APPENDIX N CASE 10-T-0139 NOISE ASSESMENT REPORT ASTORIA HVDC CONVERTER STATION - SEGMENT 22



Intertek Project No. P5410.01 January 26, 2023

Adrian Allen, Senior Project Architect Kiewit Engineering Group 470 Chestnut Ridge Road Woodcliff Lake, NJ 07677

RE: Exterior Sound Assessment CHPE Astoria - HVDC Converter Station Astoria, New York

Dear Adrian:

This report summarizes our review of the Project's exterior sound generating equipment in reference to applicable noise standards, along with our findings from the exterior sound level measurements at the nearest residential properties.

Executive Summary

Intertek understands that a High Voltage Direct Current (HVDC) Converter Station ('Project') is planned in Astoria, Queens as part of the Champlain Hudson Power Express (CHPE) Project¹; and that an acoustical study is required to review the potential noise impact on the community due to future operation of the Project facility.

The Project comprises a number of electrical high voltage (HV) main circuit apparatus and mechanical equipment. The Converter Transformers, Transformer Cooler Plant, and Valve Cooling Towers are the primary sound generating exterior equipment associated with the Project. The above-mentioned Project equipment will be in continuous operation without impulsive or intermittent characteristics.

Continuous long-term and short-term exterior sound level measurements were performed around the nearest residential properties on 20^{th} Avenue, which are located approximately 2,600 feet from the Project, to quantify the existing exterior sound levels. The measured daytime and nighttime equivalent continuous sound levels are lower than 65 dBA, $L_{Aeq, 1hour}$ (averaged over the entire measurement period / See Tables A1 to A3) at the residential properties on 20^{th} Avenue.

A 3-dimensional exterior sound predication model was created to estimate exterior sound conditions at the nearest residential properties on 20th Avenue and around the Project site boundary due to future operation of the Project.

The predicted sound levels at the nearest residential properties were compared to various applicable noise standards, including the NYSDEC Noise Policy, NYC Zoning Resolution §42-21 *Manufacturing District Regulations,* NYC Noise Code §24-218 *General Prohibitions* and §24-232 *Allowable Decibel Levels - Octave Band Measurement,* NYC Environmental Quality Review (CEQR). The assessment results indicate that requirements of the above-listed noise standards are satisfied at the nearest residential properties on 20th Avenue (See *Assessment Results* section of this report).

¹ <u>https://chpexpress.com/project-overview/</u>. See Figure 1 of this report for the Project site location.



Exterior sound levels were also estimated at the Project site boundary due to future operation of the Project equipment at 100% capacity. The predicted levels satisfy the NYSDEC Policy noise limits of 79 dBA at all project site boundaries (See Table 17).

The predicted levels in all octave bands from 31.5 Hz to 8 kHz meet the NYC Zoning Resolution §42-21 requirements at the worst-case assessment location (Project south site boundary), except 250 Hz and 500 Hz (Table 18). Understanding that the Project will be situated in the M3-1 Zoning District and similar land use/facilities are located around the Project, exceeding required levels in 250 Hz and 500 Hz center frequencies at the Project south boundary would not be considered a concern for the operation of the facilities around the Project.

As noted above, the predicted levels at the nearest residential properties on 20th Avenue due to the future operation of the Project facility are far lower than the relevant noise standard requirements. Even with the residential windows fully open, the predicted levels at the residential properties on 20th Avenue satisfy the NYC Zoning Resolution §42-21 requirements (See Tables 12 through 16). Consequently, the future operation of the Project facility is not expected to influence the existing exterior sound conditions at the nearest residential properties on 20th Avenue.

Applicable Noise Standards

NEW YORK STATE DEPARTMENT OF PUBLIC SERVICE ARTICLE VII

The New York State public review process, Article VII – Siting of Major Utility Transmission Facility, is required for any application to construct and operate a major electric transmission facility in New York State, to review the potential environmental impact of the siting, design, construction, and operation of the proposed facilities in the State.

Certificate Condition 23(c) of the Article VII for the Project notes the following²:

"A review of the sound emissions characteristics of the high-voltage transformers selected for final project design, including typical and maximum noise levels generated at associated operating levels; and a tonal analysis based on one-third octave bands to determine the potential for tonal sound generation, including pure tones."

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) NOISE POLICY

The NYSDEC Policy Section B.1.c. *Thresholds for Significant Sound Pressure Level Increase* sets the noise limits for new exterior sound sources as shown in Table 1 below.

We reviewed the primary sound generating exterior equipment associated with the Project (See the *Primary Exterior Sound Sources at Project Site* section of this report) at the nearest residential properties and at the Project site boundary and in reference to the NYSDEC Noise Policy requirements.

Per the <u>New York City's Zoning & Land Use Map</u>, the nearest residential properties are located on 20th Avenue, approximately 2,600 feet from the Project south site boundary.

² Per information provided BY EDR D.P.C.



TABLE 1. NYSDEC NOISE POLICY FOR INTRODUCING NEW NOISE SOURCES				
Assessment Location Maximum Allowed Ambient Sound Pressure level (dB) ³				
Non-industrial	65 dBA			
Industrial or Commercial	79 dBA			

NEW YORK CITY OF PLANNING ZONING RESOLUTION

Section 42-21⁴ of the New York City of Planning Zoning Resolution Article IV *Manufacturing District Regulations* sets maximum allowed sound levels for any activities associated with a project(s) in Manufacturing District at any point on or beyond any project lot line. Consequently, the Project (categorized as M3-1 Zoning District) should satisfy the requirements as shown in Table 2 below at the Project site boundary.

Section 42-21 continues to set the noise limits at a Residence District that adjoins a Manufacturing District such that maximum allowed sound levels in all octave bands from 31.5 Hz to 8 kHz should be reduced by 6 dB from the maximum allowed levels that are set forth for the Manufacturing District. As described above, the nearest residential properties (categorized as R5 or R5B Zoning District) are located on 20th Avenue.

TABLE 2. NEW YORK CITY OF PLANNIN	IG ZON	IING I	RESOL	UTION	§42-2	21 MAX	ximum	ALLOV	VABLE
DECIBEL LEVELS									
Assessment Location (Zoning District)	Octave Band Center Frequency (Hz) / Maximum Allowed Sound Pressure level (dBC) ⁵								
	31.5	63	125	250	500	1000	2000	4000	8000
Project site property line (M3-1)	80	80	75	70	64	58	53	49	46

74

See Table 2 below for the noise limit requirements at the nearest residential properties.

NEW YORK CITY NOISE CODE

Nearest residential properties on

20th Avenue (R5 or R5B)

Section 24-218⁶ General Prohibitions of the New York City Administrative Code Title 24 Environmental Protection and Utilities states that no person shall make or continue any unreasonable noise to protect the community and promote the peace and quiet of the inhabitants of the city. As shown in Table 3 below, Section 24-218 also defines 'unreasonable noise', as measured at any point within a receiving property or as measured at a public right-of-way.

74

69

64

58

52

47

43

40

As noted above in the *Executive Summary*, the Project comprises equipment that will be in continuous operation without impulsive or intermittent characteristics. As such, we reviewed the Project's primary

³ These levels are noted in the U.S. Environmental Protection Agency, Protective Noise Levels, Condensed Version of EPA Levels document, EPA 550/9-79-100, November 1979, Office of Noise Abatement & Control, Washington, D.C.

⁴ Last amended on 12/15/1961.

⁵ Note that these sound levels are C-weighted levels (dB) per the Zoning Resolution Section 42-212 *Method of Measurement*.

⁶ Enactment date 6/13/2016 & Effect on 3/13/2017

exterior sound generating equipment at the nearest residential properties on 20th Avenue in reference to the Section 24-218 prohibited levels for the *non-impulsive 'unreasonable noise'*.

TABLE 3. NEW YORK CITY ADMINISTRATIVE CODE TITLE 24 §24-218 UNREASONABLE NOISE							
Noise Characteristics Daytime (7 am to 10 pm) Nighttime (10 pm to 7 am							
Non-impulsive 'unreasonable noise'	> 10 dBA above ambient sound level	≥ 7 dBA above ambient sound level					
Impulsive 'unreasonable noise'	<u>></u> 15 dBA above ambient sound level						

Section 24-232⁷ of the Title 24 sets the maximum allowed sound levels in all octave bands from 31.5 Hz to 8 kHz for a sound source(s) in connection with commercial/business enterprise when measured in the interior of the receiving residential property. This is summarized in Table 4 below.

TABLE 4. NEW YORK CITY ADMINISTRATIVE CODE TITLE 24 §24-232 MAXIMUM ALLOWABLE DECIBEL									
LEVELS - OCTAVE BAND MEASUREMENT AT RESIDENTIAL RECEIVING PROPERTY									
Octave Band Center Frequency (Hz) /Residential Receiving PropertyMaximum Allowed Sound Pressure level (dB)									
		63	125	250	500	1000	2000	4000	8000
As measured within any room of the residential portion of the building with windows open, if possible	70	61	53	46	40	36	34	33	32

NEW YORK CITY ENVIRONMENTAL QUALITY REVIEW

The New York City's Environmental Quality Review (CEQR) is the mandated process for proposed projects in New York City, which may need discretionary approvals, city funding, or a project is undertaken by a city agency⁸.

With regard to noise, the CEQR requires projects to assess the exterior sound levels of the proposed project site and confirm that adverse impacts are not estimated for occupants of the projects. The CEQR Manual Section 410 *Impact Threshold Criteria* establishes daytime exterior and interior sound level limits for exterior stationary sound sources at noise sensitive receptors. This is summarized in Table 5 below.

For the nighttime period, a noise level increase of 3 dBA over existing ambient sound levels would be considered significant per CEQR Manual Section 410.

TABLE 5. NEW YORK CITY ENVIRONMENTAL QUALITY REVIEW NOISE LIMITS FOR STATIONARY SOUND SOURCES					
Noise Sensitive Receptor Location	Maximum Allowed Sound Pressure level (dBA) during Daytime (7 am to 10 pm)				
Exterior	L _{Aeq, 1hour} 65 dB				
Interior	L _{Aeq, 1hour} 45 dB				

⁷ Enactment date 7/18/2021 & Effect on 11/15/2021.

⁸ <u>https://www.nyc.gov/site/oec/environmental-quality-review/ceqr-basics.page</u>



Exterior Sound Level Measurements

We performed exterior sound monitoring to provide a formal record of the exterior sound conditions at the nearest residential properties located on 20th Avenue. This section details the measurement methodology and results.

MEASUREMENT EQUIPMENT

We conducted continuous exterior sound monitoring from 9:30 am on 12/8/2022 (Thursday) to 8:30 am on 12/9/2022 (Friday) to quantify the existing exterior sound levels around the residential properties on 20^{th} Avenue.

We also performed short-term sound level measurements from 10:00 am to 10:30 am on 12/8/2022 at each long-term measurement location to confirm that the exterior sound conditions at the north and south sides of the 20th Avenue are consistent (See Table 10 below for detailed information).

As shown in Figures 1 and 2 below, three (3) sound level monitors were installed along 20th Avenue for continuous measurements for approximately 23 hours (labelled as 'measurement location A, B and C').

We placed the sound level monitoring equipment on the fence line of the Consolidated Edison & New York Power Authority property ('ConEdison') as shown in Figures 3 to 8 below. The sound level monitoring microphones were placed at least 5 feet from any reflecting surfaces.

TABLE 6. SOUND MONITORING EQUIPMENT UTILIZED FOR THE PROJECT							
Measurement Location		Equipment	Serial Number	Calibration Date			
Long-term A	20 th Avenue & 24 th Street	Rion NL-52 Type 1 sound	NL-52:01187578 NH-25:87786 UC-59:14506	3/29/2022			
Long-term B	20 th Avenue & 27 th Street	level meter, Rion NH-25 microphone preamplifier & Rion UC-59 microphone	NL-52:00331834 NH-25:21785 UC-59:05046	2/14/2022			
Long-term C	20 th Avenue & 28 th Street	with WS-10 windscreen	NL-52:00698220 NH-25:98432 UC-59:15631	1/5/2022			
Short-term measurements Short-term measurements NTi MA220 microphone preamplifier & NTi MC230A Microphone With windscreen		XL2:A2A-14184-E0 MA220:7385 MC230A:A15538	11/11/2022				
All measur	rement locations	Rion NC-74 sound level meter calibrator	NC-74:35078716	5/9/2022			

Table 6 below lists the equipment utilized for the Project.

MEASUREMENT METHODOLOGY

Our measurements were performed in accordance with the procedures outlined in ASTM E1014-12(2021) *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels* and The New York City Administrative Code Title 24 Section 24-217 *Measurement*.



We set up the sound level monitoring equipment to capture 1/3rd octave band sound level data (from 12.5 Hz to 20 kHz) in sequential 1-minute periods. The captured sound levels include the following sound level metrics:

- L_{Aeq} (the A-weighted energy equivalent sound level),
- L_{max} (maximum each period),
- L_{min} (minimum each period), and
- Statistical sound levels (L₁, L₁₀, L₅₀, L₉₀, and L₉₉).

The statistical sound levels help to assess how the sound levels fluctuate over the measurement period; see the description in the *Existing Exterior Sound Conditions* section below for more detail.

In addition to the numerical data, the sound level monitoring equipment was set to record audio files for sound levels exceeding 70 dBA at the measurement locations A through C to allow us to identify any intermittent and/or impulsive sound sources at the long-term measurement locations.

The equipment was field calibrated to 94.0 dB before and after the measurements. We confirmed that the calibrated sound level did not vary by more than 0.3 dB.

Weather Conditions

Weather conditions were mostly sunny and clear with calm wind during the entire measurement duration, which were favorable for the sound level measurement without interference from weather events. We summarized the weather conditions reported for the New York City area⁹ during the measurements in Table 7 below.

TABLE 7. WEATHER CONDITIONS DURING MEASUREMENTS						
Date	Highest / Lowest Recorded Average Wind Speed Temperature (°F) (mph) Observation					
12/8 (Thursday)	55 / 43	16	Sunny and clear			
12/9 (Friday)	44 / 36 ¹⁰	1611	Sunny and clear			

Observations

During the measurements and from the sound recordings that were captured at the long-term measurement locations, we observed various sound sources, such as vehicular sounds (passenger vehicles, heavy trucks, motorbikes, buses, etc.), aircraft sounds to/from LaGuardia Airport, mechanical equipment from nearby buildings, and various activities at the ConEdison properties. This is summarized for each measurement location in Table 8 below.

TABLE 8. OBSERVATIONS OF SOUND SOURCES AT THE MEASUREMENT LOCATIONS					
Measurement Location	Dominant Exterior Sound Sources				
A	Vehicular sounds on 20 th Avenue and 24 th Street, occasional aircraft fly-bys to/from LaGuardia Airport & ConEdison activities along 19 th Avenue, HVAC equipment from nearby buildings				

⁹ National Weather Service & Weather Underground

¹⁰ The highest and lowest recorded temperature 12:01 am to 8:30 am on 12/9/2022.

¹¹ The highest wind speed recorded from 12:01 am to 8:30 am on 12/9/2022.



TABLE 8. OBSERVATIONS OF SOUND SOURCES AT THE MEASUREMENT LOCATIONS				
Measurement Location	Dominant Exterior Sound Sources			
В	Vehicular sounds on 20 th Avenue and 27 th Street, occasional aircraft fly-bys to/from LaGuardia Airport, birds, occasional ConEdison's activities in the adjacent open storage lot and along 19 th Avenue, HVAC equipment from nearby buildings			
С	Vehicular sounds on 20 th Avenue and 28 th Street, occasional aircraft fly-bys to/from LaGuardia Airport, birds, occasional ConEdison's activities along 19 th Avenue, HVAC equipment from nearby buildings			



Figure 1. Sound measurement locations A, B & C on 20th Avenue and the Project site (40°47'13.1"N 73°54'00.9"W)



Figure 2. Sound measurement locations A, B & C on 20th Avenue (Enlarged)





Microphone of the long-term monitoring equipment at measurement location A

Short-term sound level measurement at 24th Street & 20th Avenue North

Figure 3. Sound monitoring equipment (microphone) at measurement location A, at 24th Street and 20th Avenue



Microphone of the long-term monitoring equipment at the measurement

Figure 4. Sound monitoring equipment (microphone) at measurement location A, at 24th Street and 20th Avenue





Microphone of the long-term monitoring equipment at measurement location B

 Short-term sound level measurement at 27th Street & 20th Avenue North

Figure 5. Sound monitoring equipment (microphone) at measurement location B, at 27th Street and 20th Avenue



Figure 6. Sound monitoring equipment (microphone) at measurement location B, at 27th Street and 20th Avenue





Microphone of the long-term monitoring equipment at measurement location C

Short-term sound level measurement at 28th Street & 20th Avenue North

Figure 7. Sound monitoring equipment (microphone) at measurement location C, at 28th Street and 20th Avenue



Microphone of the long-term monitoring equipment at measurement location C

Figure 8. Sound monitoring equipment (microphone) at measurement location C, at 28th Street and 20th Avenue



EXISTING EXTERIOR SOUND CONDITIONS

Following the conclusion of the measurements, we analyzed the data to assess the sound levels at the measurement locations.

Sound Level Descriptors

To quantify the sound levels at the site, we studied the various sound levels that the monitors measured, which included:

- L_{Aeq} is the A-weighted energy equivalent sound pressure level, which is generally considered to be the average sound level, representative of the environmental sound.
- L_{A10} is the A-weighted sound pressure level exceeded for 10% of the measurement period. This is generally considered to be indicative of the continuous local road traffic, and
- L_{A90} is the A-weighted sound pressure level exceeded for 90% of the measurement period. This is generally accepted to be indicative of the continuous ambient sound level of steady sounds, such as distant traffic, mechanical system noise, and steady environmental sounds.

Measurement Results

A numerical summary of the measurement results, which are most relevant to understanding the existing exterior sound conditions around the nearest residential properties on 20th Avenue, is provided as follows:

• Measured average sound levels for the entire measurement period in Table 9 while measured hourly levels at the measurement locations A, B, and C are included in Tables A1 through A3 in Appendix.

As shown in Table 9 below, the measured daytime and nighttime equivalent continuous sound levels are lower than $L_{Aeq, 1hour}$ 65 dB. The existing conditions without the Project satisfy the NYSDEC and NYC CEQR maximum allowed exterior sound level of 65 dBA at noise sensitive receptor locations.

- Short-term sound levels were measured on the south side of 20th Avenue at each long-term measurement location to note any level difference between the north and south sides of 20th Avenue. As shown in Table 10 below, the measured levels indicate that the exterior sound conditions are consistent at 24th Street / 20th Avenue north & south and 28th Street / 20th Avenue north & south. 1 dB level difference at 27th Street / 20th Avenue is considered insignificant.
- A graph of the sound level versus time (also referred to as a "time history") of the measured hourly L_{Aeq} levels in Figure 9 below for measurement locations A, B, and C. As indicated in Figure 9, a predominant sound source that affected the measured levels was vehicular sounds (passenger vehicles, heavy trucks, etc.) at all measurement locations.

TABLE 9. EXTERIOR SOUND LEVEL MEASUREMENT RESULTS AT LONG-TERM MEASUREMENTLOCATIONS

Manual	Measured Average A-weighted Exterior Sound Level (dB) for the Entire Measurement Period						
Measurement Location	Daytime	e (7 am to 1	.0 pm)	Nighttime (10 pm to 7 am)			
	L _{Aeq, 1hour}	L _{A10, 1hour}	L _{A90, 1hour}	L _{Aeq, 1hour}	L _{A10, 1hour}	L _{A90, 1hour}	
A	63 (61) ¹²	64	56	58	61	54	

¹² Average $L_{Aeq, 1hour}$ levels, excluding periods when sirens on 20th Avenue occurred around 8:30 am on 12/19/2022, are provided in parentheses. This siren period exclusion did not affect daytime $L_{A10, 1hour}$ and $L_{A90, 1hour}$ levels.

TABLE 9. EXTERIOR SOUNDLOCATIONS	LEVEL MEAS	UREMENT	RESULTS	AT LONG-	TERM MEAS	SUREMENT	
Measured Average A-weighted Exterior Sound Level (dB) for the Entire Measurement Period							
Weasurement Location	Daytime	e (7 am to 1	0 pm)	Nighttime (10 pm to 7 am)			
	L _{Aeq, 1hour}	LA10, 1hour	L _{A90, 1hour}	L _{Aeq, 1hour}	LA10, 1hour	L _{A90, 1hour}	
В	62 (61) ¹²	64	55	57	60	53	
С	62 (61) ¹²	63	54	56	59	51	

TABLE 10. EXTERIOR SOUND LEVEL MEASUREMENT RESULTS AT SHORT-TERM MEASUREMENT							
Date/Time	Short-term Measurement Location	Measured Sound Level	Long-term Measurement Location	Measured Sound Level			
12/8 10:09 am	24 th Street / 20 th	Lass true 64 dB	A (24 th Street / 20 th	Lass train 64 dB			
12/0 10:05 um	Avenue South		Avenue North)	LAed, Tunin O. 4 CD			
12/9 10.19 am	27 th Street / 20 th	L 57 dB	B (27 th Street / 20 th				
12/010:10 am	Avenue South	LAeq, 1min 57 UD	Avenue North)	LAeq, 1min 50 UD			
12/9 10:25 am	28 th Street / 20 th		C (28 th Street / 20 th				
12/0 10:25 am	Avenue South	LAeq, 1min OZ UD	Avenue North)	LAeq, 1min OZ UD			





Acoustical Prediction

Based on the information provided by Kiewit and Hitachi, we developed a computer model utilizing iNoise[®], a 3-dimensional exterior sound prediction software, to predict future exterior sound conditions at the nearest residential properties on 20th Avenue and around the Project site boundary due to future operation of the Project.

iNoise[®] uses internationally accepted algorithms¹³ for sound propagation and predictions. The prediction model includes relevant site features, such as the proposed Project and existing ConEdison buildings, site topographical features, and the primary exterior sound sources associated with the Project.

PRIMARY EXTERIOR SOUND SOURCES AT PROJECT SITE

Hitachi confirmed that the Project comprises a number of electrical high voltage (HV) main circuit apparatus and mechanical equipment; and that the Converter Transformers, Transformer Cooler Plant, and Valve Cooling Towers are the primary sound generating exterior equipment associated with the Project.

There is a total of four (4) Converter Transformers and the associated Converter Transformer Cooling Plants. We understand that only 3 transformers will be in operation at any given time, while the fourth transformer is stored as a spare. The Valve Cooling Tower consists of 8 units with the redundancy built into each unit. The octave band sound power levels for the above-mentioned equipment¹⁴ are shown in Table 11 below.

TABLE 11. SOUND POWER LEVELS OF THE PRIMARY EXTERIOR SOUND SOURCES AT PROJECT SITE									
Primary Exterior Sound Sources at	Octave Band Center Frequency (Hz) / Sound Power Level (dB)								
Project Site		63	125	250	500	1000	2000	4000	8000
Converter Transformer ¹⁵	77	83	107	111	109	89	80	64	55
Transformer Cooling Plant	103	93	92	90	86	84	82	79	75
Valve Cooling Tower ¹⁶	82	83	90	91	86	85	82	76	67

Along with the sound data in Table 11 above, we reviewed the following information for creating the computer prediction model:

- Sheet M-003 CHPE Astoria HVDC Converter Station Overall HVAC Site Plan dated 12/12/2022
- Sheet FO-025 CHPE Astoria HVDC Converter Station Transformers Foundation 3D View dated 11/8/2022
- Sheets FO-136, FO-310 & FO-311 showing CHPE Astoria HVDC Converter Station Transformers Foundation Plan, Sections and Details dated 11/8/2022
- Sheet FO-201 CHPE Astoria HVDC Converter Station Transformers Fire Wall Elevations
- Document No. 1JNL9116554 Valve Cooling Area Layout & Sections dated 7/8/2022
- Document No. 1JNL9116527 *Transformer Area Layout & Sections* dated 6/27/2022

¹³ ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation

¹⁴ Information provided by Hitachi on 1/20/2023.

¹⁵ 445 MVA Converter Transformer specified by Hitachi. Information provided on 1/26/2023

¹⁶ 2.45kW per fan (196kW total), Valve Cooling Tower specified by Hitachi. Information provided on 1/26/2023



ASSESSMENT RESULTS

Predicted Levels at 20th Avenue Residential Properties

The predicted exterior sound levels at 20th Avenue residential properties due to future operation of the above-listed Project equipment at 100% capacity (worst-case scenario) are shown in Figure 10 and also summarized in Table 12 below.



Figure 10. Predicted exterior sound levels (in dBA) due to future operation of the Project's exterior equipment (100% capacity)

As shown in Table 12 below, the predicted levels comply with the NYSDEC and NYC CEQR maximum allowed exterior sound level of 65 dBA at the assessment locations (See Table 1 and Table 5 above for the relevant requirements).

Furthermore, the predicted levels are far lower than the measured daytime and nighttime exterior ambient sound levels and do not increase the existing ambient sound levels¹⁷. Consequently, the predicted levels satisfy the NYC Noise Code §24-218 and CEQR nighttime requirements.

¹⁷ See L_{A90, 1hour} levels in Table 9 above and Tables A1 to A3 in Appendix for the measured exterior ambient sound levels at the residential properties on 20th Avenue.

TABLE 12. PREDICTED SOUND LEVELS AT 20TH AVENUE RESIDENTIAL PROPERTIES DUE TO FUTURE OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)

Assossment Lesation		Octave Band Center Frequency (Hz) / Predicted Sound Pressure level (dB)									
Assessment Location	31.5	63	125	250	500	1000	2000	4000	8000	Pressure Level	
Predicted level at 24 th Street / 20 th Avenue residential properties	40	30	41	42	36	16	5	<0	<0	36 dBA	
Predicted level at 27 th Street / 20 th Avenue residential properties	45	37	49	52	49	31	22	2	<0	48 dBA	
Predicted level at 28 th Street / 20 th Avenue residential properties	42	33	45	49	44	25	15	<0	<0	44 dBA	

The predicted levels at the interior of the 20th Avenue residential properties are compared to the NYC Noise Code §24-232 requirements for two residential façade conditions; a 'closed-window' condition (Table 13) and a 'open-window' condition (Table 15).

Note that we utilized typical residential exterior windows, a 5/8-inch thick insulated glazing unit providing approximately STC 30 in laboratory testing, to represent a 'closed-window' condition while a conservative assumption of 10 dB¹⁸ sound attenuation to represent a 'open-window' condition. See Table 14 below for the Transmission Loss data of the 5/8-inch window system.

As shown in Tables 13 and 15 below, §24-232 requirements are satisfied at all residential assessment locations on 20th Avenue for both residential façade conditions.

TABLE 13. NEW YORK CITY ADMINISTRATIVE CODE TITLE 24 §24-232 ALLOWABLE DECIBEL LEVELS & PREDICTED LEVELS AT 20TH AVENUE RESIDENTIAL PROPERTIES (RESIDENTIAL WINDOWS CLOSED) DUE TO FUTURE OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)

Receiving Property	Octave Band Center Frequency (Hz) / Predicted Sound Pressure level (dB)								
	31.5	63	125	250	500	1000	2000	4000	8000
§24-232 Maximum allowable levels at residential receiving property	70	61	53	46	40	36	34	33	32
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows closed	21	11	17	22	10	<0	<0	<0	<0
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows closed	26	18	25	32	23	<0	<0	<0	<0
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows closed	23	14	21	29	18	<0	<0	<0	<0

¹⁸ We made a conservative assumption of 10 dB sound attenuation that is provided by open window(s) based on our review of the National Research Council of Canada Division of Building Research Technical Note No. 526 prepared by D. Olynyk in 1968 and the U.K. Department for Environment, Food and Rural Affairs NANR116: *Open/closed Window Research - Sound Insulation through Ventilated Domestic Windows*. We also assumed that the proportion of the exterior window is 10% of the total façade area at residential assessment locations.



TABLE 14. 5/8-INCH INSULATED GLASS SOUND TRANSMISSION LOSS (TL) DATA											
Construction		Octave Band Center Frequency (Hz) / Sound Transmission Loss (dB)									
		63	125	250	500	1000	2000	4000	8000		
5/8-inch IG comprising 1/8-inch interior											
lite, 3/8-inch airspace, & 1/8-inch	19*	19*	24	20	26	34	46	39	39*		
exterior lite per <u>Viracon Acoustic</u>	1.5										
Performance Data Tables											

*Estimated TL values

TABLE 15. NEW YORK CITY ADMINISTRATIVE CODE TITLE 24 §24-232 ALLOWABLE DECIBEL LEVELS & PREDICTED LEVELS AT 20TH AVENUE RESIDENTIAL PROPERTIES (RESIDENTIAL WINDOWS OPEN/WORST-CASE SCENARIO) DUE TO FUTURE OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)

Receiving Property	Octave Band Center Frequency (Hz) / Predicted Sound Pressure level (dB)								
	31.5	63	125	250	500	1000	2000	4000	8000
§24-232 Maximum allowable levels at residential receiving property	70	61	53	46	40	36	34	33	32
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows fully open	30	20	31	32	26	6	<0	<0	<0
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows fully open	35	27	39	42	39	21	12	<0	<0
Predicted level inside 24 th Street/ 20 th Avenue residential properties with windows fully open	32	23	35	39	34	15	5	<0	<0

The predicted levels at 20th Avenue residential properties are also compared to the NYC Zoning Resolution §42-21 requirements, which are compliant at all residential assessment locations on 20th Avenue as shown in Table 16 below.

TABLE 16. NEW YORK CITY OF PLANNING ZONING RESOLUTION §42-21 MAXIMUM ALLOWABLE DECIBEL LEVELS & PREDICTED LEVELS AT 20 TH AVENUE RESIDENTIAL PROPERTIES DUE TO FUTURE OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)									
Assessment Location	Octave Band Center Frequency (Hz) / Predicted Sound Pressure level (dBC)								
	31.5	63	125	250	500	1000	2000	4000	8000
§42-21 Maximum allowable level (dBC) at residential receiving property	74	74	69	64	58	52	47	43	40
Predicted level at 24 th Street / 20 th Avenue residential properties	37	29	41	42	36	16	5	<0	<0
Predicted level at 27 th Street / 20 th Avenue residential properties	42	36	49	52	49	31	22	1	<0
Predicted level at 28 th Street / 20 th Avenue residential properties	39	32	45	49	44	25	15	<0	<0



Predicted Levels at Project Site Boundary

The predicted sound levels at the Project site boundary due to future operation of the Project equipment at 100% capacity (worst-case scenario / See Table 11 above for the equipment list) are summarized in Table 17 and also shown in Figure 11 below. These predicted levels satisfy the NYSDEC Policy noise limits of 79 dBA at all Project site boundaries.

 TABLE 17. HIGHEST PREDICTED SOUND LEVEL AT EACH PROJECT SITE BOUNDARY DUE TO FUTURE

 OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)

Assessment Location	Sound Pressure level (dBA)
North site boundary	38 dBA
South site boundary	72 dBA
East site boundary	64 dBA
West site boundary	43 dBA

The predicted levels in octave bands from 31.5 Hz to 8 kHz at the Project's south site boundary (worst case assessment location) are compared to the NYC Zoning Resolution §42-21 requirements.

As shown in Table 18 below, the predicted levels in all octave bands meet the NYC Zoning Resolution requirements at the assessment location, except 250 Hz and 500 Hz as highlighted in RED in Table 18 below.

Understanding that the Project will be situated in the M3-1 Zoning District and similar land use/facilities are located around the Project, exceeding required levels in 250 Hz and 500 Hz center frequencies at the Project south boundary would not be considered to be a concern for the operation of the facilities around the Project.

As discussed in the *Predicted Levels at 20th Avenue Residential Properties* section above, the predicted levels due to the future operation of the Project facility are far lower than the noise limit requirements at the nearest residential properties on 20th Avenue. Even with the residential windows fully open, the predicted levels at the residential properties on 20th Avenue satisfy the NYC Zoning Resolution §42-21 requirements (See Tables 12 through 16 above). Consequently, the future operation of the Project facility is not expected to influence the existing exterior sound conditions at the nearest residential properties on 20th Avenue.

TABLE 18.NEW YORK CITY OF PLANNING ZONING RESOLUTION §42-21 MAXIMUM ALLOWABLEDECIBEL LEVELS & PREDICTED LEVELS AT THE WORST-CASE PROJECT SITE BOUNDARY (SOUTH) DUETO FUTURE OPERATION OF THE PROJECT'S EXTERIOR EQUIPMENT (100% CAPACITY)

Assessment Location	Octave Band Center Frequency (Hz) / Maximum Allowed Sound Pressure level (dBC)								
		63	125	250	500	1000	2000	4000	8000
§42-21 Maximum allowable level (dBC) at M3-1 Project lot line	80	80	75	70	64	58	53	49	46
Project south site boundary	65	58	71	76	73	55	50	43	34





Figure 11. Proposed Project buildings and exterior predicted sound levels (in dBA) at the Project site due to future operation of the Project's exterior equipment (100% capacity)

Pure Tone Analysis

To perform pure tone analyses of the above-listed Project equipment in Table 11, $1/3^{rd}$ octave band sound level information is to be provided for our review. Based on the predicted levels at the nearest residential properties on 20th Avenue (See Tables 12 through 16 above), we do not anticipate acoustical impact at these residential properties due to the future operation of the Project facility. However, we plan to confirm this once the $1/3^{rd}$ octave band sound level information is available to us.



We trust this provides the information that you need at this time. Please feel free to contact us by email (Teri.Kim@intertek.com or Cory.Nickchen@intertek.com) or phone (718-362-0579 or 561-371-3500) should you have any questions or require further information.

Sincerely,

Architectural Testing, Inc., an Intertek company

C=US, E=Teri.Kim@Intertek.com, O=Intertek, OU=Intertek-ATI, CN=Kimteri Kim I am the author of this document 2023.01.26 22:42:24-05'00'

Kimteri Kim, WELL AP Senior Consultant Building Science Solutions

Date 2023.01.27 08:26:11-05'00'

Cory Nickchen Senior Consultant Building Science Solutions

KTK/CN



APPENDIX

TABLE A1. MEAS	URED HOURLY SOUND LEVELS	S AT LONG-TERM I	MEASUREMENT LO	CATION A
		Meas	ured Average A-we	eighted
	Date/Time	Ext	terior Sound Level	(dB)
		L _{Aeq, 1hour}	L _{A10, 1hour}	L _{A90, 1hour}
	9:30 am to 10:00 am	61*	64*	57*
	10:00 am to 11:00 am	62	65	58
	11:00 am to 12:00 pm	63	67	57
	12:00 pm to 1:00 pm	62	65	56
	1:00 pm to 2:00 pm	62	65	57
	2:00 pm to 3:00 pm	63	66	57
	3:00 pm to 4:00 pm	62	65	56
12/18/2022	4:00 pm to 5:00 pm	62	65	56
	5:00 pm to 6:00 pm	61	64	55
	6:00 pm to 7:00 pm	60	63	55
	7:00 pm to 8:00 pm	60	63	55
	8:00 pm to 9:00 pm	59	62	54
	9:00 pm to 10:00 pm	58	61	54
	10:00 pm to 11:00 pm	57	60	53
	11:00 pm to 12:00 am	58	60	54
	12:00 am to 1:00 am	57	59	54
	1:00 am to 2:00 am	57	59	54
	2:00 am to 3:00 am	56	59	54
	3:00 am to 4:00 am	57	59	54
12/19/2022	4:00 am to 5:00 am	60	62	54
	5:00 am to 6:00 am	60	63	55
	6:00 am to 7:00 am	59	63	55
	7:00 am to 8:00 am	62	65	56
	8:00 am to 8:30 am	69*	73*	57*
Daytime l	owest measured level	58	61	54
Daytime h	ighest measured level	69	73	58
Nighttime	lowest measured level	56	59	53
Nighttime	highest measured level	60	63	55

*1/2-hour levels



TABLE A2. MEASURED HOURLY SOUND LEVELS AT LONG-TERM MEASUREMENT LOCATION B							
		Meas	ured Average A-we	eighted			
	Date/Time	Ext	terior Sound Level	(dB)			
		L _{Aeq, 1hour}	LA10, 1hour	L _{A90, 1hour}			
	9:30 am to 10:00 am	61*	65*	56*			
	10:00 am to 11:00 am	60	64	55			
	11:00 am to 12:00 pm	60	64	55			
	12:00 pm to 1:00 pm	61	65	54			
	1:00 pm to 2:00 pm	63	67	56			
	2:00 pm to 3:00 pm	62	66	55			
	3:00 pm to 4:00 pm	63	66	59			
12/18/2022	4:00 pm to 5:00 pm	61	64	55			
	5:00 pm to 6:00 pm	62	65	54			
	6:00 pm to 7:00 pm	64	70	54			
	7:00 pm to 8:00 pm	60	63	53			
	8:00 pm to 9:00 pm	59	64	53			
	9:00 pm to 10:00 pm	57	61	53			
	10:00 pm to 11:00 pm	56	59	52			
	11:00 pm to 12:00 am	56	59	53			
	12:00 am to 1:00 am	57	61	52			
	1:00 am to 2:00 am	55	58	52			
	2:00 am to 3:00 am	57	59	55			
	3:00 am to 4:00 am	54	57	51			
12/19/2022	4:00 am to 5:00 am	54	57	51			
	5:00 am to 6:00 am	58	61	54			
	6:00 am to 7:00 am	59	62	55			
	7:00 am to 8:00 am	61	64	56			
	8:00 am to 8:30 am	67*	70*	57*			
Daytime l	owest measured level	57	61	53			
Daytime h	ighest measured level	67	70	59			
Nighttime	lowest measured level	54	57	51			
Nighttime	highest measured level	59	62	55			

*1/2-hour levels



TABLE A3. MEASURED HOURLY SOUND LEVELS AT LONG-TERM MEASUREMENT LOCATION C								
		Meas	ured Average A-we	eighted				
	Date/Time	Ext	terior Sound Level	(dB)				
		L _{Aeq, 1hour}	L _{A10, 1hour}	L _{A90, 1hour}				
	9:30 am to 10:00 am	61*	64*	55*				
	10:00 am to 11:00 am	61	64	56				
	11:00 am to 12:00 pm	61	65	55				
	12:00 pm to 1:00 pm	61	65	54				
	1:00 pm to 2:00 pm	61	65	55				
	2:00 pm to 3:00 pm	62	65	55				
	3:00 pm to 4:00 pm	62	65	55				
12/18/2022	4:00 pm to 5:00 pm	60	63	55				
	5:00 pm to 6:00 pm	62	64	54				
	6:00 pm to 7:00 pm	59	62	54				
	7:00 pm to 8:00 pm	59	63	53				
	8:00 pm to 9:00 pm	62	65	53				
	9:00 pm to 10:00 pm	57	60	52				
	10:00 pm to 11:00 pm	55	59	51				
	11:00 pm to 12:00 am	56	59	52				
	12:00 am to 1:00 am	55	58	51				
	1:00 am to 2:00 am	55	58	51				
	2:00 am to 3:00 am	53	56	50				
	3:00 am to 4:00 am	54	56	50				
12/19/2022	4:00 am to 5:00 am	55	58	50				
	5:00 am to 6:00 am	58	61	52				
	6:00 am to 7:00 am	59	62	53				
	7:00 am to 8:00 am	61	64	55				
	8:00 am to 8:30 am	68*	69*	56*				
Daytime l	owest measured level	57	60	52				
Daytime h	nighest measured level	68	69	56				
Nighttime	lowest measured level	53	56	50				
Nighttime highest measured level		59	62	53				

*1/2-hour levels