

A. INTRODUCTION

This chapter analyzes the effects of Alternatives B, C, and Preferred Alternative D on ambient noise and vibration levels. Noise can be generated by fixed facilities, referred to as “stationary sources,” and by moving sources, such as vehicular traffic, referred to as “mobile sources.”

A quantitative analysis of the stationary source noise levels and potential for impacts from vibrations that would result from the build alternatives was conducted. Based on this analysis, none of the build alternatives would result in significant adverse stationary source noise or vibration impacts.

Regarding mobile source noise, as described in Chapter 7, “Traffic and Transportation,” the 50th Street facility would generate a total of up to seven peak hour truck trips. This level of trip generation would not double the passenger car equivalents (PCEs) on any streets affected by the proposed project. Doubling of PCEs is the threshold for detailed mobile source noise analysis specified in the *City Environmental Quality Review (CEQR) Technical Manual*. Projects that do not meet or exceed this threshold, by definition, do not have the potential to cause significant adverse mobile source noise impacts. The *CEQR Technical Manual* provides relevant guidance for when detailed analysis should be performed for projects located in New York City. Based on this information, none of the build alternatives would result in significant adverse mobile source noise impacts.

B. METHODOLOGY

NOISE FUNDAMENTALS AND TERMINOLOGY

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 these effects on people have been studied extensively on an average or statistical basis, it should be noted that all the stated effects of noise on people can vary greatly with each 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. The dependence of perceived loudness on frequency is accounted for by using a weighting network that simulates the response of the human ear. For most noise assessments, the A-weighted sound pressure level, expressed in units of dBA, is used, due to 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 9-1.

**Table 9-1
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
Busy city street, loud shout	80
Busy traffic intersection	70
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
Background noise in an office	50
Suburban areas with medium density transportation	40
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 9-2). 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 estimation of an individual's probable perception of changes in noise levels.

Table 9-2
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., <i>Fundamentals and Abatement of Highway Traffic Noise</i> , Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.	

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} , 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.

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.

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

For the purposes of this project, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) or the day-night sound level (L_{dn}) have been selected as the noise descriptors to be used in the noise impact evaluation depending on land use category as described in the FTA guidance manual and Table 9-3 below.

FTA IMPACT NOISE CRITERIA

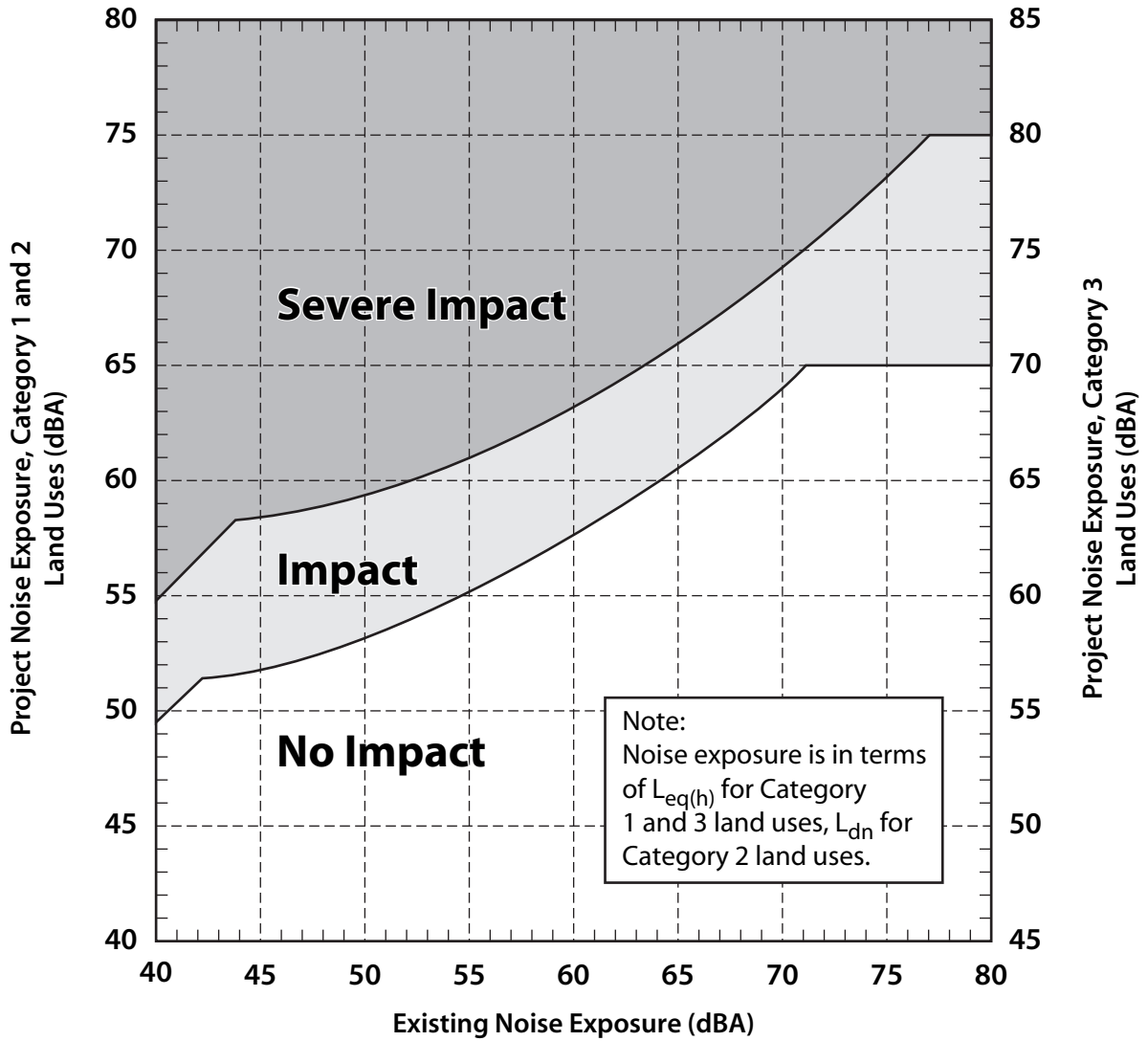
Noise levels associated with the operation of the build alternatives are subject to the noise standards defined by the FTA.

In April 1995, FTA issued its report, *Transit Noise and Vibration Impact Assessment*, as a guideline for the evaluation of noise and vibration levels resulting from mass transit projects, and the assessment of impacts that result. The noise analysis methodology in the FTA report determines operational noise impacts that result from mass transit projects based on peak-hour $L_{eq(1)}$ and 24-hour L_{dn} noise levels, depending on the land use category of the affected areas near the mass transit project. As described in Table 9-3, categories 1 and 3, which include land uses that are noise-sensitive, but where people do not sleep, require examination of a 1-hour L_{eq} for the noisiest peak hour. Category 2, which includes residences, hospitals, and other locations where nighttime sensitivity to noise is very important, use of L_{dn} is required.

Table 9-3
FTA’s Land Use Category and Metrics
for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq(h)}$	Tracts of land in which quiet is an essential element in the intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor $L_{dn(h)}$	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels, where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq(h)}$	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important—such as medical offices, conference rooms, recording studios, and concert halls—fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks, and recreational facilities are also included.
<p>Note: L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity. Source: <i>Transit Noise and Vibration Impact Assessment</i>, FTA, April 1995.</p>		

Using these noise descriptors, the FTA impact criteria are keyed to the noise level generated by the project (called “project noise exposure”) in locations of varying ambient noise levels. As shown in Figure 9-1, two types of impacts are defined for each land use category, depending on existing ambient noise levels. Thus, where existing noise levels are 40 dBA, for land use categories 1 and 2, the respective L_{eq} and L_{dn} noise exposures from the project would create impacts if they were above approximately 50 dBA, and would create severe impacts if they were above approximately 55 dBA. For category 3, a project noise exposure level above approximately 55 dBA would be considered an impact, and above approximately 60 dBA would be considered a severe impact. The difference between “severe impact” and “impact” is that the former denotes a change in noise level that a significant percentage of people would find annoying while the latter is indicative of a change in noise level noticeable to most people but not necessarily sufficient to result in strong adverse reactions from the community.



Source: Transit Noise and Vibration Impact Assessment, DOT-T-95-16, April 1995

NOISE ANALYSIS METHODOLOGY

The noise impact assessment predicted the effects of noise from stationary equipment at the 50th Street facility in Alternative B, C, and Preferred Alternative D. The methodology used to determine potential noise effects from the stationary noise included the following procedure:

- Determine receptor locations on the property line and at the closest noise-sensitive land uses within the adjacent study area where the maximum project noise levels would be likely to occur;
- Measure the existing ambient noise levels at the closest sensitive land uses within the adjacent study area;
- Determine individual equipment sound power noise levels based on available data and published material;
- Determine the location of individual equipment on the project sites and location and arrangement within the proposed facility;
- Estimate noise attenuation due to building structures and enclosures, and other factors;
- Calculate noise levels at the property lines and other sensitive receptor locations using attenuation correction terms; and
- Compare calculated noise levels with standards and existing ambient noise levels.

The closest noise-sensitive uses in the vicinity of the 50th Street facility are two commercial buildings located adjacent to the project site: the Colgate-Palmolive Building at 300 Park Avenue, to the east, and 437 Madison Avenue, to the west. These two buildings contain Category 3 uses, as described in Table 9-3. The Palace Hotel, which is located across 50th Street, is the closest Category 2 use to the project site. Elevated noise receptors, at approximately 150 feet above street level, were used to represent windows on these three nearby buildings at the same elevation as the 50th Street facility's rooftop cooling tower in Alternatives B and C. Noise receptors were also placed at windows one and two stories above the elevations of the rooftop cooling tower under these two alternatives, as well as on the sidewalk directly adjacent to the project site and across 50th Street. Under Preferred Alternative D, three additional receptors that would experience worst-case noise levels as a result of the relocation of certain project elements were also analyzed. These three receptors are located at ground level in the new public open space to be created as part of Preferred Alternative D; on the western façade of the Colgate-Palmolive Building at the height of the relocated exhaust/intake louvers for the tunnel ventilation fans; and on the southern façade of the Colgate Palmolive Building at the height of the relocated louvers for the emergency generator assist fans.

Equipment lists were prepared for the 50th Street facility. These lists included the number of operating units and the sound power levels generated by each piece of equipment. The equipment considered to generate potentially significant noise levels included emergency generators; emergency generator exhaust; tunnel ventilation fans; and the rooftop cooling tower. This equipment was then located in the facility coordinate system.

Octave band sound pressure levels, L_p , at receptor sites were calculated based on sound power levels using the following formula:

$$L_p = L_w - A_{div} - A_{atm} - A_{ground} - A_{screen} - A_{TL} - A_D - 0.6$$

where:

- L_w is the point source sound power level, in dB re: 1 picowatt;
- A_{div} is the attenuation due to geometrical divergence;
- A_{atm} is the attenuation due to atmospheric absorption;
- A_{ground} is the attenuation due to the ground effects;
- A_{screen} is the attenuation due to screening;
- A_{TL} is the attenuation due to sound transmission loss due to building partition (for equipment located inside a structure only); and
- A_D is the attenuation due to acoustical design features.

Sound power levels for each piece of equipment were determined based on published data from equipment manufacturers. The analysis included the following: attenuation due to geometric spreading; attenuation due to absorption by the air; attenuation due to ground effects (i.e., for hard ground absorption); attenuation due to shielding or obstructions; attenuation due to sound transmission loss due to building partitions; and attenuation due to acoustical design features, such as silencers, mufflers and acoustical louvers.

Attenuation levels from acoustical devices (silencers) that would be included on the emergency generators and tunnel ventilation fans were estimated based on manufacturers' insertion loss data from comparable equipment. The actual silencer attenuation would depend on the final selection of equipment to be used at the facilities.

The acoustic shielding provided by the barrier surrounding the proposed rooftop cooling tower was conservatively not included when predicting noise levels at receptors on adjacent buildings whose line of sight to the proposed cooling tower would be interrupted by this acoustic barrier.

The noise levels at receptor locations were calculated using distance correction terms and attenuation. Total stationary source noise levels at each receptor site were determined by logarithmically adding the contribution from each piece of equipment and comparing the total calculated noise levels to the applicable impact criteria.

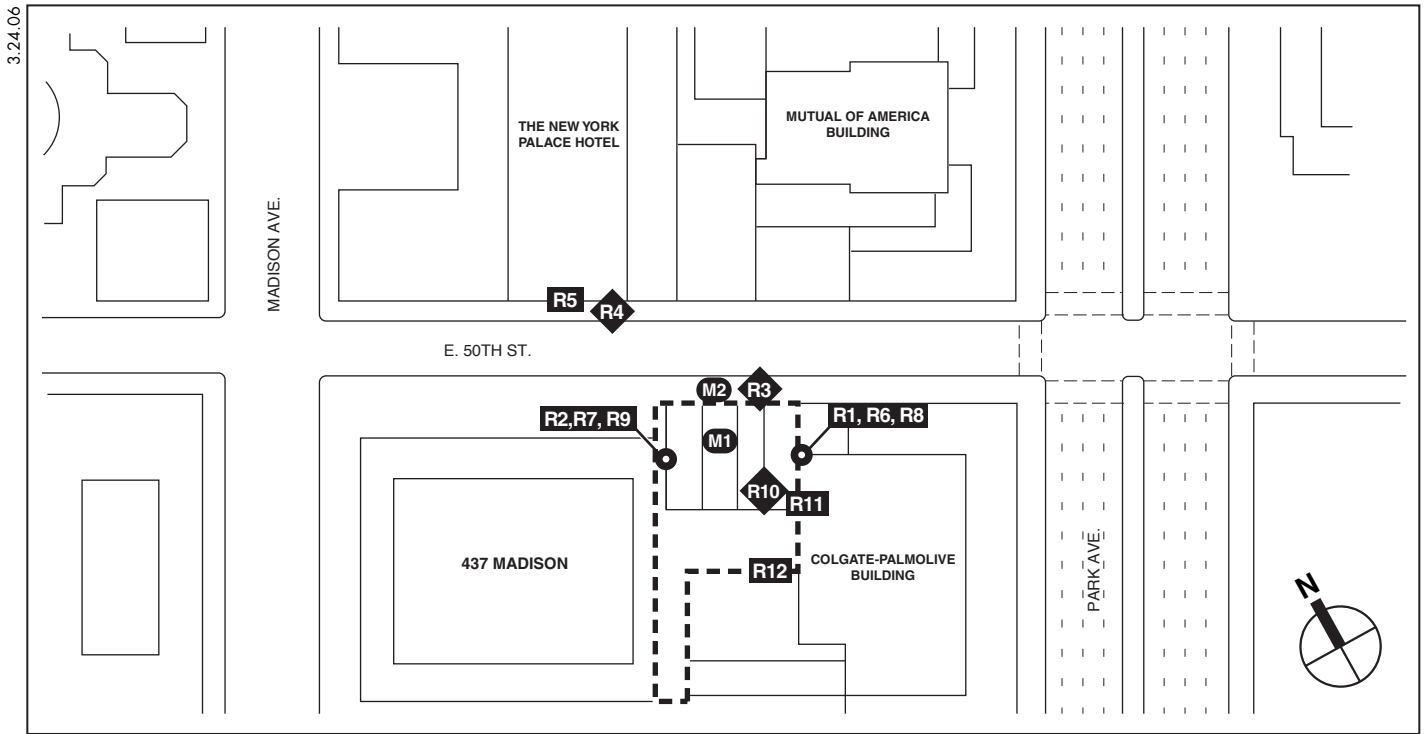
C. EXISTING CONDITIONS

NOISE MONITORING

The project site is located on the south side of 50th Street between Park and Madison Avenues. Two noise monitoring sites were selected as representative of existing ambient conditions in the vicinity of the project site (see Figure 9-2). The first monitoring site, labeled "M1" in Figure 9-2, was located on the roof of one of the existing buildings (46 East 50th Street) on the project site, and is considered representative of elevated receptors in the vicinity of the project site. The second monitoring site, labeled "M2" in Figure 9-2, was located at street level adjacent to the project site, and is considered representative of street-level receptors in the vicinity of the project site.

Noise measurements at the two noise monitoring locations were performed on November 21 through 25, 2003. At site M1, 24-hour continuous noise measurements were obtained during the weekday and weekend periods. At site M2, 20-minute spot-measurements were obtained during peak hours.

The instrumentation used for the continuous 24-hour measurements and 20-minute spot-measurements was a Brüel & Kjaer Type 4176 ½-inch microphone connected to a Brüel & Kjaer



----- Project Site Boundary

M1

Noise Monitoring Location

R5

Noise Modeling Location (Elevated Receptor)

R4

Noise Modeling Location (Sidewalk Receptor)

NOTE:

R1, R2, and R5 located at windows at same elevation as the cooling tower

R3 and R4 are located at sidewalk level

R6 and R7 are located at windows 1 story above cooling tower

R8 and R9 are located at windows 2 stories above cooling tower

R10 is located at ground level in the proposed public open space

R11 is located at the height of the tunnel ventilation louvers

R12 is located at the height of the generator assist fan louvers

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 or rooftop 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 & Kjaer Type 4231 sound-level calibrator using the appropriate adaptor. Measurements at each location were made on the A-scale (dBA). The data was 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 for the spot-measurements; 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°F and below 122°F. All measurement procedures conformed to the requirements of ANSI Standard S1.13-1971 (R1976).

RESULTS OF BASELINE MEASUREMENTS

The measured existing noise levels at the two noise monitoring sites are summarized in Tables 9-4 through 9-6. Traffic noise was the dominant noise source at both monitoring sites. Measured noise levels are relatively moderate and reflect the level of vehicular activity on 50th Street between Madison and Park Avenues.

**Table 9-4
Weekend 24-Hour Measured Noise Levels
at Site M1 (in dBA)**

Hour Ending	$L_{eq(1)}$	L_1	L_{10}	L_{50}	L_{90}
1 AM	67.4	75.4	68.1	66.6	65.5
2 AM	65.3	68.5	66.8	65.1	63.2
3 AM	64.0	67.0	65.4	63.8	62.1
4 AM	63.5	66.7	64.9	63.0	61.9
5 AM	63.8	67.1	65.3	63.5	62.0
6 AM	63.8	67.0	65.3	63.6	61.8
7 AM	64.2	68.6	65.6	63.6	61.9
8 AM	63.2	66.4	64.6	62.8	61.7
9 AM	64.4	70.5	65.3	63.4	62.2
10 AM	64.6	68.5	65.8	64.2	63.0
11 AM	64.5	67.7	65.8	64.2	63.1
Noon	65.1	68.0	66.4	64.9	63.5
1 PM	65.2	68.0	66.2	65.0	64.1
2 PM	66.0	69.6	67.1	65.5	64.4
3 PM	66.8	73.5	67.6	66.1	65.4
4 PM	66.6	73.3	67.6	65.9	64.0
5 PM	64.9	68.1	66.0	64.7	63.6
6 PM	66.4	75.7	67.0	64.9	63.9
7 PM	65.5	68.5	66.7	65.3	63.9
8 PM	66.5	70.4	67.6	66.2	65.4
9 PM	66.4	73.0	67.3	65.8	64.5
10 PM	67.0	76.3	66.7	65.2	63.9
11 PM	66.1	70.8	66.8	65.7	65.0
Midnight	65.9	67.9	66.7	65.8	65.1

Note: Field measurements were performed on November 22 and 23, 2003.

**Table 9-5
Weekday 24-Hour Measured Noise Levels
at Site M1 (in dBA)**

Hour Ending	L _{eq(t)}	L ₁	L ₁₀	L ₅₀	L ₉₀
1 AM	64.7	67.5	66.1	64.6	62.6
2 AM	63.4	66.8	64.8	62.8	61.7
3 AM	63.0	65.7	64.6	62.5	61.4
4 AM	63.9	66.4	65.4	63.9	61.6
5 AM	63.1	66.3	65.0	62.4	61.4
6 AM	63.0	66.4	64.6	62.5	61.4
7 AM	64.5	67.7	65.8	64.2	63.0
8 AM	66.0	68.7	67.2	65.8	64.6
9 AM	67.2	71.1	68.7	66.8	65.3
10 AM	68.0	72.1	69.6	67.6	66.1
11 AM	67.7	70.2	68.8	67.6	66.2
Noon	68.2	72.3	69.1	67.8	67.0
1 PM	68.7	74.7	69.0	67.9	67.2
2 PM	67.9	75.3	68.5	67.2	66.2
3 PM	68.0	70.2	69.0	67.8	66.9
4 PM	68.1	69.9	68.7	68.0	67.3
5 PM	69.0	76.1	69.3	68.1	67.3
6 PM	68.2	71.9	69.1	67.9	67.1
7 PM	68.3	70.1	69.1	68.2	67.4
8 PM	68.1	72.4	68.9	67.6	66.6
9 PM	67.1	69.8	68.0	67.0	65.9
10 PM	67.1	69.8	68.0	67.0	65.8
11 PM	66.3	71.4	67.4	66.0	64.6
Midnight	66.7	69.1	67.7	66.6	65.6

Note: Field measurements were performed on November 24 and 25, 2003.

**Table 9-6
Existing Noise Levels at Site M2
(in dBA)**

Site	Location	Time	L _{eq(t)}	L ₁	L ₁₀	L ₅₀	L ₉₀
2	North sidewalk adjacent to project site	AM	75.8	82.6	78.6	74.4	69.0
		MD	74.3	83.6	77.4	70.8	66.6
		PM	NA	NA	NA	NA	NA

Note: Field measurements were performed by AKRF, Inc. on November 24, 2003.

D. ALTERNATIVE A (NO ACTION ALTERNATIVE)

In Alternative A, the no action alternative, which was analyzed as the build alternative in the Final Environmental Impact Statement (FEIS) prepared for the East Side Access Project, dated March 2001, ventilation of the tunnel, cavern, and concourse areas would have been accomplished via street-level grates located on 49th and 50th Streets, between Park and Madison Avenues. Noise from intake or exhaust air flow through these street-level grates would not be noticeable. No other noise sources would be introduced into the vicinity of the 50th Street facility with Alternative A. As a result, noise levels with Alternative A would be comparable to existing noise levels.

E. PROBABLE IMPACTS OF BUILD ALTERNATIVES

ALTERNATIVE B (50TH STREET FACILITY WITHOUT THROUGH DRIVE)

An assessment of potential noise impacts from stationary sources to be located in the 50th Street facility under Alternative B was performed for the operating conditions described below. This assessment included the effect of several noise control measures that would be incorporated into the 50th Street facility, including: 90-degree bends in the inlets and outlets to space ventilation units and blowers; silencers on the tunnel ventilation fans; dampers, sound absorption lining, and/or silencers, elsewhere, where applicable; a lined duct plenum located between the emergency generators and the exterior louvers; a muffler for the generator exhaust; and 3-foot silencers for the generator makeup fans. The assessment of potential noise impacts conservatively did not include the shielding effect of an acoustic barrier, approximately 32 feet in height, which would surround the proposed rooftop cooling tower.

PROJECTED OPERATING CONDITIONS

Four operating conditions were examined for Alternative B, as follows: daytime peak load operation; daytime off-peak load operation; daytime testing mode; and nighttime off-peak load operation.

For peak daytime operation, all three of the cooling tower cells would operate at 80 percent capacity, three chillers, condensers, and pumps would also operate at 80 percent capacity, and the tunnel ventilation fans would operate at 50 percent capacity (i.e., two of the four fans would operate), at 100 percent fan speed. The tunnel ventilation fans would be operated at this setting when the tunnels are congested with train traffic, during the summer and possibly portions of the spring and fall seasons. Conservatively, this setting was used to model the peak daytime operating condition year round.

For off-peak daytime operation, two of the three cooling tower cells would operate at 80 percent capacity, two chillers, condensers, and pumps would also operate at 80 percent capacity, and the tunnel ventilation fans would operate at 50 percent capacity, 100 percent fan speed. Although the tunnel ventilation fans would only be operated at this setting when the tunnels are congested with train traffic, during the summer and possibly portions of the spring and fall seasons, this setting was conservatively used to model the off-peak daytime operating condition, year round.

Monthly equipment maintenance testing, which would occur only during weekday daytime hours between 9 AM and 5 PM, would be performed using typical daytime peak load operating conditions. The following additional equipment would also be operated: the two emergency

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generators, run sequentially for 30 minutes each at 50 percent of full-rated load, two make-up fans and the load bank.

For nighttime operation, a single cooling tower cell would operate at 80 percent capacity, and one condenser and pump would operate at 80 percent capacity. Also, a single chiller would operate at 80 percent capacity, and the tunnel ventilation fans would operate at 25 percent capacity, 100 percent fan speed. The tunnel ventilation fans would be operated at this setting when the tunnels are not congested with train traffic, and the outside ambient temperature is 89 degrees or higher. Conservatively, this setting was used to model the nighttime operating condition year round.

PREDICTED FUTURE NOISE LEVELS

Tables 9-7 through 9-10 show project-generated noise levels at nine modeled receptor locations for each operating condition under Alternative B: daytime peak load operation; daytime testing mode operation; daytime off-peak load operation; and nighttime operation. Appendix F, "Noise," provides support for the analysis, including FTA operational noise calculation spreadsheets (Appendix F-1), FTA construction noise analysis spreadsheets (Appendix F-2), and CEQR operational noise analysis calculation spreadsheets (Appendix F-3).

Table 9-7
Predicted Future Build Noise Levels: Alternative B
Daytime Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.3	No Impact	63.5
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.2	64.7	70.1	48.4	No Impact	63.3
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	41.7	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	40.3	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	44.7	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	56.0	No Impact	63.9
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	52.9	No Impact	63.6
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	49.6	No Impact	63.4
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	46.5	No Impact	63.3

Notes:

¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.

² Total project-generated noise level.

³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-8
Predicted Future Build Noise Levels: Alternative B
Daytime Testing Mode Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	64.5	65.5	70.9	57.6	No Impact	65.3
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	64.5	65.5	70.9	58.0	No Impact	65.4
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	53.0	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	51.2	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	53.7	No Impact	71.7
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	59.3	No Impact	65.6
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	59.0	No Impact	65.6
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	57.3	No Impact	65.3
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	58.1	No Impact	65.4

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-9
Predicted Future Build Noise Levels: Alternative B
Daytime Off-Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.2	64.7	70.1	49.5	No Impact	63.4
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.2	64.7	70.1	46.6	No Impact	63.3
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	40.6	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	39.1	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	43.0	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	54.2	No Impact	63.7
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.2	No Impact	63.5
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	47.9	No Impact	63.3
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	44.8	No Impact	63.3

Notes:

¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.

² Total project-generated noise level.

³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-10
Predicted Future Build Noise Levels: Alternative B
Nighttime Off-Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.0	64.6	70.0	46.5	No Impact	63.1
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.0	64.6	70.0	43.7	No Impact	63.1
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	63.0	64.6	70.0	37.3	No Impact	63.0
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	35.9	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	39.8	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	51.1	No Impact	63.3
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	48.2	No Impact	63.1
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	44.8	No Impact	63.1
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	41.9	No Impact	63.0

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

The nine receptor locations (R1–R9) at which noise levels were modeled for Alternative B are shown in Figure 9-2. Receptors R1, R2, and R5 represent windows on the adjacent buildings located approximately 150 feet above street level, at the same elevation as the proposed facility’s rooftop cooling tower. As described above, the acoustic shielding provided by the barrier surrounding the proposed rooftop cooling tower was conservatively not included when predicting noise levels for these receptors. Receptors R3 and R4 represent street-level uses adjacent to and across the street from the project site, respectively. Receptors R6 and R7 represent windows on adjacent buildings located one story above the top of the proposed cooling tower. Receptors R8 and R9 represent windows on adjacent buildings located two stories above the top of the proposed cooling tower. For noise analysis purposes, all windows were conservatively assumed to be open, and no window/wall attenuation was utilized.

Existing noise levels for modeled receptors R1–R9 were estimated from the existing levels measured at noise monitoring sites M1 and M2. For modeled receptors R1–R3 and R6–R9, the lowest L_{eq(1)} existing ambient noise level measured at either site M1 or site M2 during the time period corresponding to the operating condition being analyzed was conservatively used. For

modeled receptors R4 and R5, the L_{dn} existing ambient noise level was calculated from the 24-hour measurements conducted at monitoring site M1.

Noise levels due to operation of the 50th Street facility in Alternative B would be below the FTA noise impact criteria. Consequently, based on FTA noise impact criteria, the proposed project would not result in any significant adverse noise impacts.

Although the proposed project is not subject to local noise standards or criteria, an analysis was performed to evaluate project-generated noise levels based on New York City CEQR standards for informational purposes. Based on the results of this analysis, project-generated noise increments would not exceed the CEQR impact threshold, which is a 3 dBA increase over existing noise levels.

ALTERNATIVE C (50TH STREET FACILITY WITH THROUGH DRIVE)

An assessment of potential noise impacts from stationary sources for Alternative C was performed using the same methodology and four operating conditions previously described. Noise attenuation features (i.e., silencers, etc.) that would be included in the design of the 50th Street facility in this alternative were accounted for in the analysis. Tables 9-11 through 9-14 show future noise levels under this alternative at the nine receptor locations analyzed. Noise levels due to operation of Alternative C would be below FTA noise impact criteria, and thus would not result in any significant adverse noise impacts. Project-generated noise increments under this alternative also would not exceed the CEQR impact threshold.

PREFERRED ALTERNATIVE D (50TH STREET FACILITY WITH THROUGH DRIVE AND PUBLIC OPEN SPACE)

An assessment of potential noise impacts from stationary sources for Preferred Alternative D was performed for the worst-case of the four scenarios analyzed for Alternatives B and C—the daytime testing scenario. As described above, this scenario includes typical daytime peak load operating conditions, including two tunnel ventilation fans operating at 100 percent fan speed, two emergency generators run sequentially, three cooling tower cells operating at 80 percent capacity, and noise attenuation features (e.g., silencers).

Table 9-15 shows future noise levels under Preferred Alternative D at the nine receptor locations analyzed for Alternatives B and C described above, and three additional receptors that would experience worst-case noise levels as a result of the relocation of certain project elements under Preferred Alternative D. These three receptors are: R10, located at ground level in the new public open space to be created as part of Preferred Alternative D; R11, on the western façade of the Colgate-Palmolive Building at the height of the relocated exhaust/intake louvers for the tunnel ventilation fans; and R12, on the southern façade of the Colgate-Palmolive Building (300 Park Avenue) at the height of the relocated louvers for the emergency generator assist fans. These three additional receptors are shown in Figure 9-2.

Table 9-11
Predicted Future Build Noise Levels: Alternative C
Daytime Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.3	No Impact	63.5
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.2	64.7	70.1	48.3	No Impact	63.3
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	41.6	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	40.3	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	44.5	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	56.0	No Impact	64.0
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	52.9	No Impact	63.6
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	49.5	No Impact	63.6
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	46.4	No Impact	63.3

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

**Table 9-12
Predicted Future Build Noise Levels: Alternative C
Daytime Testing Mode Operation (dBA)**

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	64.5	65.5	70.9	57.9	No Impact	65.4
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	64.5	65.5	70.9	58.4	No Impact	65.5
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	52.6	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	52.3	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	54.8	No Impact	71.7
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	59.2	No Impact	65.6
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	58.8	No Impact	65.5
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	56.7	No Impact	65.2
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	64.5	65.5	70.9	57.1	No Impact	65.2

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-13
Predicted Future Build Noise Levels: Alternative C
Daytime Off-Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.2	64.7	70.1	49.6	No Impact	63.4
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.2	64.7	70.1	46.7	No Impact	63.3
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	40.2	No Impact	74.3
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	38.9	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	42.9	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	54.3	No Impact	63.7
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.3	No Impact	63.5
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	47.8	No Impact	63.3
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	44.8	No Impact	63.3

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-14
Predicted Future Build Noise Levels: Alternative C
Nighttime Off-Peak Load Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.0	64.6	70.0	46.6	No Impact	63.1
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.0	64.6	70.0	43.7	No Impact	63.1
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	63.0	64.6	70.0	36.5	No Impact	63.0
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	35.4	No Impact	71.6
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	39.9	No Impact	71.6
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	51.2	No Impact	63.3
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	48.3	No Impact	63.1
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	44.7	No Impact	63.1
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.0	64.6	70.0	41.8	No Impact	63.0

Notes:
¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.
² Total project-generated noise level.
³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

Table 9-15
Predicted Future Build Noise Levels: Preferred Alternative D
Daytime Testing Mode Operation (dBA)

Site	Location	FTA Land Use Category / Noise Descriptor ¹	Existing Ambient Noise Level	FTA Allowable Project Noise Exposure Level		Predicted Project Noise Exposure Level ²	Result	Build Noise Level ³
				Impact	Severe Impact			
R1	Colgate-Palmolive Building (east)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.4	No Impact	63.5
R2	437 Madison Avenue (west)	Cat 3 / L _{eq}	63.2	64.7	70.1	44.1	No Impact	63.3
R3	Sidewalk adjacent (north)	Cat 3 / L _{eq}	74.3	70.0	77.7	57.4	No Impact	74.4
R4	Sidewalk across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	53.3	No Impact	71.7
R5	Hotel elevated receptor across 50th Street (north)	Cat 2 / L _{dn}	71.6	65.0	70.6	53.3	No Impact	71.7
R6	Colgate-Palmolive Building (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	50.5	No Impact	63.4
R7	437 Madison Avenue (windows 1 story above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.4	No Impact	63.5
R8	Colgate-Palmolive Building (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	50.5	No Impact	63.4
R9	437 Madison Avenue (windows 2 stories above cooling tower)	Cat 3 / L _{eq}	63.2	64.7	70.1	51.4	No Impact	63.5
R10	Proposed public open space adjacent to 50th Street facility	Cat 3 / L _{eq}	74.3	70.0	77.7	59.5	No Impact	74.4
R11	Colgate-Palmolive Building (western façade at the height of the relocated tunnel ventilation fan louvers)	Cat 3 / L _{eq}	63.2	64.7	70.1	59.6	No Impact	64.8
R12	Colgate-Palmolive Building (southern façade at the height of the relocated generator assist fan louvers)	Cat 3 / L _{eq}	63.2	64.7	70.1	59.7	No Impact	64.8

Notes:

¹ Definition of land use categories and noise descriptor based on FTA Manual, see Table 9-3.

² Total project-generated noise level.

³ Based on logarithmic addition of existing ambient and predicted project noise exposure levels.

As shown in Table 9-15, noise levels due to operation of Preferred Alternative D would be below FTA noise impact criteria, and thus would not result in any significant adverse noise impacts. Project-generated noise increments under Preferred Alternative D also would not exceed the New York City CEQR impact threshold.

F. VIBRATION

HUMAN RESPONSE TO VIBRATION LEVELS

The perceptibility threshold for vibration is about 65 VdB, and the typical threshold of human annoyance is 72 VdB. Typical vibration levels are shown in Table 9-16. Background vibration is usually well below the threshold of human perception, and is of concern only when the vibration affects very sensitive manufacturing or research equipment. Electron microscopes, high-resolution lithography equipment, recording studios, and laser and optical benches are examples of equipment that is highly sensitive to vibration.

**Table 9-16
Typical Vibration Levels**

Human/Structural Response	Velocity Level (VdB)	Typical Sources (at 50 feet)
Threshold, minor cosmetic damage fragile buildings	100	Blasting from construction projects
Difficulty with vibration-sensitive tasks, such as reading a video screen	90	Bulldozers and other heavy tracked construction equipment
Residential annoyance, infrequent events	80	Rapid Transit Rail, upper range
Residential annoyance, frequent events	70	Rapid Transit Rail, typical range
Limit for vibration-sensitive equipment. Approximate threshold for human perception of vibration	65	Bus or truck, typical
	50	Typical background vibration
Source: U.S. Dept of Transportation, FTA, <i>Transit Noise and Vibration Impact Assessment</i> , April 1995.		

IMPACT CRITERIA

The vibration impact criteria specified in the FTA document *Transit Noise and Vibration Impact Assessment*, April 1995, address vibrations from train operations and therefore do not apply to the proposed facility. Therefore, the New York City Zoning Resolution vibration performance standards were used as relevant guidance regarding acceptable vibration levels for projects located in New York City. The most stringent of these standards—those for M1 manufacturing districts, which can be located adjacent to commercial and residential districts—are summarized in Table 9-17.

Table 9-17
New York City Zoning Resolution
Vibration Performance Standards

Frequency (cycles per second)	Vibration displacement (inches)
10 or below	.0008
10–20	.0005
20–30	.0003
30–40	.0002
40–50	.0001
50–60	.0001
60 or above	.0001
Source: New York City Zoning Resolution, Section 42-22.	

PROBABLE IMPACTS OF BUILD ALTERNATIVES

Alternative B, C, and Preferred Alternative D would be designed to meet the New York City Zoning Resolution vibration performance standards shown in Table 9-17.

Where possible, equipment within the 50th Street facility would be positioned away from vibration-sensitive receptors in adjacent buildings. Where this cannot be achieved because of floor space constraints or other design restrictions, vibration isolators, such as spring isolators and concrete inertia bases, would be used. All recommended vibration control measures would comply with the guidelines and specifications of the ASHRAE HVAC Applications Handbook. The number of isolators to be employed for each piece of equipment would be proportional to the overall weight of the equipment (e.g., more isolators would be used for larger equipment, to better distribute the heavier weight).

Spring isolators with neoprene pads would be used for all fans (such as those in the cooling tower, the make-up air fans, and the tunnel ventilation fans). To achieve maximum vibration control for the heavier emergency generators, spring isolators with high static deflections (mounted on a steel frame with neoprene pads) would be used. With few exceptions, vibration reductions of 95 percent or greater would be achieved through the installation of vibration isolators on the equipment. For the cooling tower, vibration reductions of about 80 percent would be achieved.

With the incorporation of the above vibration control measures, equipment vibration levels would not exceed any of the New York City Zoning Resolution vibration performance standards shown in Table 9-17. Accordingly, none of the build alternatives would result in significant adverse vibration impacts to neighboring properties.

G. CONCLUSIONS

Alternatives B, C, and Preferred Alternative D would generate a total of up to seven peak hour truck trips, which would not result in any significant adverse noise impacts. The operation of the 50th Street under any of the build alternatives would not result in significant adverse impacts related to stationary source noise. The quantified analysis conducted concluded that noise levels during the operational phase would increase by no more than 1.6 dBA, well below the 3 dBA

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threshold for noise impacts defined in the *CEQR Technical Manual*. Project-generated noise would also be less than project noise exposure limits specified by FTA to determine adverse impacts. Based on the results of this analysis, neither Alternative B, C, nor Preferred Alternative D would result in significant adverse stationary source noise impacts.

With the incorporation of vibration control measures, including spring isolators and concrete inertia bases, equipment vibration levels would not exceed the New York City Zoning Resolution vibration performance standards under any of the build alternatives. Accordingly, none of the build alternatives would result in significant adverse vibration impacts to neighboring properties.

*