Chapter 13: Noise

A. INTRODUCTION AND SUMMARY OF FINDINGS

This chapter considers the potential for the Proposed Action to result in significant adverse noise impacts. As discussed in Chapter 1, "Project Description," the Proposed Action includes: 1) the adoption of the MOD Zoning (the "Proposed Zoning Action") to establish a Medical Oriented District (MOD) in the area surrounding the existing New York Presbyterian Hospital (NYPH) facility; and 2) site plan approval for the MOD Development Plan (the "Proposed Project") proposed by the Applicants, Gyrodyne, LLC and VS Construction, including a mix of medical, residential, and commercial uses as well as on multiple parcels within the MOD. The new medical, residential and commercial development on the Gyrodyne Site would replace the existing medical office buildings and single-family home, and would include a publicly accessible hamlet green and plaza area, publicly accessible open space around Orchard Lake and pedestrian pathways. The development on the Evergreen Site would include the construction of a new assisted-living residence, a hotel with retail space, and a mixed-use building containing retail, commercial office space and residential units.

The noise analysis establishes existing noise levels through ambient noise measurements in the study area. An initial noise impact screening considers whether a proposed action would generate any mobile or stationary source noise, or be located in an area with high ambient noise levels. A noise analysis examines an action for its potential effects on sensitive noise receptors, and the effects on the interior noise levels of residential, commercial, and institutional uses.

Noise associated with the Proposed Zoning Action would be in compliance with the Town of Cortlandt's code restrictions on noise. Additionally, the Proposed Zoning Action would not be expected to result in significant adverse noise impacts at residences or other receptors immediately adjacent to the project site according to the New York State Department of Environmental Conservation (NYSDEC) noise guidance document, and future noise levels at the buildings included in the Proposed Zoning Action would experience noise levels in the range considered acceptable for residential use according to the NYSDEC guidance document.

Further, noise associated with the Proposed Project would be in compliance with the Town of Cortlandt's code restrictions on noise. Additionally, the Proposed Project would not be expected to result in significant adverse noise impacts at residences or other receptors immediately adjacent to the project site according to the NYSDEC noise guidance document, and future noise levels at the buildings included in the Proposed Project would experience noise levels in the range considered acceptable for residential use according to the NYSDEC guidance document.

The analysis finds that the Proposed Action would not result in any significant adverse noise increases at nearby noise receptors.

B. NOISE 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 discernible 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 13-1**, the threshold of human hearing is defined as 0 dBA; very 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.

Table 13-1
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.

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.

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. The L_{eq} represents the constant sound level that, in a given 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 used to indicate noise levels that are exceeded 1, 10, 50, 90 and x percent of the time, respectively. Discrete event peak levels are given as L_1 levels. L_{eq} is used in the prediction of future noise levels, by adding the contributions from new sources of noise (i.e., increases in traffic volumes) to the existing levels and in relating annoyance to increases in noise levels.

The relationship between L_{eq} and levels of exceedance is worth noting. Because L_{eq} is defined in energy rather than straight numerical terms, it is not simply related to the levels of exceedance. If the noise fluctuates very little, L_{eq} will approximate L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}. The relationship between L_{eq} and exceedance levels has been used in this analysis to characterize the noise sources and to determine the nature and extent of their impact at all receptor locations.

For the purposes of this DEIS analysis, the maximum one-hour equivalent sound level ($L_{eq(1)}$) has been selected as the noise descriptor to be used in the noise impact evaluation. $L_{eq(1)}$ is the noise descriptor used by most governmental agencies, including the New York State Department of Environmental Conservation (NYSDEC) for noise impact evaluation, and is used to provide an indication of highest expected sound levels.

NOISE STANDARDS AND IMPACT CRITERIA

TOWN OF CORTLANDT NOISE CONTROL LAW

The Town of Cortlandt Noise Control Law, Chapter 197 of the Municipal Code of Cortlandt, prevents "excessive, unnecessary or unusually loud noise which may jeopardize the well-being, public health, comfort, convenience, safety and welfare of its citizens and the peace and quiet of its inhabitants." Specific noise level restrictions are set forth in the law, specifically mechanical equipment noise, which must not create continuous sound levels in areas zoned residential exceeding 55 dBA as measured at the property line of the property where the mechanical equipment is located.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NYSDEC has published a policy and guidance document, *Assessing and Mitigating Noise Impacts* (DEP-00-1, February 2, 2001), which presents noise impact assessment methods, identifies

thresholds for significant impacts, and discusses potential avoidance and mitigative measures to reduce or eliminate noise impacts.[1]

NYSDEC's guidance document sets forth thresholds that can be used in determining whether a noise increase due to a project may constitute a significant adverse impact, noting that these thresholds should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances. According to DEP-00-1:

- Increases in noise ranging from 0 to 3 dBA should have no appreciable effect on receptors;
- Increases of 3 to 6 dBA may have the potential for adverse impacts only in cases where the most sensitive of receptors (e.g., hospital or school) are present;
- Increases of more than 6 dBA may require a closer analysis of impact potential depending on existing noise levels and the character of surrounding land use and receptors; and
- Increases of 10 dBA or greater deserve consideration of avoidance and mitigation measures in most cases.

The guidance document also sets forth noise thresholds that can be used in identifying whether a noise level due to a project should be considered a significant adverse impact. According to the guidance, the addition of any noise source in a non-industrial setting should not raise the ambient noise level above a maximum of 65 dBA, and ambient noise levels in industrial or commercial areas may exceed 65 dBA with a high end of approximately 79 dBA. As set forth in the guidance, projects that exceed these levels should explore the feasibility of implementing mitigation.

PROJECT IMPACT CRITERIA

For purposes of this impact assessment, consistent with NYSDEC guidance, operations that would result in an increase of more than 6 dBA in ambient $L_{eq(1)}$ noise levels at receptor sites and produce ambient noise levels of more than 65 dBA at residences or 79 dBA at an industrial or commercial area will be considered to be a significant adverse noise impact resulting from the Proposed Action. These criteria are consistent with the NYSDEC guidance document. It is assumed that the Proposed Project's mechanical equipment will be designed to comply with the restrictions in the Cortlandt Noise Control Law.

C. METHODOLOGY

MOBILE SOURCE NOISE METHODLOGY- PROPORTIONAL MODELING

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 commonly used for projection of noise resulting from vehicular traffic. The noise analysis examined the weekday AM and PM peak hours at all receptor locations. The selected time periods are when the Proposed Action would be expected to produce the maximum traffic generation (based on the traffic studies presented in Chapter 11, "Transportation") and therefore result in the maximum potential for significant adverse noise impacts. The proportional modeling used for the noise analysis is described below.

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 the future Proposed Action (Build) levels. The Proposed Action would not be expected

[1] http://www.dec.ny.gov/docs/permits_ej_operations_pdf/noise2000.pdf.

to generate vehicle trips that would include more heavy vehicles than the existing roadway traffic in the area, so noise resulting from project-generated traffic is evaluated based on traffic volumes without assuming any change in the amount of heavy vehicles. Future noise levels are calculated using the following equation:

FB NL - EX NL = 10 * log10 (FB TV / EX TV)

where:

FB NL = Future Build Noise Level

EX NL = Existing Noise Level

FB TV = Future Build Traffic Volume

EX TV = Existing Traffic Volume

Sound levels are measured in decibels. They increase logarithmically with sound source strength. In this case, the sound source is traffic volumes (vehicles). For example, assume that traffic is the dominant noise source at a particular location. If the existing traffic volume on a street is 100 vehicles, and the future traffic volume increased by 50 to a total of 150 vehicles, the noise level would increase by 1.8 dBA. Similarly, if the future traffic were doubled, the noise level would increase by 3.0 dBA.

D. EXISTING CONDITIONS

SELECTION OF NOISE RECEPTOR LOCATIONS

A total of 4 receptor locations were selected for evaluation of existing and future noise levels. These locations are detailed below in **Table 13-2** and are shown in **Figure 13-1**. The receptor locations were selected based on the following criteria: (1) locations near the Project Sites; and (2) to provide comprehensive geographic coverage throughout the study area.

Table 13-2
Noise Measurement Locations

Noise Receptor	Location
1	Buttonwood Avenue south of Route 202/35
2	Route 202/35 between Lafayette Avenue and Conklin Avenue
3	Lafayette Avenue between Route 202/35 and Ridge Road
4	Ogden Avenue north of Route 202/35

NOISE MONITORING

At each receptor location, existing noise levels were determined by field measurements. Noise monitoring was performed on April 24 and 25, 2019. At each receptor location, 20-minute measurements were conducted. All measurements were performed during both the weekday AM peak period (7:00 to 9:00 AM) and the weekday PM peak period (4:00 to 6:00 PM). At locations where traffic noise is a primary contributing or dominant source of noise, 20-minute noise measurements are a statistical representation of the hourly equivalent noise level, allowing sufficient time for L_{eq} values, as well as other statistical noise descriptors, to stabilize and not fluctuate based on individual noise events (e.g., vehicle pass-bys). A 20-minute measurement will include several cycles of any nearby traffic lights and the traffic cycles associated with those light cycles, as well as any other natural short-term traffic cycles that would manifest themselves within

a single hour. Since the 20 minutes of traffic accounted for by the 20-minute noise measurement would be comparable to a full hour of traffic at the same location, and traffic is the dominant source of noise at the location, the 20-minute noise measurement provides a representation of the one-hour noise level, generally within 1-3 dBA.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using a Brüel & Kjær Type 2260 Sound Level Meter (SLM), Brüel & Kjær Type 4189 ½-inch microphone, and Brüel & Kjær Type 4231 Sound Level Calibrators. The Brüel & Kjær SLM is a Type 1 instrument according to ANSI Standard S1.4-1983 (R2006). The SLM has a laboratory calibration date within the past year at the time of use. At all locations, the microphone was mounted at a height of approximately five feet above the ground surface on a tripod and approximately six feet or more away from any large sound-reflecting surface to avoid major interference with sound propagation. The SLM was calibrated before and after readings with a Brüel & Kjær Type 4231 Sound Level Calibrator using the appropriate adaptor. The data were digitally recorded by the SLMs and displayed at the end of the measurement period in units of dBA. Measured quantities included the L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. Windscreens were used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

EXISTING NOISE LEVELS AT NOISE RECEPTOR LOCATIONS

The results of the measurements of existing noise levels are summarized in **Table 13-3**. Roadway traffic was the dominant noise source for all receptor locations. Noise levels within the Project Site are low to moderate with the nearby Route 202/35 being the dominant noise source. Noise levels along adjacent roadways in the Project Area are also moderate, reflecting the level of vehicular activity present predominantly on Route 202/35 and Layfayette Avenue. As shown below in **Table 13-3**, the measured existing L_{eq} values at Sites 2 and 4 exceed the NYSDEC's threshold of 65 dBA for a non-industrial setting. At all other sites, the measured existing L_{eq} values are below this threshold.

Table 13-3
Existing Noise Levels (in dBA)

Receptor	Measurement Location	Time	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	Buttonwood Avenue south of Route 202/35	AM	54.2	68.2	53.5	46.9	44.3
		PM	53.4	65.8	54.1	47.6	45.7
2	Route 202/35 between Lafayette Avenue and Conklin Avenue	AM	66.3	77.4	68.0	60.6	54.2
		PM	65.9	74.9	67.6	60.1	54.2
3	Lafayette Avenue between Route 202/35 and Ridge Road	AM	62.5	73.0	67.0	53.6	44.7
		PM	62.7	73.1	67.5	51.6	45.2
4	Ogden Avenue north of Route 202/35	AM	66.9	75.0	70.7	64.2	53.9
		PM	66.5	74.5	70.3	63.7	54.1

Notes: Field measurements were performed by AKRF, Inc. on April 24 and 25, 2019.

E. FUTURE WITHOUT THE PROPOSED PROJECT

Using the methodology previously described, noise levels without the Proposed Action were calculated for the 2021 analysis year at each noise receptor location. The No Build condition noise levels are shown in **Table 13-4**.

As shown in **Table 13-4**, noise levels in the future without the Proposed Action would be similar to existing conditions at the analyzed noise receptor locations. The projected noise level

increments in the future without the Proposed Action compared to existing noise levels would be approximately 1 dBA or less, which is an imperceptible difference.

Table 13-4
2021 Future Noise Levels Without the Proposed Project (in dBA)

Site	Time	Existing $L_{eq(1)}$	Future Build $L_{eq(1)}$	Project Increment
1	AM	54.2	55.3	1.1
	PM	53.4	53.4	0.0
2	AM	66.3	67.0	0.7
	PM	65.9	66.8	0.9
3	AM	62.5	62.8	0.3
	PM	62.7	63.0	0.3
4	AM	66.9	66.9	0.0
	PM	66.5	66.5	0.0

F. POTENTIAL IMPACTS OF THE PROPOSED PROJECT

Using the methodology previously described, noise levels with the proposed MOD Development Plan (the Gyrodyne and Evergreen Project Sites) were calculated for the 2021 analysis year at each noise receptor location. These future With Action condition noise levels are shown below in **Table 13-5**.

Table 13-5
2021 Future Noise Levels With the Proposed MOD Development Plan (dBA)

Site	Time	Existing $L_{eq(1)}$	Future Build $L_{eq(1)}$	Project Increment
1	AM	54.2	55.3	1.1
	PM	53.4	53.4	0.0
2	AM	66.3	67.6	1.3
	PM	65.9	67.7	1.8
3	AM	62.5	63.0	0.5
	PM	62.7	63.2	0.5
4	AM	66.9	66.9	0.0
	PM	66.5	66.5	0.0

As shown in **Table 13-5**, noise levels in the future with the Proposed Project (the Gyrodyne and Evergreen Project Sites) would be similar to existing conditions at the analyzed noise receptor locations. The projected noise level increments compared to existing noise levels would be less than 2 dBA in the future with the Proposed Project, which would be considered imperceptible and not a significant impact according to NYSDEC noise impact criteria.

Noise levels on the Project Site are represented by those at noise receptor sites 1 through 4, which are located within the MOD campus. At sites 1 and 3, the existing and projected noise levels in the future with the Proposed Project are less than 65 dBA, which is considered acceptable for residential use according to NYSDEC noise evaluation criteria. At sites 2 and 4, the existing ambient noise levels already exceed the 65 dBA criteria for residential areas, however the noise level increment with the Proposed Project is less than 2 dBA and would have no appreciable effect on receptors. Consequently, the establishment of residential uses on the Project Site would not result in a significant adverse impact.

G. POTENTIAL IMPACTS OF THE PROPOSED ZONING ACTION

Using the methodology previously described, noise levels with the full build out of the Proposed Zoning Action were calculated for the 2021 analysis year at each noise receptor location. These future With Action condition noise levels are shown in **Table 13-6**.

Table 13-6
2021 Future Noise Levels With the Proposed Zoning Action (dBA)

Site	Time	Existing $L_{eq(1)}$	Future Build $L_{eq(1)}$	Project Increment
1	AM	54.2	55.3	1.1
	PM	53.4	53.4	0.0
2	AM	66.3	68.0	1.7
	PM	65.9	68.2	2.3
3	AM	62.5	63.2	0.7
	PM	62.7	63.3	0.6
4	AM	66.9	66.9	0.0
	PM	66.5	66.5	0.0

As shown in **Table 13-6**, noise levels in the future with the full build out of the Proposed Zoning Action would be similar to existing conditions at the analyzed noise receptor locations. The projected noise level increments compared to existing noise levels would be less than 3 dBA in the future with the Proposed Zoning Action, which would be considered imperceptible and not a significant impact according to NYSDEC noise impact criteria. Noise Exposure at residences included in the Proposed Project would not result in a significant adverse impact.

Noise levels on the Project Site are represented by those at noise receptor sites 1 through 4, which are located within the MOD campus. At sites 1 and 3, the existing and projected noise levels in the future with the Proposed Zoning Action are less than 65 dBA, which is considered acceptable for residential use according to NYSDEC noise evaluation criteria. At sites 2 and 4, the existing ambient noise levels already exceed the 65 dBA criteria for residential areas, however the noise level increment with the Proposed Zoning Action is less than 3 dBA and would have no appreciable effect on receptors. Consequently, the establishment of residential uses on the Project Site would not result in a significant adverse impact.

H. MECHANICAL EQUIPMENT

It is assumed that the building mechanical systems (i.e., HVAC systems) would be designed to meet all applicable noise regulations to avoid producing levels that would result in any significant increase in ambient noise levels. Specifically, the mechanical equipment system would be designed to comply with the Town of Cortlandt Noise Control Law, and would thus not create noise levels in excess of 55 dBA at the property line of project sites located within the MOD campus. Given the measured existing noise levels at the nearby noise receptors, which range from approximately 53 dBA to 67 dBA, compliance with the Town of Cortlandt Noise Control Code would also result in noise level increases less than the NYSDEC's threshold for a significant noise level increase of 6 dBA. Consequently, the building mechanical systems that would be included in the Proposed Action would not result in a significant adverse noise impact.

I. CONSTRUCTION NOISE

Construction of the Proposed Action would generate noise and vibration from construction equipment, construction vehicles, and delivery vehicles traveling to and from the Project Site.

Noise levels caused by construction activities would vary widely, depending on the phase of construction and the specific task being undertaken. All construction activities would be conducted in full compliance with the Town of Cortlandt's existing noise regulations (Article V. Sound Levels by Receiving Land Use §197-16 of the Town of Cortlandt Noise Control Law), including local day and hour construction limitations. As required, construction activities on the Project Site would be limited to the hours of 7:00 AM–7:00 PM, Monday through Saturday, and would not occur on Sundays or national holidays.

Local, state, and federal requirements mandate that certain classifications of construction equipment and motor vehicles be used to minimize adverse impacts. Thus, construction equipment would meet specific noise emission standards. Usually, noise levels associated with construction and equipment are identified for a reference distance of 50 feet, as shown in **Table 13-7**.

Table 13-7
Typical Noise Emission Levels For Construction Equipment

Equipment item	Noise level at 50 feet (dBA)
Air Compressor	80
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	82
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	80
Paver	85
Pile-Driver (Impact)	101
Pile-driver (Sonic)	95
Pneumatic Tool	85
Pump	77
Rail Saw	90
Rock Drill	95
Roller	85
Saw	76
Scarifier	83
Scraper	85
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	84
Source: Transit Noise and Vibration Impact Assessment, FTA, September 2018	

Significant noise levels typically occur nearest the construction activities, and may reach as high as 90 A-weighted decibels (dBA) under worst-case conditions. The level of noise at local receptors would depend on the construction activities involved, the noise emission of the involved

equipment, the location of the equipment and the hours of operation. Noise levels would decrease with distance from the construction site. Increased noise levels due to construction activity would be highest during the early construction phases such as demolition, excavation, and foundation work. These phases would occur for only a portion of the construction period (which would last less than three years in total), and noise generated would be intermittent based on the equipment in use and the work being done. While the exact numbers of construction equipment that would be utilized has not been finalized, it is known that certain equipment including excavators, bulldozers, backhoes, graders, cranes, and dump trucks would be required. Construction operations, for some limited time periods, would result in increased noise levels that may be intrusive and annoying and may significantly increase ambient noise levels.

As stated above, construction activities would comply with the hour limitations in the Town of Cortlandt Noise Control Law §197-16 to minimize noise intrusion from construction activities during weekends and nights when most families are at home. Based on the temporary and intermittent nature of construction noise incident at surrounding noise receptors, together with the fact that the construction activities with the most potential to create a significant noise impact would occur proximate to sensitive receptors for only a limited period of time, it is the Applicant's belief that the potential noise generated by construction of the Proposed Action would not create a significant adverse noise impact.