A. INTRODUCTION

The proposed enlargement of Hylan Plaza Shopping Center at 2600 Hylan Blvd in Staten Island, New York (the proposed project) 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). However, the effect of ambient noise (e.g., noise from vehicular traffic) is addressed in this ~~attachment~~chapter, and an analysis is presented that determines the level of building attenuation necessary to ensure that the proposed building's interior noise levels satisfy applicable City Environmental Quality Review (CEQR) interior noise criteria.

PRINCIPAL CONCLUSIONS

The proposed project would not generate sufficient traffic to have the potential to cause a significant adverse noise impact. It is assumed that the building's mechanical systems would be designed to meet all applicable noise regulations and to avoid producing levels that would result in any significant increase in ambient noise levels. Therefore, the proposed project would not result in any significant adverse noise impacts related to building mechanical equipment.

Due to existing high levels of ambient noise in the area, building attenuation would be required to ensure that interior noise levels meet CEQR criteria. The proposed design for the building includes acoustically-rated windows and central air conditioning as an alternate means of ventilation. The proposed buildings would provide sufficient attenuation to achieve the CEQR interior $L_{10(1)}$ noise level guideline of 50 dBA or lower for retail uses.

B. ACOUSTICS 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 6-1**, the threshold of human hearing is defined as 0 dBA; 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.

In considering these values, it is important to note that the dBA scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of perceived loudness. Thus, the background noise in an office, at 50 dBA, is perceived as twice as loud as a library at 40 dBA. For most people to perceive an increase in noise, it must be at least 3 dBA. At 5 dBA, the change will be readily noticeable.

Table 6-1
Common Noise Levels

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

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

SOUND LEVEL DESCRIPTORS

Because the sound pressure level unit of dBA describes a noise level at just one moment and 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., one 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.

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 little, L_{eq} will approximately L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}.

For purposes of the proposed project, the L_{10} descriptor has been selected as the noise descriptor to be used in this noise impact evaluation. The one-hour L_{10} is the noise descriptor used in the *CEQR Technical Manual* noise exposure guidelines for City environmental impact review classification.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CEQR NOISE CRITERIA

The *CEQR Technical Manual* defines attenuation requirements for buildings based on exterior noise level (see **Table 6-2**). Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 50 dBA or lower for retail uses and are determined based on exterior $L_{10(1)}$ noise levels.

Table 6-2
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Unacceptable				Clearly Unacceptable
Noise Level With Proposed Action	$70 < L_{10} \leq 73$	$73 < L_{10} \leq 76$	$76 < L_{10} \leq 78$	$78 < L_{10} \leq 80$	$80 < L_{10}$
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)

Notes:
[A] The above composite window-wall attenuation requirements are for residential dwellings and community facility development. Commercial uses would require 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

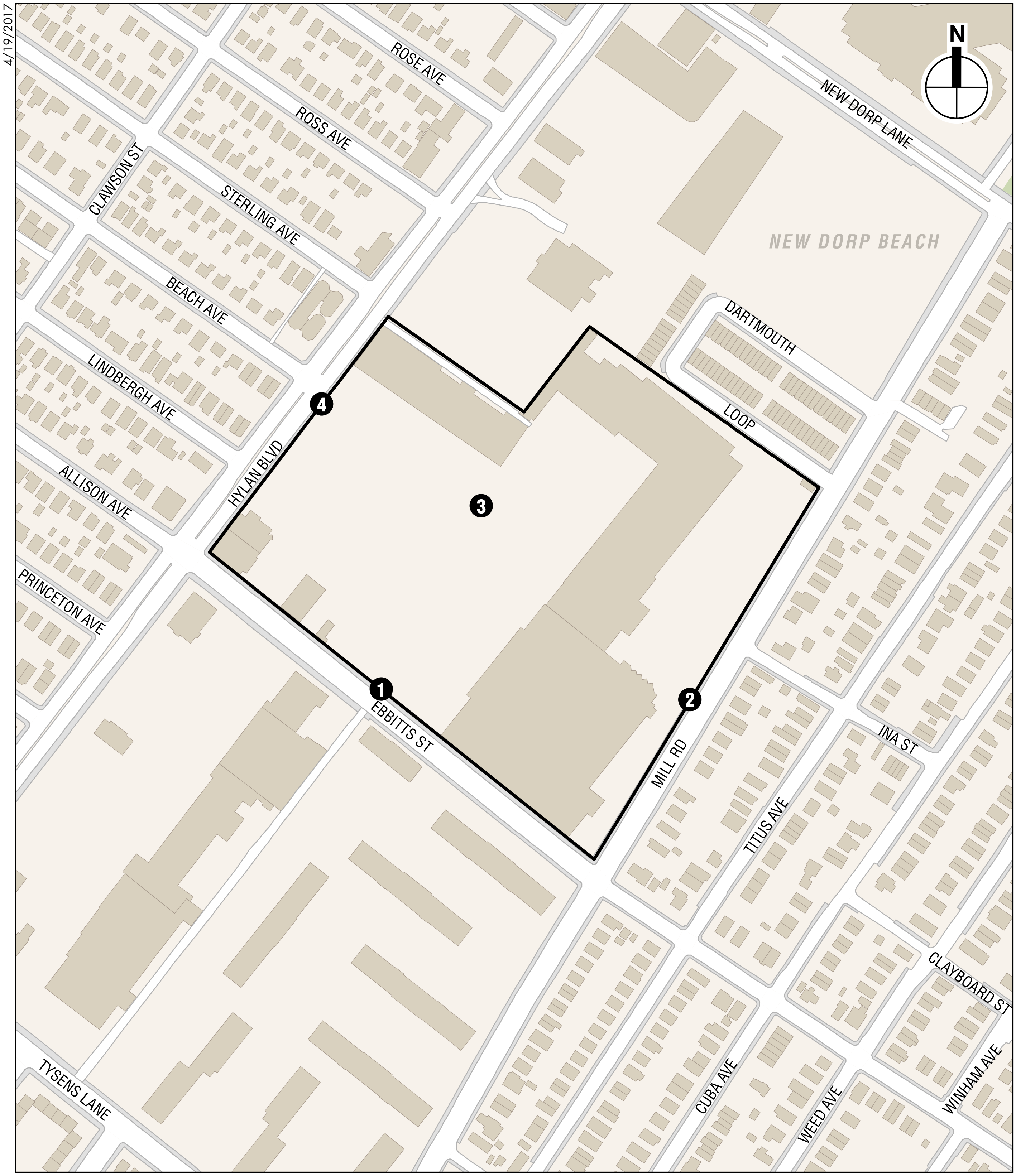
Existing noise levels at the project site were measured at four locations. As illustrated in **Figure 6-1**, receptor site 1 was located on Ebbitts Street between Hylan Boulevard and Mill Road; receptor site 2 was located on Mill Road between Ebbitts Street and Ina Street; receptor site 3 was located inside the Hylan Plaza parking lot; and receptor site 4 was located on Hylan Boulevard adjacent to Hylan Plaza Entrance.

At all receptor sites, the existing noise levels were measured for a 20-minute period during the two weekday peak periods—midday (MD) (12:00 PM to 2:00 PM) and PM (4:30 PM to 6:30 PM) and during the weekend peak period—Saturday midday (SAT MD) (12:00 PM to 2:00 PM). Measurements were taken June 13, 17 and 20, 2015.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using a Brüel & Kjær Sound Level Meter (SLM) Type 2260, a Brüel & Kjær ½-inch microphone Type 4189, and a Brüel & Kjær Sound Level Calibrator Type

4/19/2017



Project Site

Noise Receptor

0 400 FEET

Noise Receptor Locations
Figure 6-1

The Boulevard at Hylan Plaza

4231. The SLM has a valid laboratory calibration within 1 year, as is standard practice. The Brüel & Kjær SLM is a Type 1 instrument according to ANSI Standard S1.4-1983 (R2006). The microphone was mounted at a height of approximately five feet above the ground surface on a tripod and at least approximately 5 feet away from any large reflecting surfaces. The SLM was calibrated before and after readings with a Brüel & Kjær Type 4231 Sound Level Calibrator using the appropriate adaptor. Measurements were made on the 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}, L_{90}, and 1/3 octave band levels. 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 existing noise level measurements are summarized in **Table 6-3**.

Table 6-3
Existing Noise Levels in dBA

Site	Location	Time Period	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	Ebbitts Street between Hylan Boulevard and Mill Road	WD MD	63.5	71.5	66.4	61.9	67.5
		WD PM	62.3	69.4	65.9	60.4	55.7
		SAT MD	64.0	70.4	67.8	61.8	55.0
2	Mill Road between Ebbitts Street and Ina Street	WD MD	65.4	74.4	70.3	58.6	50.1
		WD PM	66.8	74.5	71.0	62.8	52.2
		SAT MD	64.4	72.4	68.3	60.6	52.0
3	Hylan Plaza Parking Lot	WD MD	63.1	73.3	65.0	60.4	56.3
		WD PM	62.4	69.4	64.9	60.0	55.7
		SAT MD	62.9	71.1	65.2	60.6	57.2
4	Hylan Boulevard adjacent to Hylan Plaza Entrance	WD MD	71.8	82.5	74.6	68.5	61.4
		WD PM	71.8	81.8	74.7	67.2	60.7
		SAT MD	70.1	78.4	73.4	67.2	62.3
Noise measurements were performed by AKRF, Inc. on June 13, 17 and 20, 2015.							

At each of the receptor sites, general vehicular traffic on adjacent roadways was the dominant noise source. Measured levels at the sites 1 and 3 are relatively low to moderate and measured levels at sites 2 and 4 are moderate to relatively high, reflecting the level of vehicular activity on the adjacent roadways. In terms of the CEQR criteria, the existing noise levels at sites 1 and 3 are in the “marginally acceptable” category and the existing noise levels at sites 2 and 4 are in the “marginally unacceptable” category.

E. NOISE PREDICTION METHODOLOGY

Future noise levels were calculated using a proportional modeling technique, which was used as a screening tool to estimate changes in noise levels. The proportional modeling technique is an analysis methodology recommended for analysis purposes in the *CEQR Technical Manual*. The noise analysis examined the weekday MD, PM and the Saturday MD peak hours at all receptor sites. The selected time periods are when development facilitated by the Proposed Project would be expected to produce maximum traffic generation (based on the traffic studies presented in ~~Attachment D~~Chapter 4, “Transportation”) and therefore result in the maximum noise level increases. The methodology used for the noise analysis is described below.

PROPORTIONAL MODELING

Proportional modeling was used to determine future noise levels at the project site. Proportional modeling is one of the techniques recommended in the *CEQR Technical Manual* for mobile source analysis.

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

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

where:

F NL = Future Noise Level

E NL = Existing Noise Level

F PCE = Future Noise PCEs

E PCE = Existing Noise PCEs

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

F. FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology described above, future No Action noise levels for the 2019 analysis year were determined at the four mobile source noise analysis receptor sites. These No Action noise levels are shown in **Table 6-4**.

In 2019, the maximum increase in $L_{eq(1)}$ noise levels for the No Action condition would be 1.6 dBA. Noise levels of this magnitude would be imperceptible. In terms of CEQR criteria, noise levels at receptor sites 1 and 3 would remain in the “marginally acceptable” category and noise levels at receptors sites 2 and 4 would remain in the “marginally unacceptable” category.

Table 6-4
2019 No Action Noise Levels (in dBA)

Receptor	Location	Time Period	Existing $L_{eq(1)}$	No Action $L_{eq(1)}$	$L_{eq(1)}$ Change	No Action $L_{10(1)}$
1	Ebbitts Street between Hylan Boulevard and Mill Road	WD MD	63.5	64.3	0.8	67.2
		WD PM	62.3	63.0	0.7	66.6
		SAT MD	64.0	64.9	0.9	68.7
2	Mill Road between Ebbitts Street and Ina Street	WD MD	65.4	66.7	1.3	71.6
		WD PM	66.8	67.7	0.9	71.9
		SAT MD	64.4	66.0	1.6	69.9
3	Hylan Plaza Parking Lot	WD MD	63.1	63.4	0.3	65.3
		WD PM	62.4	62.7	0.3	65.2
		SAT MD	62.9	63.2	0.3	65.5
4	Hylan Boulevard adjacent to Hylan Plaza Entrance	WD MD	71.8	72.1	0.3	74.9
		WD PM	71.8	72.0	0.2	74.9
		SAT MD	70.1	70.3	0.2	73.6

G. FUTURE WITH THE PROPOSED ACTIONS

Using the methodology described above, future With Action noise levels for the 2019 analysis year were determined at the four mobile source noise analysis receptor sites. These With Action noise levels are shown in **Table 6-5**.

Table 6-5
2019 With Action Noise Levels (in dBA)

Receptor	Location	Time Period	No Action $L_{eq(1)}$	With Action $L_{eq(1)}$	$L_{eq(1)}$ Change	With Action $L_{10(1)}$
1	Ebbitts Street between Hylan Boulevard and Mill Road	WD MD	64.3	64.4	0.1	67.3
		WD PM	63.0	63.1	0.1	66.7
		SAT MD	64.9	65.1	0.2	68.9
2	Mill Road between Ebbitts Street and Ina Street	WD MD	66.7	66.7	0.0	71.6
		WD PM	67.7	67.8	0.1	72.0
		SAT MD	66.0	66.1	0.1	70.0
3	Hylan Plaza Parking Lot	WD MD	63.4	63.9	0.5	65.8
		WD PM	62.7	63.3	0.6	65.8
		SAT MD	63.2	63.8	0.6	66.1
4	Hylan Boulevard adjacent to Hylan Plaza Entrance	WD MD	72.1	72.2	0.1	75.0
		WD PM	72.0	72.1	0.1	75.0
		SAT MD	70.3	70.4	0.1	73.7

In 2019, the maximum increase in $L_{eq(1)}$ noise levels for the With Action condition would be 0.6 dBA. Noise levels of this magnitude would be imperceptible and would not constitute a significant noise impact. In terms of CEQR criteria, noise levels at receptor sites 1 and 3 would remain in the “marginally acceptable” category and noise levels at receptors sites 2 and 4 would remain in the “marginally unacceptable” category.

H. NOISE ATTENUATION MEASURES

As shown in **Table 6-2**, the *CEQR Technical Manual* has set noise attenuation quantities for buildings based on exterior $L_{10(1)}$ noise levels in order to maintain interior noise levels of 50 dBA or lower for commercial/office uses. The results of the building attenuation analysis are summarized in **Table 6-6**.

Table 6-6
Minimum Building Attenuation

Building	Associated Noise Receptor Site	Maximum $L_{10(1)}$ (in dBA)	Attenuation Required[1] (in dBA)
Grocery	1	68.9	N/A[2]
E	4	75.0	26
F1	3	66.1	N/A[2]
F2, F3	2	72.0	23
G1, G2	3	66.1	N/A[2]
G3, G4	2	72.0	23

Notes: [1] The CEQR attenuation requirements shown are for commercial and retail use; residential and cinema/auditorium uses would require 5 dBA more attenuation.
[2] "N/A" indicates that the L_{10} value is less than 70 dB(A). The *CEQR Technical Manual* does not address noise levels this low, therefore there is no minimum attenuation guidance.

To implement the attenuation requirements shown in **Table 6-6**, an (E) designation for noise would be applied to the Hylan Plaza site (Block 3969 Lots 1, 6, 31, 35) specifying a requirement for the appropriate amount of window/wall attenuation and an alternate means of ventilation. The text for the (E) designation would be as follows:

To ensure an acceptable interior noise environment, the building façade(s) of future development at Block 3969 Lots 1, 6, 31, 35 must provide minimum composite building façade attenuation as shown in ***Table 6-6*** *of the Hylan Plaza Retail Development EAS to ensure an interior L_{10} noise level not greater than 50 dBA for commercial uses. To maintain a closed-window condition in these areas, an alternate means of ventilation that brings outside air into the building without degrading the acoustical performance of the building façade(s) must also be provided.*

The 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 wall, glazing, and any vents or louvers associated with the building mechanical systems in various ratios of area. The proposed design for the building includes acoustically-rated windows and central air conditioning as an alternate means of ventilation. The proposed building's façades, including these elements, would be designed to provide a composite Outdoor-Indoor Transmission Class (OITC) rating[1] greater than or equal to those listed in above in **Table 6-6**, along with an alternative means of ventilation. By adhering to these design specifications, the proposed buildings would provide sufficient attenuation to achieve the CEQR interior $L_{10(1)}$ noise level guideline of 50 dBA or lower for commercial or retail uses, which would be considered acceptable according to CEQR interior noise level guidelines.

[1] The OITC classification is defined by ASTM International (ASTM E1332) 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.

The existing buildings in the shopping center do not constitute sensitive receptors per section 124 of Chapter 19, “Noise,” in the *CEQR Technical Manual*. Since they are already occupied and the proposed project would not introduce new uses to these buildings, they are not subject to noise attenuation requirements as a result of the proposed actions. Consequently, no changes to the facades of these buildings would be required.

I. MECHANICAL EQUIPMENT

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