Chapter 17: Noise

A. INTRODUCTION

This chapter assesses the potential for the Proposed Actions to result in significant adverse noise impacts. The analysis determines whether the Proposed Actions would result in increases in noise levels that could have a significant adverse impact on nearby sensitive receptors and also considers the effect of existing noise levels at the projected and potential development sites on the proposed uses.

PRINCIPAL CONCLUSIONS

The analysis finds that, with the incorporation of noise attenuation requirements set forth in (E) Designation (E-422) applicable to privately owned sites, or required through a Land Disposition Agreement for sites under City jurisdiction, the Proposed Actions would not result in any significant adverse noise impacts. The noise analysis determined that the projected and potential development sites included in the Proposed Actions would require between 28 and 44 dBA window/wall attenuation to meet applicable 2014 *City Environmental Quality Review (CEQR) Technical Manual* interior noise level requirements and between 25 and 40 dBA window/wall attenuation to meet applicable U.S. Department of Housing and Urban Development (HUD) interior noise level guidelines, where applicable. These attenuation requirements would be included in Noise (E) Designation E-422 (or required through a Land Disposition Agreement or comparable mechanism for City-owned sites). With these attenuation measures, the Proposed Actions are not expected to result in significant adverse impacts related to noise.

B. ACOUSTICAL 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 discernible and therefore more intrusive than many of the lower frequencies (e.g., the lower notes on the French horn).

"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 17-1**, the threshold of human hearing is defined as 0 dBA; very 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.

Table 17-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Freight train at 30 meters	95
Train horn at 30 meters	90
Heavy truck at 15 meters	80–90
Busy city street, loud shout	80
Busy traffic intersection	70–80
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Light car traffic at 15 meters, city or commercial areas, or residential areas close to industry	50–60
Background noise in an office	50
Suburban areas with medium-density transportation	40–50
Public library	40
Soft whisper at 5 meters	30
Threshold of hearing	0

Note: A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.
Sources: Cowan, James P. *Handbook of Environmental Acoustics,* Van Nostrand Reinhold, New York, 1994. Egan, M. David, Architectural Acoustics. McGraw-Hill Book Company, 1988.

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, the change will be readily noticeable.

NOISE DESCRIPTORS USED IN IMPACT ASSESSMENT

Because the sound pressure level unit of dBA describes a noise level at just one moment and very few noises are constant, other ways of describing noise over extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise 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 as $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. The Day-Night Sound Level, L_{dn}, refers to a 24-hour average noise level with a 10 dB penalty applied to the noise levels during the hours between 10 PM and 7 AM, due to increased sensitivity to noise levels during these hours. 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 very 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}.

For purposes of the Proposed Actions, the 1-hour L_{eq} descriptor has been selected as the noise descriptor to be used in this noise impact evaluation, and the 1-hour L_{10} has been selected as the noise descriptor used to evaluate noise exposure at newly introduced noise receptors. These are the descriptors recommended by the *CEQR Technical Manual* for city environmental impact review classification. The L_{dn} is the noise descriptor used in the *HUD Noise Guidebook* and sets exterior noise standards for housing construction projects receiving federal funds.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CEQR TECHNICAL MANUAL NOISE STANDARDS

The *CEQR Technical Manual* sets external noise exposure standards; these standards are shown in **Table 17-2**. Noise exposure is classified into four categories: acceptable, marginally acceptable, marginally unacceptable, and clearly unacceptable.

Table 17-2
Noise Exposure Guidelines For Use in City Environmental Impact Review

Receptor Type	Time Period	Acceptable General External Exposure	Airport[3] Exposure	Marginally Acceptable General External Exposure	Airport[3] Exposure	Marginally Unacceptable General External Exposure	Airport[3] Exposure	Clearly Unacceptable General External Exposure	Airport[3] Exposure
Outdoor area requiring serenity and quiet[2]		$L_{10} \leq 55$ dBA	---------- Ldn ≤ 60 dBA ----------	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Hospital, nursing home		$L_{10} \leq 55$ dBA		55 < $L_{10} \leq 65$ dBA	---- 60 < Ldn ≤ 65 dBA ----	65 < $L_{10} \leq 80$ dBA	(I) 65 < Ldn ≤ 70 dBA, (II) 70 ≤ Ldn	$L_{10} > 80$ dBA	---------- Ldn ≤ 75 dBA ----------
Residence, residential hotel, or motel	7 AM to 10 PM	$L_{10} \leq 65$ dBA		65 < $L_{10} \leq 70$ dBA		70 < $L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
	10 PM to 7 AM	$L_{10} \leq 55$ dBA		55 < $L_{10} \leq 70$ dBA		70 < $L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
School, museum, library, court, house of worship, transient hotel or motel, public meeting room, auditorium, outpatient public health facility		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)	
Commercial or office		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)		Same as Residential Day (7 AM-10 PM)	
Industrial, public areas only[4]	Note 4	Note 4		Note 4		Note 4		Note 4	

Notes:
(i) In addition, any new activity shall not increase the ambient noise level by 3 dBA or more.
1 Measurements and projections of noise exposures are to be made at appropriate heights above site boundaries as given by American National Standards Institute (ANSI) Standards; all values are for the worst hour in the time period.
2 Tracts of land where serenity and quiet are extraordinarily important and serve an important public need, and where the preservation of these qualities is essential for the area to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
3 One may use FAA-approved L_{dn} contours supplied by the Port Authority, or the noise contours may be computed from the federally approved INM Computer Model using flight data supplied by the Port Authority of New York and New Jersey.
4 External Noise Exposure standards for industrial areas of sounds produced by industrial operations other than operating motor vehicles or other transportation facilities are spelled out in the New York City Zoning Resolution, Sections 42-20 and 42-21. The referenced standards apply to M1, M2, and M3 manufacturing districts and to adjoining residence districts (performance standards are octave band standards).
Source: New York City Department of Environmental Protection (adopted policy 1983).

The *CEQR Technical Manual* defines attenuation requirements for buildings based on exterior noise level (see **Table 17-3**). Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 45 dBA or lower for residential or community facility uses

and 50 dBA or lower for retail or office uses, and are determined based on exterior $L_{10(1)}$ noise levels.

Table 17-3
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Unacceptable				Clearly Unacceptable
Noise Level with Proposed Actions	$70 < L_{10} \leq 73$	$73 < L_{10} \leq 76$	$76 < L_{10} \leq 78$	$78 < L_{10} \leq 80$	$80 < L_{10}$
Attenuation[A]	(I) 28 dBA	(II) 31 dBA	(III) 33 dBA	(IV) 35 dBA	$36 + (L_{10} - 80)$[B] dBA

Notes:
[A] The above composite window-wall attenuation values are for residential dwellings. Retail and office spaces would be 5 dBA less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.
[B] Required attenuation values increase by 1 dBA increments for L_{10} values greater than 80 dBA.
Source: New York City Department of Environmental Protection.

HUD DEVELOPMENT GUIDELINES

The *HUD Noise Guidebook* sets exterior noise standards for housing construction projects based on L_{dn} values (see **Table 17-4**). If the exterior noise level is 65 dBA L_{dn} to 70 dBA L_{dn}, 25 dBA of window/wall attenuation must be provided; if the exterior noise level is 70 dBA L_{dn} to 75 dBA L_{dn}, 30 dBA window/wall attenuation must be provided; and if the exterior noise levels exceeds 75 dBA L_{dn}, sufficient window/wall attenuation must be provided to achieve interior noise levels of 45 dBA L_{dn} or lower for residential uses.

Table 17-4
HUD Exterior Noise Standards

	Acceptable	Normally Unacceptable	Unacceptable
Noise Level with Proposed Actions	$L_{dn} \leq 65$	$65 < L_{dn} \leq 75$	$75 < L_{dn}$
Source: U.S. Department of Housing and Urban Development (HUD)			

For this analysis, L_{dn} noise levels were estimated using the following equation:

$$L_{dn} = L_{10} - 3$$

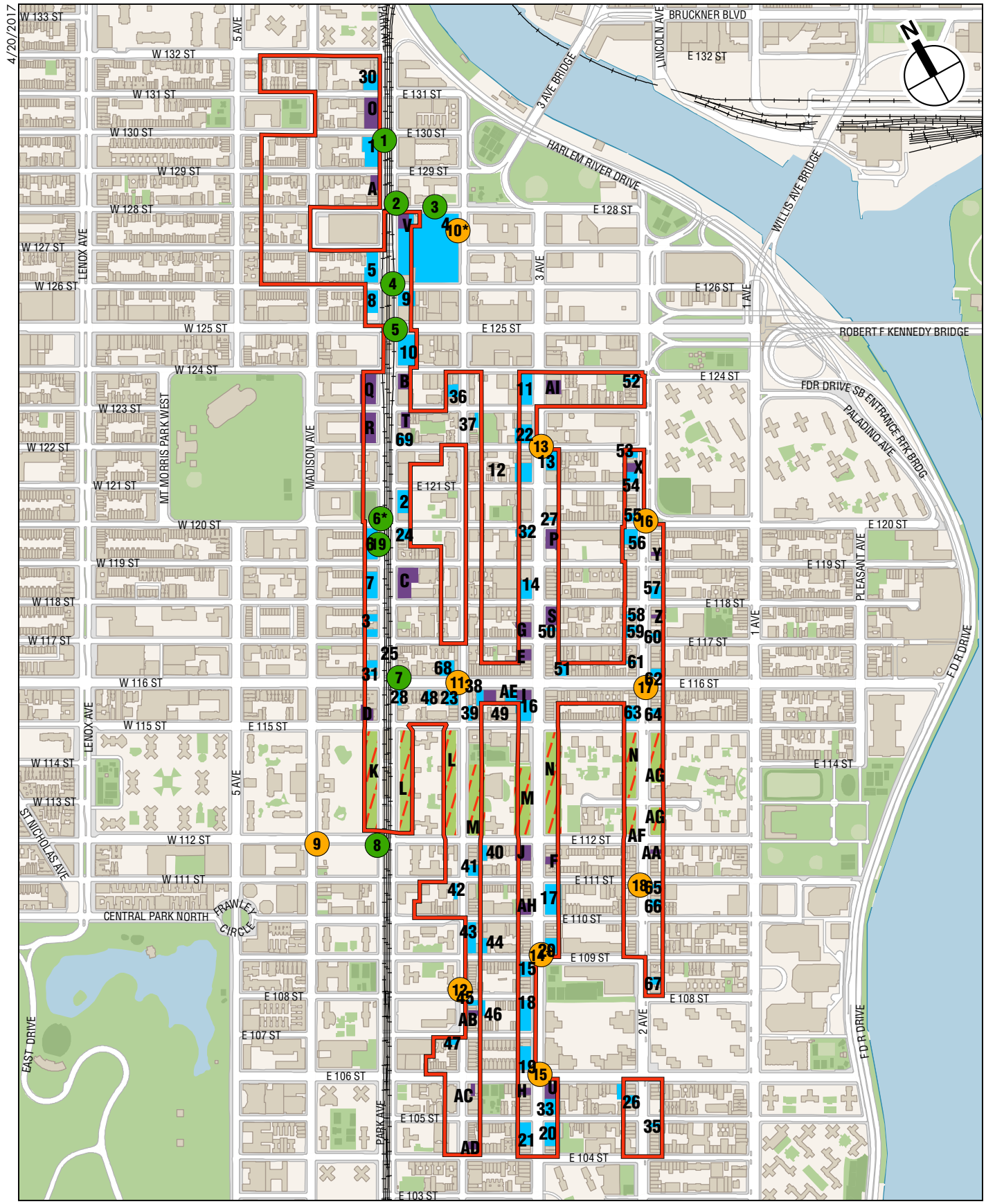
The method used to determine L_{dn} noise levels is to measure the loudest hourly L_{10} for a typical day and then to estimate the L_{dn} from this loudest hourly L_{10}, which is consistent with the *HUD Noise Guidebook.*

D. EXISTING NOISE LEVELS

SELECTION OF NOISE RECEPTOR LOCATIONS

A total of 19 receptor locations within the Project Area were selected for evaluation of noise attenuation requirements. These locations are detailed below in **Table 17-5** and shown in **Figure 17-1.**

The receptor locations were selected based on the following criteria: (1) locations near projected and potential development sites; and (2) to provide comprehensive geographic coverage throughout the study area to get an accurate picture of the ambient noise environment.



EAST HARLEM REZONING

Noise Monitoring Receptor Locations

Figure 17-1

NOISE MONITORING

At each receptor site, existing noise levels were determined by field measurements. Noise monitoring was performed between November 1 and November 16, 2016 at all receptor sites except for the midday measurement at receptor site 4, which occurred on December 8, 2016, and all measurements at receptor site 19, which occurred on June 2, 2016. Midday noise monitoring at receptor site 4 was performed on December 8, 2016. Train noise is the dominant source of noise at receptor site 4; consequently, measured noise levels at this location would not be influenced by vehicular traffic volumes occurring at this time of year. Furthermore, measured noise levels at this receptor site are expected to be comparable to noise levels measured on any other day with typical train traffic. At receptor sites 1-8 and 19, which are adjacent to the elevated Metro-North Railroad, 1-hour spot noise measurements were conducted during typical weekday AM (7:15 AM–9:30 AM), midday (12:00 PM–2:30 PM), and PM (4:00 PM–6:30 PM) peak periods, with the exception of receptor site 4 whose midday measurement occurred between 10:30 AM and 11:30 AM because access to the Metro-North Railroad platform was restricted to this time. It was confirmed by consultation with the Metropolitan Transit Authority (MTA) that train traffic is heavier during the 10:30 AM–11:30 AM hour than the typical midday time period. Therefore, the noise measurements at this receptor site during the 10:30 AM–11:30 AM hour would be a conservative representation of noise levels measured during the typical midday time period. At all other receptor sites, 20-minute spot noise measurements were conducted during the same peak periods. At receptor sites 10 and 14, additional 20-minute spot noise measurements were conducted during the pre-PM typical school peak period (2:30 PM–3:30 PM). At receptor site 6, an additional 60-minute spot noise measurement was conducted during the same pre-PM typical school peak period (2:30 PM–3:30 PM).

Table 17-5
Noise Receptor Locations

Noise Receptor Site	Duration	Projected Development Sites	Potential Development Sites	Location
1	1-hour	1,30	A,O	Southwest corner of East 130th Street and Park Avenue
2	1-hour	4 (West Façade)	V	Southeast corner of East 128th Street and Park Avenue
3	1-hour	4 (North and South Façades		East 128th Street between Park Avenue and Lexington Avenue
4[2]	1-hour	5,8,9		On Northbound platform of Metro-North 125th Street Station at East 126th Street
5	1-hour	10, 69	B,Q,R,T	Southeast corner of East 125th Street and Park Avenue
6[1]	1-hour	2,6,7,24	C	Northwest corner of East 120th Street and Park Avenue
7	1-hour	3,25,28,31	D	Southeast corner of East 116th Street and Park Avenue
8[3]	1-hour		K,L	Southwest corner of East 112th Street and Park Avenue
9[4]	20-minute			Southeast corner of East 112th Street and Madison Avenue
10[1]	20-minute	4 (East Façade), 36,37		Lexington Avenue between East 127th Street and East 128th Street
11	20-minute	23,38,39,48,49,68	M,AE	Southwest corner of East 116th Street and Lexington Avenue
12	20-minute	40,41,42,43,44,45, 46,47	AB,AC,AD	Southeast corner of East 108th Street and Lexington Avenue
13	20-minute	11,12,13,14,15,16, 22,27,32,50	E,I,P,S, AI	Southeast corner of East 122nd Street and 3rd Avenue
14[1]	20-minute	17,18,29	G,J,F, AH	Northeast corner of East 109th Street and 3rd Avenue
15	20-minute	19,20,21,26,33,35	H,U	Southeast corner of East 106th Street and 3rd Avenue
16	20-minute	52,53,54,55,56,57	X,Y	Northwest corner of East 120th Street and 2nd Avenue
17	20-minute	51,58,59,60,61,62, 63,64	Z,N	Northeast corner of East 116th Street and 2nd Avenue
18	20-minute	65,66,67	AA, AF, AG	Southeast corner of East 111th Street and 2nd Avenue
19	1-hour	N/A		Elevated approximately 25 feet above grade on Park Avenue between East 119th Street and East 120th Street

Notes: Noise measurements were conducted during typical weekday AM, midday, and PM peak periods.
[1] An additional pre-PM noise measurement was conducted between 2:30 and 3:30 PM.
[2] The midday measurement at Receptor Site 4 was conducted between 10:30 AM and 11:30 AM instead of the typical midday peak period as described in the "Noise Monitoring" section.
[3] Measurements taken for the north, east, and south façades of the Sendero Verde Alternative Site.
[4] Measurements taken for the west façade of the Sendero Verde Alternative Site.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using Brüel & Kjær Type 2260 2250, and 2270 Sound Level Meters (SLMs), Brüel & Kjær Type 4189 ½-inch microphones, and Brüel & Kjær Type 4231 Sound Level Calibrators. The Brüel & Kjær SLMs are Type 1 instruments according to ANSI Standard S1.4-1983 (R2006). The SLMs had a laboratory calibration date within the past one year at the time of use. All noise measurement locations were approximately 5 feet above grade, with the exception of receptor site 4 and 19. Receptor site 4 was located approximately 30 feet above grade on the northbound platform of the elevated Metro-North 125th Street-Harlem station facing East 126th Street. Receptor site 19 was located approximately 25 feet above grade. The SLMs were calibrated before and after readings with a Brüel & Kjær Type 4231 Sound Level Calibrator using the appropriate adaptors. The data were digitally recorded by the SLMs and displayed at the end of the measurement period in units of dBA. Measured quantities included the L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. Windscreens were used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

EXISTING NOISE LEVELS AT NOISE RECEPTOR LOCATIONS

MEASURED NOISE LEVELS

The results of the measurements of existing noise levels are summarized in **Table 17-6**. Vehicular traffic was the dominant noise source throughout the study area, except along Park Avenue. Along Park Avenue, elevated Metro-North trains were the dominant noise sources. Noise levels are moderate to relatively high and reflect the level of vehicular and rail activity present adjacent to each receptor site.

In terms of *CEQR Technical Manual* criteria, receptor site 3 is in the "marginally acceptable" category, receptor sites 2, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 are in the "marginally unacceptable" category and receptor sites 1, 4, 5, 6, 7, and 8 are in the "clearly unacceptable" category.

The existing L_{dn} for all receptors was estimated according to the methodology described above and is summarized in **Table 17-6**. According to HUD criteria, the calculated existing L_{dn} noise levels at receptor sites 3, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 would be in the "normally unacceptable" category and calculated existing L_{dn} noise levels at receptor sites 1, 2, 4, 5, 6, 7, and 8 would be in the "unacceptable" category.

E. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

Future noise levels were calculated using a proportional modeling technique, which was used as a screening tool to estimate changes in noise levels. The proportional modeling technique is an analysis methodology recommended for analysis purposes in the *CEQR Technical Manual*. The noise analysis examined the weekday AM, midday (MD), and PM peak hours at all receptor sites and the Pre-PM hour at sites 10 and 14. The selected time periods are when the proposed project would be expected to produce the maximum traffic generation (based on the traffic studies presented in Chapter 14, "Transportation") and therefore result in the maximum potential for significant adverse noise impacts. The proportional modeling used for the noise analysis is described below.

Table 17-6
Existing Noise Levels (in dBA)

Receptor	Measurement Location	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{dn}
1	Southwest corner of East 130th Street and Park Avenue	AM	76.0	85.3	81.3	69.4	61.8	78.4
		MD	73.2	84.5	77.5	65.1	59.9	
		PM	76.2	85.3	81.4	68.8	64.2	
2	Southeast corner of East 128th Street and Park Avenue	AM	74.8	84.3	79.5	67.7	60.5	76.5
		MD	72.8	82.7	76.0	64.9	59.6	
		PM	77.9	67.0	79.3	68.2	62.2	
3	East 128th Street between Park Avenue and Lexington Avenue	AM	64.8	74.1	67.0	60.7	56.5	65.3
		MD	64.5	76	65.6	59.1	56.4	
		PM	72.1	76.2	68.3	61.9	57.6	
4	On Northbound platform of Metro-North 125th Street Station at East 126th Street	AM	79.4	89.0	82.9	75.0	62.6	80.9
		MD[2]	78.7	90.6	82.1	67.7	58.3	
		PM	79.7	89.6	83.9	74.7	60.7	
5	Southeast corner of East 125th Street and Park Avenue	AM	77.9	87.8	81.1	74.3	68.6	78.1
		MD	76.9	85.8	79.6	73.5	69.3	
		PM	77.6	85.1	79.8	73.9	69.2	
6	Northwest corner of East 120th Street and Park Avenue	AM	76.0	86	80.9	68	62.2	78.3
		MD	72.9	85	76.0	64.1	56.5	
		PM	76.4	86.6	81.3	66.8	60.6	
		Pre-PM	74.4	85.2	78.0	67.4	60.5	
7	Southeast corner of East 116th Street and Park Avenue	AM	81.1	91.5	86.1	72.7	65.2	83.1
		MD	76.4	89.5	78.0	67.9	62.4	
		PM	78.6	90.5	82.4	69.5	64.5	
8	Southwest corner of East 112th Street and Park Avenue	AM	76.8	87.4	81.6	67.5	60.0	78.6
		MD	73.6	85.7	75.9	65.1	58.7	
		PM	76.1	87.8	80.1	65.6	59.9	
9	Southeast corner of East 112th Street and Madison Avenue	AM	68.0	76.8	70.1	65.4	60.5	67.1
		MD	67.1	75.3	69.7	64.0	56.5	
		PM	67.1	74.2	70.1	65.6	60.5	
10	Lexington Avenue between East 127th Street and East 128th Street	AM	65.1	75.1	67.8	61.7	58.5	67.5
		MD	66.7	76.5	69.4	63.4	58.5	
		PM	67.7	77.7	70.5	63.7	59.2	
		Pre-PM	67.5	77.6	69.4	62.6	59.0	
11	Southwest corner of East 116th Street and Lexington Avenue	AM	73.0	81.3	76.5	70.7	66.1	73.5
		MD	72.7	81.0	75.3	69.8	65.2	
		PM	71.5	79.1	74.2	69.9	67.0	
12	Southeast corner of East 108th Street and Lexington Avenue	AM	70.6	80.9	73.0	65.7	57.9	70.0
		MD	66.5	76.9	69.9	62.4	56.2	
		PM	69.0	78.2	71.6	65.2	59.6	
13	Southeast corner of East 122nd Street and 3rd Avenue	AM	73.0	82.7	76.4	68.9	64.7	73.4
		MD	71.0	79.3	73.7	68.4	65.3	
		PM	72.0	82.0	75.1	68.1	63.4	
14	Northeast corner of East 109th Street and 3rd Avenue	AM	73.8	83.0	77.4	70.1	65.0	74.4
		MD	72.2	80.8	75.8	69.2	64.0	
		PM	71.0	79.3	74.0	69.2	63.6	
		Pre-PM	72.8	82.4	75.6	69.5	63.0	

Table 17-6 (cont'd)
Existing Noise Levels (in dBA)

Receptor	Measurement Location	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{dn}
15	Southeast corner of East 106th Street and 3rd Avenue	AM	71.6	79.1	75.1	69.4	65.5	72.9
		MD	71.4	79.0	75.0	69.2	64.0	
		PM	72.4	79.6	75.9	70.5	65.9	
16	Northwest corner of East 120th Street and 2nd Avenue	AM	72.0	80.6	75.8	68.8	62.0	72.8
		MD	71.6	80.7	75.1	68.3	61.8	
		PM	70.7	80.0	73.7	68.1	62.0	
17	Northeast corner of East 116th Street and 2nd Avenue	AM	72.0	81.3	74.4	69.6	65.9	71.5
		MD	71.7	79.6	74.5	70.0	65.8	
		PM	69.0	76.8	71.5	66.7	63.1	
18	Southeast corner of East 111th Street and 2nd Avenue	AM	71.4	80.1	74.6	68.6	61.9	71.6
		MD	70.0	78.6	73.5	67.0	59.7	
		PM	68.3	76.2	70.6	66.5	61.9	
19[3]	Elevated approximately 25 feet above grade on Park Avenue between East 119th Street and East 120th Street	AM	72.1	80.3	76.7	66.3	60.5	73.7
		MD	68.9	78.7	73.3	64.1	60.0	
		PM	71.4	80.9	76.2	65.3	59.5	

Notes
[1] Field measurements were performed by AKRF, Inc. between November 1 and December 8, 2016.
[2] Midday measurements at Receptor 4 occurred between 10:30 AM and 11:30 AM on December 8, 2016 as described in the "Noise Monitoring" section.
[3] Noise level measurements at Receptor 19 occurred on June 2, 2016.

PROPORTIONAL MODELING

Proportional modeling was used to determine locations with the potential for having significant noise impacts. Proportional modeling is one of the techniques recommended in the *CEQR Technical Manual* for mobile source analysis.

Using this technique, the prediction of future noise levels where traffic is the dominant noise source is based on a calculation using measured existing noise levels and predicted changes in traffic volumes to determine No Action and With Action Condition noise levels. Vehicular traffic volumes are converted into Noise Passenger Car Equivalent (Noise PCE) values, for which one medium-duty truck (having a gross weight between 9,900 and 26,400 pounds) is assumed to generate the noise equivalent of 13 cars, and one heavy-duty truck (having a gross weight of more than 26,400 pounds) is assumed to generate the noise equivalent of 47 cars, and one bus (vehicles designed to carry more than nine passengers) is assumed to generate the noise equivalent of 18 cars. Future noise levels are calculated using the following equation:

$F\ NL - E\ NL = 10 * \log_{10} (F\ PCE / E\ PCE)$

where:

F NL = Future Noise Level

E NL = Existing Noise Level

F PCE = Future Noise PCEs

E PCE = Existing Noise PCEs

Sound levels are measured in decibels and therefore increase logarithmically with sound source strength. In this case, the sound source is traffic volumes measured in Noise PCEs. As an

example, traffic is assumed to be the dominant noise source at a particular location. If the existing traffic volume on a street is 100 PCE and if the future traffic volume were increased by 50 PCE to a total of 150 PCE, the noise level would increase by 1.8 dBA. Similarly, if the future traffic were increased by 100 PCE, or doubled to a total of 200 PCE, the noise level would increase by 3.0 dBA.

BUILDING REFLECTIONS

An analysis was performed using the CadnaA model to examine whether the addition of buildings on either side of the railway along Park Avenue would result in reflections of sound generated by the railway resulting in increased noise levels along the Park Avenue corridor. The CadnaA model is a computerized model developed by DataKustik for noise prediction and assessment. The model can be used for the analysis of a wide variety of noise sources, including stationary sources (e.g., construction equipment, industrial equipment, power generation equipment, etc.), transportation sources (e.g., roads, highways, railroad lines, busways, airports, etc.), and other specialized sources (e.g., sporting facilities, etc.) The model takes into account the noise power levels of the noise sources, attenuation with distance, ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The CadnaA model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2. This standard is currently under review for adoption by the American National Standards Institute as an American standard. The CadnaA model is a state-of-the-art tool for noise analysis.

Noise analysis receptors were placed in the model immediately adjacent to two large projected development sites (i.e., Projected Development Sites 8 and 9) at various elevations. The CadnaA model was run both with and without the buildings on these projected development sites in order to determine the potential increase in noise levels due to reflections from the future buildings.

The maximum noise level increment due to building reflections at any elevation was determined to be minimal, and furthermore the existing monitoring captured most of the building reflections that would be expected as part of the With Action Condition noise levels. Therefore, the increment due to building reflections was not added to the predicted With Action Condition noise levels.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology previously described, No Action Condition noise levels were calculated at the 19 mobile source noise analysis receptors for the 2027 analysis year. These No Action Condition values are shown in **Table 17-7**.

In 2027, the maximum increase in $L_{eq(1)}$ noise levels for the No Action Condition would be 1.2 dBA or less at all 19 noise analysis receptors. Changes of this magnitude would be considered imperceptible and not significant according to *CEQR Technical Manual* noise impact criteria. In terms of CEQR noise exposure guidelines, noise levels at receptor site 3 would be in the "Marginally Acceptable" category, noise levels at receptor sites 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 would be in the "Marginally Unacceptable" category, noise levels at receptor sites 1, 2, 4, 5, 6, 7, and 8 would be in the "Clearly Unacceptable" category.

Table 17-7
2027 No Action Condition Noise Levels (in dBA)

Receptor	Location	Time	Existing $L_{eq(1)}$	No Action $L_{eq(1)}$	$L_{eq(1)}$ Change	No Action $L_{10(1)}$	No Action L_{dn}
1	Southwest corner of East 130th Street and Park Avenue	AM	76.0	76.5	0.5	81.8	79.0
		MD	73.2	73.8	0.6	78.1	
		PM	76.2	76.8	0.6	82.0	
2	Southeast corner of East 128th Street and Park Avenue	AM	74.8	75.7	0.9	80.4	77.4
		MD	72.8	73.9	1.1	77.1	
		PM	77.9	78.7	0.8	80.1	
3	East 128th Street between Park Avenue and Lexington Avenue	AM	64.8	65.9	1.1	68.1	66.5
		MD	64.5	65.6	1.1	66.7	
		PM	72.1	73.3	1.2	69.5	
4	On Northbound platform of Metro-North 125th Street Station at East 126th Street	AM	79.4	80.3	0.9	83.8	81.7
		MD	78.7	79.8	1.1	83.2	
		PM	79.7	80.5	0.8	84.7	
5	Southeast corner of East 125th Street and Park Avenue	AM	77.9	78.8	0.9	82.0	79.0
		MD	76.9	78.0	1.1	80.7	
		PM	77.6	78.4	0.8	80.6	
6	Northwest corner of East 120th Street and Park Avenue	AM	76.0	76.3	0.3	81.2	78.7
		MD	72.9	73.4	0.5	76.5	
		PM	76.4	76.8	0.4	81.7	
		Pre-PM	74.4	74.8	0.4	78.4	
7	Southeast corner of East 116th Street and Park Avenue	AM	81.1	81.8	0.7	86.8	83.8
		MD	76.4	77.4	1.0	79.0	
		PM	78.6	79.3	0.7	83.1	
8	Southwest corner of East 112th Street and Park Avenue	AM	76.8	77.1	0.3	81.9	78.9
		MD	73.6	74.0	0.4	76.3	
		PM	76.1	76.4	0.3	80.4	
9	Southeast corner of East 112th Street and Madison Avenue	AM	68.0	68.2	0.2	70.3	67.3
		MD	67.1	67.3	0.2	69.9	
		PM	67.1	67.3	0.2	70.3	
10	Lexington Avenue between East 127th Street and East 128th Street	AM	65.1	65.3	0.2	68.0	67.7
		MD	66.7	66.9	0.2	69.6	
		PM	67.7	67.9	0.2	70.7	
		Pre-PM	67.5	67.7	0.2	69.6	
11	Southwest corner of East 116th Street and Lexington Avenue	AM	73.0	73.2	0.2	76.7	73.7
		MD	72.7	73.0	0.3	75.6	
		PM	71.5	71.7	0.2	74.4	
12	Southeast corner of East 108th Street and Lexington Avenue	AM	70.6	70.9	0.3	73.3	70.3
		MD	66.5	67.0	0.5	70.4	
		PM	69.0	69.4	0.4	72.0	
13	Southeast corner of East 122nd Street and 3rd Avenue	AM	73.0	73.2	0.2	76.6	73.6
		MD	71.0	71.3	0.3	74.0	
		PM	72.0	72.3	0.3	75.4	
14	Northeast corner of East 109th Street and 3rd Avenue	AM	73.8	74.0	0.2	77.6	74.6
		MD	72.2	72.5	0.3	76.1	
		PM	71.0	71.3	0.3	74.3	
		Pre-PM	72.8	73.1	0.3	75.9	

Table 17-7 (cont'd)
2027 No Action Condition Noise Levels (in dBA)

Receptor	Location	Time	Existing $L_{eq(1)}$	No Action $L_{eq(1)}$	$L_{eq(1)}$ Change	No Action $L_{10(1)}$	No Action L_{dn}
15	Southeast corner of East 106th Street and 3rd Avenue	AM	71.6	71.9	0.3	75.4	73.2
		MD	71.4	71.8	0.4	75.4	
		PM	72.4	72.7	0.3	76.2	
16	Northwest corner of East 120th Street and 2nd Avenue	AM	72.0	72.3	0.3	76.1	73.1
		MD	71.6	72.0	0.4	75.5	
		PM	70.7	71.1	0.4	74.1	
17	Northeast corner of East 116th Street and 2nd Avenue	AM	72.0	72.2	0.2	74.6	71.8
		MD	71.7	72.0	0.3	74.8	
		PM	69.0	69.2	0.2	71.7	
18	Southeast corner of East 111th Street and 2nd Avenue	AM	71.4	71.7	0.3	74.9	71.9
		MD	70.0	70.4	0.4	73.9	
		PM	68.3	68.6	0.3	70.9	
19	Elevated approximately 25 feet above grade on Park Avenue between East 119th Street and East 120th Street	AM	72.1	72.4	0.3	77.0	74.0
		MD	68.9	69.4	0.5	73.8	
		PM	71.4	71.9	0.5	76.7	

Note: Noise levels at all receptor sites were calculated by using proportional modeling.

The No Action Condition L_{dn} for all receptors was estimated according to the methodology described above. According to HUD criteria, the calculated No Action Condition L_{dn} noise levels at receptor sites 3, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 would remain in the "normally unacceptable" category and calculated No Action Condition L_{dn} noise levels at receptor sites 1, 2, 4, 5, 6, 7, and 8 would remain in the "unacceptable" category.

G. THE FUTURE WITH THE PROPOSED ACTIONS

Using the methodology previously described, With Action Condition noise levels due to mobile source noise were calculated at the 19 mobile source noise analysis receptors for the 2027 analysis year. The With Action Condition noise levels at sites 1, 2, 4, 5, 6, 7, 8, and 19 were adjusted based on building reflections as described above. The With Action Condition noise levels for each receptor site are shown in **Table 17-8**.

Table 17-8
2027 With Action Condition Noise Levels (in dBA)

Receptor	Location	Time	No Action $L_{eq(1)}$	With Action $L_{eq(1)}$	$L_{eq(1)}$ Change	With Action $L_{10(1)}$	With Action L_{dn}
1	Southwest corner of East 130th Street and Park Avenue	AM	76.5	76.6	0.1	81.9	79.1
		MD	73.8	74.0	0.2	78.3	
		PM	76.8	76.9	0.1	82.1	
2	Southeast corner of East 128th Street and Park Avenue	AM	75.7	76.0	0.3	80.7	77.7
		MD	73.9	74.2	0.3	77.4	
		PM	78.7	78.7	0.0	80.1	
3	East 128th Street between Park Avenue and Lexington Avenue	AM	65.9	66.1	0.2	68.3	66.7
		MD	65.6	65.7	0.1	66.8	
		PM	73.3	73.5	0.2	69.7	
4	On Northbound platform of Metro-North 125th Street Station at East 126th Street	AM	80.3	80.6	0.3	84.1	81.9
		MD	79.8	80.1	0.3	83.5	
		PM	80.5	80.7	0.2	84.9	
5	Southeast corner of East 125th Street and Park Avenue	AM	78.8	79.1	0.3	82.3	79.3
		MD	78.0	78.3	0.3	81.0	
		PM	78.4	78.6	0.2	80.8	
6	Northwest corner of East 120th Street and Park Avenue	AM	76.3	76.4	0.1	81.3	78.8
		MD	73.4	73.5	0.1	76.6	
		PM	76.8	76.9	0.1	81.8	
		Pre-PM	74.8	74.9	0.1	78.5	
7	Southeast corner of East 116th Street and Park Avenue	AM	81.8	82.2	0.4	87.2	84.2
		MD	77.4	77.6	0.2	79.2	
		PM	79.3	79.5	0.2	83.3	
8	Southwest corner of East 112th Street and Park Avenue	AM	77.1	77.1	0.0	81.9	78.9
		MD	74.0	74.0	0.0	76.3	
		PM	76.4	76.4	0.0	80.4	
9	Southeast corner of East 112th Street and Madison Avenue	AM	68.2	68.2	0.0	70.3	67.3
		MD	67.3	67.3	0.0	69.9	
		PM	67.3	67.3	0.0	70.3	
10	Lexington Avenue between East 127th Street and East 128th Street	AM	65.3	65.4	0.1	68.1	67.8
		MD	66.9	67.0	0.1	69.7	
		PM	67.9	68.0	0.1	70.8	
		Pre-PM	67.7	67.8	0.1	69.7	
11	Southwest corner of East 116th Street and Lexington Avenue	AM	73.2	73.2	0.0	76.7	73.7
		MD	73.0	73.0	0.0	75.6	
		PM	71.7	71.8	0.1	74.5	
12	Southeast corner of East 108th Street and Lexington Avenue	AM	70.9	70.9	0.0	73.3	70.3
		MD	67.0	67.1	0.1	70.5	
		PM	69.4	69.5	0.1	72.1	
13	Southeast corner of East 122nd Street and 3rd Avenue	AM	73.2	73.3	0.1	76.7	73.7
		MD	71.3	71.4	0.1	74.1	
		PM	72.3	72.4	0.1	75.5	
14	Northeast corner of East 109th Street and 3rd Avenue	AM	74.0	74.0	0.0	77.6	74.6
		MD	72.5	72.5	0.0	76.1	
		PM	71.3	71.4	0.1	74.4	
		Pre-PM	73.1	73.2	0.1	76.0	
15	Southeast corner of East 106th Street and 3rd Avenue	AM	71.9	71.9	0.0	75.4	73.3
		MD	71.8	71.8	0.0	75.4	
		PM	72.7	72.8	0.1	76.3	
16	Northwest corner of East 120th Street and 2nd Avenue	AM	72.3	72.4	0.1	76.2	73.2
		MD	72.0	72.1	0.1	75.6	
		PM	71.1	71.2	0.1	74.2	

Table 17-8 (cont'd)
2027 With Action Condition Noise Levels (in dBA)

Receptor	Location	Time	No Action $L_{eq(1)}$	With Action $L_{eq(1)}$	$L_{eq(1)}$ Change	With Action $L_{10(1)}$	With Action L_{dn}
17	Northeast corner of East 116th Street and 2nd Avenue	AM	72.2	72.2	0.0	74.6	71.8
		MD	72.0	72.0	0.0	74.8	
		PM	69.2	69.3	0.1	71.8	
18	Southeast corner of East 111th Street and 2nd Avenue	AM	71.7	71.7	0.0	74.9	71.9
		MD	70.4	70.4	0.0	73.9	
		PM	68.6	68.6	0.0	70.9	
19	Elevated approximately 25 feet above grade on Park Avenue between East 119th Street and East 120th Street	AM	72.4	72.5	0.1	77.1	74.1
		MD	69.4	69.5	0.1	73.9	
		PM	71.9	72.0	0.1	76.8	

Note: Noise levels at all receptor sites were calculated using proportional modeling.

In 2027, the maximum increase in $L_{eq(1)}$ noise levels for the With Action Condition would be 0.4 dBA or less at all 19 mobile source noise analysis receptors. Changes of this magnitude would be considered imperceptible according to *CEQR Technical Manual* guidance and would fall below the CEQR threshold for a significant adverse noise impact. In terms of CEQR noise exposure guidelines, With Action Condition noise levels at receptor site 3 would remain in the "Marginally Acceptable" category. With Action Condition noise levels at receptor sites 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 would remain in the "Marginally Unacceptable" category, With Action Condition noise levels at receptor sites 1, 2, 4, 5, 6, 7, and 8 would remain in the "Clearly Unacceptable" category.

The With Action Condition L_{dn} for all receptors was estimated according to the methodology described above. According to HUD criteria, the calculated With Action Condition L_{dn} noise levels at receptor sites 3, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 would remain in the "normally unacceptable" category and calculated No Action L_{dn} noise levels at receptor sites 1, 2, 4, 5, 6, 7, and 8 would remain in the "unacceptable" category.

H. NOISE ATTENUATION MEASURES

The *CEQR Technical Manual* has set noise attenuation requirements for buildings based on exterior noise levels. Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 45 dBA or lower for residential or community facility uses and 50 dBA or lower for retail and office uses, and are determined based on exterior L10(1) noise levels. The *HUD Noise Guidebook* sets exterior noise standards for housing construction projects based on L_{dn} values.

Table 17-9 shows the minimum window/wall attenuation necessary to meet *CEQR Technical Manual* and *HUD Noise Guidebook* requirements for internal noise levels at each of the noise measurement locations. The build $L_{10(1)}$ noise levels were determined by adjusting the existing noise measurements to account for future increases in building reflections and traffic with the Proposed Actions and the With Action Condition L_{dn} noise levels were determined by the methodology described above. See **Appendix F** for details.

Table 17-9
Required Attenuation at Noise Measurement Locations (in dBA)

Receptor	Location	Highest With Action $L_{10(1)}$	With Action L_{dn}	Minimum CEQR Required Attenuation[(1)]	Minimum HUD Required Attenuation[(2)]
1	Southwest corner of East 130th Street and Park Avenue	82.1	79.1	39	35
2	Southeast corner of East 128th Street and Park Avenue	80.7	77.7	37	33
3	East 128th Street between Park Avenue and Lexington Avenue	69.7	66.7	N/A[(3)]	25
4	On Northbound platform of Metro-North 125th Street Station at East 126th Street	84.9	81.9	41	37
5	Southeast corner of East 125th Street and Park Avenue	82.3	79.3	39	35
6	Northwest corner of East 120th Street and Park Avenue	81.8	78.8	38	34
7	Southeast corner of East 116th Street and Park Avenue	87.2	84.2	44	40
8	Southwest corner of East 112th Street and Park Avenue	81.9	78.9	38	34
9	Southeast corner of East 112th Street and Madison Avenue	70.3	67.3	28	25
10	Lexington Avenue between East 127th Street and East 128th Street	70.8	67.8	28	25
11	Southwest corner of East 116th Street and Lexington Avenue	76.7	73.7	33	30
12	Southeast corner of East 108th Street and Lexington Avenue	73.3	70.3	31	30
13	Southeast corner of East 122nd Street and 3rd Avenue	76.7	73.7	33	30
14	Northeast corner of East 109th Street and 3rd Avenue	77.6	74.6	33	30
15	Southeast corner of East 106th Street and 3rd Avenue	76.3	73.3	33	30
16	Northwest corner of East 120th Street and 2nd Avenue	76.2	73.2	33	30
17	Northeast corner of East 116th Street and 2nd Avenue	74.8	71.8	31	30
18	Southeast corner of East 111th Street and 2nd Avenue	74.9	71.9	31	30
19	Elevated approximately 25 feet above grade on Park Avenue between East 119th Street and East 120th Street	77.1	74.1	33	30

Notes:
(1) CEQR attenuation values are shown for residential or community facility uses; retail and office uses would be 5 dBA less.
(2) HUD attenuation values are only applicable for residential uses.
(3) "N/A" indicates that the highest calculated L_{10} is below 70 dBA. The *CEQR Technical Manual* does not specify minimum attenuation guidance for exterior $L_{10(1)}$ values below this level.

Based on the values shown in **Table 17-9**, required attenuation levels were determined for all projected and potential development sites. These values are shown in **Appendix H**.

To implement the attenuation requirements shown in **Appendix H**, an (E) Designation for noise would be applied to all privately held projected and potential development sites specifying the appropriate amount of window/wall attenuation. The text of Noise (E) Designation E-422 for window/wall attenuation of 40 dBA or less would be as follows:

> To ensure an acceptable interior noise environment, the building façade(s) or future development must provide minimum composite building façade attenuation as shown in Appendix F of the *East Harlem Rezoning Environmental Impact Statement* in order to maintain an interior L_{10} noise level not greater than 45 dBA for residential and community facility uses or not greater than 50 dBA for commercial uses. To maintain a closed-window condition in these areas, an alternate means of ventilation that brings outside air into the building without degrading the acoustical performance of the building façade(s) must also be provided.

The text of Noise (E) Designation E-422 for window/wall attenuation greater than 40 dBA would be as follows:

> To ensure an acceptable interior noise environment, the building façade(s) or future development must provide minimum composite building façade attenuation as shown in Appendix F of the *East Harlem Rezoning Environmental Impact Statement* in order to

maintain an interior L_{10} noise level not greater than 45 dBA for residential and community facility uses or not greater than 50 dBA for commercial uses. To achieve up to 44 dBA of building attenuation, special design features that go beyond the normal double-glazed windows are necessary and may include using specifically designed windows (i.e., windows with small sizes, windows with air gaps, windows with thicker glazing, etc.), and additional building attenuation. To maintain a closed-window condition in these areas, an alternate means of ventilation that brings outside air into the building without degrading the acoustical performance of the building façade(s) must also be provided.

The attenuation requirements for City-owned sites would be required through a Land Disposition Agreement or comparable binding mechanism.

The attenuation of a composite structure is a function of the attenuation provided by each of its component parts and how much of the area is made up of each part. Normally, a building façade is composed of the wall, glazing, and any vents or louvers for HVAC systems in various ratios of surface area. Buildings proposed to be located on the (E) designated sites or City-owned sites with a Land Disposition Agreement would be designed to provide a composite Outdoor-Indoor Transmission Class (OITC) rating greater than or equal to the attenuation requirements listed in **Appendix G**. The OITC classification is defined by ASTM International (ASTM E1332-10) and provides a single-number rating that is used for designing a building façade including walls, doors, glazing, and combinations thereof. The OITC rating is designed to evaluate building elements by their ability to reduce the overall loudness of ground and air transportation noise.

By adhering to these design guidelines, the Proposed Actions would provide sufficient attenuation to achieve the *CEQR Technical Manual* interior noise level guidelines of 45 dBA L_{10} for residential or community facility uses and 50 dBA L_{10} for commercial uses and the *HUD Noise Guidebook* interior noise level guidelines of 45 dBA L_{dn} for residential uses.

I. MECHANICAL EQUIPMENT

It is assumed that the building mechanical systems (i.e., HVAC systems) would be designed to meet all applicable noise regulations (i.e., Subchapter 5, §24-227 of the New York City Noise Control Code, the New York City Department of Buildings Code) and to avoid producing levels that would result in any significant increase in ambient noise levels. Therefore, the Proposed Actions would not result in any significant adverse noise impacts related to building mechanical equipment. ✷