A. INTRODUCTION

This chapter assesses the potential for the proposed projects to result in significant adverse noise impacts as a result of the operation of the proposed East Site project and the Center for Comprehensive Care (construction-related impacts are discussed in Chapter 20, "Construction Impacts"). The proposed projects would not generate sufficient traffic to 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 would be necessary to cause a 3 dBA increase in noise levels). This chapter does address noise exposure for the proposed open space on the Triangle Site and considers ambient noise levels to address any noise abatement requirements for the proposed buildings.

PRINCIPAL CONCLUSIONS

The analysis concludes that the traffic generated by the proposed projects would not have the potential to produce significant noise level increases at any sensitive receptors near the project area. With the incorporation of the attenuation levels specified below under "Attenuation Requirements," noise levels within the proposed buildings would comply with all applicable requirements. Although noise levels within the proposed open space on the Triangle Site would exceed the *City Environmental Quality Review* (*CEQR) Technical Manual* noise exposure guidelines for outdoor areas requiring serenity and quiet, they would be comparable to noise levels in a number of open space areas that are also located adjacent to heavily trafficked roadways, including Hudson River Park, Riverside Park, Bryant Park, Fort Greene Park, and other urban open space areas such as the numerous small parks and playgrounds on nearby blocks in the Chelsea and Greenwich Village neighborhoods. Overall, the proposed projects would not result in any significant adverse noise impacts.

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 discernable 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.

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.

Combinations of different sources are added logarithmically due to the dBA scale's nature. For example, two noise sources—a vacuum cleaner operating at approximately 72 dBA and a telephone ringing at approximately 58 dBA—do not combine to create a noise level of 130 dBA, the equivalent of a jet airplane or air raid siren (see **Table 17-1**). In fact, the noise produced by the telephone ringing would be largely masked by the noise of the vacuum cleaner, and the combination of these two noise sources would yield a noise level of 72.2 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
Train horn at 30 meters	90
Busy city street, loud shout	80
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Background noise in an office	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.

EFFECTS OF DISTANCE ON SOUND

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

SOUND LEVEL DESCRIPTORS

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

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}.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CEQR NOISE STANDARDS

The *CEQR Technical Manual* contains noise exposure guidelines for use in New York City environmental impact review, and required attenuation values to achieve acceptable interior noise levels. These values are shown in **Tables 17-2 and 17-3**. Noise exposure is classified into four categories: "acceptable," "marginally acceptable," "marginally unacceptable," and "clearly unacceptable." The *CEQR Technical Manual* criteria are based on maintaining an interior noise level for the worst-case hour L_{10} or less than or equal to 45 A-weighted decibels (dBA).

Table 17-2
CEQR Noise Exposure Guidelines[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	---- Ldn ≤ 60 dBA ----	**NA**	**NA**	**NA**	(i) 65 < Ldn ≤ 70 dBA, (ii) 70 ≤ Ldn	**NA**	---- Ldn ≤ 75 dBA ----
Hospital, nursing home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA	---- 60 < Ldn ≤ 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-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)	
Commercial or office		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 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; (ii) *CEQR Technical Manual* noise criteria for train noise are similar to the above aircraft noise standards: the noise category for train noise is found by taking the L_{dn} value for such train noise to be an L^{y}_{dn} (L_{dn} contour) value.

Table Notes:

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. Examples are grounds for ambulatory hospital patients and patients and residents of sanitariums and nursing homes.

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).

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

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

Note:

A The above composite window-wall attenuation values are for residential dwellings and community facility development. Commercial office spaces and meeting rooms would be 5 dB(A) 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 dB(A) increments for L_{10} values greater than 80 dBA.

Source: New York City Department of Environmental Protection

D. EXISTING NOISE LEVELS

Existing noise levels were measured for 20-minute periods during the five weekday peak periods—AM (7:00 – 9:00 AM), pre-midday (Pre-MD) (9:30 – 11:30 AM), midday (MD) (12:00 – 2:00 PM), Pre-PM (2:30 – 4:30 PM), and PM (4:00 – 6:00 PM) on September 24, 29, and 30, 2009 at six receptor sites adjacent to the project area. Site 1 was located on West 12th Street between Sixth and Seventh Avenues, Site 2 was located on West 11th Street between Sixth and Seventh Avenues, Site 3 was located on Greenwich Avenue between West 11th and West 12th Streets, Site 4 was located on West 12th Street between 7th and Greenwich Avenues, Site 5 was located on Seventh Avenue between West 12th and West 13th Streets, and Site 6 was located on West 13th Street between Seventh and Eighth Avenues (see **Figure 17-1**). Between the Draft Environmental Impact Statement (DEIS) and Final EIS (FEIS), two additional measurement sites will be added at the intersections of Seventh Avenue and West 11th Street and Seventh Avenue and West 12th Street. These locations will be added to assess the potentially higher noise levels that may exist close to the intersections, as opposed to the measured levels at mid-block sites.

Measurements were performed using Brüel & Kjær Sound Level Meters (SLM) Type 2260 (S/N 2375602 and 2384814), Brüel & Kjær ½-inch microphones Type 4189 (S/N 2378182 and 2385722), and Brüel & Kjær Sound Level Calibrators Type 4231 (S/N 2137037 and 1800102). The Brüel & Kjær SLM is a Type 1 instrument according to ANSI Standard S1.4-1983 (R2006). The SLMs have laboratory calibration dates of August 14, 2009 (S/N 2384814) and August 7, 2009 (S/N 2384814) which is valid through August of 2010. The microphones were mounted at a height of five feet above the ground surface on a tripod and at least six feet away from any large sound-reflecting surface to avoid major interference with sound propagation. The SLMs were calibrated before and after readings with Brüel & Kjær Type 4231 Sound Level Calibrators using the appropriate adaptor. Measurements at each location were made on the A-scale (dBA). The data were digitally recorded by the SLMs 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.

The results of the measurements of existing noise levels are summarized in **Table 17-4**. At all monitoring sites, vehicular traffic was the dominant noise source. Measured noise levels are moderate to relatively high and reflect the level of vehicular activity on the adjacent streets. In terms of the CEQR criteria, the existing noise levels at Sites 1 2, and 4 would be in the "marginally acceptable" category and existing noise levels at Sites 3, 5, and 6 would be in the "marginally unacceptable" category.

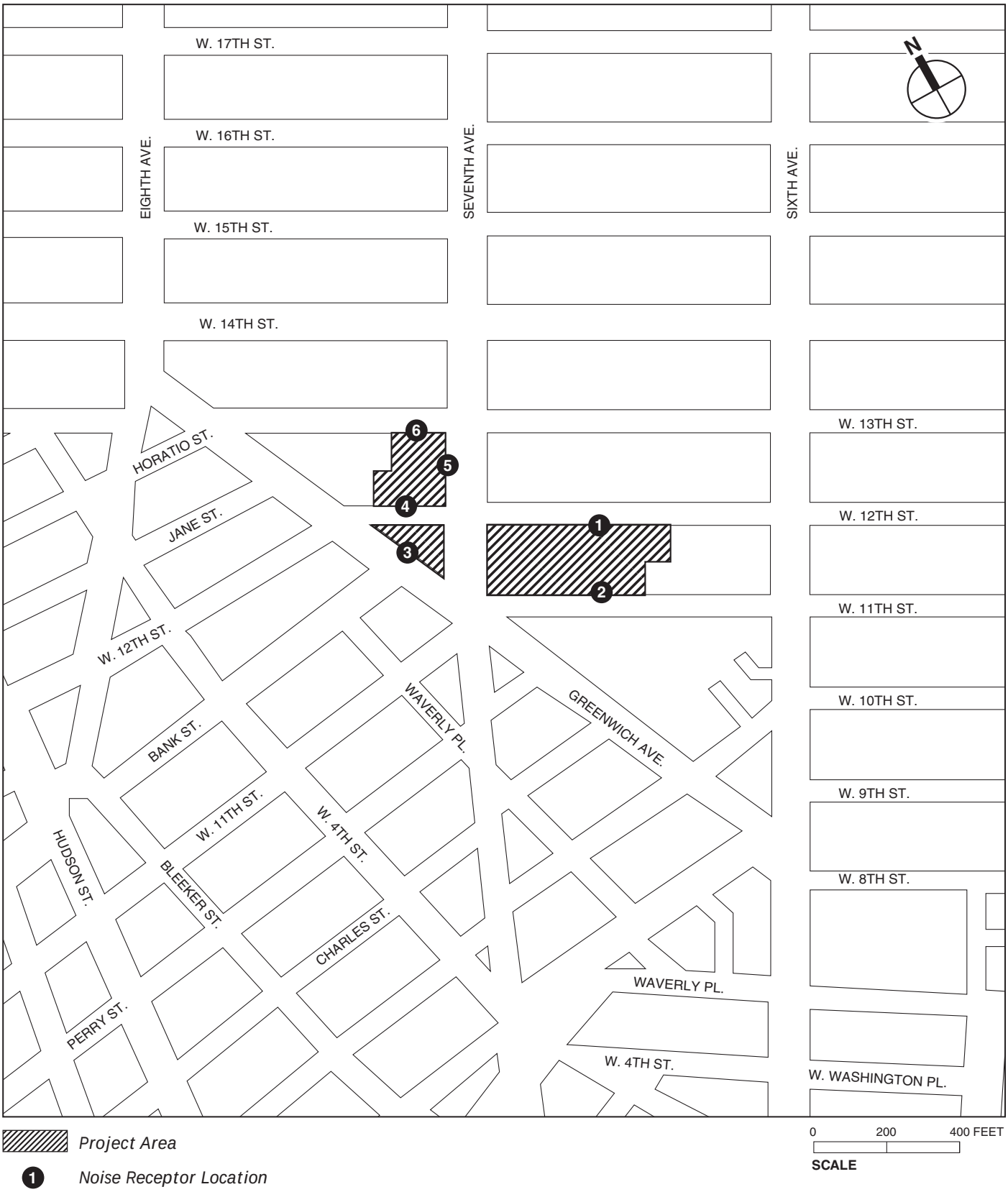


Figure 17-1
Noise Receptor Locations

Table 17-4
Existing Noise Levels at Sites 1 through 6 (in dBA)

Site	Measurement Location	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	West 12th Street between Sixth and Seventh Avenues	AM	64.3	73.9	66.8	61.7	58.7
		Pre-MD	66.0	77.4	67.8	61.7	59.6
		MD	67.8	79.3	67.4	62.2	59.5
		Pre-PM	64.8	73.0	67.7	62.3	60.0
		PM	62.9	70.9	65.6	60.7	58.2
2	West 11th Street between Sixth and Seventh Avenues	AM	63.8	73.8	66.4	60.9	59.5
		Pre-MD	64.3	71.1	66.4	63.1	61.1
		MD	64.1	73.6	66.0	62.0	60.5
		Pre-PM	63.6	69.4	66.0	62.5	61.2
		PM	64.6	70.8	66.6	63.3	62.4
3	Greenwich Avenue between West 11th and West 12th Streets	AM	66.2	73.5	69.3	64.5	60.5
		Pre-MD	67.3	75.5	70.2	65.1	62.0
		MD	65.0	73.1	67.5	62.8	60.2
		Pre-PM	65.4	72.6	68.0	63.9	60.6
		PM	65.4	73.5	68.0	63.5	60.7
4	West 12th Street between Seventh and Greenwich Avenues	AM	67.0	72.6	69.3	65.8	64.1
		Pre-MD	66.8	74.5	68.9	65.1	62.2
		MD	67.3	75.3	69.4	65.4	63.1
		Pre-PM	65.8	73.2	68.1	64.3	62.2
		PM	66.2	72.7	68.9	64.8	62.1
5	Seventh Avenue between West 12th and West 13th Streets	AM	72.6	80.5	75.6	70.4	66.1
		Pre-MD	71.9	78.9	75.0	70.1	66.2
		MD	71.8	80.6	74.6	69.2	66.4
		Pre-PM	73.3	80.1	76.0	72.2	67.2
		PM	71.7	77.7	74.6	70.6	66.7
6	West 13th Street between Seventh and Greenwich Avenues	AM	66.9	73.9	69.3	65.7	62.2
		Pre-MD	67.9	78.4	70.1	65.5	63.1
		MD	67.1	75.1	69.0	65.7	63.1
		Pre-PM	66.5	74.1	68.6	64.9	62.9
		PM	65.4	71.4	67.5	64.6	62.1

Note: Field measurements performed by AKRF on September 14, 29, and 30, 2009.

E. THE FUTURE WITHOUT THE PROPOSED PROJECTS

In the future without the proposed projects, noise levels at and adjacent to the project area would be comparable to those in the existing conditions, and there would be no requirements for building attenuation at project buildings or noise exposure at project-generated open space.

F. PROBABLE IMPACTS OF THE PROPOSED PROJECTS

The proposed projects would not generate sufficient traffic to 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 would be necessary to cause a 3 dBA increase in noise levels).

The proposed projects are anticipated to generate a small number of ambulance trips compared to the volume of vehicular traffic in the future with the proposed projects (No Build) condition. Further, there is no requirement for ambulances to use a siren when transporting patients, even those in need of urgent care. An ambulance (or other emergency vehicle) is only required to employ “lights and siren” when using emergency vehicle privileges under the vehicle and traffic

law such as exceeding the posted speed limit or proceeding past traffic signals. Lights and sirens are most often employed upon dispatch to arrival on scene. Most patients are stabilized on the scene before removal to an emergency department. Only a small sub-set of all ambulances approaching the Center for Comprehensive Care are expected to employ sirens. Since many emergency department visits are expected to be walk-ins, only a small percentage of emergency department visits would produce any vehicular noise or sirens. Furthermore, all ambulances associated with the proposed projects would be subject to Subchapter 5, §24-241(b) of the New York City Noise Control Code, and would be required to produce noise levels no greater than 90 dBA when measured at a distance of 50 feet. Consequently, no significant adverse impacts are anticipated.

NOISE LEVELS AT TRIANGLE SITE OPEN SPACE

Noise levels within the proposed open space on the Triangle Site would be above the 55 dBA $L_{10(1)}$ *CEQR Technical Manual* guideline for outdoor areas requiring serenity and quiet (see **Table 17-2**, above). In the future with the proposed projects, $L_{10(1)}$ values at the Triangle Site open space would be in the high 60s or low 70s dBA. There are no practical and feasible mitigation measures that could be implemented to reduce noise levels to below the 55 dBA $L_{10(1)}$ guideline within this open space. Although noise levels in this area would be above the 55 dBA $L_{10(1)}$ guideline noise level, they would be comparable to noise levels in a number of open space areas that are also located adjacent to heavily trafficked roadways, including Hudson River Park, Riverside Park, Bryant Park, Fort Greene Park, and other urban open space areas such as the numerous small parks and playgrounds on nearby blocks in the Chelsea and Greenwich Village neighborhoods. The 55 dBA $L_{10(1)}$ guideline is a worthwhile goal for outdoor areas requiring serenity and quiet. However, due to the level of activity present at most New York City open space areas and parks (except for areas far away from traffic and other typical urban activities) this relatively low noise level is often not achieved. This would not constitute a significant adverse impact.

NOISE ATTENUATION MEASURES

As shown in **Table 17-3**, the *CEQR Technical Manual* has set noise attenuation quantities for buildings based on exterior $L_{10(1)}$ noise levels to maintain interior noise levels of 45 dBA or lower for residential and hospital uses, and 50 dBA or lower for retail and commercial uses. The results of the building attenuation analysis are summarized in **Table 17-5**.

Table 17-5
Building Attenuation Requirements

Parcel	Proposed Building Façade Locations	Attenuation Required[1] (in dBA)
O'Toole Building	North Façade	28
	East Façade	31
	South Façade	25
Proposed East Site Development	North Façade	31 within 60 feet of Seventh Avenue, 25 elsewhere
	West Façade	31
	South Façade	31 within 60 feet of Seventh Avenue, 25 elsewhere

Note:
[1] Required attenuation values shown are for residential and hospital uses. Attenuation for retail or commercial uses would be 5 dBA less.

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 consists of the wall, glazing, and any vents or louvers for heating, ventilation, and air conditioning (HVAC) units in various ratios of area. The proposed design for both project buildings includes the use of acoustically rated windows and central air conditioning units. The proposed buildings' façades, including these elements, would provide a composite Outdoor-Indoor Transmission Class (OITC) rating greater than or equal to the attenuation requirements listed in **Table 17-5**. The OITC classification is defined by the American Society of Testing and Materials (ASTM E1332-90 [Reapproved 2003]) 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 requirements, the proposed buildings would thus provide sufficient attenuation to achieve the CEQR interior noise level guideline of 45 dBA L_{10} or lower for residential and hospital uses, and 50 dBA L_{10} or lower for retail and commercial uses.

In addition, the building mechanical systems, including emergency generators associated with the proposed projects, would be designed, with enclosures where necessary, to meet all applicable noise regulations (i.e., Subchapter 5, §24-227 of the New York City Noise Control Code and the New York City Department of Buildings Code) and to avoid producing levels that would result in any significant increase in ambient noise levels. ✷