A. INTRODUCTION

Noise pollution in an urban area comes from many sources. Some of these are activities essential to the health, safety, and welfare of a 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, 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 principal effect of the proposed actions on ambient noise levels would result from project-generated automobile and truck traffic.

The proposed actions would provide for the development of sites for a mix of office, academic, cultural, residential, and retail uses. The noise analysis concentrated on locations where there was the potential for significant increases in noise due to project-generated traffic, and quantified those increases in noise levels. In addition, the noise analysis also examined the level of attenuation necessary to achieve interior noise levels that do not exceed City Environmental Quality Review (CEQR) standards.

B. 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 such factors 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 response of the human ear. For most noise assessments the A-weighted sound pressure level in units of dBA is used in view of its widespread recognition and its close correlation with 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 17-1.

Table 17-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Freight train at 30 meters	95
Train horn at 30 meters	90
Heavy truck at 15 meters	
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.

Sources: 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 17-2). Generally, changes in noise levels of 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 17-2
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 during 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 17-3). 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 17-3
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 of dBA describes a noise level at just one moment and very few noises are constant, other ways of describing noise over extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific time period as if it had been a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and time period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted as $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1, L_{10}, L_{50}, and L_{90} are sometimes used to indicate noise levels that are exceeded 1, 10, 50, and 90 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 project, 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 *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 2001 *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.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CITY NOISE CODE

The New York City Noise Control Code promulgates sound-level standards for motor vehicles, air compressors, and paving breakers; requires that all exhausts be muffled; and prohibits all unnecessary noise adjacent to schools, hospitals, or courts. The Code further limits construction activities to weekdays between 7 AM and 6 PM.

This Code contains ambient noise quality criteria and standards based on existing land use zoning designations. Table 17-4 summarizes the ambient noise quality criteria contained in the Noise Control Code. Conformance with the noise level values contained in the Code is determined by considering noise emitted directly from stationary activities within the boundaries of a project. Construction activities and noise sources outside the boundaries of a project are not included within the provisions of this law.

Table 17-4
City of New York
Ambient Noise Quality Zone Criteria (in dBA)

Ambient Noise Quality Zone (ANQZ)	Daytime Standards* (7 AM-10PM)	Nighttime Standards* (10 PM-7AM)
Noise quality zone N-1 (Low density residential R_L; land-use zones R-1 to R-3)	60	50
Noise quality zone N-2 (High density residential R_H; land-use zones R-4 to R-10)	65	55
Noise quality zone N-3 (All commercial and manufacturing land-use zones)	70	70

Note: * Leq(1 hour).
Source: City of New York Local Law No. 64.

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 17-5 and 17-6. 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 17-6.

In addition, the 2001 *CEQR Technical Manual* uses the following criteria to determine whether a proposed project development would result in a significant adverse noise impact. The impact assessments compare the proposed action's $L_{eq(1)}$ noise levels with those calculated for the future noise levels without the proposed action (Future No Build) for receptors potentially affected by the project development.

If the future No Build noise levels are less than 60 dBA 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 proposed action condition noise level would have to be equal to or less than 65 dBA. If the future No Build 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 CEPO-CEQR standards as being between 10 PM and 7 AM), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$. (If the future No Build 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 threshold.)

PERFORMANCE STANDARDS FOR MANUFACTURING DISTRICTS

Section 42-213 of the New York City Zoning Resolution contains noise performance standards for uses in manufacturing districts. Noise levels from any activity, whether open or enclosed, cannot exceed the sound pressure levels shown in Table 17-7, on or beyond the lot line. Operation of motor vehicles or other transportation facilities are not included in the maximum levels specified in the performance standards. When a manufacturing district adjoins a residential district, the maximum permitted levels are reduced by 6 decibels. A small portion of the rezoning area (the northwestern portion of the rezoning area) is located in an M1-1 zoned district. That area is proposed to be rezoned to C6-4. With the proposed rezoning, new manufacturing uses would not be introduced into the area

Table 17-5
CEQR Noise Exposure Guidelines
For Use in City Environmental Impact Review

Receptor Type	Time Period	Acceptable General External Exposure	Airport[3]	Marginally Acceptable General External Exposure	Airport[3]	Marginally Unacceptable General External Exposure	Airport[3]	Clearly Unacceptable General External Exposure	Airport[3] Exposure
1. Outdoor area requiring serenity and quiet[2]		$L_{10} \leq 55$ dBA	$L_{dn} \leq 60$ dBA						
2. Hospital, Nursing Home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA	$60 < L_{dn} \leq 65$ dBA	$65 < L_{10} \leq 80$ dBA	(I) $65 < L_{dn} \leq 70$ dBA, (II) $70 \leq L_{dn}$	$L_{10} > 80$ dBA	$L_{dn} \leq 75$ 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 17-6
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)
Source: New York City Department of Environmental Protection						

Table 17-7
City of New York Noise Performance Standards for Manufacturing Districts
Maximum Permitted Sound Pressure Levels (in dB)

Octave Band (Hz)	M1 District	M2 District	M3 District
20 to 75	79	79	80
75 to 150	74	75	75
150 to 300	66	68	70
300 to 600	59	62	64
600 to 1200	53	56	58
1200 to 2400	47	51	53
2400 to 4800	41	47	49
Above 4800	39	44	46
Source: City of New York Performance Standards for Manufacturing Districts.			

D. NOISE PREDICTION METHODOLOGY

PROPORTIONAL MODELING TECHNIQUE

A proportional modeling technique was used as a screening mechanism to determine locations which had the potential for having significant noise impacts based on a calculation using measured existing noise levels and predicted changes in traffic volumes. The proportional model is consistent with the methodology described in the 2001 *CEQR Technical Manual* for mobile source analysis.

Using this technique, the prediction of future traffic noise levels is based on a calculation using measured existing noise levels and predicted changes in traffic volumes to determine future No Build and Build noise levels. Future No Build traffic volumes were based on applying a growth factor to the existing traffic volumes. Future Build traffic volumes were obtained by adding project-generated traffic values to No Build conditions. The vehicular traffic volumes were 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; one heavy-duty truck (having a gross weight of more than 26,400 pounds) is assumed to generate the noise equivalent of 47 cars; and one bus (vehicles designed to carry more than nine passengers) is assumed to generate the noise equivalent of 18 cars. Future noise levels are calculated using the following equation:

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

where:

F NL = Future Noise Level

E NL = Existing Noise Level

F PCE = Future PCEs

E PCE = Existing 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 PCEs and if the future traffic volume were increased by 50 PCEs to a total of 150 PCEs, the noise level would increase by 1.8 dBA. Similarly, if the future traffic were increased by 100 PCEs, or doubled to a total of 200 PCEs, the noise level would increase by 3.0 dBA.

This procedure was used to identify whether there were any locations in the vicinity of the rezoning area where project-generated PCE values would have the potential to result in an increase of 3 dBA or more in vehicle-related noise levels from No Build to Build conditions. (i.e., locations where there was a doubling of PCEs) and, consequently, where there is the potential for significant noise impacts. This analysis examined the weekday AM, midday, and PM peak periods. These are the time periods when the projected development under the proposed actions would have its maximum traffic generation and, therefore, the hours when the noise levels are most likely to have a significant impact. At locations where there was the potential for significant increases in noise levels based upon the development that would occur due to the proposed actions, future noise levels were determined either using the proportional modeling technique described above, or, in cases where existing volumes were very low and/or traffic on nearby streets or other sources were major noise contributors, the TNM model, which is described below.

TNM MODEL

The *Traffic Noise Model* version 2.1 (TNM) is a computerized model developed for the Federal Highway Administration (FHWA) that takes into account various factors due to traffic flow, including traffic volumes, vehicle mix (i.e., percentage of autos, light duty trucks, heavy duty trucks, buses, etc.), sources/receptor geometry, and shielding (including barriers and terrain, ground attenuation, etc.) It is the current state-of-the-art model for traffic noise analysis.

At locations where there was the potential for significant increases in noise levels, and where existing volumes were very low and/or traffic on nearby streets or other sources were major noise contributors, the TNM model was used for analysis, and the following four step procedure was followed: first, measurements were made of ambient noise levels; second, the TNM model was used to calculate the traffic component of the existing noise levels based on traffic on the immediately adjacent street; third, the noise component of the measured ambient noise levels traffic on nearby area streets or other sources was determined by subtracting the TNM calculated traffic component (based on traffic on the immediately adjacent street) from the measured ambient noise levels; and fourth, future noise levels were calculated by adding this non-adjacent street noise component to TNM model calculated traffic components based on traffic on the adjacent street, both with and without the proposed actions.

E. EXISTING CONDITIONS

STUDY AREA GENERAL DESCRIPTION

The proposed area for rezoning is located in Downtown Brooklyn and is roughly bounded by Tillary Street to the north, Schermerhorn Street to the south, Adams Street to the west, and Ashland Place to the east. The area is very heavily trafficked and contains commercial and retail uses, in addition to residential and other noise sensitive uses. The majority of development area is zoned commercial (C6), with a small area that is zoned R6 and a small area that is zoned M1. The commercial and manufacturing zoned areas are within an N3 Ambient Noise Quality Zone (ANQZ). $L_{eq(1)}$ noise level limits for this type of zone are 70 dBA for both daytime (7 AM to 10 PM) and nighttime (10 PM to 7 AM) hours. The residential zoned areas are within an N2 Ambient Noise Quality Zone (ANQZ). $L_{eq(1)}$ noise level limits for this type of zone are 65 dBA for daytime (7 AM to 10 PM) and 55 dBA for nighttime (10 PM to 7 AM) hours.

SELECTION OF NOISE RECEPTOR LOCATIONS

Based on the screening analysis, 16 locations were identified as areas where project-generated traffic would have the potential to cause significant increases in noise levels or noise impacts. In addition, these 16 receptors were also selected to determine the levels of attenuation that would be necessary to comply with CEQR interior noise standards. See Figure 17-1 for receptor site locations. Site 1 was located on Bridge Street between Willoughby and Fulton Streets; Site 2 was located on Duffield Street between Willoughby and Fulton Streets; Site 3 was located on Albee Square West/Gold Street between Willoughby Street and DeKalb Avenue; Site 4 was located on Gallatin Place between Fulton and Livingston Streets; Site 5 was located on Fulton Street between Hanover Place and Bond Street; Site 6 was located on Fleet Street between DeKalb Avenue and Flatbush Avenue Extension; Site 7 was located at the intersection of Flatbush Avenue Extension and Prince Street; Site 8 was located on Livingston Street between Bond and Hoyt Streets; Site 9 was located on Willoughby Street between Bridge and Duffield Streets; Site 10 was located on Flatbush Avenue between Lafayette Avenue and Hanson Place; Site 11 was located at the southwest corner of the Ashland Place and Myrtle Avenue intersection; Site 12 was located on Myrtle Avenue between Prince Street and Ashland Place; Site 13 was located on Gold Street between Johnson Street and Flatbush Avenue Extension; Site 14 was located on Tillary Street between Jay and Bridge Streets; Site 15 was located on Adams Street between Tillary and Johnson Streets; and Site 16 was located on Fulton Street between Adams and Jay Streets.

NOISE MONITORING

Noise monitoring at the receptor locations was performed in year 2003 on May 29 and June 3, 12 and 17. At each of these sites, 20-minute measurements were made during the AM (7:30–10:00 AM), midday (MD) (11:00 AM–3:00 PM), and PM (4:30–6:30 PM) weekday peak periods. 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°F and below 122°F. Consistent with CEQR practice and to maximize possible project impacts, noise from aircraft activity in the project area was excluded from the noise measurements.

EQUIPMENT USED DURING NOISE MONITORING

The instrumentation used for the 20-minute measurements of mobile source noise was a Brüel & Kjær Type 4176 ½-inch microphone connected to a Larson Davis Laboratories (LDL) preamplifier attached to an LDL Model 700 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. All measurement procedures conformed with the requirements of ANSI Standard S1.13-1971 (R1976).

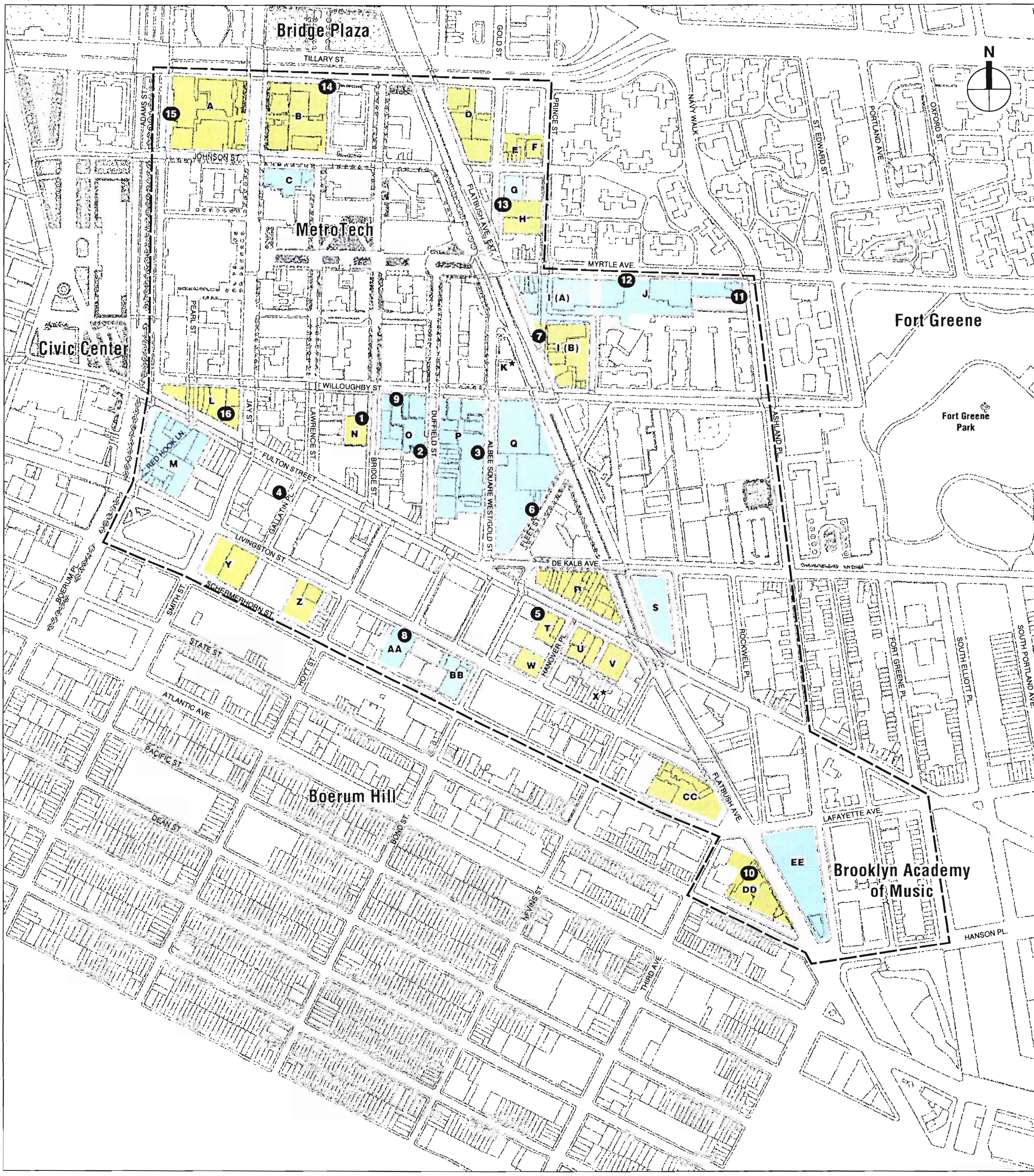
RESULTS OF BASELINE MEASUREMENTS

Noise monitoring results of the 16 receptor sites are shown in Table 17-8. Noise levels at all 16 sites are relatively high and reflect the heavy traffic volumes. In terms of CEQR standards, existing noise levels at all sites with the exception of Sites 1, 3, and 6 are in the "marginally unacceptable" category. The existing noise levels at Sites 1, 3, and 6 are in the "marginally acceptable" category.

Table 17-8
Existing Noise Levels (in dBA)

Site	Location	Time	Measured Values				
			$L_{eq(1)}$	L_1	L_{10}	L_{50}	L_{90}
1	Bridge Street between Willoughby and Fulton Streets	AM	64.4	71.7	67.2	62.7	60.2
		MD	66.6	76.5	69.0	63.0	61.0
		PM	63.3	72.7	65.7	60.2	58.2
2	Duffield Street between Willoughby and Fulton Streets	AM	64.9	75.2	67.7	61.7	57.7
		MD	69.4	76.0	72.5	67.5	63.5
		PM	66.2	74.0	68.4	64.2	62.4
3	Albee Square West/Gold Street between Willoughby Street and DeKalb Avenue	AM	65.1	75.2	67.7	62.2	58.7
		MD	66.1	75.0	69.0	63.5	60.0
		PM	67.6	75.2	69.7	66.2	63.7
4	Gallatin Place between Fulton and Livingston Streets	AM	70.8	80.2	74.7	66.2	62.7
		MD	76.6	85.5	80.0	73.0	68.5
		PM	65.0	72.2	67.2	63.2	61.2
5	Fulton Street between Hanover Place and Bond Street	AM	71.3	82.7	75.2	64.7	60.2
		MD	71.1	80.0	74.5	68.5	64.5
		PM	72.5	81.2	75.7	70.7	66.2
6	Fleet Street between DeKalb Avenue and Flatbush Avenue Extension	AM	63.6	70.0	66.0	62.2	59.6
		MD	65.8	71.5	67.5	64.5	63.5
		PM	64.7	69.8	66.0	63.6	62.6
7	Intersection of Flatbush Avenue Extension and Prince Street	AM	71.3	79.2	72.8	69.0	65.0
		MD	74.3	82.0	77.0	72.5	66.5
		PM	69.5	77.4	71.6	67.8	63.4

4.29.04



Project Area Boundary

Projected Development Site

Potential Development Site

Noise Receptor Site

* Since the issuance of the DEIS/DSEIS, Sites K and X have been removed from the proposed development plan

Noise Receptor Locations

Figure 17-1

Table 17-8
Existing Noise Levels (in dBA) (cont'd)

Site	Location	Time	Measured Values				
			$L_{eq(1)}$	L_1	L_{10}	L_{50}	L_{90}
8	Livingston Street between Bond and Hoyt Streets	AM	71.3	81.0	74.2	67.2	63.4
		MD	68.2	77.2	71.2	65.0	62.2
		PM	70.5	80.6	73.2	67.4	63.6
9	Willoughby Street between Bridge and Duffield Streets	AM	66.4	75.4	68.0	63.8	61.6
		MD	69.4	76.8	71.4	68.0	65.2
		PM	67.5	75.8	70.2	65.2	62.6
10	Flatbush Avenue Between Lafayette Avenue and Hanson Place	AM	72.7	81.0	75.8	70.6	65.6
		MD	72.5	79.4	76.0	70.4	62.8
		PM	72.1	79.0	75.4	70.0	65.2
11	Southwest corner of Ashland Place and Myrtle Avenue	AM	67.7	78.0	69.5	64.0	60.0
		MD	69.7	79.0	70.0	64.5	59.5
		PM	69.6	79.5	72.5	66.0	61.0
12	Myrtle Avenue between Prince Street and Ashland Place	AM	66.5	75.0	69.0	63.5	59.0
		MD	66.8	76.0	70.0	64.0	59.5
		PM	68.8	80.5	71.0	65.5	60.5
13	Gold Street between Johnson Street and Flatbush Avenue Extension	AM	68.4	76.5	71.0	66.5	63.5
		MD	68.7	73.5	70.5	68.5	63.0
		PM	67.9	78.5	69.5	65.5	62.0
14	Tillary Street between Jay and Bridge Streets	AM	73.3	81.5	75.5	70.5	67.0
		MD	74.8	83.0	76.0	70.0	65.0
		PM	73.1	85.5	74.0	68.5	64.5
15	Adams Street between Tillary and Johnson Streets	AM	68.2	75.8	70.4	66.6	63.2
		MD	70.4	80.4	73.0	67.4	64.8
		PM	68.1	74.2	71.4	65.8	62.6
16	Fulton Street between Adams and Jay Streets	AM	72.0	81.6	75.0	68.4	64.2
		MD	73.3	81.6	76.0	70.4	66.0
		PM	74.6	82.6	77.6	72.4	68.2

Note: Measurements performed by AKRF, Inc. on May 29, 2003 and June 3, 12 and 17, 2003.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

Table 17-9 shows noise levels for future year 2013 conditions without the proposed actions (based on No Build traffic conditions) at the 16 receptor locations for the three analysis periods. These values were calculated using the methodology described above. With the exception of Sites 1 and 2, future noise levels were calculated using proportional modeling techniques. Future noise levels at Sites 1 and 2 were calculated using the TNM model.

Future No Build noise levels without the project are not expected to be significantly higher than existing levels. Traffic is the dominant noise source, and future traffic without the proposed actions will not be significantly increased when compared with existing volumes. At each of the 16 receptor sites, noise levels in the year 2013 will increase by less then 1.6 dBA. Change of this magnitude would be imperceptible and insignificant.

Table 17-9
Future No Build Noise Levels (in dBA)

Site	Time	Existing Leq(1)	2013 No Build Leq(1)	Change
1	AM	64.4	64.6	0.2
	MD	66.6	66.9	0.3
	PM	63.3	63.7	0.4
2	AM	64.9	65.1	0.2
	MD	69.4	69.6	0.2
	PM	66.2	66.4	0.2
3	AM	65.1	65.3	0.2
	MD	66.1	66.3	0.2
	PM	67.6	67.8	0.2
4	AM	70.8	71.0	0.2
	MD	76.6	76.8	0.2
	PM	65.0	65.2	0.2
5	AM	71.3	72.0	0.7
	MD	71.1	71.7	0.6
	PM	72.5	73.2	0.7
6	AM	63.6	64.8	1.2
	MD	65.8	66.8	1.0
	PM	64.7	65.9	1.2
7	AM	71.3	71.4	0.1
	MD	74.3	74.4	0.1
	PM	69.5	69.6	0.1
8	AM	71.3	72.5	1.2
	MD	68.2	69.1	0.9
	PM	70.5	71.5	1.0
9	AM	66.4	66.9	0.5
	MD	69.4	69.8	0.4
	PM	67.5	68.0	0.5
10	AM	72.7	73.5	0.8
	MD	72.5	73.4	0.9
	PM	72.1	73.0	0.9
11	AM	67.7	68.1	0.4
	MD	69.7	70.2	0.5
	PM	69.6	70.1	0.5
12	AM	66.5	67.0	0.5
	MD	66.8	67.4	0.6
	PM	68.8	69.3	0.5
13	AM	68.4	68.6	0.2
	MD	68.7	68.9	0.2
	PM	67.9	68.1	0.2
14	AM	73.3	74.2	0.9
	MD	74.8	75.7	0.9
	PM	73.1	73.8	0.7
15	AM	68.2	69.3	1.1
	MD	70.4	71.5	1.1
	PM	68.1	69.2	1.1
16	AM	72.0	73.5	1.5
	MD	73.3	74.3	1.0
	PM	74.6	76.0	1.4

In terms of CEQR standards, the future No Build noise levels at all sites, with the exception of Sites 1, 3, 4, and 6, would remain in the "marginally unacceptable" category. Future No Build noise levels at Sites 1, 3, and 6 would remain in the "marginally acceptable" category. At Site 4, future No Build noise levels would change from the "marginally unacceptable" category to the "clearly unacceptable" category.

G. THE FUTURE WITH THE PROPOSED ACTIONS

Table 17-10 presents future 2013 noise levels at the 16 receptor sites with the development of the projected development sites. Noise levels were calculated using the methodology described above. With the exception of Sites 1 and 2, future noise levels were calculated using proportional modeling techniques. Future noise levels at Sites 1 and 2 were calculated using the TNM model.

Table 17-10
Future Build Noise Levels (in dBA)

Site	Time	2013 No Build Leq(1)	2013 Build Leq(1)	Change
1	AM	64.6	66.2*	1.6
	MD	66.9	68.8	1.9
	PM	63.7	65.6	1.9
2	AM	65.1	68.5*	3.4
	MD	69.6	70.4*	0.8
	PM	66.4	67.3	0.9
3	AM	65.3	67.4	2.1
	MD	66.3	68.1	1.8
	PM	67.8	69.2	1.4
4	AM	71.0	71.0	0.0
	MD	76.8	76.8	0.0
	PM	65.2	65.2	0.0
5	AM	72.0	72.0	0.0
	MD	71.7	71.7	0.0
	PM	73.2	73.2	0.0
6	AM	64.8	65.0	0.2
	MD	66.8	67.0	0.2
	PM	65.9	66.0	0.1
7	AM	71.4	71.4	0.0
	MD	74.4	74.4	0.0
	PM	69.6	69.6	0.0
8	AM	72.5	73.1	0.6
	MD	69.1	69.8	0.7
	PM	71.5	71.9	0.4
9	AM	66.9	69.2	2.3
	MD	69.8	71.8	2.0
	PM	68.0	70.0	2.0
10	AM	73.5	73.6	0.1
	MD	73.4	73.5	0.1
	PM	73.0	73.1	0.1
11	AM	68.1	68.5	0.4
	MD	70.2	70.5	0.3
	PM	70.1	70.2	0.1

Table 17-10
Future Build Noise Levels (in dBA) (cont'd)

Site	Time	2013 No Build Leq(1)	2013 Build Leq(1)	Change
12	AM	67.0	67.3	0.3
	MD	67.4	67.7	0.3
	PM	69.3	69.5	0.2
13	AM	68.6	68.7	0.1
	MD	68.9	69.0	0.1
	PM	68.1	68.4	0.3
14	AM	74.2	74.5	0.3
	MD	75.7	76.0*	0.3
	PM	73.8	74.0	0.2
15	AM	69.3	69.4	0.1
	MD	71.5	71.6	0.1
	PM	69.2	69.4	0.2
16	AM	73.5	73.6	0.2
	MD	74.3	74.5	0.3
	PM	76.0	76.4	0.4

Note:
* Values calculated using TNM Modeling.

In terms of CEQR standards, with the exception of Sites 1 and 3, future noise levels with the proposed actions at all sites would remain the same, such that Sites 2, 5, and 7 through 16 would remain in the "marginally unacceptable" category. Site 6 would remain in the "marginally acceptable" category, and Site 4 would remain in the "clearly unacceptable" category. Sites 1 and 3 would change from the "marginally acceptable" category to the "marginally unacceptable" category.

With the exception of Site 2, future noise levels with the proposed actions at all of the analysis sites would increase by less than 3 dBA during all of the analysis periods compared to future noise levels without the proposed actions. (Noise levels at Sites 1, 4 through 8, and 10 through 16 would increase by less than 2 dBA, an imperceptible and insignificant increase. Noise levels at Sites 3 and 9 would increase by less than 3 dBA, a barely perceptible and insignificant increase.) Consequently, with the exception of Site 2, the development of the projected development sites would not result in any significant increases in noise levels.

At Site 2, during the MD and PM peak periods, future noise levels with the proposed actions would increase by less than 2 dBA compared to future noise levels without the proposed actions, an imperceptible and insignificant increase. However, during the AM peak period, future noise levels with the proposed actions would increase by up to 3.4 dBA compared to future noise levels without the proposed actions. Increases of this magnitude would be perceptible and, based upon CEQR noise impact criteria, would constitute a significant noise impact. This impact occurs because of the relatively low volumes at this location without the proposed actions, and the number of vehicles (particularly trucks) generated by the development expected on this street and in the surrounding area. While there are a few residences currently on Duffield Street between Willoughby and Fulton Streets, with the proposed actions these residences would be replaced with commercial/office/retail buildings (projected development sites O and P). While no residences would be impacted with the proposed actions, the increase in noise levels at Site 2, during the AM peak period would exceed the CEQR impact criteria and thus, the project would have a significant noise impacts at this location. There is no feasible mitigation to eliminate this impact at this site during this time period, and thus it constitutes an unmitigated project impact.

In addition, as part of the development that would occur with the proposed actions, a 1.15-acre public space, Willoughby Square, is proposed to be built over the below-grade public parking facility at Site 2. Based upon the Site 2 analysis results, L_{10} noise levels of approximately 69 to 73 dBA would be expected at this new public space. These noise levels would be higher than those generally recommended for outdoor activities (i.e., they would exceed the CEQR Exposures Guideline value of 55 dBA L_{10} for this use, shown in Table 17-5), but would be comparable to levels in existing parks in New York City which are adjacent to moderately to heavily trafficked streets and roadways. This exceedance of the CEQR Exposure Guideline value would result in elevated noise levels on future public space users. There are no feasible mitigation measures to reduce noise levels within an urban public space such as this to within recommended levels for this type of use.

ATTENUATION REQUIREMENTS

As shown in Table 17-6, the 2001 *CEQR Technical Manual* has set noise attenuation values 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, and are determined based on exterior $L_{10(1)}$ noise levels.

Based on the measured L_{10} noise levels, levels of building attenuation needed to achieve interior noise levels of 45 dBA or lower are shown in Table 17-11. In general, 20 to 25 dBA of building attenuation can be achieve with double glazed windows and alternative means of ventilation, such as window-sleeve air conditioning units; 30 dBA of building attenuation can be achieved with double glazed windows with good sealing properties and alternative means of ventilation such as well-sealed through-the-wall air conditioning, or central air conditioning; and 35 to 40 dBA of building attenuation can be achieve with double glazed windows with good sealing properties and alternative means of ventilation such as central air conditioning. Based upon the $L_{10(1)}$ values measured at the analysis sites, a maximum of 40 dBA of building attenuation would be required. The provision for providing sufficient building attenuation would be mandated by placing an E designation on the projected and potential development sites (see Table 17-11 or Tables 1-3 and 1-4 in Chapter 1 for a list of the affected blocks and lots). The text of the E designation would state that in order to ensure an acceptable interior noise environment at the projected and potential development sites, future uses on the sites must provide a minimum window/wall attenuation of either 25, 30, 35, or 40 dBA (depending on the site). Noise attenuation measures could include the installation of double- or triple-glazed windows, central air conditioning, air conditioning sleeves containing air conditioners, or HUD-approved fans. Prior to development on these sites, the New York City Department of Buildings would be furnished with a report from DEP stating that the environmental requirements related to the E designation have been met.

In addition, mechanical equipment such as heating, ventilation, and air conditioning (HVAC), and elevator motors would utilize sufficient noise reduction devices to comply with applicable noise regulations and standards.

Overall, with the specified attenuation measures, the proposed actions would not have any significant interior noise impacts, and would comply with all CEQR requirements.

Table 17-11
Minimum Building Attenuation to Comply With CEQR Requirements*

Site	Location	Time	L_{10} (dBA)	Building Attenuation (dBA)	Affected Blocks and Lots
1	Bridge Street between Willoughby and Fulton Streets	MD	71.2	30	B 152, L 37; B 145, L 8, 10, 13-15
2	Duffield Street between Willoughby and Fulton Streets	MD	73.7	30	B 145, L 26, 32; B 146, L 2, 7, 11-18
3	Albee Square West/Gold Street between Willoughby Street and DeKalb Avenue	PM	71.3	30	B 146, L 23, 29, 34-37, 41-43, 46-52
4	Gallatin Place between Fulton and Livingston Streets	MD	80.2	40	B 164, L 1, 13, 29, 31, 42-44
5	Fulton Street between Hanover Place and Bond Street	PM	76.4	35	B 160, L 18, 29; B 149, L 14, 15, 17, 19, 22, 26, 28, 30-34, 50; B 161, L, 27, 30, 33, B 2093, L1
6	Fleet Street between DeKalb Avenue and Flatbush Avenue Extension	MD	68.7	25	B 149, L 1, 49
7	Intersection of Flatbush Avenue Extension and Prince Street	MD	77.1	35	B 2060, L 22-27, 32, 122; B 2062; L 1, 5, 6, 17-19, 21, 23, 24, 103
8	Livingston Street between Bond and Hoyt Streets	AM	76.0	35	B 165, L 17-19, 29, 58
9	Willoughby Street between Bridge and Duffield Streets	MD	73.8	30	B 145, L 16, 18-22
10	Flatbush Avenue between Lafayette Avenue and Hanson Place	MD	77.0	35	B 174, L 9, 13, 18, 23, 24; B 2110, L 3; B 167, L 15, 16, 26, 28, 36, 42
11	Southwest corner of Ashland Place and Myrtle Avenue	PM	73.1	30	B 2061, L1
12	Myrtle Avenue between Prince Street and Ashland Place	PM	71.7	30	B2061, L1

Table 17-11
Minimum Building Attenuation to Comply With CEQR Requirements* (cont'd)

Site	Location	Time	L_{10} (dBA)	Building Attenuation (dBA)	Affected Blocks and Lots
13	Gold Street between Johnson Street and Flatbush Avenue Extension	AM	71.3	30	B 2049, L 2, 8; B 133, L 1, 5, 13, 15; B 134, L 1, 5, 30, 38, 41
14	Tillary Street between Jay and Bridge Streets	MD	77.2	35	B 131, L 1; B 142, L 1
15	Adams Street between Tillary and Johnson Streets	MD	74.2	30	B 128, L 1, 26
16	Fulton Street between Adams and Jay Streets	PM	79.4	35	B 144, L 1; B 150, L 1, 6, 10, 11, 19; B 153, L 3, 14, 15; B 154, L 1, 5, 11, 12, 36-40

Note: * The provision for providing sufficient building attenuation to comply with CEQR requirements will be mandated by placing an E designation on these lots.

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