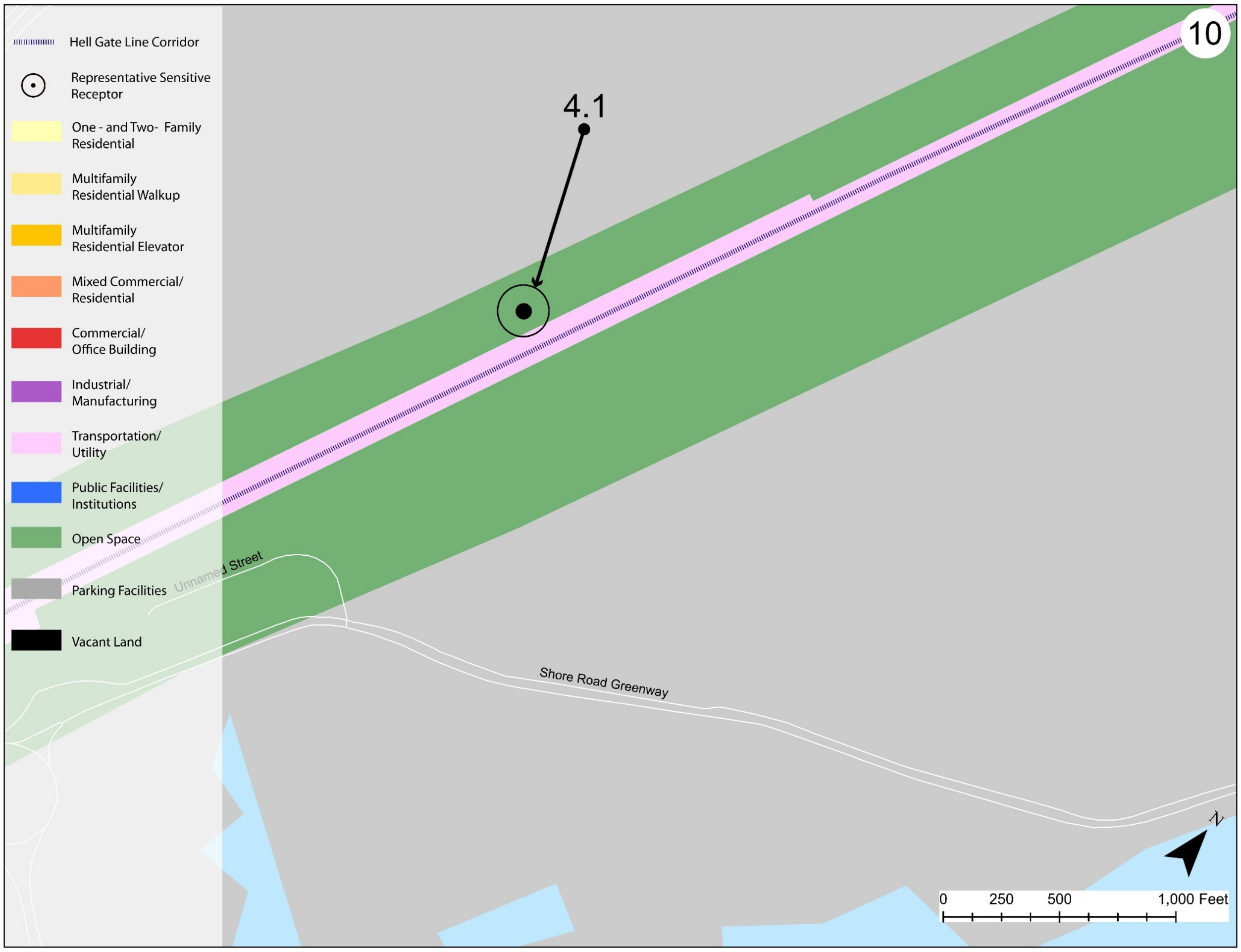
[3] Existing noise level determined based on distance adjusted noise measurement collected at Receptor Site 4.3.

Figure 16-17. Representative Sensitive Receptors: Segment 4 (Corridor)



Source: New York City Department of City Planning and WSP, 2020

Figure 16-18. Representative Sensitive Receptor 4.1: Segment 4 (Corridor)



Source: New York City Department of City Planning and WSP, 2020

Figure 16-19. Representative Sensitive Receptor 4.2: Segment 4 (Corridor)

Source: New York City Department of City Planning and WSP, 2020

Figure 16-20. Representative Sensitive Receptor 4.3: Segment 4 (Corridor)

Source: New York City Department of City Planning and WSP, 2020

16.4 PROPOSED PROJECT

As described in Chapter 2, "Project Alternatives," the Proposed Project stations would be at Hunts Point, Parkchester-Van Nest, Morris Park, and Co-op City. As evaluated in Chapter 12, "Transportation," the projected number of vehicles accessing the stations would have no traffic impact. Therefore, MTA did not specifically assess increased noise levels from vehicular traffic generated by the Proposed Project because the projected increase in traffic volume at the new stations would not be high enough to cause a perceptible increase in noise levels. This noise analysis focuses on the daily rail line operations expected in 2025, their expected operating speeds, and the resultant Proposed Project noise exposure and future vibration levels at each of the Proposed Project representative sites identified within the study area.

16.4.1 Segment 1 (Corridor)

16.4.1.1 Noise

Table 16-10 summarizes the projected noise exposure at the 11 representative receptors identified within Segment 1. The existing, high ambient rail-noise conditions overshadow the future projected noise-exposure estimates. Eight residential receptors would experience moderate noise impacts. However, for the most part these impacts would be at the lower moderate impact range and would result in a small increase of up to 1 decibel in total noise exposure from what these communities experience today. People do not discern 1-decibel noise level increases and therefore are not considered a perceptible increase.

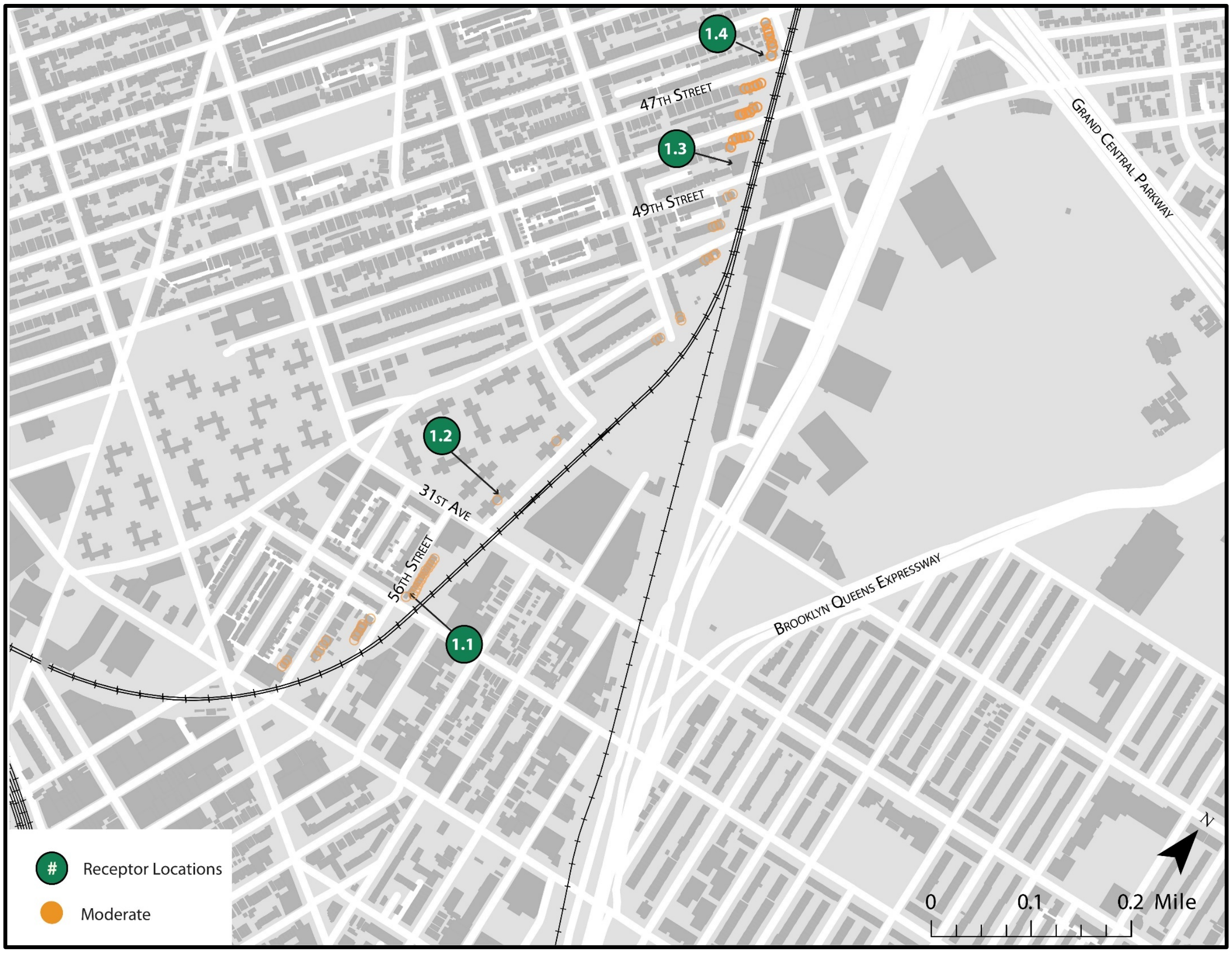
As shown in Figure 16-21 through Figure 16-23, the moderate impact zone for Segment 1 generally encompasses the first- and second-row buildings adjacent to the railroad right-of-way. First-row buildings typically reflect some of the train noise back toward the tracks, thus providing shielding to second- and third-row buildings and therefore limiting noise exposure from the tracks into the community. However, in some areas of Segment 1, the elevated tracks and the street layout allow for sound to penetrate a little farther into a community (Figure 16-21). This noise analysis found that no impacts would occur at the three FTA Category 3 daytime land uses. A moderate impact is projected for 196 residential buildings (602 dwelling units).

Table 16-10. Projected Transit Noise-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 1 (Corridor)

Map ID	Description	FTA Receptor Category	Existing Noise Level (dBA)[1]	Distance to the Closest Track (Feet)	FTA Impact Threshold Levels2		Projected Noise Exposure of Proposed Project[1, 3]	FTA Impact	Total Future Noise Level (dBA)[4]	Total Future Noise Level Change Versus Existing (dBA)
					Moderate	Severe				
1.1	56th Street Residences, Queens	2	75	60	66-73	>73	68	Moderate Impact	76	1
1.2	31st Avenue Residences, Queens	2	74	75	66-72	>72	67	Moderate Impact	75	1
1.3	49th St. Islamic School, Queens	3	77	70	71-79	>79	65	No Impact	77	0
1.4	47th Street Residences, Queens	2	81	25	66-75	>75	72	Moderate Impact	82	1
1.5	43rd Street Residences, Queens	2	81	30	66-75	>75	72	Moderate Impact	82	1
1.6	33rd Street Residences, Queens	2	76	40	66-74	>74	71	Moderate Impact	77	1
1.7	36th Street Residences, Queens	2	76	60	66-74	>74	68	Moderate Impact	77	1
1.8	26th Street Residences, Queens	2	76	50	66-74	>74	69	Moderate Impact	77	1
1.9	19th Street Residences, Queens	2	76	65	66-74	>74	68	Moderate Impact	77	1
1.10	Astoria Park	3	73	200	71-76	>76	61	No Impact	73	0
1.11	Randall's and Wards Islands Park	3	70	100	70-74	>74	64	No Impact	71	1

Source: WSP, 2020
1 Existing or projected day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown depending on FTA receptor category.
2 All-day or peak-hour thresholds shown dependent on FTA receptor category.
3 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."
4 Based on existing conditions and Proposed Project conditions only.

Figure 16-21. Moderate Noise Impacts: Segment 1 (Corridor) – Part 1



Source: WSP, 2020

Figure 16-22. Moderate Noise Impacts: Segment 1 (Corridor) – Part 2

Source: WSP, 2020

Figure 16-23. Moderate Noise Impacts: Segment 1 (Corridor) – Part 3

Source: WSP, 2020

16.4.1.2 Vibration

As shown in Table 16-11, the Proposed Project would generate no vibration impacts at any of the 11 representative receptors in Segment 1, largely in part because the train tracks are on an elevated structure and not directly at-grade with the buildings surrounding it, thus providing a poor conduit for vibration to travel into the ground.

Table 16-11. Projected Transit Vibration-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 1 (Corridor)

Map ID	Description	FTA Receptor Category	Track Position Relative to Receptor[1]	FTA Impact Threshold (VdB)	Projected Vibration Exposure of Proposed Project[2]	FTA Impact? (Yes/No)
1.1	56th Street Residences, Queens	2	Aerial	72	63	No
1.2	31st Avenue Residences, Queens	2	Aerial	72	61	No
1.3	49th St. Islamic School, Queens	3	Aerial	72	62	No
1.4	47th Street Residences, Queens	2	Aerial	72	69	No
1.5	43rd Street Residences, Queens	2	Aerial	72	68	No
1.6	33rd Street Residences, Queens	2	Aerial	72	66	No
1.7	36th Street Residences, Queens	2	Aerial	72	63	No
1.8	26th Street Residences, Queens	2	Aerial	72	65	No
1.9	19th Street Residences, Queens	2	Aerial	72	63	No
1.10	Astoria Park	3	Aerial	75	52	No
1.11	Randall's and Wards Islands Park	3	Aerial	75	59	No

Source: WSP, 2020

1 FTA methodology applies to modifications based on at-grade or aerial (on a structure) relative track position for vibration transference.

2 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."

16.4.2 Segment 2 (Corridor and Hunts Point Station Area)

16.4.2.1 Noise

Unlike Segment 1 where the rail tracks are elevated, the rail tracks in Segment 2 are generally below street grade. As a result, background noise exposure in this portion of the corridor is not dominated by rail noise, but instead is dominated by traffic noise generated from nearby Bruckner Boulevard and other roadways. Thus, under the Proposed Project, service line operations (particularly during the daytime hours) that affect FTA Category 3 land uses would only marginally contribute to the future noise exposure. As a result, MTA projects no impact to Receptor 2.1, Concrete Plant Park (Table 16-12).

Table 16-12. Projected Transit Noise-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 2 (Corridor and Hunts Point Station Area)

Map ID	Description	FTA Receptor Category	Existing Noise Level (dBA)[1]	Distance to the Closest Track	FTA Impact Threshold Levels[2]		Projected Noise Exposure of Proposed Project[1,3]	FTA Impact	Total Future Noise Level (dBA)[4]	Total Future Noise Level Change Versus Existing (dBA)
					Moderate	Severe				
2.1	Concrete Plant Park	3	72	58	71-76	>76	65	No Impact	73	1

Source: WSP, 2020
1 Existing or projected day-night (Ldn) noise levels (FTA Receptor Category 2) or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown, depending on FTA receptor category.
2 All-day or peak-hour thresholds shown, depending on FTA receptor category.
3 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."
4 Based on existing conditions and the Proposed Project only.

16.4.2.2 Vibration

As indicated in Table 16-13, within Segment 2 the Proposed Project would generate no vibration impact at Concrete Plant Park.

Table 16-13. Projected Transit Vibration-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 2 (Corridor and Hunts Point Station Area)

Map ID	Description	FTA Receptor Category	Track Position Relative to Receptor1	FTA Impact Threshold (VdB)	Projected Vibration Exposure of Proposed Project[2]	FTA Impact? (Yes/No)
2.1	Concrete Plant Park	3	At-Grade	75	70	No

Source: WSP, 2020
1 FTA methodology applies modifications based on at-grade or aerial relative track position for vibration transference.
2 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."

16.4.3 Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

16.4.3.1 Noise

Table 16-14 summarizes the Proposed Project noise exposure at the nine representative sites within Segment 3. The Proposed Project would result in two moderate impacts and one severe impact—all at residential properties. No impacts would occur at any of the three daytime FTA Category 3 receptor sites. The severe impact would occur at the residential neighborhood at the end of Hone Avenue alongside the railroad right-of-way (Receptor 3.6). The projected noise exposure at Receptor 3.6 would be severe, because at the closest point, the Proposed Project would bring the Amtrak outbound track approximately 14 feet away from the rear of the property. Additionally, the noise exposure would increase by 4 decibels, resulting in a perceptible increase. The impact zone within Segment 3 would generally extend to the first-row buildings directly adjacent to the railroad right-of-way surrounding each of the representative receptors. Figure 16-24 and Figure 16-25 show the properties with severe and moderate impacts, which are identified by the orange and red-colored buildings in each illustration, respectively. These first-row buildings typically absorb the noise and buffer the buildings farther away from the rail right-of-way.

In summary, based on projected impacts at Receptor Sites 3.4, 3.5 and 3.6, MTA estimates that with the Proposed Project approximately 68 buildings (154 dwelling units) would be exposed to a moderate level of noise exposure and 17 buildings (34 dwelling units) would be subject to a severe level of noise exposure.

Table 16-14. Projected Transit Noise-Exposure Levels and FTA Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 3 (Corridor, Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Map ID	Description	FTA Receptor Category	Existing Noise Level (dBA)1	Distance to the Closest Track	FTA Impact Threshold Levels2		Projected Noise Exposure of Proposed Project1, 3	FTA Impact	Total Future Noise Level (dBA)4	Total Future Noise Level Change Versus Existing (dBA)
					Moderate	Severe				
3.1	Starlight Park	3	72	25	71 to 76	>76	65	No Impact	73	1
3.2	Bronx River Ave Residences, Bronx	2	76	114	66 to 74	>74	64	No Impact	76	0
3.3	Adams Street Residences, Bronx	2	74	137	66 to 72	>72	61	No Impact	74	0
3.4	Van Buren Ave Residences, Bronx	2	75	49	66 to 73	>73	66	Moderate Impact	76	1
3.5	Sackett Ave Residence, Bronx	2	67	36	63 to 67	>67	66	Moderate Impact	70	3
3.6	Hone Ave Residences, Bronx	2	68	14	63 to 68	>68	69	**Severe Impact**	72	4
3.7	Poplar Street, Medical Building, Bronx	3	67	51	68 to 72	>72	64	No Impact	69	2
3.8	Pelham Bay Park	3	65	154	66 to 71	>71	61	No Impact	66	1
3.9	Palmer Ave Residences, Bronx	2	64	145	61 to 65	>65	60	No Impact	65	1

Source: WSP, 2020

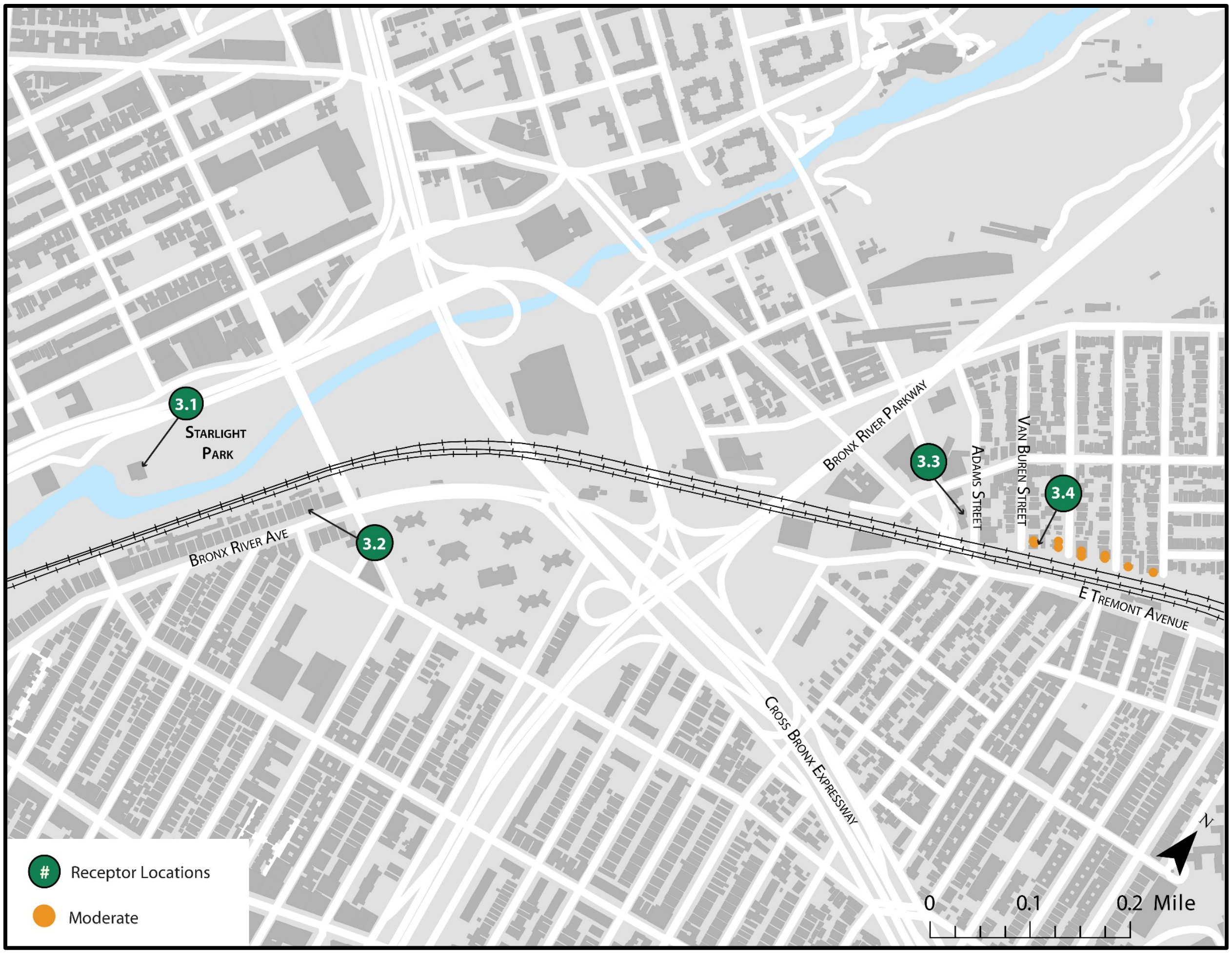
1 Existing conditions, or projected day-night (Ldn) noise levels (FTA Receptor Category 2), or peak-hour daytime Leq (hr) (FTA Receptor Category 3) shown, depending on FTA receptor category.

2 All-day or peak-hour thresholds shown, depending on FTA receptor category.

3 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."

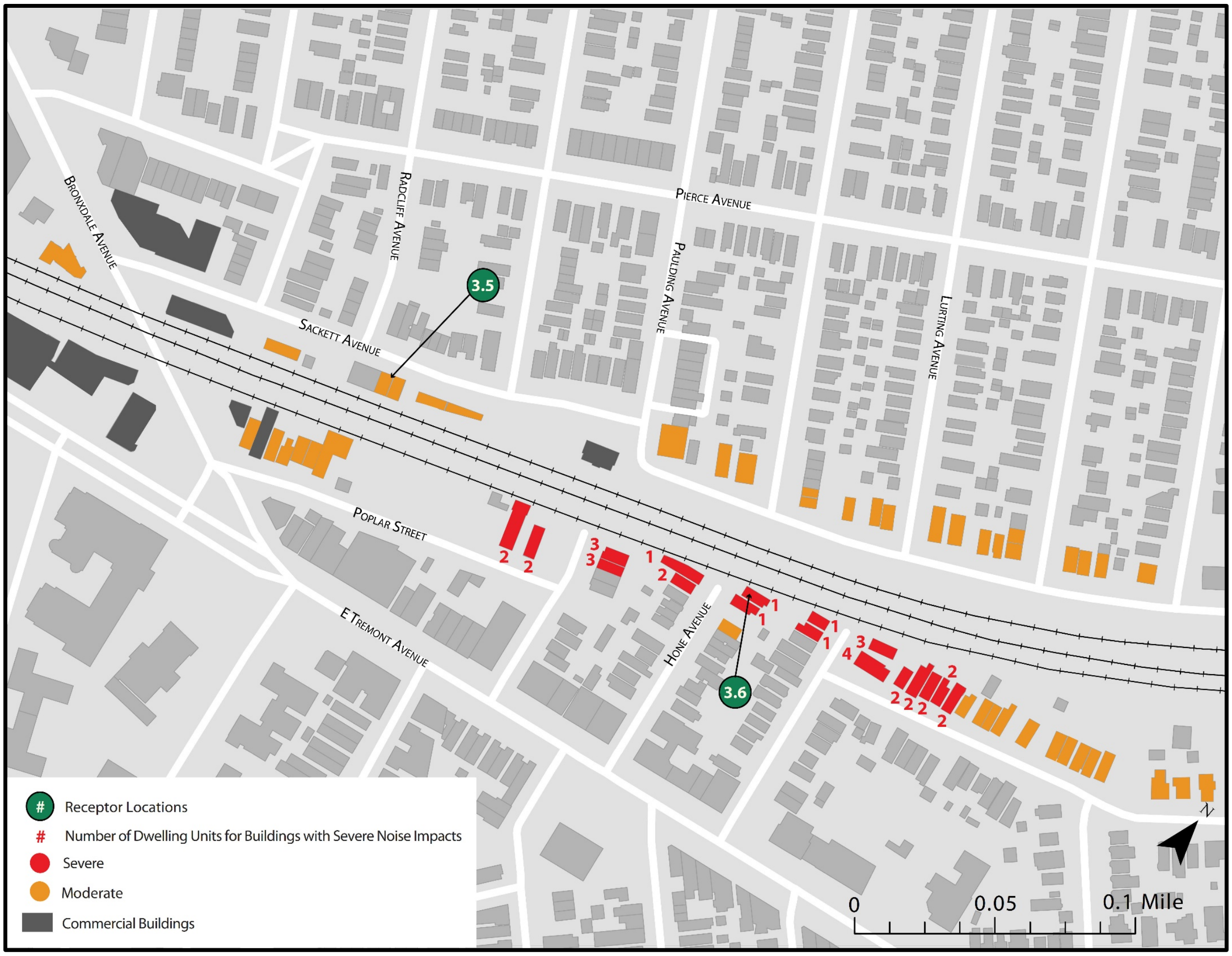
4 Based on existing conditions and the Proposed Project only.

Figure 16-24. Moderate Noise Impacts: Segment 3 (Corridor)



Source: WSP, 2020

Figure 16-25. Moderate and Severe Noise Impacts: Segment 3 (Corridor and Parkchester-Van Nest Station Area)



Source: WSP, 2020

16.4.3.2 Vibration

Table 16-5 summarizes the vibration impact assessment. The Proposed Project would result in vibration impacts at three of the nine representative receptors in Segment 3. Receptor Site 3.4 adjacent to Van Buren Avenue and Receptor Site 3.5 at Sacket Avenue are the same residential properties where moderate noise impacts would be experienced. Furthermore, the Hone Avenue residential properties where MTA projects severe noise exposure would also be exposed to vibration levels well above the 72 VdB impact threshold. Vibration levels at Hone Avenue are projected to reach 78 VdB because only 14 feet separates the rear of this property from the Amtrak outbound track. However, impacts at Receptor Sites 3.4 and 3.5 would be at the lower range of the FTA vibration impact exceedance threshold. In total, 34 residential buildings (75 dwellings) would experience vibration levels above 72 VdB. However in all cases, MTA would eliminate and dampen the elevated vibration levels by installing under-rail pads and resilient fasteners during the track construction phase.

Table 16-15. Projected Transit Vibration-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 3 (Corridor and Parkchester-Van Nest, Morris Park, and Co-op City Station Areas)

Map ID	Description	FTA Receptor Category	Track Position Relative to Receptor1	FTA Impact Threshold (VdB)	Projected Vibration Exposure of Proposed Project2	FTA Impact? (Yes/No)
3.1	Starlight Park	3	At grade	75	74	No
3.2	Bronx River Ave Residences, Bronx	2	At grade	72	67	No
3.3	Adams Street Residences, Bronx	2	At grade	72	66	No
3.4	Van Buren Ave Residences, Bronx	2	At grade	72	73	Yes
3.5	Sackett Ave Residence, Bronx	2	At grade	72	74	Yes
3.6	Hone Ave Residences, Bronx	2	At grade	72	78	Yes
3.7	Poplar Street, Medical Bldg., Bronx	3	At grade	75	73	No
3.8	Pelham Bay Park	3	At grade	75	66	No
3.9	Palmer Ave Residences, Bronx	2	At grade	72	67	No

Source: WSP, 2020

[1] FTA methodology applies modifications based on at-grade or aerial relative track position for vibration transference.

[2] Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."

16.4.3.3 Segment 3 Noise-Abatement Evaluation

In cases where a severe impact is predicted, MTA performed an abatement evaluation. The ideal method for abating the projected severe noise impacts would be to install 8-foot-tall concrete-block noise barriers to reduce exterior noise levels between 4 dBA and 7 dBA, depending on the distance of the property from the sound wall. Properties closest to the proposed barriers would experience the greatest benefit, and those farther away would experience less noise-reduction benefit. Based on the severe impact analysis findings (Figure 16-25), a single continuous 1,000-foot-long noise barrier would be required to be installed at the right-of-way along the southern side of the corridor adjacent to the shared Metro-North/Amtrak outbound track. However, the feasibility of installing a noise barrier at this location depends largely on the available space within the right-of-way while at the same time satisfying minimum clearance requirements between the proposed barrier location and the nearest track. A typical noise barrier installation requires a spread footing width of 2 feet to 4 feet to support a 4-inch-wide by 8-foot-high barrier. Amtrak Track Design Specification 63 requires 16 feet of horizontal clearance from the center line of track to an obstruction. The State of New York freight rail clearance specifies 9 feet of horizontal clearance. Therefore, depending on the final track alignment design, MTA would need a minimum of 13 feet of clearance to install a noise barrier (footing width plus horizontal clearance).

South Side of the Railroad Right-of-Way. Figure 16-26 shows the existing track spacing on the south side from the edge of Receptor Site 3.6 (Hone Avenue) where the severe impact would be greatest. The spacing was measured to be only 9 feet from the track centerline to the building edge. This narrow distance is representative of the buildings west of the receptor to just west of Paulding Avenue. In the existing track alignment, the nearest track is the freight track, which is noted by an open hopper railcar on the adjacent track to the building (Figure 16-26). Under the Proposed Project preliminary track design, the freight track would no longer operate in this portion of the corridor. The closest rail line would be the Amtrak outbound track, which would be 14 feet from the edge of track to the rear of Receptor Site 3.6 (Hone Avenue). As a result, under the present track design there would be insufficient space to install a noise barrier at this location. The railroad right-of-way begins to widen from adjacent buildings 500 feet farther east, past Lurting Avenue and Poplar Street, which increases the distance between the buildings and the track to 15 feet.

Figure 16-26. Receptor 3.6 – Hone Avenue Location Relative to Nearest Track on Railroad Right-of-Way

Source: Google Earth, 2018.

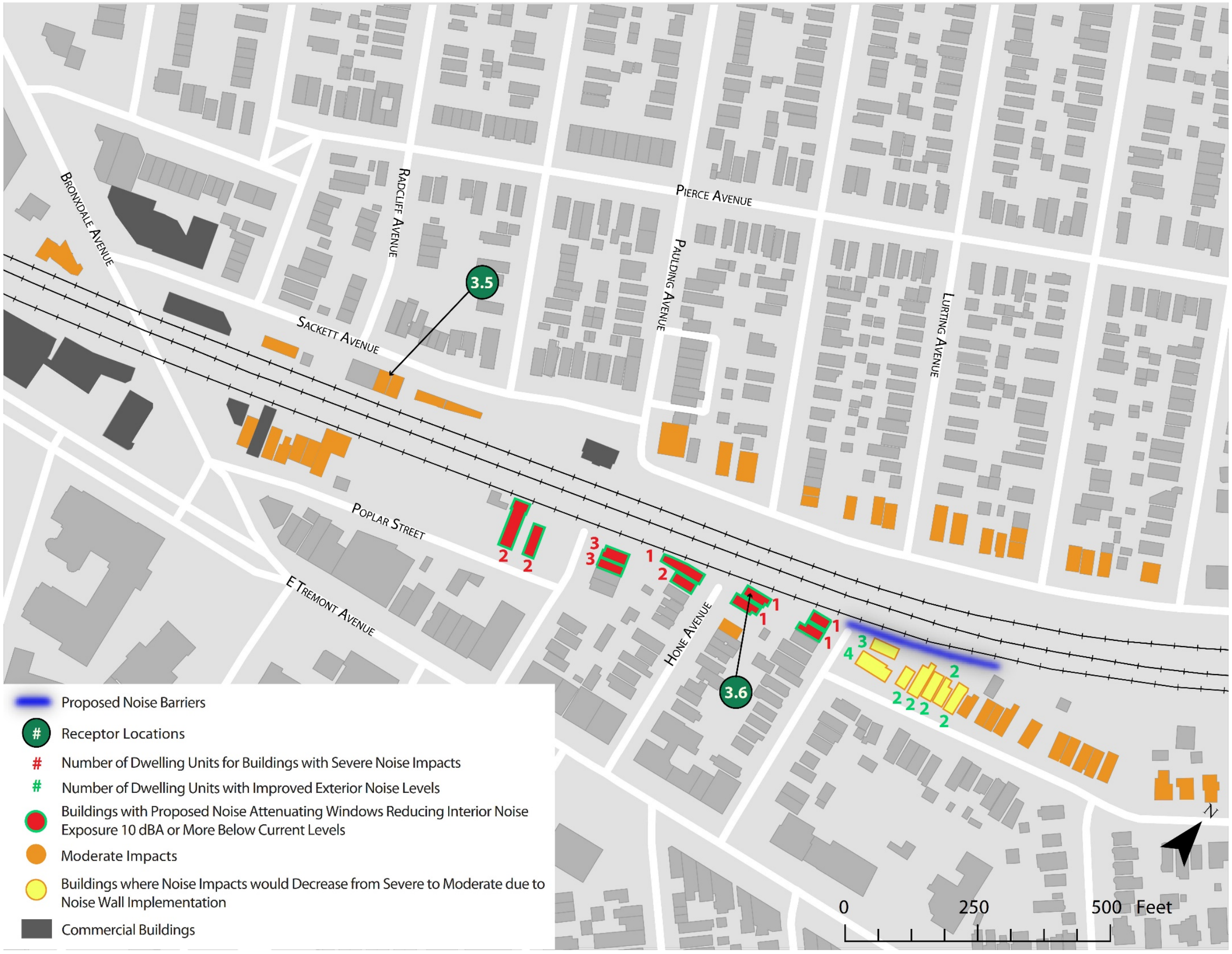
16.4.3.4 Noise Barrier Recommendations

South Side of the Railroad Right-of-Way. Pending final design, MTA could install a barrier limited to the buildings east of Lurting Avenue, approximately 200 feet in length (Figure 16-27), which would reduce the number of severe impacts by 7 buildings (17 dwelling units).

16.4.3.5 Additional Abatement Recommendations

For properties with severe impacts where a noise barrier could not be constructed because of the space constraints, MTA will employ other noise control measures to minimize noise impacts. In general, because these properties have insufficient space, they also lack exterior areas of frequent human use where a noise barrier would be of benefit. Therefore, providing the maximum noise reduction within the indoor spaces of these homes will be the best solution. Thus, subject to approval by the property owners, installing new double-paned, fully sealed soundproof windows in buildings directly adjacent to the HGL right-of-way will provide the greatest noise-reduction benefit to these properties with severe impacts. MTA will specify that the soundproof windows will have a minimum sound transmission classification (STC) rating of 40. MTA will replace all windows, including those with a partial visual exposure to the tracks, with STC 40 rated soundproof windows. This abatement measure will reduce interior noise levels by 10 dBA or more over current noise levels experienced today inside these homes. MTA will perform this abatement measure for at least 10 buildings (17 dwelling units) as illustrated by the green outlined red boxed buildings in Figure 16-27.

Figure 16-27. Proposed Noise Mitigation Locations and Effects: Segment 3 (Close-up)



Source: WSP, 2020

16.4.3.6 Abatement Effect

The noise impact analysis found that 17 buildings consisting of 34 dwellings would experience noise exposure within the FTA severe impact range. As a result, abatement measures will be necessary. Figure 16-27 illustrates the effect of the various abatement measures to be employed. Pending final design, the installation of a single 200-foot-long noise barrier along the right-of-way will reduce the severe impacts at 7 buildings (17 dwelling units) to moderate noise-exposure levels or lower. For the remaining 10 buildings (17 dwelling units) with severe impacts, constructing noise barriers will not be possible because of the space constraints. Therefore, an alternate abatement measure of installing STC 40 rated soundproof windows (subject to approval by the property owners) will be the most effective feasible measure that will benefit these homes and thus minimize impact. Interior noise levels inside these properties will be reduced by 10 dBA or more below the current interior levels experienced today from rail transit pass-by noise.

16.4.4 Segment 4 (Corridor)

Under the Proposed Project, the track geometries for this segment would be generally similar to the existing Amtrak track alignments.

16.4.4.1 Noise

Table 16-16 shows the projected noise exposure for the Proposed Project at each of the three representative receptors in Segment 4. The Proposed Project would result in one moderate impact at Receptor Site 4.3. Figure 16-28 illustrates the moderate property impacts. MTA projects no impact to FTA Category 3 Pelham Bay/Split Golf Courses or within the residential area represented by Receptor Site 4.2. Golfers playing on the 18th hole of Split Rock would experience noise-level increases of 3 dBA, which is considered just at the barely perceivable threshold range and thus would not constitute a significant adverse impact. MTA projects moderate noise impacts at the 6 homes (9 dwelling units) on Cliff Street near Birch Street and Beechwood Avenue. These properties are just before the merge of the HGL tracks at CP 216 – Shell Interlocking, which contributes to the high background noise level in this area. Total future noise levels with the Proposed Project would increase by 1 decibel to 76 dBA and would not be perceptible to listeners living within this residential area.

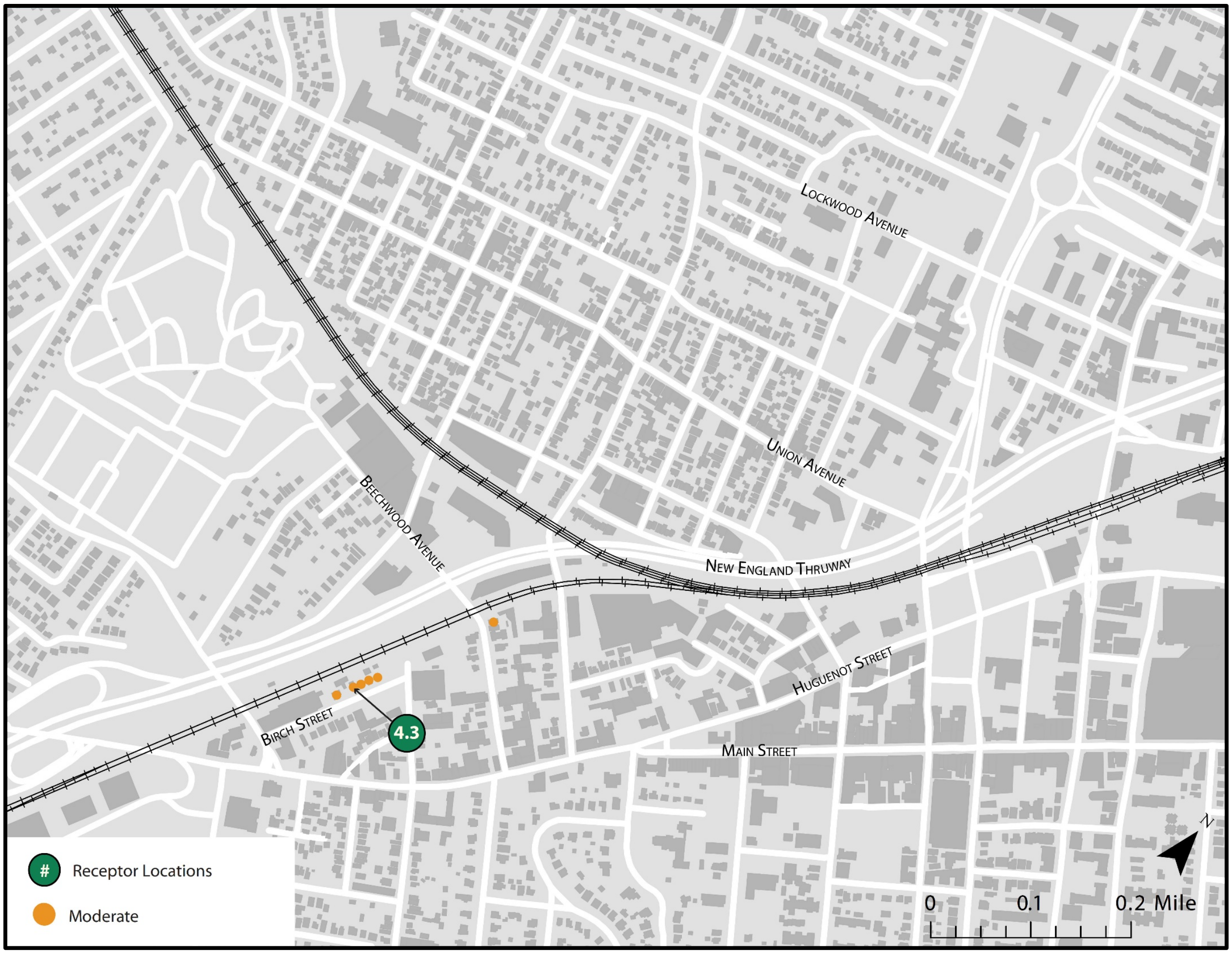
Table 16-16. Projected Transit Noise-Exposure Levels and FTA Impact Criteria for Proposed Project Train Service at Sensitive Receptors: Segment 4 (Corridor)

Map ID	Description	FTA Receptor Category	Existing Noise Level (dBA)[1]	Distance to the Closest Track	FTA Impact Threshold Levels: Moderate	FTA Impact Threshold Levels: Severe	Projected Noise Exposure of Proposed Project[2, 3]	FTA Impact	Total Future Noise Level (dBA)[4]	Total Future Noise Level Change Versus Existing (dBA)
4.1	Pelham Bay/Split Rock Golf Course	3	62	125	64 to 69	>69	61	No Impact	65	3
4.2	Forest Rd, Pelham Manor	2	72[5]	165	66 to 71	>71	62	No Impact	72	0
4.3	Cliff at Birch Street[5]	2	75	55	66 to 73	>73	67	Moderate Impact	76	1

Source: WSP, 2020

1 Existing or projected day-night (Ldn) noise levels, or peak-hour daytime Leq (hr) shown, depending on FTA receptor category.
2 All-day or peak-hour thresholds shown, depending on FTA receptor category.
3 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."
4 Based on existing conditions and the Proposed Project only.
5 Existing noise level determined based on distance adjusted noise measurement collected at receptor 4.3.

Figure 16-28. Moderate Noise Impacts: Segment 4 (Corridor)



Source: WSP, 2020

16.4.4.2 Vibration

As shown in Table 16-17, the homes on Cliff Street could experience a slight increase in vibration levels above the 72 VdB impact threshold. However, MTA will mitigate the vibration impacts by using under-rail pads and resilient fasteners throughout the corridor during the track construction phase.

Table 16-17. Projected Transit Vibration-Exposure Levels and Federal Transit Administration Impact Criteria for Proposed Project Train Service at Representative Sensitive Receptors: Segment 4 (Corridor)

Map ID	Description	FTA Receptor Category	Track Position Relative to Receptor[1]	FTA Impact Threshold (VdB)	Projected Vibration Exposure of Proposed Project[2]	FTA Impact? (Yes/No)
4.1	Pelham Bay/Split Rock Golf Course	3	At-Grade	75	67	No
4.2	Forest Rd, Pelham Manor	2	At-Grade	72	65	No
4.3	Cliff at Birch Street	2	At-Grade	72	73	Yes

Source: WSP, 2020

1 The Federal Transit Administration methodology applies modifications based on at-grade or aerial relative track position for vibration transference.

2 Based on Metro-North operations as noted in Section 16.2.2, "Assessment Methodology."

16.5 CONCLUSION

Residential and other sensitive land uses in communities adjacent to the right-of-way are exposed to relatively high ambient noise during most hours of the day. The noisy existing environment is a direct result of the proximity of these properties to major roadways and rail operations along the HGL Corridor. Nevertheless, in spite of these high existing noise conditions, the Proposed Project would incrementally increase noise exposure in each segment. Table 16-18 summarizes the impact analysis findings, which indicates that without abatement the Proposed Project would result in 270 buildings (765 dwelling units) experiencing moderate noise impacts and 17 buildings (34 dwelling units) experiencing severe noise impacts.

Table 16-18. Projected Transit Noise and Vibration Impacts by Segment

Segment	FTA Moderate Impacts[1]	FTA Severe Impacts[1]	FTA Severe Plus Moderate Impacts[1]	Noise Barrier Abatement Measures for Severe Impacts[1]	Proposed Soundproof (STC 40) Replacement Windows for Severe Impacts without Noise Barriers	Moderate Impacts Remaining with Abatement[1]	Vibration Dwelling Unit Impacts	Vibration Dwelling Unit Impacts with Abatement[3]
1	196 (602)	0 (0)	196 (602)	0 (0)	0 (0)	196 (602)	0	0
2	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0	0
3	68 (154)	17 (34)	85 (188)	7 (17)	10 (17)2	75 (171)	75	0
4	6 (9)	0 (0)	6 (9)	0 (0)	0 (0)	6 (9)	9	0
TOTAL	**270 (765)**	**17 (34)**	**287 (799)**	**7 (17)**	**10 (17)**	**277 (782)**	**84**	**0**

Source: WSP, 2020

1 Number of dwelling units shown in parenthesis.

2 Proposed STC 40-rated soundproof windows for sites with severe impacts will be installed where space constraints would not allow noise barriers to be installed (subject to approval by property owners).

3 Proposed vibration abatement will include MTA installing under-rail ballast pads and resilient fasteners throughout the entire corridor as part of the track construction.

MTA is considering noise-abatement measures only for the properties projected to experience severe impacts. Due to space constraints, constructing noise barriers is not possible at all properties where severe noise exposure is projected to occur. However, pending final design, one noise barrier will be feasible and will provide abatement to 7 buildings (17 dwelling units). Figure 16-27 shows the location of the proposed noise wall. Noise exposure with the barrier wall will reduce exterior noise levels to the moderate impact range or lower. As a result, the moderate impacts shown in the extreme right-hand column of Table 16-18 under Segment 3 will increase from 68 buildings (154 dwelling units) without abatement to 75 buildings (171 dwelling units) with abatement.

The remaining 10 buildings with severe impacts where there is insufficient space to construct a noise wall generally do not have exterior areas of frequent human use that would benefit from a noise wall. Therefore, the best practical and acoustically effective abatement measure will be to lower interior noise levels in these properties by having MTA replace (subject to property owners' approval) the windows on building facades that have a visual exposure to the tracks with soundproof windows that provide a minimum STC rating of 40 or more. Exterior areas of these 10 buildings would still be exposed to noise levels in the severe impact range. However, the new windows will lower interior noise levels by 10 dBA or more over existing interior noise levels experienced inside these homes today (see detail in Appendix J, Table J-9). This proposed noise control measure, depicted by the green outlined red boxed buildings in Figure 16-27, will provide some measure of noise control relief to these properties from daily transit operations. MTA will fully develop details of these measures to minimize impacts as part of the Proposed Project's final design.

Though not as extensive as the noise impact findings, MTA will eliminate the projected vibration levels by installing under-rail pads and resilient fasteners as part of the track construction.