Chapter 13: Noise

A. INTRODUCTION

This chapter assesses the potential for the proposed Lenox Hill Hospital (LHH) Redevelopment project (the Proposed Project) to result in significant adverse noise impacts.

As described in Chapter 1, "Project Description," Lenox Hill Hospital (the Applicant) is requesting a series of discretionary actions from the City Planning Commission (CPC) to facilitate the enlargement and modernization of the existing LHH on Block 1411, Lots 1 and 113 (Projected Development Site 1), bounded by Park and Lexington Avenues and East 76th and East 77th Streets in Manhattan. The Proposed Project would include a new building fronting on Lexington Avenue, as well as additions and modifications to portions of the existing hospital complex on Projected Development Site 1 and connections between the new hospital building and the renovated buildings. Two building envelopes are proposed, each of which would accommodate the Proposed Project's program. Envelope 1 would include a new approximately 771,000-gross-square-foot (gsf) building on Lexington Avenue and 56,000 gsf of additions to the existing hospital. Envelope 2 would include a new approximately 867,000-gsf building and 8,000 gsf of additions to the existing hospital. With the existing buildings to remain, the overall gross floor area of the Proposed Project on Projected Development Site 1 would be approximately 1.4 million gsf with either envelope. The program, project population (staff, patients, visitors), site access, zoning actions, and construction duration would be the same for both Envelope 1 and Envelope 2.

This Environmental Impact Statement (EIS) also considers the as-of-right development of a building with hospital support functions at 111-115 East 77th Street between Lexington and Park Avenues (Block 1412, Lots 9, 10, and 11) (Projected Development Site 1a) as part of the Proposed Project. It would be connected to Projected Development Site 1 by a utility tunnel under East 77th Street. In addition, the Applicant proposes to provide improvements to the 77th Street subway station of the Lexington Avenue (No. 6) line, providing Americans with Disabilities Act (ADA) access to the downtown platform and improving sidewalk conditions in the immediate area.

According to the guidelines established in the 2021 *City Environmental Quality Review (CEQR) Technical Manual*, an initial noise impact screening considers whether a proposed action would generate any mobile or stationary source noise or be located in an area with high ambient noise levels. This analysis determines whether the Proposed Project would result in increases in noise levels that could have a significant adverse impact on nearby sensitive receptors and also considers the potential effect of existing noise levels on the Proposed Project to ensure that noise-sensitive uses included in the Proposed Project are not exposed to excessive noise.

The analysis presented in Chapter 10, "Transportation," found that the Proposed Project would not generate sufficient traffic volumes to require a detailed traffic analysis. Consequently, the Proposed Project would not result in traffic volume increases that would have the potential to cause a significant noise impact (i.e., it would not result in a doubling of noise passenger car equivalents [Noise PCEs], which is necessary to cause a perceptible increase in noise levels).

However, ambient noise levels adjacent to the Projected Development Sites also must be examined to address any noise attenuation requirements, as prescribed in the *CEQR Technical Manual*, for interior noise levels. Consequently, the noise analysis is focused on the level of building attenuation necessary to ensure that interior noise levels within the proposed buildings would satisfy applicable interior noise criteria.

PRINCIPAL CONCLUSIONS

A noise assessment was undertaken to determine the levels of noise attenuation that may be needed to achieve interior noise levels that are acceptable and in accordance with the *CEQR Technical Manual* guidance. The *CEQR Technical Manual* has noise attenuation values for buildings based on exterior $L_{10(1)}$ noise levels for the purposes of achieving interior noise levels of 45 "A" weighted decibels (dBA) or lower for community facility uses and 50 dBA or lower for commercial office and laboratory uses. The With Action condition $L_{10(1)}$ noise levels were determined by adjusting the existing noise measurements to account for background growth in traffic volumes (i.e., increases in traffic volumes not resulting from the Proposed Project) on adjacent roadways.

Based on the projected noise levels, up to 31 dBA of window/wall attenuation would be required for the Proposed Project with either Envelope 1 or Envelope 2 to achieve acceptable interior noise levels per the *CEQR Technical Manual* noise exposure guideline at community facility uses.

To implement the attenuation requirements, an (E) Designation (E-777) for noise would be applied, specifying the appropriate window/wall attenuation. By meeting the design guidelines specified in the Noise (E) Designation, buildings developed as a result of the Proposed Project would provide sufficient attenuation to achieve the *CEQR Technical Manual* interior noise level guidelines of 45 dBA $L_{10(1)}$ for community facility uses and 50 dBA $L_{10(1)}$ for commercial office and laboratory uses.

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 13-1**, 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; and levels above 70 dBA would be considered noisy, and then loud, intrusive, and deafening as the scale approaches 130 dBA.

Table 13-1
Noise Levels of Common Sources

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

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," or 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. 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}.

A descriptor for cumulative 24-hour exposure is the day-night average sound level, abbreviated as L_{dn}. This is a 24-hour measurement that accounts for the moment-to-moment fluctuations in A-weighted noise levels due to all sound sources, combined. Mathematically, the L_{dn} noise level is the energy average of all $L_{eq(1)}$ noise levels over a 24-hour period, where nighttime noise levels (10 p.m. to 7 a.m.) are increased by 10 dBA before averaging because of increased noise sensitivity during nighttime, when people are typically sleeping.

The descriptor for the annual average day-night average sound level is the DNL. Aircraft noise around airports is usually mapped out in terms of DNL, which are normally depicted as noise contours on a map. The DNL contours are lines of constant DNL mapped similarly to elevations on topographical maps.

For purposes of the Proposed Project, the L_{10} descriptor has been selected as the noise descriptor to be used in this noise impact evaluation. The 1-hour L_{10} is the noise descriptor used in the *CEQR Technical Manual* noise exposure guidelines for City Environmental Impact Review classification when vehicular traffic is the dominant source of noise.

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 13-2**. Noise exposure is classified into four categories: acceptable, marginally acceptable, marginally unacceptable, and clearly unacceptable.

Table 13-2
Noise Exposure Guidelines for Use in City Environmental Impact Review[1]

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	---------- DNL ≤ 60 dBA ----------	NA	---------- 60 < DNL ≤ 65 dBA ----------	NA	65 < DNL ≤ 75 dBA(i)	NA	---------- 75 dBA < DNL ----------
Hospital, nursing home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA		$65 < L_{10} \leq 80$ dBA		$L_{10} > 80$ 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–10PM)	
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 Federal Aviation Administration (FAA)-approved L_{dn} contours supplied by the Port Authority of New York and New Jersey, or the noise contours may be computed from the federally approved Integrated Noise Model (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 (DEP) (adopted policy 1983).

The *CEQR Technical Manual* defines attenuation requirements for buildings based on exterior noise levels (see **Table 13-3**). 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 commercial office uses.

For purposes of the Proposed Project, the recommended noise attenuation values are determined based on exterior $L_{10(1)}$ noise levels since vehicular traffic is the dominant noise source in the project area.

Table 13-3
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Unacceptable				Clearly Unacceptable
Vehicular Traffic	$70 < L_{10} \leq 73$	$73 < L_{10} \leq 76$	$76 < L_{10} \leq 78$	$78 < L_{10} \leq 80$	$80 < L_{10}$
Aircraft[A]	$65 < DNL \leq 68$	$68 < DNL \leq 71$	$71 < DNL \leq 73$	$73 < DNL \leq 75$	$75 < DNL$
Train	$65 < L_{dn} \leq 68$	$68 < L_{dn} \leq 71$	$71 < L_{dn} \leq 73$	$73 < L_{dn} \leq 75$	$75 < L_{dn}$
Attenuation[B]	(I) 28 dBA	(II) 31 dBA	(III) 33 dBA	(IV) 35 dBA	See note [C]

Notes:
[A] DNL descriptor based on average values of L_{dn} over a year period.
[B] The above composite window-wall attenuation values are for residential dwellings and community facility development. Commercial office spaces and meeting rooms would be 5 dBA less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.
[C] The required attenuation value is the difference between L_{build} and $L_{interior}$, using the appropriate noise descriptor where:
L_{build} is the projected noise level under the build condition rounded up to the whole number; and
$L_{interior}$ is the designed interior noise level (45 dBA for vehicular noise, 40 dBA for aircraft and train noise)
Source: DEP

D. EXISTING NOISE LEVELS

SELECTION OF NOISE RECEPTOR LOCATIONS

A total of four receptor locations adjacent to the Projected Development Sites were selected for evaluation of noise attenuation requirements. These locations are detailed below in **Table 13-4** and shown in **Figure 13-1**.

Table 13-4
Noise Receptor Locations

Noise Receptor Site	Location
1	East 77th Street between Park Avenue and Lexington Avenue
2	Lexington Avenue between East 76th and East 77th Streets
3	East 76th Street between Park Avenue and Lexington Avenue
4	Park Avenue between East 76th and East 77th Streets

NOISE MONITORING

At each receptor location, existing noise levels were determined by field measurements. Noise monitoring was performed on June 10, 2021. At all receptor locations, 20-minute duration measurements were conducted. All measurements were performed during the weekday AM (7:15



Noise Receptor Locations

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Figure 13-1

AM–9:15 AM), midday (12:00 PM–2:00 PM), and PM (4:00 PM–6:00 PM) peak periods. At all noise measurement locations, the microphones were mounted at a height of approximately five feet above the ground surface on a tripod and approximately six feet or more away from any large sound-reflecting surface to avoid major interference with sound propagation.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using a Brüel & Kjær Type 2270 Sound Level Meter (SLM), a Brüel & Kjær Type 4189 1/2-inch microphone, and a Brüel & Kjær Type 4231 Sound Level Calibrator. The Brüel & Kjær SLM is a Class 1 instrument according to ANSI Standard S1.4-1983 (R2006). The SLM had a laboratory calibration date within the past one year at the time of use. The SLM was calibrated before and after readings with a Brüel & Kjær Type 4231 Class 1 Sound Level Calibrator using the appropriate adaptor. The data were digitally recorded by the SLM and displayed at the end of the measurement period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. A windscreen was used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

EXISTING NOISE LEVELS AT NOISE RECEPTOR LOCATIONS

MEASURED NOISE LEVELS

The results of the measurements of existing noise levels are summarized in **Table 13-5**. Roadway traffic was the dominant noise source for all receptor locations. In terms of *CEQR Technical Manual* criteria, noise levels measured at receptor location 3 are categorized as "marginally acceptable," and noise levels measured at receptor locations 1, 2, and 4 are categorized as "marginally unacceptable."

Table 13-5
Measured Existing Noise Levels (in dBA)

Receptor	Measurement Location	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	East 77th Street between Park Avenue and Lexington Avenue	AM	67.9	78.9	67.8	65.6	64.6
		MD	66.6	73.5	67.6	65.4	64.3
		PM	79.4	88.0	71.2	68.8	66.9
2	Lexington Avenue between East 76th and East 77th Streets	AM	69.5	78.3	72.5	67.2	63.2
		MD	70.6	80.8	73.2	67.3	63.7
		PM	71.4	80.1	74.3	69.3	66.5
3	East 76th Street between Park Avenue and Lexington Avenue	AM	66.7	76.6	68.6	64.2	62.2
		MD	65.3	70.2	65.9	63.5	62.6
		PM	64.0	71.3	65.7	62.8	61.6
4	Park Avenue between East 76th and East 77th Streets	AM	66.6	75.4	70.9	64.4	60.9
		MD	66.4	75.1	68.4	64.4	61.4
		PM	66.3	74.6	68.8	64.0	60.8

Note: Field measurements were performed by AKRF, Inc. on June 10, 2021.

E. NOISE ATTENUATION MEASURES

As shown in **Table 13-3**, the *CEQR Technical Manual* has set noise attenuation values for buildings based on exterior $L_{10(1)}$ noise levels in order to maintain interior noise levels of 45 dBA or lower for community facility uses and 50 dBA or lower for laboratory or commercial office uses.

As described above, the analysis of traffic presented in Chapter 10, "Transportation," concluded that the hospital complex would not generate a greater volume of vehicular traffic with the Proposed Project with either Envelope 1 or Envelope 2 than the current existing condition. Consequently, the measured existing noise levels along with a 0.1 dBA increment to account for background growth in traffic volumes between 2021 and the Proposed Project's 2036 build year according to the growth rates in Table 16-4 of the *CEQR Technical Manual* were determined to provide a conservative representation of noise exposure for the Proposed Project. **Table 13-6** shows the minimum window/wall attenuation necessary for the Proposed Project with either Envelope 1 or Envelope 2 to meet *CEQR Technical Manual* requirements for internal noise levels at each of the noise measurement locations.

Table 13-6
CEQR Required Attenuation at Noise Measurement Locations (in dBA)

Receptor	Location	Highest $L_{10(1)}$ Value[1]	Minimum Required Attenuation[2, 3]
1	East 77th Street between Park Avenue and Lexington Avenue	71.3	28
2	Lexington Avenue between East 76th and East 77th Streets	74.4	31
3	East 76th Street between Park Avenue and Lexington Avenue	68.7	N/A
4	Park Avenue between East 76th and East 77th Streets	71.0	28

Notes:
[1] Includes adjustment for background growth in traffic volumes between 2021 and 2036 according to growth rates specified in Table 16-4 of the *CEQR Technical Manual.*
[2] Attenuation values are shown for community facility uses; commercial office or laboratory uses would require 5 dBA less attenuation.
[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} values below this level.

Table 13-7 below and **Figure 13-2** outline the required façade attenuation values for the Proposed Project based on the maximum $L_{10(1)}$ noise levels.

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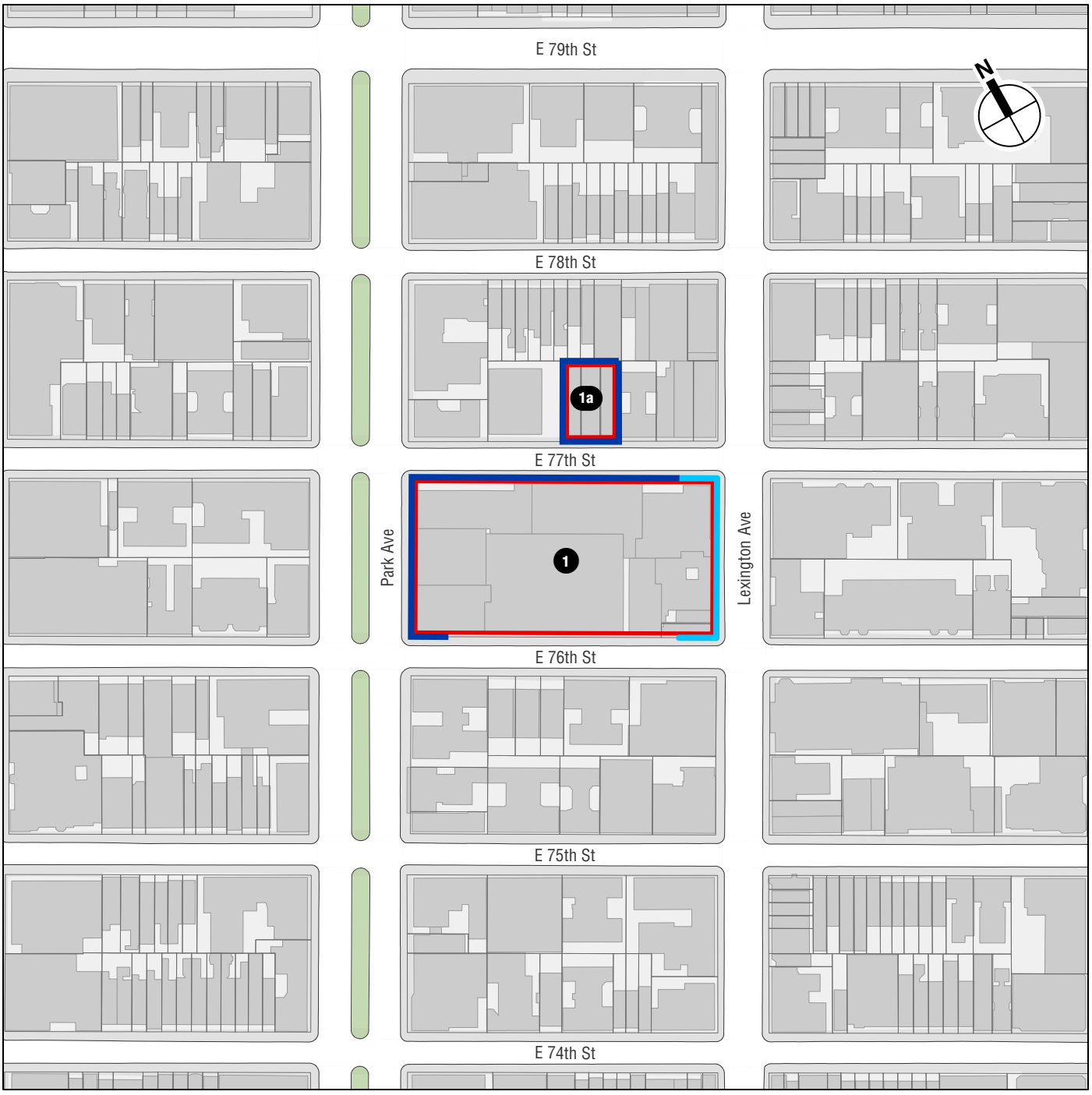

NOTE: Window/wall attenuation requirements shown are for community facility uses only; commercial office use or laboratory uses would require 5 dBA less attenuation. Attenuation requirements are not applied at lobby, corridor, mechanical, or back-of-house areas.

CEQR Window/Wall Attenuation Requirements

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Figure 13-2

Table 13-7
Minimum Required Attenuation at the Projected Development Sites (in dBA)

Projected Development Site	Block	Lot	Façade(s)	Associated Noise Measurement Site(s)	Required Attenuation[1,2]
Projected Development Site 1 (Hospital Block)	1411	1, 113	West façade, North façade beyond 50 feet of Lexington Avenue, and South façade within 50 feet of Park Avenue	1, 4	28
			East façade and North and South façades within 50 feet of Lexington Avenue	2	31
			South façade beyond 50 feet of Lexington Avenue and Park Avenue	3	N/A
Projected Development Site 1a (77th Street Site)	1412	9, 10, 11	All	1	28

Notes:
[1] Attenuation values are shown for community facility uses; commercial office or laboratory uses would require 5 dBA less attenuation.
[2] "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} values below this level.

Based on the noise levels shown in **Tables 13-6 and 13-7**, up to 31 dBA window/wall attenuation would be required to provide acceptable interior noise levels per the *CEQR Technical Manual* noise exposure guideline.

To require attenuation at the Proposed Project with either Envelope 1 or Envelope 2, an (E) Designation (E-777) for noise would be applied, specifying the appropriate amount of window/wall attenuation. The text of the (E) Designation would be as follows:

Block 1411, Lots 1 and 113: To ensure an acceptable interior noise environment, future community facility uses must provide a closed-window condition with a minimum building façade attenuation of 28 dBA on the west façade, north façade beyond 50 feet of Lexington Avenue, and south façade within 50 feet of Park Avenue, and 31 dBA on the east façade and within 50 feet of Lexington Avenue on the north and south façades, in order to maintain an interior noise level not greater than 45 dBA for community facility uses or not greater than 50 dBA for commercial office uses. The south façade requires no building attenuation beyond 50 feet of Lexington Avenue and Park Avenue. To maintain a closed-window condition, an alternate means of ventilation must also be provided. Alternate means of ventilation includes, but is not limited to, air conditioning.

Block 1412, Lots 9, 10, and 11: To ensure an acceptable interior noise environment, future community facility uses must provide a closed-window condition with a minimum building façade attenuation of 28 dBA in order to maintain an interior noise level not greater than 45 dBA for community facility uses or not greater than 50 dBA for commercial office uses. To maintain a closed-window condition, an alternate means of ventilation must also be provided. Alternate means of ventilation includes, but is not limited to, air conditioning.

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 heating, ventilation, and air conditioning (HVAC) systems in various ratios of area. Buildings proposed to be located on the (E) Designated sites would be designed to provide composite window/wall attenuation greater than or equal to the attenuation requirements listed in **Table 13-7**.

By adhering to the (E) Designation described above, buildings to be developed as a result of the Proposed Project with either Envelope 1 or Envelope 2 would provide sufficient attenuation to achieve the *CEQR Technical Manual* interior noise level guidelines of 45 dBA L_{10} for community facility uses and 50 dBA L_{10} for laboratory and commercial office uses.

F. 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 Project with either Envelope 1 or Envelope 2 would not result in any significant adverse noise impacts related to building mechanical equipment. ✷