A. INTRODUCTION

Noise pollution in an urban area comes from many sources. Some sources are activities essential to the health, safety, and welfare of the city's inhabitants, such as noise from emergency vehicle sirens, garbage collection operations, and construction and maintenance equipment. Other sources, such as traffic, stem from the movement of people and goods and are activities that are essential to the viability of the city as a place to live and do business. Although these and other noise-producing activities are necessary to a city, the noise they produce is undesirable. Urban noise detracts from the quality of the living environment, and there is increasing evidence that excessive noise represents a threat to public health.

The proposed project is expected to change traffic volumes in the general vicinity of the project site. Since traffic on adjacent roadways and the nearby Williamsburg Bridge are the main sources of ambient noise, this could lead to changes in the ambient noise level. Increases of at least 3 dBA between the future without the proposed project (the "No Action" condition) and the future with the proposed project would constitute significant impacts. An analysis was designed and conducted to identify and quantify any such impacts.

The noise analysis for the proposed project consisted of two parts:

- A detailed analysis at locations where traffic generated by the proposed project would have the potential to result in significant adverse noise impacts to determine the magnitude of the increase in noise level; and
- An analysis to determine the level of building attenuation necessary to ensure that interior noise levels throughout the study area satisfy applicable interior noise criteria.

Based on a survey of land uses in the area, it was determined that no stationary noise sources contribute significantly to noise levels in the area, and a stationary noise source analysis would not be necessary.

PRINCIPAL CONCLUSIONS

In summary, the analysis concludes that the traffic generated by the proposed project would not result in any significant adverse noise impacts.

With the incorporation of the attenuation levels specified below under "Attenuation Requirements," noise levels within the proposed buildings would comply with all applicable requirements and result in no significant adverse impacts.

NOISE FUNDAMENTALS

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise may adversely affect people in several ways. For example, noise may interfere with human activities such as sleep, speech communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Although it is possible to study these effects on people on an average or statistical basis, it must be remembered that all the stated effects of noise on people vary greatly with the individual. Several noise scales and rating methods are used to quantify the effects of noise on people. These scales and methods consider factors such as loudness, duration, time of occurrence, and changes in noise level with time.

"A"-WEIGHTED SOUND LEVEL (dBA)

Noise is typically measured in units called decibels (dB), which are ten times the logarithm of the ratio of the sound pressure squared to a standard reference pressure squared. Because loudness is important in the assessment of the effects of noise on people, the dependence of loudness on frequency must be taken into account in the noise scale used in environmental assessments. Frequency is the rate at which sound pressures fluctuate in a cycle over a given quantity of time, and is measured in Hertz (Hz), where 1 Hz equals 1 cycle per second. Frequency defines sound in terms of pitch components. In the measurement system, one of the simplified scales that accounts for the dependence of perceived loudness on frequency is the use of a weighting network—known as A-weighting—that simulates the response of the human ear. For most noise assessments, the A-weighted sound pressure level in units of dBA is used due to its widespread recognition and its close correlation to perception. In this analysis, all measured noise levels are reported in dBA or A-weighted decibels. Common noise levels in dBA are shown in Table 20-1.

Table 20-1
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	
Busy city street, loud shout	80
Busy traffic intersection	
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	
Background noise in an office	50
Suburban areas with medium density transportation	
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.
Source: Cowan, James P. Handbook of Environmental Acoustics. Van Nostrand Reinhold, New York, 1994. Egan, M. David, Architectural Acoustics. McGraw-Hill Book Company, 1988.

COMMUNITY RESPONSE TO CHANGES IN NOISE LEVELS

The average ability of an individual to perceive changes in noise levels is well documented (see Table 20-2). Generally, changes in noise levels less than 3 dBA are barely perceptible to most listeners, whereas 10 dBA changes are normally perceived as doublings (or halvings) of noise levels. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Table 20-2
Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A dramatic change
40	Difference between a faintly audible sound and a very loud sound

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

It is also possible to characterize the effects of noise on people by studying the aggregate response of people in communities. The rating method used for this purpose is based on a statistical analysis of the fluctuations in noise levels in a community, and integrates the fluctuating sound energy over a known period of time, most typically during 1 hour or 24 hours. Various government and research institutions have proposed criteria that attempt to relate changes in noise levels to community response. One commonly applied criterion for estimating this response is incorporated into the community response scale proposed by the International Standards Organization (ISO) of the United Nations (see Table 20-3). This scale relates changes in noise level to the degree of community response and permits direct estimation of the probable response of a community to a predicted change in noise level.

Table 20-3
Community Response to Increases in Noise Levels

Change (dBA)	Category	Description
0	None	No observed reaction
5	Little	Sporadic complaints
10	Medium	Widespread complaints
15	Strong	Threats of community action
20	Very strong	Vigorous community action

Source: International Standards Organization, Noise Assessment with Respect to Community Responses, ISO/TC 43 (New York: United Nations, November 1969).

NOISE DESCRIPTORS USED IN IMPACT ASSESSMENT

Because the sound pressure level unit, 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. Statistical sound level descriptors, such as L_1, L_{10}, L_{50}, L_{90}, and L_x, are sometimes 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. L_{eq} is used in the prediction of future noise levels, by adding the contributions from new sources of noise (i.e., increases in traffic volumes) to the existing levels and in relating annoyance to increases in noise 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}. The relationship between L_{eq} and exceedance levels has been used in this analysis to characterize the noise sources and to determine the nature and extent of their impact at all receptor locations.

For the purposes of this analysis, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) has been selected as the noise descriptor to be used in the noise impact evaluation. $L_{eq(1)}$ is the noise descriptor used in the *New York City Environmental Quality Review (CEQR) Technical Manual* for noise impact evaluation, and is used to provide an indication of highest expected sound levels. $L_{10(1)}$ is the noise descriptor used in the *CEQR Technical Manual* for building attenuation. Hourly statistical noise levels (particularly L_{10} and L_{eq} levels) were used to characterize the relevant noise sources and their relative importance at each receptor location.

B. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

At all receptor sites in the study area, the dominant noise source is vehicular traffic on adjacent and nearby streets and roadways. Noise from other sources, including local manufacturing uses and train pass-bys on the nearby Williamsburg Bridge, contribute to the local ambient noise levels. Future noise levels were calculated using either a proportional modeling technique or the Federal Highway Administration (FHWA) *Traffic Noise Model* (TNM) Version 2.5. The proportional modeling technique was used as a screening tool to estimate changes in noise levels. At locations where proportional modeling screening indicated the potential for significant adverse noise impacts, the TNM was used to obtain more detailed results. Both the proportional modeling screening technique and the TNM are analysis methodologies recommended for analysis purposes in the *CEQR Technical Manual.* The noise analysis examined the weekday AM, midday (MD), and PM peak hours. The selected time periods are when the proposed actions would result in maximum traffic generation and/or the maximum potential for significant adverse noise impacts, based on the traffic studies presented in Chapter 17, "Traffic and Parking." The proportional modeling and TNM procedures used for analysis are described below.

PROPORTIONAL MODELING

Proportional modeling was used to determine locations which had the potential for having significant noise impacts and to quantify the magnitude of those potential impacts. Proportional modeling is one of the techniques recommended in the New York City *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 future with the proposed project (Build) levels. Vehicular traffic volumes are converted into Passenger Car Equivalent (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:

$$\text{FB NL} - \text{FNA NL} = 10 * \log_{10} (\text{FB PCE} / \text{FNB PCE})$$

where:

FB NL = Future Build Noise Level

FNA NL = Future No Action Noise Level

FB PCE = Future Build PCEs

FNA PCE = Future No Action 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 PCEs. For example, assume that traffic is 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.

Analyses were conducted for three time periods: the weekday AM, weekday midday (MD), and weekday PM peak hours. These time periods are the hours when the maximum traffic generation is expected and, therefore, the hours when future with the proposed project conditions are most likely to result in maximum noise impacts.

As described in Chapter 17, “Traffic and Parking,” Kent Avenue has recently been reconfigured from two-way north-south operation to one-way northbound operation. It should be noted that existing noise measurements at Sites 1 through 6 and Site 11 were performed with Kent Avenue operating as a two-way street. Although Kent Avenue now operates as a one-way northbound street, noise levels are not expected to have changed substantially at these locations as a result of the reconfiguration. The traffic volumes on the cross streets between Kent Avenue and Wythe Avenue, which were the dominant noise sources at Sites 1 through 5, did not substantially change as a result of the Kent Avenue reconfiguration (i.e., there was not a doubling of traffic volumes). While traffic patterns changed on Kent Avenue, noise levels at Site 6 (Kent Avenue between South 3rd and South 4th Streets) were primarily a result of truck traffic on Kent Avenue, the volume of which was not substantially altered by the Kent Avenue reconfiguration (i.e., there was not a doubling of traffic volumes). The noise levels at Site 11 were dominated by train and roadway noise from the Williamsburg Bridge, which was unaffected by the Kent Avenue reconfiguration. Measurements were performed at Sites 7 through 10 with Kent Avenue in its new one-way northbound configuration.

TRAFFIC NOISE MODEL

The TNM is a computerized model developed for the FHWA that calculated the noise contribution of each roadway segment to a given noise receptor. The noise from each vehicle type is determined as a function of the reference energy-mean emission level, corrected for vehicle volume, speed, roadway grade, roadway segment length, and source-receptor distance. Further considerations reflected in the modeling of the propagation path included identifying the shielding provided by rows of buildings, and analyzing the effects of any intervening noise barriers. The TNM was used for Sites 2, 4, and 5, where the proportional modeling screening technique showed the potential for significant adverse noise impacts.

ANALYSIS PROCEDURE

The following procedure was used in performing the noise analysis:

- Noise monitoring locations (receptor sites) were selected at noise-sensitive land uses (i.e., residential, church, school, etc.) located on the predicted traffic routes that project-generated traffic would use to access and egress the project site.
- Noise monitoring locations were selected adjacent to and on the proposed project site to determine the appropriate level of building attenuation required to satisfy CEQR interior noise level criteria and to compare noise levels at the proposed project's newly created open space with CEQR guidelines.
- Existing noise levels were determined at receptor sites listed above, for each analysis time period, by performing field measurements.
- Using the results of the traffic studies presented in Chapter 17, "Traffic and Parking," a screening analysis was performed using the proportional model to identify locations that had the potential for a significant increase in noise levels.
- At locations where the screening analysis indicated the potential for a significant increase in noise levels, existing traffic noise levels were calculated at each receptor site, for each analysis time period, using the TNM and traffic data for existing conditions.
- At locations where the screening analysis indicated the potential for a significant increase in noise levels (i.e., Sites 2, 4, and 5), the calculated TNM existing traffic noise level for each analysis time period was subtracted from the measured existing noise level. The difference between the two reflects the contribution of non-traffic noise sources—such as train noise from the Williamsburg Bridge and noise from nearby manufacturing operations—to the existing noise levels. This difference was applied as a correction factor to calculated future traffic noise levels to account for non-traffic noise sources.
- Future noise levels for the No Action and future with the proposed project scenarios, for each receptor site and for each analysis time period, were determined using either the proportional model or the TNM approach described above.
- The level of building attenuation to satisfy CEQR requirements was determined for the proposed project's building based on the noise monitoring and TNM results.

APPLICABLE NOISE CODES AND IMPACT CRITERIA

NEW YORK CITY NOISE CODE

The New York City Noise Control Code, amended in December 2005, contains prohibitions regarding unreasonable noise and specific noise standards, including plainly audible criteria for specific noise sources. In addition, the amended code specifies that no sound source operating in connection with any commercial or business enterprise may exceed the decibel levels in the designated octave bands shown in Table 20-4 at the specified receiving properties.

Table 20-4
New York City Noise Codes

Octave Band Frequency (Hz)	Maximum Sound Pressure Levels (dB) as Measured Within a Receiving Property	
	Residential receiving property for mixed-use building and residential buildings[1]	Commercial receiving property[2]
31.5	70	74
63	61	64
125	53	56
250	46	50
500	40	45
1000	36	41
2000	34	39
4000	33	38
8000	32	37

Notes:
1. As measured within any room of the residential portion of the building with windows open, if possible.
2. As measured within any room containing offices within the building with windows open, if possible.

Source: Section §24-232 of the Administrative Code of the City of New York, as amended December 2005.

NEW YORK CEQR NOISE STANDARDS

The New York City Department of Environmental Protection (DEP) has set external noise exposure standards. These standards are shown in Table 20-4 and 20-5. Noise Exposure is classified into four categories: acceptable, marginally acceptable, marginally unacceptable, and clearly unacceptable. The standards shown are based on maintaining an interior noise level for the worst-case hour L_{10} less than or equal to 45 dBA. Attenuation requirements are shown in Table 20-6.

In addition, the *CEQR Technical Manual* uses the following criteria to determine whether a proposed project would result in a significant adverse noise impact. The impact assessments compare the projected future with the proposed project condition $L_{eq(1)}$ noise levels to those calculated for the No Action condition, for receptors potentially affected by the proposed project. If the No Action levels are less than 60 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period, the threshold for a significant impact would be an increase of at least 5 dBA $L_{eq(1)}$. For the 5 dBA threshold to be valid, the resultant future with the proposed project condition noise level would have to be equal to or less than 65 dBA. If the No Action noise level is equal to or greater than 62 dBA $L_{eq(1)}$, or if the analysis period is a nighttime period (defined in the CEQR standards as being between 10 PM and 7 AM), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$. (If the No Action noise level is 61 dBA $L_{eq(1)}$, the maximum incremental increase would be 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold.)

Table 20-5
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
1. Outdoor area requiring serenity and quiet[2]		$L_{10} \leq 55$ dBA	---------- $Ldn \leq 60$ dBA ----------						
2. Hospital, Nursing Home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA	---------- $60 < Ldn \leq 65$ dBA ----------	$65 < L_{10} \leq 80$ dBA	(I) $65 < Ldn \leq 70$ dBA, (II) $70 \leq Ldn$	$L_{10} > 80$ dBA	---------- $Ldn \leq 75$ dBA ----------
3. 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	
4. School, museum, library, court, house of worship, transient hotel or motel, public meeting room, auditorium, out-patient 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)	
5. 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)	
6. 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. Examples are grounds for ambulatory hospital patients and patients and residents of sanitariums and old-age homes.

[3] One may use the 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 20-6
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Acceptable	Marginally Unacceptable		Clearly Unacceptable		
Noise Level With Proposed Action	$65 < L_{10} \leq 70$	$70 < L_{10} \leq 75$	$75 < L_{10} \leq 80$	$80 < L_{10} \leq 85$	$85 < L_{10} \leq 90$	$90 < L_{10} \leq 95$
Attenuation*	25 dB(A)	(I) 30 dB(A)	(II) 35 dB(A)	(I) 40 dB(A)	(II) 45 dB(A)	(III) 50 dB(A)

Note: * The above composite window-wall attenuation values are for residential dwellings. 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.

Source: New York City Department of Environmental Protection.

C. EXISTING CONDITIONS

STUDY AREA

The study area for this analysis is roughly bounded by the East River to the west, Grand Street to the north, Wythe Avenue to the east, and the Williamsburg Bridge to the south. These blocks make up the study area, and are thus the areas with the highest potential for noise impacts.

SELECTION OF NOISE RECEPTOR LOCATIONS

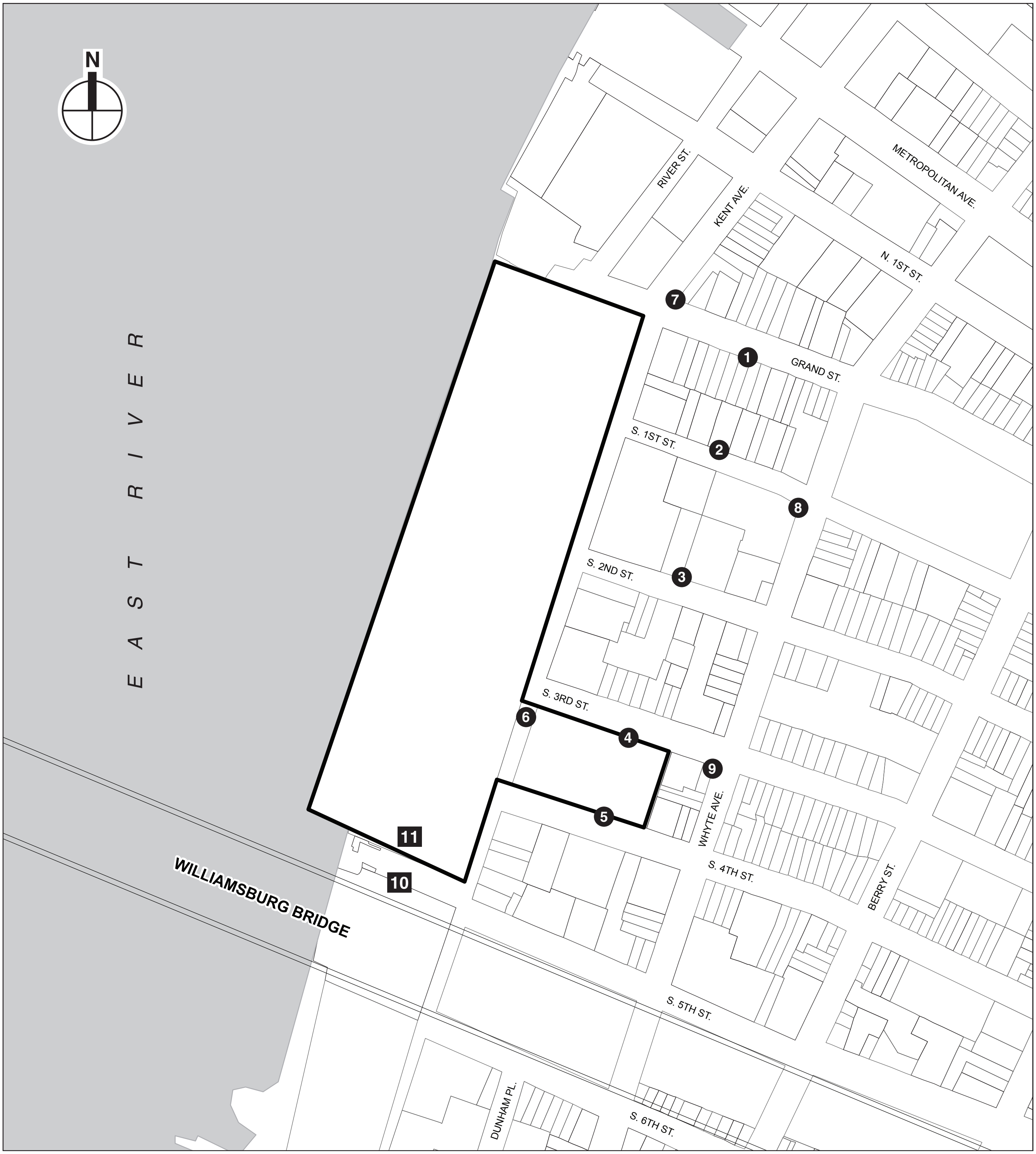
Based upon a screening analysis, eleven noise receptor locations were chosen within the study area (see Figure 20-1). Site 1 is located on Grand Street between Kent and Wythe Avenues. Site 2 is located on South 1st Street between Kent and Wythe Avenues. Site 3 is located on South 2nd Street between Kent and Wythe Avenues. Site 4 is located on South 3rd Street between Kent and Wythe Avenues. Site 5 is located on South 4th Street between Kent and Wythe Avenues. Site 6 is located on Kent Avenue between South 3rd and South 4th Streets. Site 7 is located at the northeast corner of Grand Street and Kent Avenue. Site 8 is located at the southwest corner of South 1st Street and Wythe Avenue. Site 9 is located at the southwest corner of South 3rd Street and Wythe Avenue. Site 10 is located on the pedestrian walkway of the Williamsburg Bridge, directly across from the project site. Site 11 is located on the roof of the existing Adant House at the south end of the project site, adjacent to the Williamsburg Bridge. Measurements performed at Sites 1 through 9 were done as part of the impact identification and building attenuation analyses. These sites are representative of other locations in the immediate area, and are generally the locations where maximum impacts would be expected. The sites were used to assess the potential impacts of traffic noise generated by the proposed project.

Measurements at Sites 10 and 11 were performed as part of the building attenuation analysis to account for noise generated by traffic on the Williamsburg Bridge. These sites were selected because project buildings with south-facing façades, particularly the building on Site D, would be exposed to noise generated by roadway and subway traffic over the Williamsburg Bridge. Because a measurement on the Site D façade at the same height as the bridge is not possible, the noise measurements at Sites 10 and 11 were used to estimate the noise levels at the building façade. As discussed below, the noise levels at these sites were determined two different ways and used to confirm the accuracy of the measurements.

NOISE MONITORING

At receptor sites 1 through 9, existing noise levels were determined by field measurements for each of the three noise analysis time periods. Noise monitoring was performed at Sites 1 through 6 and Site 11 during October, 2007. Noise monitoring was performed at Sites 7 through 10 in February and March of 2010. Kent Avenue was two-way at the time of the measurements at Sites 1 through 6 and Site 11. As discussed above, noise levels are not expected to have changed substantially at these locations as a result of the reconfiguration. The traffic volumes on the cross streets between Kent Avenue and Wythe Avenue, which were the dominant noise sources at Sites 1 through 5, did not substantially change as a result of the Kent Avenue reconfiguration (i.e., there was not a doubling of traffic volumes). While traffic patterns changed on Kent Avenue, noise levels at Site 6 (Kent Avenue between South 3rd and South 4th Streets) were primarily a result of truck traffic on Kent Avenue, the volume of which was not substantially altered by the Kent Avenue reconfiguration (i.e., there was not a doubling of traffic volumes). The noise levels at

5.17.10



Project Site Boundary

1 Noise Receptor Location

10 Noise Receptor Location (Elevated Measurement)

NOTE: This figure has been revised for the FEIS

Note: Sites 10 and 11 are analyzed only in the building attenuation analysis

DOMINO SUGAR

Noise Receptor Locations

Figure 20-1

Site 11 were dominated by train and roadway noise from the Williamsburg Bridge, which was unaffected by the Kent Avenue reconfiguration.

At Sites 1 through 9, 20-minute spot measurements were taken during the three weekday periods that reflect peak hours of trip generation: AM weekday (8 AM to 9 AM), MD weekday (12 Noon to 1:30 PM), and PM weekday (5 PM to 6:30 PM). At Site 11, a continuous measurement was performed between 8 AM and 6 PM in order to determine the maximum noise that would result from automobile and subway traffic on the Williamsburg Bridge. At Site 10, a 20-minute spot measurement was performed during the PM weekday period, which was determined to be the loudest hour of the day by the measurement at Site 11. Sites 10 and 11 were used solely for the purpose of determining the building attenuation required by reason of their proximity to the Williamsburg Bridge, and are therefore not presented in the No Action and future with the proposed project scenarios.

EQUIPMENT USED DURING NOISE MONITORING

The instrumentation used for the measurements was a Brüel & Kjær Type 4189 ½-inch microphone connected to a Brüel & Kjær Model 2260 Type 1 (according to ANSI Standard S1.4-1983) sound level meter. This assembly was mounted at a height of 5 feet above the ground surface on a tripod and at least 6 feet away from any large sound-reflecting surface to avoid major interference with sound propagation. The meter was calibrated before and after readings with a Brüel & Kjær Type 4231 sound-level calibrator using the appropriate adaptor. Measurements at each location were made on the A-scale (dBA). The data were digitally recorded by the sound level meter 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. Only traffic-related noise was measured; noise from other sources (e.g., emergency sirens, aircraft flyovers, etc.) was excluded from the measured noise levels. Weather conditions were noted to ensure a true reading as follows: wind speed under 12 mph; relative humidity under 90 percent; and temperature above 14^{o}F and below 122^{o}F. All measurement procedures conformed to the requirements of ANSI Standard S1.13-1971 (R2005).

EXISTING NOISE LEVELS AT NOISE RECEPTOR LOCATIONS

MEASURED NOISE LEVELS

Noise monitoring results for the eleven receptor locations are summarized in Tables 20-7 and 20-8. Table 20-7 provides the noise monitoring results for Sites 1 through 10, which utilized 20-minute spot measurements. Table 20-8 provides the results for Site 11, which utilized a continuous measurement instead of the 20-minute spot measurements used for Sites 1 through 10. Traffic was the dominant noise source at all eleven sites, and the values shown reflect the level of vehicular activity on the adjacent streets.

Table 20-7
Existing Noise Levels at Noise Receptor Sites 1 through 10 (in dBA)

Site	Measurement Location	Day	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	Grand Street Between Kent Avenue and Wythe Avenue	Weekday	AM	65.2	77.2	65.5	58.4	55.2
		Weekday	MD	66.4	77.5	68.2	59.6	55.0
		Weekday	PM	65.5	76.8	67.5	59.6	55.6
2	South 1st Street Between Kent Avenue and Wythe Avenue	Weekday	AM	69.8	80.8	72.0	63.3	58.1
		Weekday	MD	65.4	73.6	68.3	63.0	59.7
		Weekday	PM	64.3	74.7	67.0	58.7	56.3
3	South 2nd Street Between Kent Avenue and Wythe Avenue	Weekday	AM	62.7	72.6	65.0	59.3	57.1
		Weekday	MD	59.8	68.0	62.6	56.9	54.0
		Weekday	PM	60.8	70.0	63.3	58.8	56.3
4	South 3rd Street Between Kent Avenue and Wythe Avenue	Weekday	AM	64.1	71.1	68.1	61.4	58.1
		Weekday	MD	63.6	71.2	66.9	61.0	58.3
		Weekday	PM	67.9	76.5	70.2	65.4	62.6
5	South 4th Street Between Kent Avenue and Wythe Avenue	Weekday	AM	64.1	74.7	66.3	60.2	55.3
		Weekday	MD	64.1	74.0	66.7	60.2	57.1
		Weekday	PM	62.8	72.4	65.0	60.2	58.0
6	Kent Avenue between South 4th Street and South 3rd Street	Weekday	AM	72.1	83.1	75.2	67.1	59.6
		Weekday	MD	70.6	81.3	73.8	65.6	60.6
		Weekday	PM	71.0	80.1	73.5	69.2	63.3
7	Northeast corner of Grand Street and Kent Avenue	Weekday	AM	68.1	77.6	70.6	65.5	61.8
		Weekday	MD	67.5	78.5	71.1	61.7	54.6
		Weekday	PM	66.7	77.6	70.3	60.3	53.2
8	Southwest corner of South 1st Street and Wythe Avenue	Weekday	AM	69.8	80.9	73.2	63.9	55.8
		Weekday	MD	68.1	79.9	70.7	62.7	54.8
		Weekday	PM	68.2	77.6	71.3	65.2	56.3
9	Southwest corner of South 3rd Street and Wythe Avenue	Weekday	AM	66.5	76.9	69.4	61.2	56.6
		Weekday	MD	65.9	75.4	69.4	62.6	56.5
		Weekday	PM	68.8	79.2	70.9	65.4	59.2
10	Pedestrian walkway of Williamsburg Bridge	Weekday	PM	82.5	92.3	86.5	78.6	75.7

Notes: Field measurements were performed by AKRF, Inc. during October 2007, February and March, 2010. Refer to Figure 20-1 for noise monitoring locations.

Table 20-8
Existing Noise Levels at Receptor Site 11 (in dBA)

Date	Start Time	dBA						
		L_{eq}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{(min)}$	$L_{(max)}$
10/16/2007	8:00 AM	69.5	76.6	73.2	67.1	62.0	59.1	78.9
10/16/2007	9:00 AM	68.1	76.2	71.7	65.4	61.1	58.7	81.4
10/16/2007	10:00 AM	67.5	75.8	70.9	64.4	61.7	59.7	83.3
10/16/2007	11:00 AM	67.3	75.6	70.6	64.8	62.1	58.9	82.9
10/16/2007	12:00 PM	68.5	77.2	72.2	64.7	60.9	58.5	87.5
10/16/2007	1:00 PM	68.7	77.0	72.3	65.5	63.6	61.1	82.9
10/16/2007	2:00 PM	68.2	76.5	71.5	65.8	64.0	61.5	78.4
10/16/2007	3:00 PM	68.8	76.9	72.8	65.8	63.9	59.4	79.7
10/16/2007	4:00 PM	68.6	76.5	72.4	65.9	63.9	60.8	79.4
10/16/2007	5:00 PM	70.0	77.5	73.7	66.5	64.2	61.4	91.8

Note: Field measurements were performed by AKRF, Inc. during October 2007.

At the time of the noise measurements at Sites 1-6 and 11, Kent Avenue was operating two ways, north and south. As noted above, its recent reconfiguration to one-way northbound operation did not result in a doubling of traffic on Kent Avenue or any of the cross streets between Kent Avenue and Wythe Avenue with noise receptor locations.

In terms of CEQR noise criteria, noise levels at Sites 1, 3, and 5 are in the "marginally acceptable" category, noise levels at Sites 2, 4, 6, 7, 8, 9, and 11 are in the "marginally unacceptable" category, and noise levels at Site 10 are in the "clearly unacceptable" category.

D. THE FUTURE WITHOUT THE PROPOSED PROJECT

Using the methodology previously described, future noise levels in the No Action condition were calculated for the three analysis periods in the year 2020. Table 20-9 shows the calculated noise levels.

Table 20-9
No Action Noise Levels (in dBA)

Noise Receptor Site[2]	Day	Time	Existing $L_{eq(1)}$	2020 No Action $L_{eq(1)}$	Change	2020 No Action $L_{10(1)}$
1	Weekday	AM	65.2	65.6	0.4	65.9
	Weekday	MD	66.4	67.0	0.6	68.8
	Weekday	PM	65.5	66.1	0.6	68.1
2[1]	Weekday	AM	69.8	70.7	0.9	72.9
	Weekday	MD	65.4	66.4	1.0	69.3
	Weekday	PM	64.3	65.1	0.8	67.8
3	Weekday	AM	62.7	65.3	2.6	67.6
	Weekday	MD	59.8	60.6	0.8	63.4
	Weekday	PM	60.8	61.7	0.9	64.2
4[1]	Weekday	AM	64.1	66.3	2.2	70.3
	Weekday	MD	63.6	66.4	2.8	69.7
	Weekday	PM	67.9	71.4	3.5	73.7
5[1]	Weekday	AM	64.1	65.6	1.5	67.8
	Weekday	MD	64.1	66.0	1.9	68.6
	Weekday	PM	62.8	66.2	3.4	68.4
6	Weekday	AM	72.1	73.8	1.7	76.9
	Weekday	MD	70.6	72.5	1.9	75.7
	Weekday	PM	71.0	73.6	2.6	76.1
7	Weekday	AM	68.1	69.7	1.6	72.2
	Weekday	MD	67.5	69.3	1.8	72.9
	Weekday	PM	66.7	69.0	2.3	72.6
8	Weekday	AM	69.8	71.6	1.8	75.0
	Weekday	MD	68.1	69.6	1.5	72.2
	Weekday	PM	68.2	69.8	1.6	72.9
9	Weekday	AM	66.5	68.3	1.8	71.2
	Weekday	MD	65.9	67.4	1.5	70.9
	Weekday	PM	68.8	70.4	1.6	72.5

Notes:
[1] Future No Action noise levels at these locations were calculated using the TNM modeling technique.
[2] Sites 10 and 11 were used solely for the purpose of determining the building attenuation required by reason of their proximity to the Williamsburg Bridge, and are therefore not presented in the No Action and future with the proposed project scenarios.

Comparing future No Action noise levels with existing noise levels, the increases in $L_{eq(1)}$ noise level would be between 0.0 and 3.5 dBA. Increases of less than 3.0 dBA would be barely perceptible, and based upon CEQR impact criteria would not be significant. The increases of 3.5

dBA and 3.4 dBA, which would occur at Site 4 and Site 5, respectively, would occur as a result of additional traffic that would be expected to occur with the No Action development.

In terms of CEQR noise criteria, noise levels at Sites 1, 3, and 5 would remain in the “marginally acceptable” category, and noise levels at Sites 2, 4, 6, 7, 8, and 9 would remain in the “marginally unacceptable” category.

As noted previously, measurements at receptor Sites 10 and 11 were used solely for the purpose of determining the building attenuation required by reason of their proximity to the Williamsburg Bridge and, therefore, modeling of future noise levels was not performed at these locations.

E. THE FUTURE WITH THE PROPOSED PROJECT

Using the methodology previously described, noise levels in the future with the proposed project were calculated for the three peak analysis periods in the year 2020. Table 20-10 presents noise levels in the future with the proposed project at the eleven receptor locations in the year 2020.

Table 20-10
Future with the Proposed Project Noise Levels (in dBA)

Noise Receptor Site[2]	Day	Time	2020 No Action $L_{eq(1)}$	2020 Future with the Proposed Project $L_{eq(1)}$	Change	2020 Future with the Proposed Project $L_{10(1)}$
1	Weekday	AM	65.6	65.6	0.0	65.9
	Weekday	MD	67.0	66.8	-0.2	68.6
	Weekday	PM	66.1	65.9	-0.2	67.9
2[1]	Weekday	AM	70.7	71.1	0.4	73.3
	Weekday	MD	66.4	66.8	0.4	69.7
	Weekday	PM	65.1	67.2	2.1	69.9
3	Weekday	AM	65.3	66.4	1.1	68.7
	Weekday	MD	60.6	61.2	0.6	64.0
	Weekday	PM	61.7	64.4	2.7	66.9
4[1]	Weekday	AM	66.3	67.3	1.0	71.3
	Weekday	MD	66.4	66.7	0.3	70.0
	Weekday	PM	71.4	74.2	2.8	76.5
5[1]	Weekday	AM	65.6	63.9	0.9	66.1
	Weekday	MD	66.0	62.7	0.7	65.3
	Weekday	PM	66.2	66.4	0.2	68.6
6	Weekday	AM	73.8	74.8	1.0	77.9
	Weekday	MD	72.5	73.4	0.9	76.6
	Weekday	PM	73.6	74.8	1.2	77.3
7	Weekday	AM	69.7	70.8	1.1	73.3
	Weekday	MD	69.3	70.3	1.0	73.9
	Weekday	PM	69.0	69.5	0.5	73.1
8	Weekday	AM	71.6	71.9	0.3	75.3
	Weekday	MD	69.6	69.7	0.1	72.3
	Weekday	PM	69.8	70.1	0.3	73.2
9	Weekday	AM	68.3	68.8	0.5	71.7
	Weekday	MD	67.4	68.0	0.6	71.5
	Weekday	PM	70.4	71.0	0.6	73.1

Notes:
[1] Future with the proposed project noise levels at these locations were calculated using the TNM modeling technique.
[2] Sites 10 and 11 were used solely for the purpose of determining the building attenuation required by reason of their proximity to the Williamsburg Bridge, and are therefore not presented in the No Action and future with the proposed project scenarios.

Comparing future with the proposed project noise levels with No Action noise levels, at all sites, the maximum increase in $L_{eq(1)}$ noise level would be less than 3.0 dBA. Increases of this magnitude would be barely perceptible, and based upon CEQR impact criteria would not be significant.

In terms of CEQR noise criteria, noise levels at Sites 1, 3, and 5 would remain in the “marginally acceptable” category, and noise levels at Sites 2, 4, 6, 7, 8, and 9 would remain in the “marginally unacceptable” category.

F. OTHER NOISE CONCERNS

MECHANICAL EQUIPMENT

No detailed designs of the buildings’ mechanical systems (i.e., heating, ventilation, and air conditioning [HVAC] systems) are available at this time. However, those systems will be designed to meet all applicable noise regulations and requirements, and would be designed to produce noise levels which would not result in any significant increases in ambient noise levels.

ATTENUATION REQUIREMENTS

As shown in Table 20-6, 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 and community facility uses, and 50 dBA or lower for retail and office uses, and are determined based on exterior $L_{10(1)}$ noise levels.

Project buildings with south-facing façades would be exposed to noise generated by roadway and subway traffic over the Williamsburg Bridge, and would require sufficient building attenuation to ensure that interior noise levels comply with CEQR criteria. In order to conservatively determine the necessary amount of attenuation, the $L_{10(1)}$ was determined at the location on the project site closest to the bridge, which would be the southern façade of Site D at a height level with the bridge. This $L_{10(1)}$ was determined in two ways: (1) projecting the value measured at Site 11 south and up to Site D, and (2) projecting the value measured at Site 10 north to Site D. In both cases it was assumed that the measured levels were dominated by noise generated by the Williamsburg Bridge and a 3 dBA drop-off per doubling of distance from the bridge. These methods yielded $L_{10(1)}$ values of 74.6 and 73.5, respectively. These two values are within 1 dBA of each other, and both show a requirement of 30 dBA of window/wall attenuation. However, with the resultant noise levels being very close to the 75 dBA threshold, the south and west facades would require 31 dBA of attenuation rather than 30 dBA.

For the remainder of the project site, attenuation requirements were determined based on the future with the proposed project $L_{10(1)}$ values shown in Table 20-10.

The results of the building attenuation analysis are summarized in Table 20-11.

Attenuation would be required at certain sites due to the high existing background noise levels to achieve interior residential noise levels of 45 dBA or lower in residential zoning districts. This zoning attenuation would be mandated for the proposed project via the Restrictive Declaration.

Table 20-11
Minimum Building Attenuation to Comply with CEQR Requirements at the Project Site

Site	Proposed Land Use	Governing Noise Sites	Required Building Attenuation* (dBA)
A	Residential/Retail/Office/Community Facility	2,6	35 on East Façade, 30 on all other façades
B	Residential/Retail	2,6	35 on East Façade, 30 on all other façades
C	Residential/Retail	6, 10,11	35 on East Façade, 30 on all other façades
D	Residential/Retail	6, 10,11	35 on East Façade, 30 on the North Façade, 31** on all other façades
E	Residential/Retail	4, 5, 6	35 on West and North Façades, 30 on all others
Refinery	Residential/Retail/Community Facility	6, 10,11	35 on East Façade, 30 on all other façades

Notes: *The required attenuation values shown are for residential and certain community facility uses. Required attenuation for retail, and office uses would be 5 dBA less.
**With the resultant noise level from the Williamsburg Bridge of 74.6 being very close to the 75 dBA threshold, the south and west facades would require 31 dBA of attenuation rather than 30 dBA.

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/air conditioning units in various ratios of area. The proposed design for all project buildings includes the use of well-sealed double-glazed windows and air conditioning units. The proposed buildings' façades, including these elements, would be designed to provide a composite Outdoor-Indoor Transmission Class (OITC) rating greater than or equal to the attenuation requirements listed in Table 20-11. 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 will thus provide sufficient attenuation to achieve the CEQR interior noise level guideline of 45 dBA L_{10} for residential uses and 50 dBA L_{10} for commercial uses.

In order to achieve a composite OITC rating of 30, a building façade would likely include well-sealed insulating glass windows with an air gap, as well as alternate means of ventilation such as well-sealed through-the-wall air conditioning, package-terminal air conditioners (PTACs), or central air conditioning. In order to achieve a composite OITC rating of 31, a building façade would likely include well-sealed insulating glass windows with an air gap, as well as alternate means of ventilation such as package-terminal air conditioners (PTACs) or central air conditioning. In order to achieve a composite OITC rating of 35, a building façade would likely include well-sealed insulating glass windows with at least one layer of laminate and an air gap, as well as alternate means of ventilation such as central air conditioning.

Based upon the predicted $L_{10(1)}$ values at the project site, the proposed project's design measures would be expected to provide sufficient attenuation to achieve the CEQR interior noise level requirements.

Building designs for buildings on the streets listed above would be required to provide at least the level of building attenuation specified in Table 20-11. Buildings on other streets that are part of this action would be required to provide either a minimum of 35 dBA attenuation, or to provide noise analyses which show that sufficient building attenuation would be provided to satisfy CEQR building attenuation requirements, as shown in Table 20-6.

PUBLIC SCHOOL OPTION

As described in Chapter 23, "Mitigation," the applicant will enter into an agreement with the New York City School Construction Authority (SCA) to provide an option to locate an approximately 100,000-square-foot public elementary and intermediate school within the community facility space in the Refinery complex. Should this school be constructed, a portion of the project's open space may be set aside for school use as a play area and staging area during school hours. Based on expected noise levels at the boundary of an elementary school playground, the required attenuation levels described above would be sufficient to ensure acceptable interior noise levels in project buildings according to CEQR criteria. Additionally, the play area would not have a line of sight to any existing noise-sensitive uses. As a result, the play area would not result in any significant adverse noise impacts. ✷