APPENDIX T

SOUND IMPACT EVALUATION AND ASSESSMENT

PS&S, NOVEMBER 2021

SOUND IMPACT EVALUATION AND ASSESSMENT

Bridgehampton to Buell 69kV Underground Cable Installation
Towns of Southampton and East Hampton
Suffolk County, New York

Prepared for:

PSEG Long Island
175 Old Country Road
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November 2021

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EXECUTIVE SUMMARY

PSEG Long Island LLC (PSEGLI) requested that PS&S Engineering, PC (PS&S) perform a Sound Impact Evaluation and Assessment ("the Assessment") for the underground 69kV transmission cable from the Bridgehampton Substation located on Bridgehampton-Sag Harbor Turnpike in the Town of Southampton to the Buell Substation located on Cove Hollow Road, to assess the potential sound-level impacts at the nearest property boundaries of the Proposed Action Area. PS&S completed the requested Assessment in accordance with accepted noise level evaluation standards, procedures, requirements, and guidelines.

The existing ambient daytime sound levels measured/observed along the Proposed Action Route varied between 47 dBA and 58 dBA, and existing ambient nighttime sound levels varied between 47 dBA and 50 dBA. Nighttime sound level measurements were collected at locations 1, 2, and 3 where Horizontal Directional Drilling (HDD) work will be performed on limited occasions during nighttime hours during construction. Nighttime work at locations 9 and 10 is anticipated to only occur for one night. The Proposed Action does not include the installation of any significant permanent sound producing equipment; therefore, sound propagation modeling was completed solely for construction activities.

Sound propagation modeling for construction activities along the Proposed Action Route was performed using SoundPLAN Essential 5.0 to identify and incorporate known sound sources around the Proposed Action Route as well as proposed sound sources associated with the Proposed Action. The sound propagation modeling results indicate that sound generated along the Proposed Action Route during construction will raise sound levels above 65 dBA during daytime hours at 10 of the 11 locations (from 71 dBA at Location 9 to 90 dBA at Location 3), and also raise sound levels more than 10 dBA above existing total sound levels at 10 of the 11 locations (from 21 dBA at Location 9 to 37 dBA at Location 3).

Sound generated along the Proposed Action Route during construction will raise sound levels during nighttime hours above 65 dBA (from 76 dBA at Location 2 to 90 dBA at Location 3), and also raise sound levels more than 10 dBA above existing total sound levels (from 29 dBA at Location 1 to 40 dBA at Location 3).

1.0 INTRODUCTION

PSEG Long Island LLC (PSEGLI) is proposing the installation of a 69kV Underground transmission cable (the Proposed Action) connecting the existing Bridgehampton Substation located along Bridgehampton-Sag Harbor Turnpike, in the Town of Southampton, and the Buell Substation located at 18 Cove Hollow Road, in the Town of East Hampton, Suffolk County, New York. The cable installation runs 5.12 miles within the LIPA-owned and/or controlled overhead Right-of-Way and crosses six (6) local roads ("Proposed Action Route"). The Proposed Action will consist primarily of open-trench installation but will also include Horizontal Directional Drilling (HDD).

PS&S Engineering, PC (PS&S) performed a Sound Impact Evaluation and Assessment ("Assessment") for the construction of the Proposed Action to assess potential sound-level impacts at receptors in the vicinity of the Proposed Action Route. The Proposed Action does not include the installation of any significant permanent sound producing equipment; therefore, only sound propagation modeling was completed for construction activities. PS&S completed the Assessment in accordance with accepted noise level evaluation standards, procedures, requirements, and guidelines. The Assessment included the following:

- Measurement of existing ambient daytime and nighttime sound levels for the surrounding area, biased towards sensitive receptors along the Proposed Action Route, and identification and characterization of noise source influences in the area;

- Sound propagation modeling of anticipated sound-level contributions from the Proposed Action using the nationally recognized SoundPLAN Essential (V. 5.0) three-dimensional acoustic propagation model software; and

- Comparison of the results of the sound propagation modeling to the applicable New York State Department of Environmental Conservation (NYSDEC) Noise Policy Guidelines.

2.0 PROJECT LOCATION & SOUND LEVEL STANDARDS

2.1 Site Location

The Proposed Action Route consists of a 5.12-mile path primarily within the LIPA-owned and/or controlled overhead Right-of-Way (ROW) located in the Towns of Southampton and East Hampton, Suffolk County, New York. The Proposed Action Route will connect the existing Bridgehampton Substation located along Bridgehampton-Sag Harbor Turnpike, in the Hamlet of Noyack, New York, and the existing Buell Substation located at 18 Cove Hollow Road, East Hampton, New York.

The Proposed Action Route begins at the existing Bridgehampton Substation, exits the substation onto an access road and runs 356 feet before open-trench installation stops at the proposed HDD 1 entry pit to the west of Bridgehampton-Sag Harbor Turnpike. The area to the east of Bridgehampton-Sag Harbor Turnpike has been identified as an environmentally sensitive area so work in this area will be completed using HDD techniques. HDD will consist of two sets of drilling, HDD 1, and HDD 2. HDD 1's exit pit will be within the existing ROW located to the east of Bridgehampton-Sag Harbor Turnpike, 0.50 miles (2,651 feet) east of the entry pit.

A single manhole will be placed at this exit pit within the previously disturbed area. HDD 2 continues within the ROW for 0.14 miles (725 feet), crossing Widow Gavits Road before open-trench installation resumes.

Open-trenching will align with the ROW 0.13 miles southeast to Sagg Road and then another 0.78 miles southeast to Town Line Road. The Proposed Action Route then continues along the existing ROW 0.90 miles southeast to Wainscott NW Road and 1.44 miles southeast to Stephen Hands Path. The Proposed Action Route continues southeast approximately 500 feet across Buckskill Road and then 0.45 miles southeast within the ROW through a residential neighborhood. The Proposed Action Route then turns south-southeast and runs approximately 300 feet before turning northeast and running another

0.22 miles along the ROW, stopping at the proposed exit pit for HDD 3. The proposed entry pit for HDD 3 is located within the existing National Grid East Hampton Site. HDD 3 spans 0.18 miles (950 feet), crossing west-northwest underneath the Long Island Rail Road ("LIRR") tracks to the north of the entry pit and meeting the open-trenching within the ROW. After the LIRR crossing, the route continues using open-trench installation adjacent to the LIRR right-of-way for 0.15 miles, crossing Cove Hollow Road and terminating in the Buell Substation.

The Proposed Action Route is surrounded primarily by vegetated areas (trees and shrubs), except when crossing local roads or the 0.45-mile stretch east of Buckskill Road which is situated between residential properties.

2.2 Noise/Sound-Level Standards & Criteria

NYSDEC Noise Policy Guidelines are detailed in the Program Policy Memorandum/Noise Policy Guidelines titled *Assessing and Mitigating Noise Impacts* (NYSDEC, October 6, 2000, Revised February 2, 2001). The NYSDEC Noise Policy Guidelines (included as **Appendix A)** provide guidance on when sound-levels resulting from proposed projects have the potential for adverse noise impacts and details when projects may require review and possible mitigation measures. This guidance document states that sound pressure levels (SPLs) be measured on the A-weighted decibel scale dB(A) which is weighted towards those portions of the frequency spectrum, between 20 and 20,000 Hertz, to which the human ear is most sensitive. Guidance states that the goal for any new operation should ideally not exceed existing ambient noise levels by more than 6 dBA at the receptor. An SPL increase of 10 dBA, which results in a perceived doubling of loudness, "deserves consideration of avoidance and/or mitigation measures in most cases." The guidance also states that SPL increases ranging from 0 to 3 dBA should have no appreciable effect on receptors. Furthermore, the addition of any new noise generating equipment in a non-industrial (e.g., residential) setting should not raise the ambient noise level above a maximum of 65 dBA, which is the level that allows for undisturbed speech at a distance of approximately three feet.

3.0 EXISTING SOUND MONITORING SURVEY

3.1 Sound-Level Monitoring

Existing sound levels were measured at eleven locations along the Proposed Action Route on June 10, 2021. All locations were monitored during daytime (7 AM – 10 PM) periods, while three locations were also monitored during nighttime (10 PM – 7 AM) periods. Existing sound sources potentially influencing the area and observed during sound monitoring activities were also noted. Existing nighttime sound levels were only collected in areas where construction will occur between 10 PM and 7 AM.

The sound level measurements were obtained with a certified and calibrated TSI Quest SoundPro Model DL-1-1/3 Sound Level Meter set to the "A-weighting" scale and "slow" measurement speed. A wind screen was used on the sound level meter during all readings. The wind speed and temperature were recorded at the beginning and end of each measurement period to ensure changing weather conditions did not impact sound level measurements. The noise-level meter was calibrated at hourly intervals as well as at the beginning and end of the sound level monitoring during the survey.

3.2 Sound Monitoring Locations

The sound monitoring locations are shown in **Figure 3-1**. These locations were selected to document the existing sound levels at several locations along the Proposed Action Route near sensitive receptors and near specific noise generating activities. An additional monitoring location was also chosen to assess the potential sound level impact to wildlife in proximity to the Proposed Action Route. Five monitoring locations, Locations 1, 2, 3, 9, and 10 were selected to coincide with the proposed HDD entry and exit pits. Since some nighttime work will be required at the HDD pits for conduit pullback, Locations 1, 2, and 3 were monitored during both daytime and nighttime periods. Nighttime work at locations 9 and 10 is anticipated to only occur for one night.

3.3 Sound-level Measurements (A-weighted)

A summary of the sound monitoring observation data is presented in **Table 3-1** below. This table lists the range of existing total sound levels observed at the eleven monitoring locations. The observed existing total sound levels varied between 47 dBA and 58 dBA during daytime hours, and between 47 dBA and 50 dBA during nighttime hours.

The major sound-level influences along the Proposed Action Route were from wildlife (birds and insects), local vehicular roadway traffic, and construction/maintenance work at nearby properties, as well as contributions from non-anthropogenic sources such as wind rustling nearby leaves. Airplane and helicopter traffic from the East Hampton Airport also generated irregular, significant increases in noise levels (up to 76 dBA) which were excluded from total sound results.

Table 3-1: Existing Sound-Level Measurement Data Summary			
MONITORING LOCATION ID	**MONITORING LOCATION DESCRIPTION**	**MEASURED DAYTIME TOTAL SOUND LEVELS (dBA)**	**MEASURED NIGHTTIME TOTAL SOUND LEVELS (dBA)**
1	Bridgehampton Substation – Bridgehampton-Sag Harbor Turnpike HDD Exit Pit #1	58	48
2	Adjacent to 279 Widow Gavits Road HDD Entry Pit #2	52	47
3	Adjacent to 212 Widow Gavits Road HDD Exit Pit #2	53	50
4	East of Sagg Road, adjacent to 1114 Sagg Road	52	--
5	Adjacent to East Hampton Indoor Tennis	49	--
6	Between Stephen Hands Path and Buckskill Road Adjacent to 215 Canary Road	56	--
7	Adjacent to 17 Blue Jay Way	48	--
8	Adjacent to 39 Blue Jay Way	51	--
9	Adjacent to 31 Surrey Court HDD Exit Pit #3	50	--
10	Adjacent to 24 Horseshoe Drive	47	--
11 (Wooded Habitat)	South of 11 Highview Drive	51	--
NOTES: Sound-level measurement data was collected on 06/10/2021.			

FIGURE 3-1

Noise Monitoring Location Plan

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FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

N
0 100 200 Feet
1 inch = 200 feet

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FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

N

0 100 200 Feet

1 inch = 200 feet

PSEG LONG ISLAND
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FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

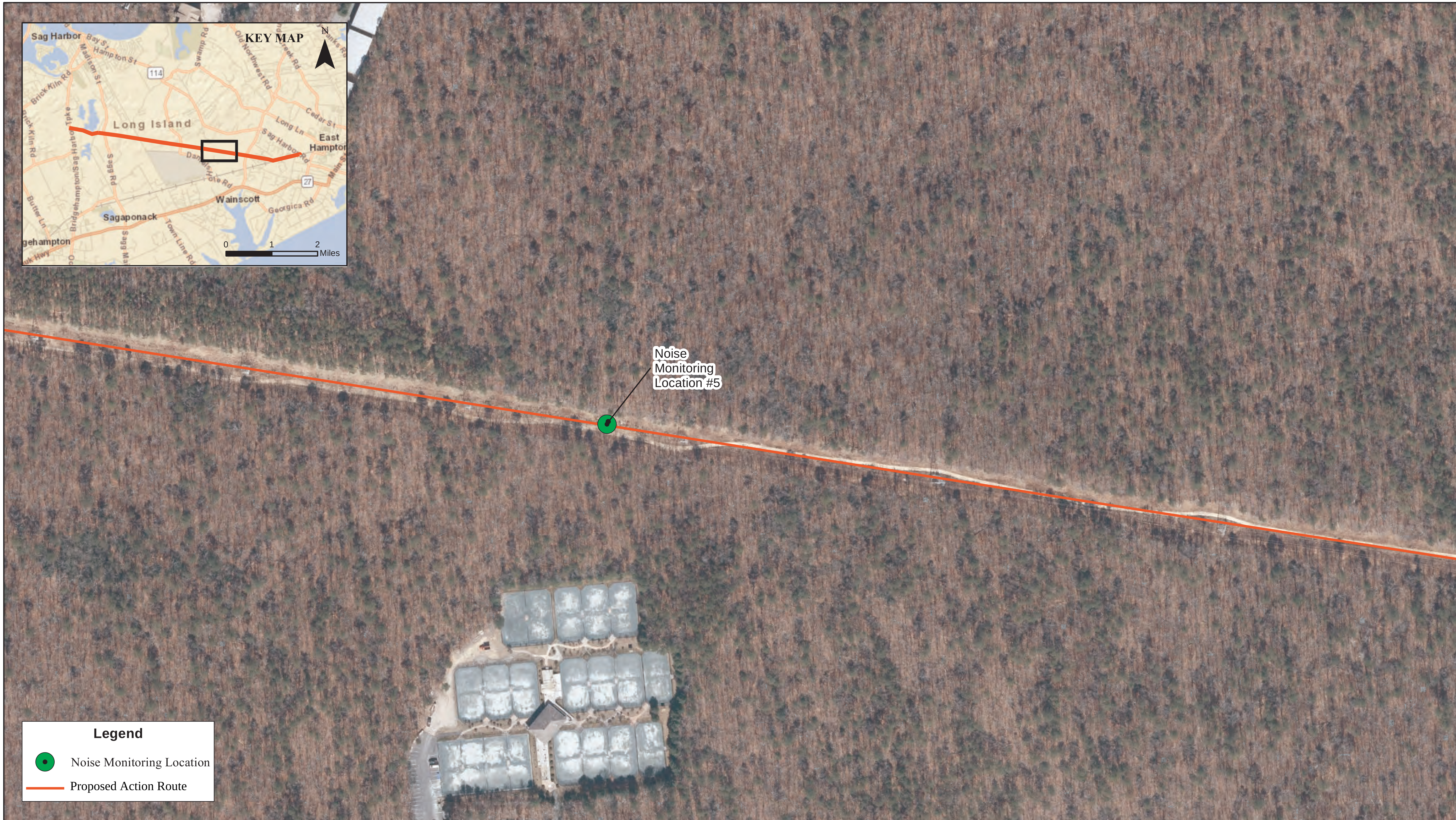

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FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

N
0 100 200 Feet
1 inch = 200 feet

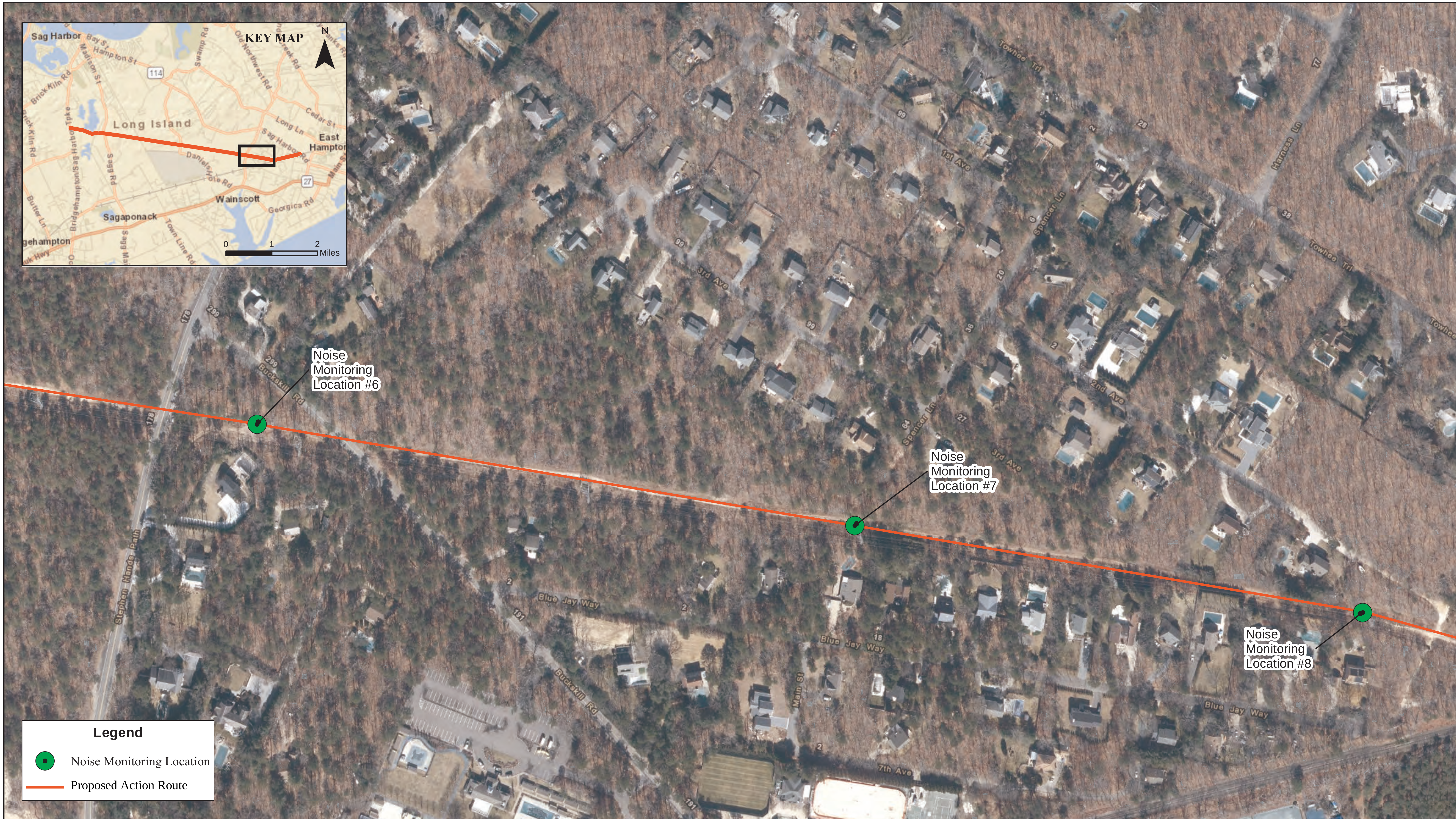

FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

N
0 100 200 Feet
1 inch = 200 feet

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FIGURE #3-1
NOISE MONITORING LOCATION PLAN

Sources:
Route "A", PSEG, 2021
Esri, World Transportation, 2021
Esri, World Imagery, 2020

N
0 100 200 Feet
1 inch = 200 feet

4.0 SOUND MODELING

4.1 Construction Noise

The sound propagation modeling for the Proposed Action includes the proposed noise generating equipment to be used for each of the separate construction activities associated with the Proposed Action. Construction activities will consist of HDD, open-trench installation, and manhole installation. Each phase of construction will include multiple pieces of equipment operating simultaneously. In order to determine the total sound levels generated by this equipment, PS&S followed NYSDEC Guidelines.

4.2 Sound Sources – Assumptions and Model Inputs

The sound propagation modeling performed for this assessment is based on the list of equipment to be used for construction provided by PSEGLI. The sound levels from that equipment are based on manufacturer specifications, when available, or from a table of maximum sound level estimates for different pieces of construction equipment, generated by Hoover and Keith, Inc. These sound level estimates are based on engine power ratings for diesel powered engines typically used for construction.

Open-Trench Installation

The equipment to be utilized for open-trench installation will consist of a Komatsu PC490LC-11 large hydraulic excavator, a Wacker-Neuson DPU6555-HE Plate Compactor, and a Kenworth T880 Dump Truck or similar pieces of equipment.

All equipment is modeled as operating simultaneously. While the excavator is likely to be idling or running for the duration of work, other equipment is likely to be in use intermittently, with simultaneous use of all equipment occurring for short durations.

Based on manufacturer specifications and NYSDEC guidelines, open-trench installation work can be expected to produce sound levels of 86 dBA at a distance of 50 feet from the source.

Manhole Installation

Manhole installation will consist of the same equipment as open-trench installation, with the addition of a Liebherr LTM 1250-6.1 Mobile Crane, or a similar mobile crane, for placement of precast manholes in the open excavation.

As per the Hoover and Keith Table 8.5, which provides maximum sound level estimates for different pieces of construction equipment, total sound from a large mobile crane would not be louder than 85 dBA at a distance of 50 feet. Since the Wacker-Neuson Plate Compactor is also rated for approximately 86 dB at a distance of 50 feet, manhole installation is expected to generate total sound levels 2 dB higher than other trenching work.
Based on manufacturer specifications and NYSDEC guidelines, manhole installation work can be expected to produce sound levels of 88 dBA at a distance of 50 feet from the source.

Horizontal Directional Drilling (HDD)

Equipment for HDD work will include a HDD Drill Rig, a pickup truck, dump truck, backhoe, concrete truck, vacuum truck, excavator, and loader, as well as a compressor and pneumatics, mud pumps, and a generator for electric powered equipment. A pneumatic Pipe Rammer will also be used as part of HDD work, only when the Drill Rig is not in operation.

Projected maximum sound levels for all of this equipment was derived from the Federal Highway Administration "Construction Noise Handbook" and included an acoustical usage factor (AUF) for each piece of equipment. For equipment which will not be in constant use, the modeled total sound level can be calculated using the formula stated in

"Acoustical Assessment in Air." This formula states that the maximum sound level for a given piece of equipment can be subtracted by a factor proportional to its AUF, Leq = Lmax + 10*log(AUF). For example, a generator with a maximum sound level of 81 dBA and an AUF of 0.5 (approximately 50% usage) would more realistically generate a sound level of 78 dBA during working hours.

Based on manufacturer specifications, the Construction Noise Handbook, and NYSDEC guidelines, HDD work can be expected to produce sound levels of 99 dBA at a distance of 50 feet from the source.

HDD Acoustical Barrier

Potential noise mitigation practices include the installation of ECHOBarrier H2 Acoustical Barriers, or similar noise blankets, around the HDD work areas. Acoustical barriers will be installed either as an 8-foot-high layer, or a 16-foot-high layer, as well as acoustical barriers around the recycler/reclaimer.

Based on manufacturer specifications, the Construction Noise Handbook, and NYSDEC guidelines, HDD work mitigated by the 8-foot noise acoustical barrier can be expected to produce sound levels of 98 dBA at a distance of 50 feet from the source, and HDD work mitigated by the 16-foot noise barrier can be expected to produce sound levels of 94 dBA at a distance of 50 feet from the source.

Ambient Sound

Ambient sound can have an additive effect on total sound levels. Ambient sound was derived from existing sound level measurements taken along the Proposed Action Route and recorded in **Table 3-1**.

Site Model Layout

Areas where specific noise generating activities will occur, such as HDD work locations, and sensitive receptor locations along the Proposed Action Route were used in the computer sound propagation modeling, as depicted on **Figures 4-1 through 4-6**.

4.3 Sound Impact Modeling

Sound-level contributions from the installation equipment were predicted using the nationally recognized SoundPLAN Essential (V. 5.0) three-dimensional acoustic propagation model software (Braunstein and Berndt, GmbH/SoundPLAN LLC, 2019). The SoundPLAN industrial noise type option was used for the sound modeling calculations.

The SoundPLAN software allows for calculation of sound from multiple sound sources at multiple receivers while accounting for specific Proposed Action Area sound radiation patterns and propagation effects of structures. The sound sources are identified in the propagation modeling with x and y coordinates and a relative height above terrain. The Proposed Action equipment identified in this assessment was modeled as point sources and digitized in a geo-referenced coordinate system based on Proposed Action Area plan dimensions. The model receptors are also identified with three-dimensional x, y, and z coordinates. Model receptors were located along the nearest property boundaries at an average ear level height of 1.5 meters above ground level in accordance with applicable modeling guidance. The projected sound-level changes were then compared to NYSDEC Noise Policy Guidelines.

In addition to the proposed noise sources, existing noise sources, specific site conditions, and equipment layout can influence sound propagation, as described below.

Elevation

SoundPLAN software uses a digital ground model (based on elevation contours). Existing ground elevations for the immediately surrounding properties for the Proposed Action Area were used in the modeling, based on data incorporated from Google Earth. No change in the existing ground elevations were assumed under the build condition for the modeling.

Buildings

Existing buildings were digitized from Google Earth©, while PSEGLI-provided Site plans and actual and proposed dimensions were included in the model calculations (i.e., calculation of diffraction around buildings).

Structure Reflections

Structures may modify the noise radiation patterns of equipment. The SoundPLAN software includes calculations to account for potential sound amplification from reverberation/reflection off the exterior surfaces of the existing and proposed structures based on the structure's facade. A reflection loss coefficient is assigned to each building or structure based on the material of the facade. All structures were conservatively modeled as "minimally absorbent" (default reflection loss of 1 dB).

4.4 Modeling Results (Projected A-weighted Sound Pressure Levels)

A summary of the projected (modeled) cumulative equipment sound levels at the selected locations closest to potential residential and commercial receptors is presented in **Table 4-1** below.

The sound level impact of the construction of the Proposed Action is anticipated to exceed 65 dBA (between 71 dBA and 91 dBA) and to increase total sound levels by more than 10 dBA (between 21 dBA and 44 dBA) at 10 of the 11 identified receptors, including all of the identified residential properties in closest proximity to the Proposed Action Route. The greatest impacts due to sound are anticipated in proximity to the HDD work.

The sound levels in proximity to the open-trench installation activities are anticipated to exceed 65 dBA within 400 feet of the Proposed Action, before attenuating to existing ambient levels. The sound levels in proximity to the HDD work activities are anticipated to exceed 65 dBA within 1,200 feet of the Proposed Action before attenuating to existing ambient levels. While no sensitive receptors are present along the majority of the Proposed Action Route, sound levels will be elevated during construction activities, as outlined above.

Table 4-1: Summary of Modeled Sound-Levels Generated by Construction at Selected Property Boundaries					
RECEPTOR NO.	**RECEPTOR LOCATION**	**TOTAL DAYTIME MODELED SOUND LEVELS (dBA)**	**DAYTIME MEASURED AMBIENT TOTAL SOUND LEVELS (dBA)**	**TOTAL NIGHTTIME MODELED SOUND LEVELS (dBA)**	**NIGHTTIME MEASURED AMBIENT TOTAL SOUND LEVELS (dBA)**
1	**Bridgehampton Substation – Bridgehampton-Sag Harbor Turnpike HDD Entry Pit #1**	**80**	**58**	**80**	**48**
2	**Adjacent to 279 Widow Gavits Road HDD Exit Pit #2**	**76**	**52**	**76**	**47**
3	**Adjacent to 212 Widow Gavits Road HDD Entry Pit #2**	**90**	**53**	**90**	**50**
4	**East of Sagg Road, adjacent to 1114 Sagg Road**	**79**	**52**	**--**	**--**
5	**Adjacent to East Hampton Indoor Tennis**	**61**	**49**	**--**	**--**
6	**Between Stephen Hands Path and Buckskill Road Adjacent to 215 Canary Road**	**84**	**56**	**--**	**--**
7	**Adjacent to 17 Blue Jay Way**	**83**	**48**	**--**	**--**
8	**Adjacent to 39 Blue Jay Way**	**85**	**51**	**--**	**--**
9	**Adjacent to 31 Surrey Court HDD Exit Pit #3**	**71**	**50**	**--**	**--**
10	**Adjacent to 24 Horseshoe Drive**	**75**	**47**	**--**	**--**
11 (Wooded Habitat)	**South of 11 Highview Drive**	**88 (at 50 feet from source)**	**51**	**--**	**--**

FIGURES 4-1 THROUGH 4-6

Modeled Sound Levels

Figure 4-1

PSEG Long Island
Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 1 ENTRY/EXIT PITS
(LOCATIONS 1 & 2)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and Mud Pumps at 81.0 dB
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Receiver

Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

Figure 4-1A

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 1 ENTRY/EXIT PITS
(LOCATIONS 1 & 2)
Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
 Mud Pumps at 81.0 dB
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Acoustical Barrier (8ft)

Receiver

Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

Figure 4-1B

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 1 ENTRY/EXIT PITS
(LOCATIONS 1 & 2)
Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
 Mud Pumps at 81.0 dB
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

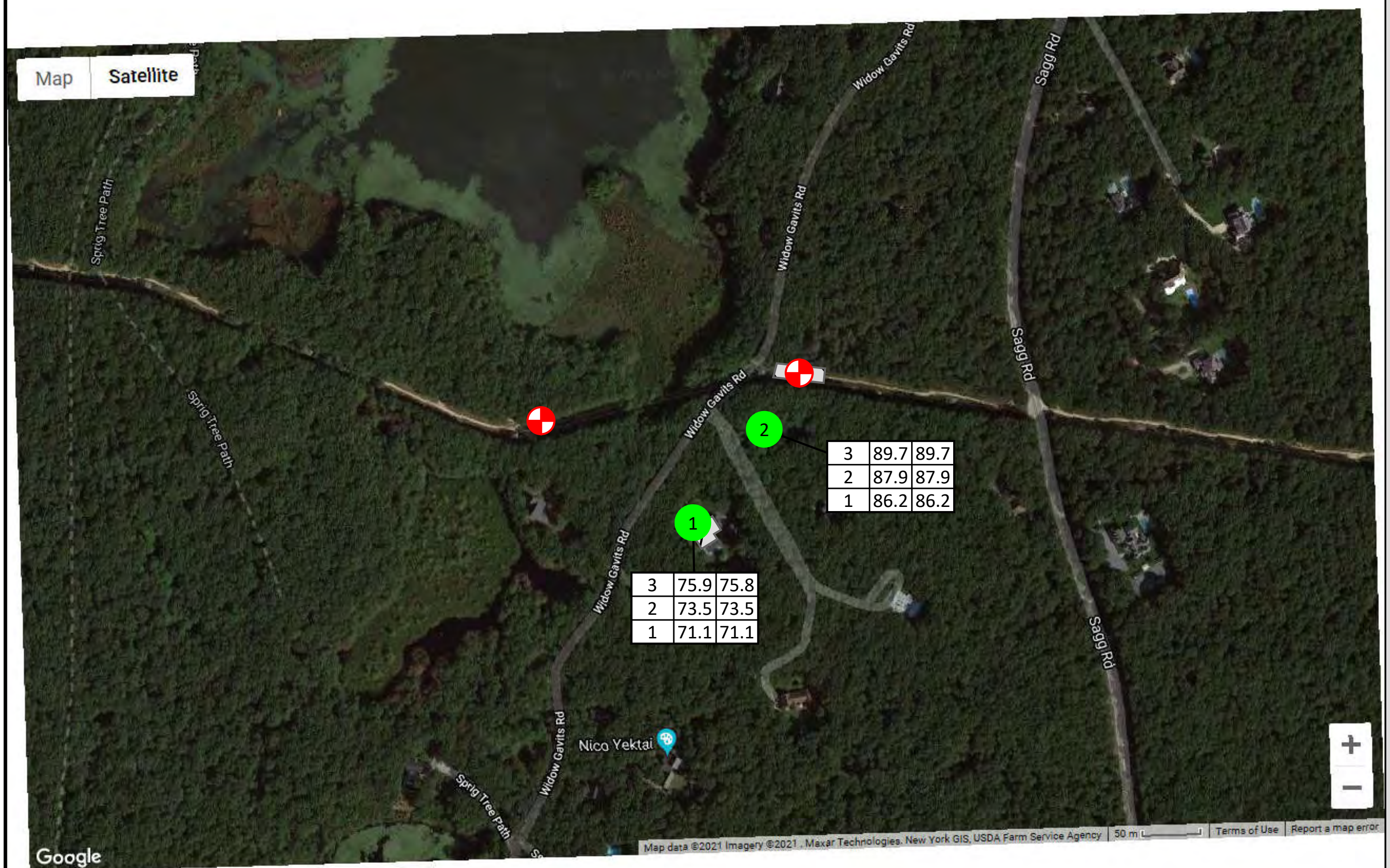
Acoustical Barrier (16ft)
Receiver
Point source

Level tables

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m



3	89.7	89.7
2	87.9	87.9
1	86.2	86.2

3	75.9	75.8
2	73.5	73.5
1	71.1	71.1

N

Figure 4-2

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS AT
HDD 2 ENTRY/EXIT PITS
(LOCATIONS 2 & 3)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Receiver at building
Point source

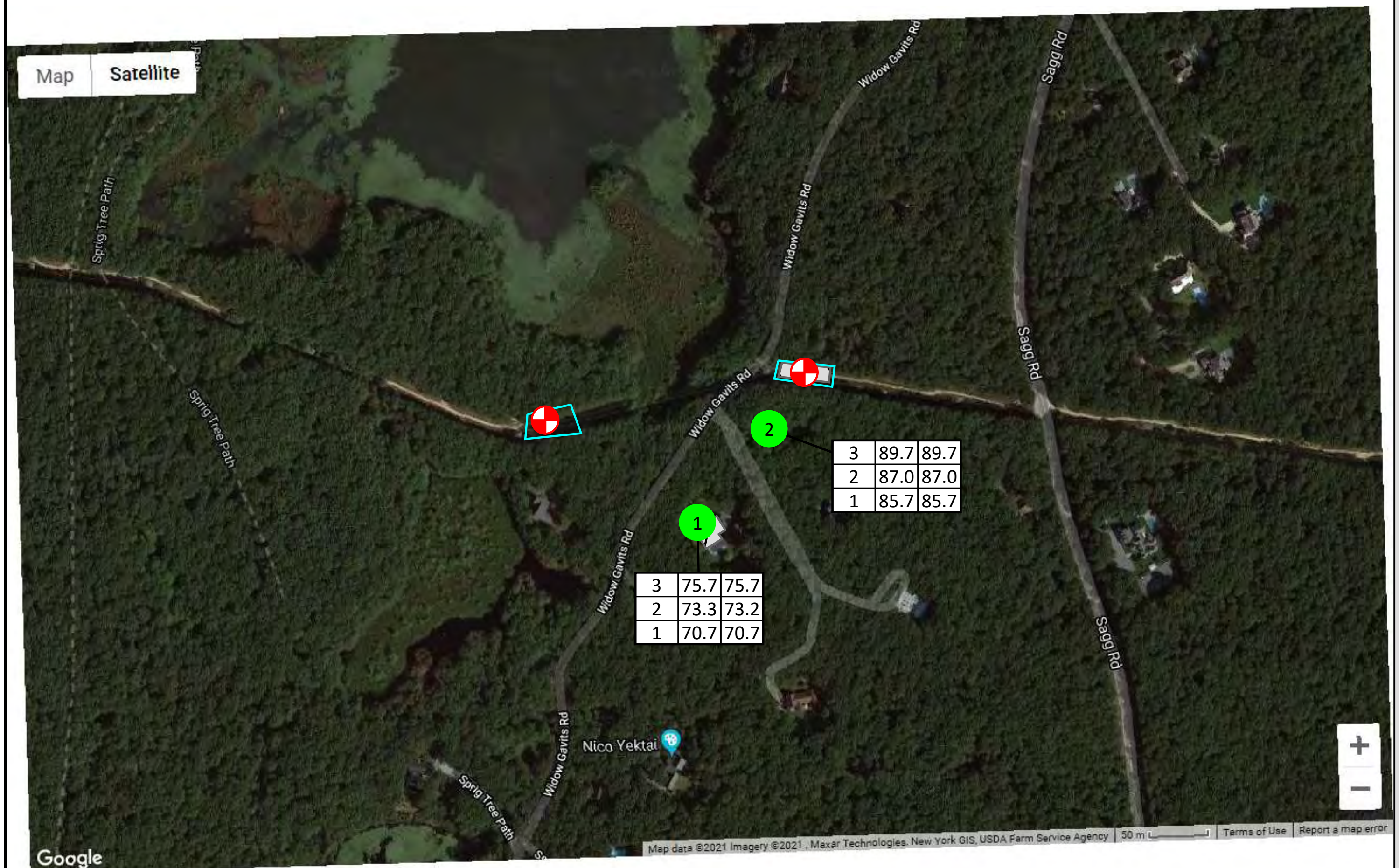
Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m



3	89.7	89.7
2	87.0	87.0
1	85.7	85.7

3	75.7	75.7
2	73.3	73.2
1	70.7	70.7

N

Figure 4-2A

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS AT
HDD 2 ENTRY/EXIT PITS
(LOCATIONS 2 & 3)
Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
 Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Acoustical Barrier (8ft)
Receiver at building
Point source

Level tables

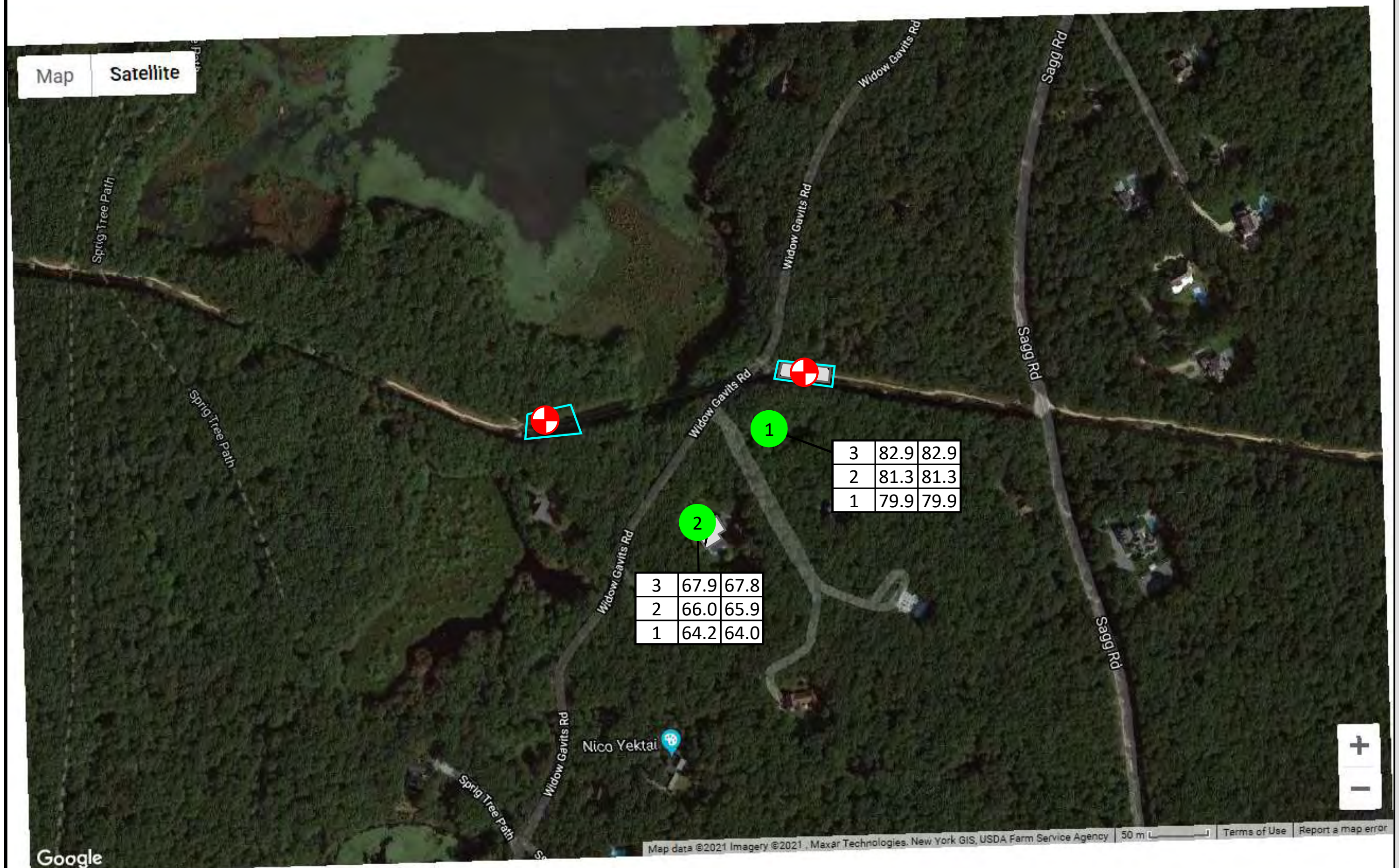
3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

PS&S



3	82.9	82.9
2	81.3	81.3
1	79.9	79.9

3	67.9	67.8
2	66.0	65.9
1	64.2	64.0

N

Figure 4-2B

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS AT
HDD 2 ENTRY/EXIT PITS
(LOCATIONS 2 & 3)
Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
 Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Acoustical Barrier (16 ft)

Receiver at building

Point source

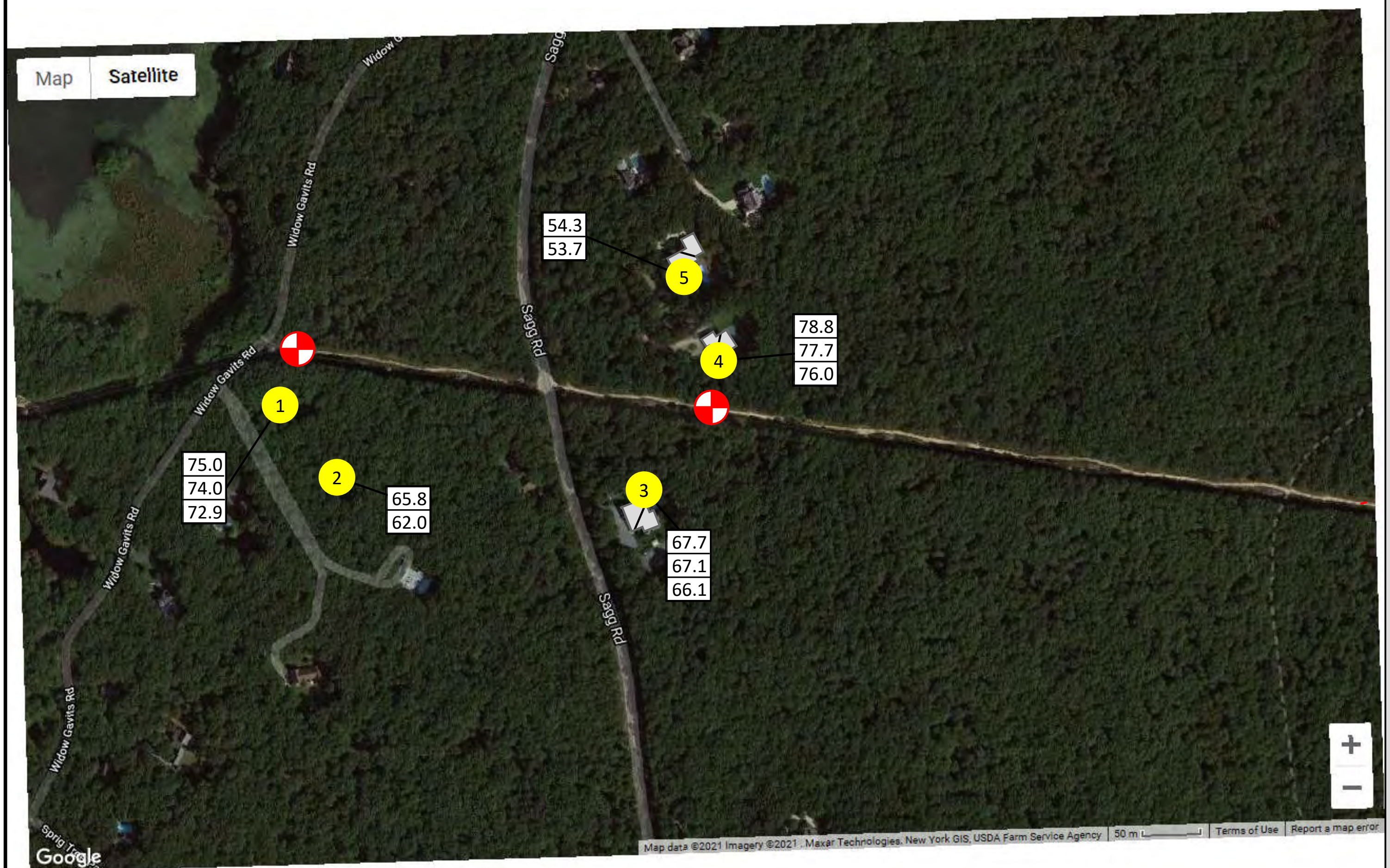
Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m



N

Figure 4-3

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED TRENCHING SOUND LEVELS AT RECEPTORS ALONG RIGHT-OF-WAY (LOCATIONS 3 & 4)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for Trenching and Manhole Construction.

No nighttime activity will occur in this area so nighttime sound levels modeled at 0.0 dBA

Construction Sound Sources:
-Excavator at 70.0 dB;
-Dump Truck at 76.0 dB;
-Mobile Crane at 85.0 dB; and
-Plate Compactor at 86.0 dB.

Signs and symbols

Receiver

Point source

Line source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
3 - 3rd Floor
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

PS&S

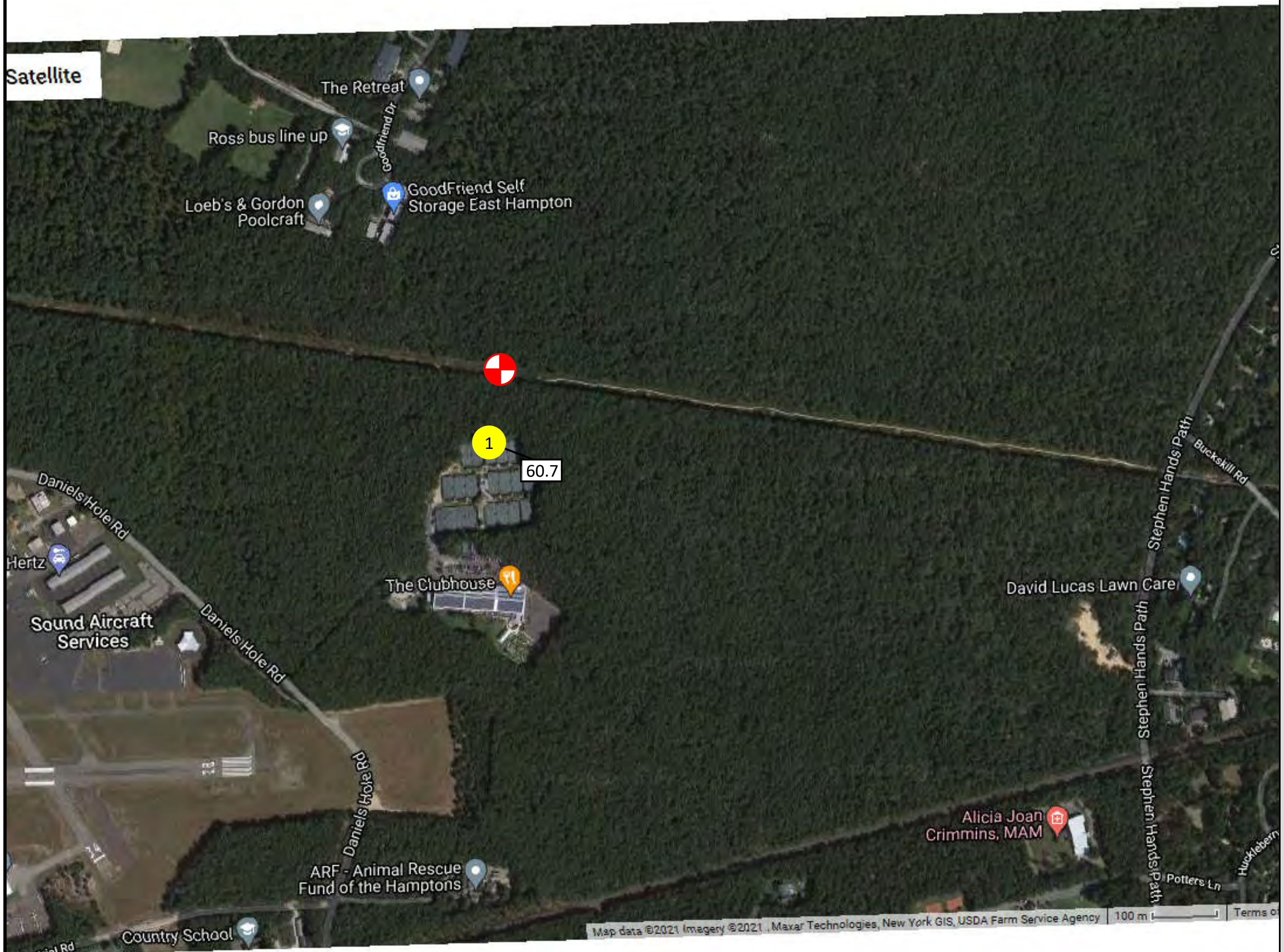


Figure 4-4

PSEG Long Island
Bridgehampton to Buell 69kV Project

MODELED TRENCHING SOUND LEVELS AT EAST HAMPTON INDOOR TENNIS (LOCATION 5)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for Trenching and Manhole Construction.

No nighttime activity will occur in this area so nighttime sound levels modeled at 0.0 dBA

Construction Sound Sources:
-Excavator at 70.0 dB;
-Dump Truck at 76.0 dB;
-Mobile Crane at 85.0 dB; and
-Plate Compactor at 86.0 dB.

Signs and symbols

Receiver

Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)

1 : 10000

0 50 100 200 300 400 m

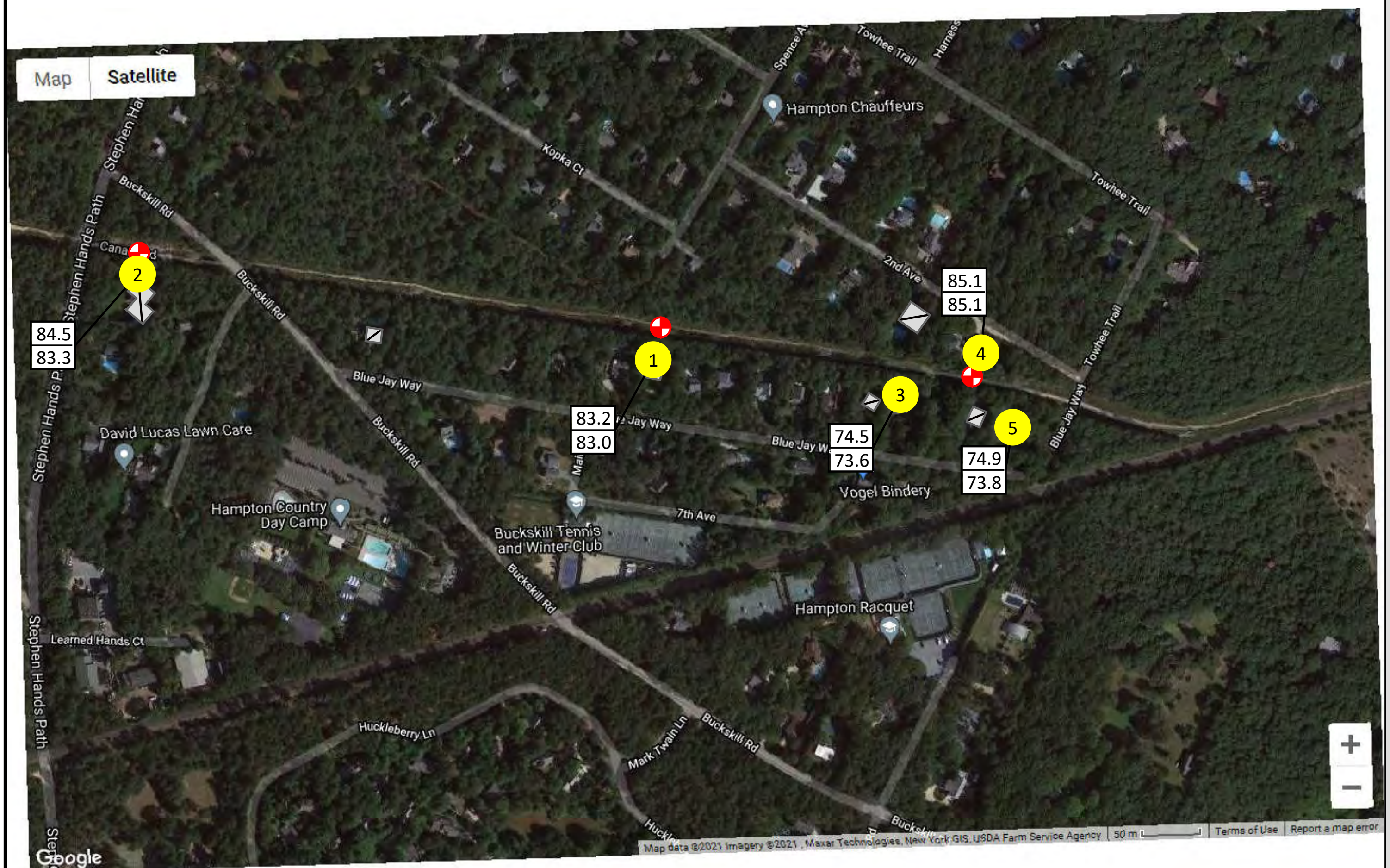


Figure 4-5

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED TRENCHING SOUND LEVELS AT RECEPTORS ALONG BLUE JAY WAY (LOCATIONS 6, 7, & 8)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for Trenching and Manhole Construction.

No nighttime activity will occur in this area so nighttime sound levels modeled at 0.0 dBA

Construction Sound Sources:
-Excavator at 70.0 dB;
-Dump Truck at 76.0 dB;
-Mobile Crane at 85.0 dB; and
-Plate Compactor at 86.0 dB.

Signs and symbols

Receiver

Point source

Level Tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

N

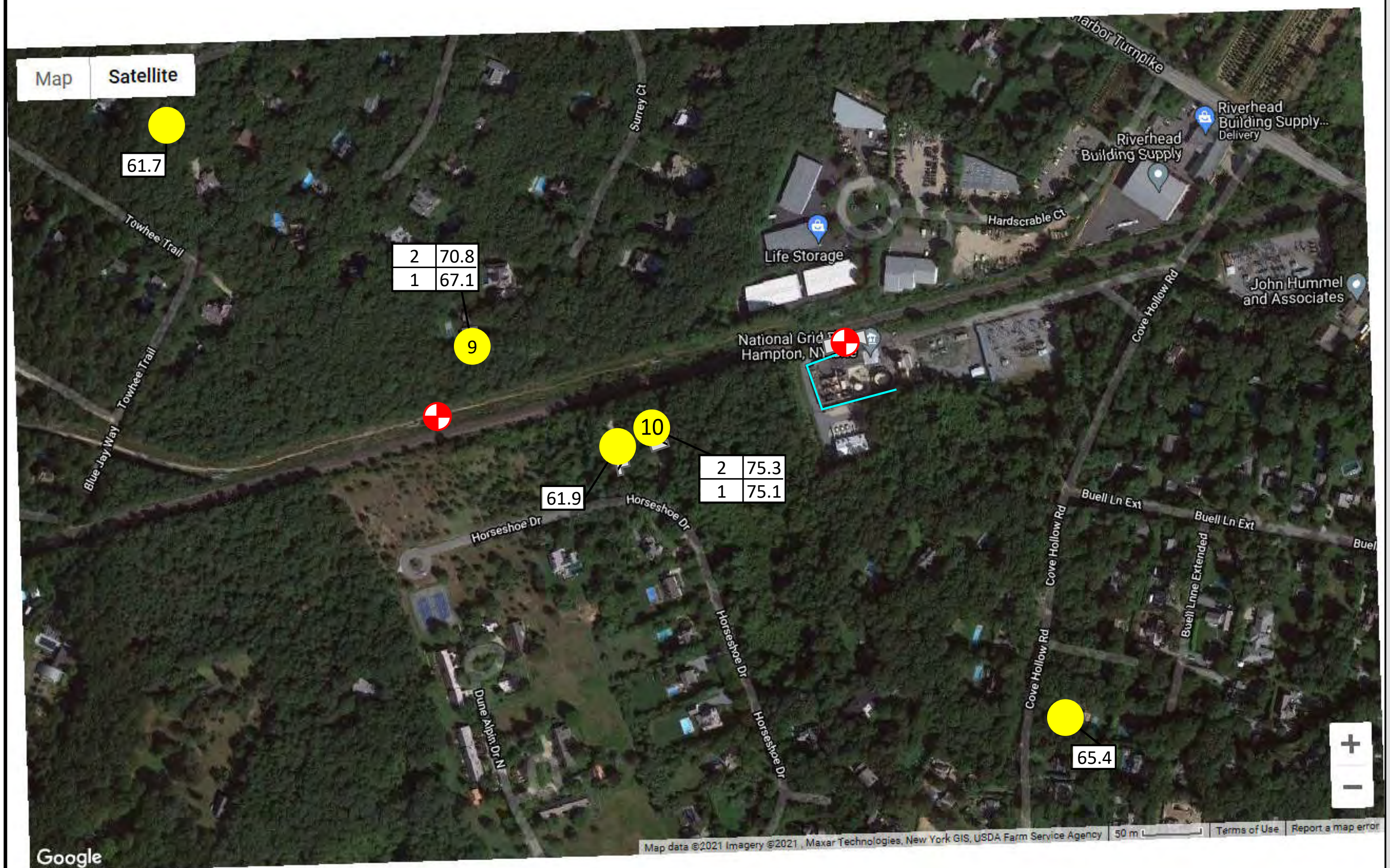


Figure 4-6

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 3 ENTRY/EXIT PITS
(LOCATIONS 9 & 10)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
No nighttime activity will occur in this area so nighttime sound levels modeled at 0.0 dBA

HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and
Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Receiver

Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

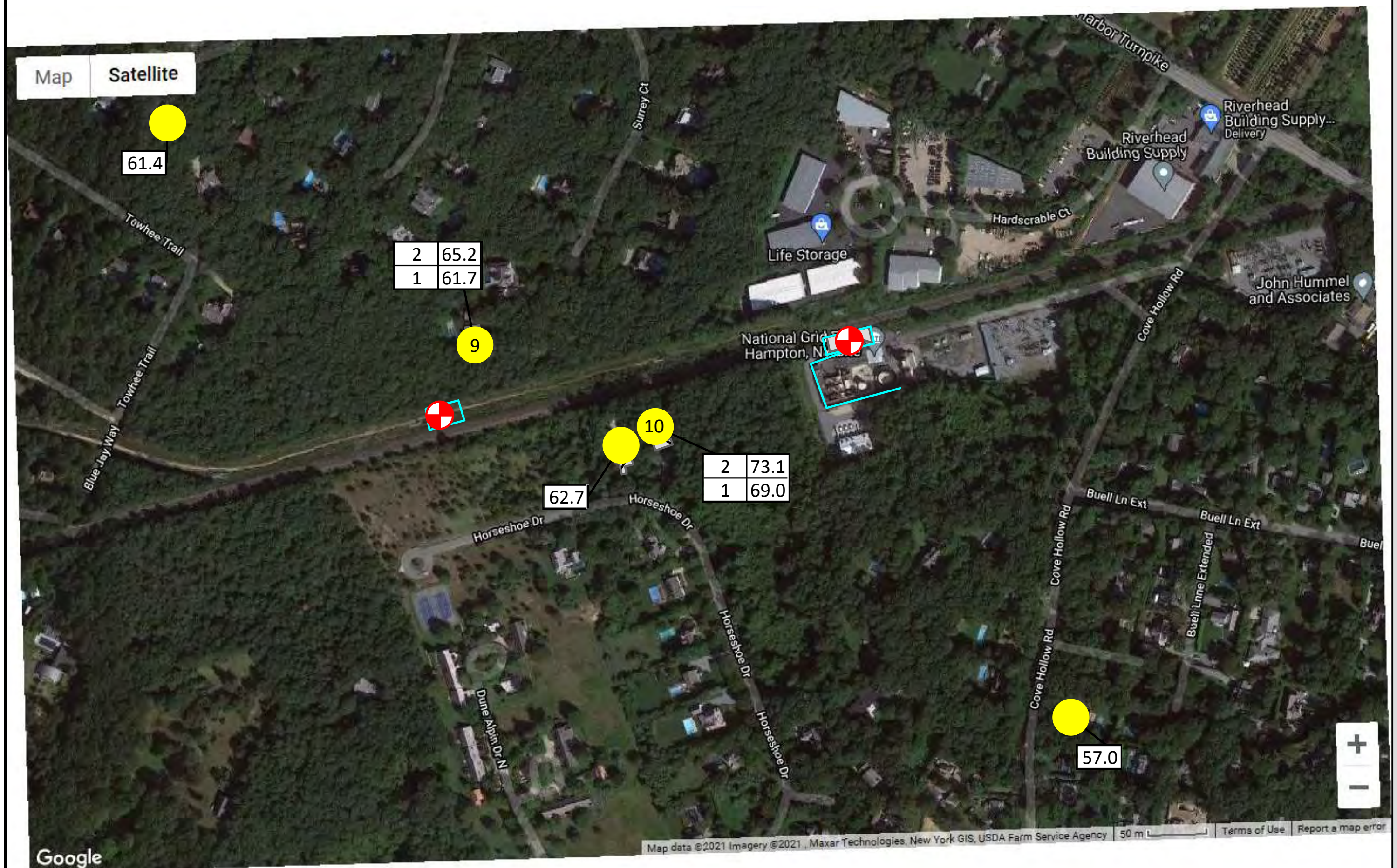


Figure 4-6A

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 3 ENTRY/EXIT PITS
(LOCATIONS 9 & 10)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.

HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
HDD Drill Rig at 105.4 dB.

Signs and symbols

Acoustical Barrier (8ft)
Receiver
Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

N

Figure 4-6B

PSEG Long Island Bridgehampton to Buell 69kV Project

MODELED SOUND LEVELS
AT HDD 3 ENTRY/EXIT PITS
(LOCATIONS 9 & 10)

Sound sources were modeled based on the Equipment Specs provided by PSEGLI for HDD Construction.
HDD Sound Sources:
-Pickup Truck at 75.0 dB;
-Dump Truck at 76.0 dB;
-Backhoe and Compressor at 78.0 dB;
-Concrete Truck and Loader at 79.0 dB;
-Excavator, Generator, and Mud Pumps at 81.0 dB;
-Vacuum Truck and Pneumatics at 85.0 dB;
-Mud Cleaning at 86.0 dB;
-Rammer at 97.0 dB; and
-HDD Drill Rig at 105.4 dB.

Signs and symbols

Acoustical Barrier (16ft)

Receiver

Point source

Level tables

3	59.3	51.8
2	58.3	50.8
1	57.3	49.8

Modeled Sound Levels
Day (left) Night (right)
2 - 2nd Floor
1- 1st Floor

1 : 6000

0 30 60 120 180 240 m

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5.0 SUMMARY AND RECOMMENDED MITIGATION MEASURES

The recorded existing ambient daytime sound levels along the Proposed Action Route varied between 47 dBA to 58 dBA, with the nighttime noise levels ranging from 47 dBA to 50 dBA. The major sound-level influences in the vicinity of the Proposed Action Area during the noise monitoring were from local vehicular traffic on surrounding roadways, local wildlife, and occasional rustling leaves from wind, as well as noise generated by the landscaping work in the vicinity of the Proposed Action Route.

The sound propagation modeling results indicate that projected noise levels from construction will exceed 65 dBA (71 dBA to 90 dBA) and will raise sound levels more than 10 dBA (21 dBA to 40 dBA) above existing total sound levels at 10 of the 11 identified receptors, including all residential properties in the closest proximity to the Proposed Action Route.

Acoustical Barriers

The sound propagation modeling results indicate that the installation of ECHOBarrier H2 Acoustical Barriers, or similar noise blankets, around the HDD work areas will result in a reduction of projected noise levels at nearby receptors. When an 8-foot-high layer of acoustical barriers is in place, modeled results show a reduction in projected noise levels ranging from by 0 dB to 6 dB. When a 16-foot-high layer of acoustical barriers is in place, modeled results show a reduction in projected noise levels ranging from by 2 dB to 8 dB. A summary of the projected (modeled) cumulative equipment sound levels at the selected locations closest to potential residential and commercial receptors is presented in **Table 5-1** below.

Table 5-1: Summary of Modeled Sound-Levels Generated by Construction at Selected Property Boundaries with Acoustical Barrier Attenuation						
RECEPTOR NO.	**RECEPTOR LOCATION**	**TOTAL MODELED SOUND LEVELS (dBA)**	**TOTAL MODELED SOUND LEVELS with 8ft ACOUSTICAL BARRIERS (dBA)**	**TOTAL MODELED SOUND LEVELS with 16ft ACOUSTICAL BARRIERS (dBA)**	**MEASURED DAYTIME TOTAL SOUND LEVELS (dBA)**	**MEASURED NIGHTTIME TOTAL SOUND LEVELS (dBA)**
1	**Bridgehampton Substation – Bridgehampton-Sag Harbor Turnpike HDD Entry Pit #1**	**80**	**80**	**74**	**58**	**48**
2	**Adjacent to 279 Widow Gavits Road HDD Exit Pit #2**	**76**	**76**	**68**	**52**	**47**
3	**Adjacent to 212 Widow Gavits Road HDD Entry Pit #2**	**90**	**90**	**83**	**53**	**50**
9	**Adjacent to 31 Surrey Court HDD Exit Pit #3**	**71**	**65**	**63**	**50**	**--**
10	**Adjacent to 24 Horseshoe Drive**	**75**	**73**	**73**	**47**	**--**

Recommended Mitigation Measures

NYSDEC guidelines state that while operational noise is regulated, "it is not the intention of this guidance to require decibel limits to be established for operations where such limits are not required by regulation," including construction noise. However, NYSDEC presents Best Management Practices (BMPs) for noise generators. BMPs include limiting work times to normal work hours and coordinating with the local residents about the date and duration of work near given sensitive receptors, as well as increasing setback distance from a given receptor or enclosing equipment in buildings.

The nature of each work activity and each receptor also provides opportunities to implement specific BMPs, such as modifying selected equipment with noise-reducers such as mufflers or specifying times for certain activities that may be especially disruptive to sensitive receptors. Five of the eleven chosen receptors are in proximity to HDD work. All other receptors will be in proximity to open-trench installation. Eight of the eleven chosen receptors are residential properties (private homes), while two receptors (Locations 1 and 5) are commercial properties.
For most of the length of the Proposed Action Route, work will be limited to daytime hours. The HDD operation will include work during nighttime hours due to construction requirements.

Some of the BMPs identified by NYSDEC cannot be implemented on the Proposed Action Route. Since the work will take place within the existing ROW there is no opportunity to increase setback distance from sensitive receptors. The construction activity moves along the right-of-way so enclosing equipment in buildings is not an option.

While some BMPs are not applicable, we recommend PSEGLI implement an 'enhanced outreach program' for residents in areas where the sound levels will be highest to coordinate potential scheduling adjustments where possible and allow the residents to prepare themselves for the construction activity in any way possible.

6.0 REFERENCES

Braunstein and Berndt. SoundPLAN Essential Version 5.0. Braunstein and Berndt GmbH/ SoundPLAN LLC, May 2019.

New York State Department of Environmental Conservation (NYSDEC). Assessing and Mitigating Noise Impacts. Department ID: DEP-00-1. Office of Environmental Permits. October 6, 2000, Revised February 2, 2001.

Hoover & Keith INC., Noise Control for Buildings, Manufacturing Plants, Equipment and Products. 2003

Jacobs. "In-Air Noise Evaluation – South Fork Wind Farm and South Export Cable." March 21, 2019.

APPENDIX A

NYSDEC Noise Policy Guidance

Assessing and Mitigating Noise Impacts

New York State
Department of Environmental Conservation

PROGRAM POLICY	**Department ID: DEP-00-1**	**Program ID: n/a**
Issuing Authority: Environmental Conservation Law Articles 3, 8, 23, 27 Name: Jeffrey Sama Title: Director Signature: /S/ Date: 10/6/00	**Originating Unit: Division of Environmental Permits** Office/Division: Environmental Permits Unit: Phone: (518) 402-9167	
Issuance Date: October 6, 2000 Revised: February 2, 2001	Latest Review Date (Office Use):	

Abstract: Facility operations regulated by the Department of Environmental Conservation located in close proximity to other land uses can produce sound that creates significant noise impacts for proximal sound receptors. This policy and guidance presents noise impact assessment methods, examines the circumstances under which sound creates significant noise impacts, and identifies avoidance and mitigative measures to reduce or eliminate noise impacts.

Related References: See references pages 27 and 28.

I. PURPOSE[1]

This policy is intended to provide direction to the staff of the Department of Environmental Conservation for the evaluation of sound levels and characteristics (such as pitch and duration) generated from proposed or existing facilities. This guidance also serves to identify when noise levels may cause a significant environmental impact and gives methods for noise impact assessment, avoidance, and reduction measures. These methods can serve as a reference to applicants preparing environmental assessments in support of an application for a permit. Additionally, this guidance explains the Department's regulatory authority for undertaking noise evaluations and for imposing conditions for noise mitigation measures in the agency's approval

[1] A Program Policy Memorandum is designed to provide guidance and clarify program issues for Division staff to ensure compliance with statutory and regulatory requirements. It provides assistance to New York State Department of Environmental Conservation (DEC) staff and the regulated community in interpreting and applying regulations and statutes to assure that program uniformity is attained throughout the State. Nothing set forth in a Program Policy Memorandum prevents DEC staff from varying from that guidance as specific circumstances may dictate, provided the staff's actions comply with applicable statutory and regulatory requirements. As this guidance document is not a fixed rule, it does not create any enforceable right by any party using the Program Policy Memorandum.

of permits for various types of facilities pursuant to regulatory program regulations and the State Environmental Quality Review Act (SEQR).

II. BACKGROUND

Noise is defined as any loud, discordant or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as unwanted sound. Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise. The sound generated by proposed or existing facilities may become noise due to land use surrounding the facility. When lands adjoining an existing or proposed facility contain residential, commercial, institutional or recreational uses that are proximal to the facility, noise is likely to be a matter of concern to residents or users of adjacent lands.

A. Sources of Noise Generation

The three major categories of noise sources associated with facilities are (1) fixed equipment or process operations; (2) mobile equipment or process operations; and (3) transport movements of products, raw material or waste. The fixed plant may include a very wide range of equipment including: generators; pumps; compressors; crushers of plastics, stone or metal; grinders; screens; conveyers; storage bins; or electrical equipment. Mobile operations may include: drilling; haulage; pug mills; mobile treatment units; and service operations. Transport movements may include truck traffic within the operation, loading and unloading trucks and movement in and out of the facility. Any or all of these activities may be in operation at any one time. Singular or multiple effects of sound generation from these operations may constitute a potential source of noise.

B. Potential for Adverse Impacts

Numerous environmental factors determine the level or perceptibility of sound at a given point of reception. These factors include: distance from the source of sound to receptor; surrounding terrain; ambient sound level; time of day; wind direction; temperature gradient; and relative humidity. The characteristics of a sound are also important determining factors for considering it as noise. The amplitude (loudness), frequency (pitch), impulse patterns and duration of sound all affect the potential for a sound to be a noise. The combination of sound characteristics, environmental factors and the physical and mental sensitivity of a receptor to a sound determine whether or not a sound will be perceived as a noise. This guidance uses these factors in assessing the presence of noise and the significance of its impacts. It relies upon qualitative and quantitative sound evaluation techniques and sound pressure level impact modeling presented in accepted references on the subject.

C. Mitigation

Mitigation refers to actions that will be taken to reduce the effects of noise or the noise levels on a receptor. Adverse noise effects generated by a facility can be avoided or reduced at the point of generation thereby diminishing the effects of the noise at the point of reception. This guidance identifies various mitigation techniques and their proper application either at the source of noise generation or on a facility's property. Alternative construction or operational methods, equipment maintenance, selection of alternative equipment, physical barriers, siting of activities, set backs, and established hours of construction or operation, are among the techniques that can successfully avoid or reduce adverse noise effects.

D. Decision Making

When an assessment of the potential for adverse noise impacts indicates the need for noise mitigation, it is preferred that specifications for such measures be incorporated in a noise analysis and in the applicant's work or operational plan necessary for a complete application. Presenting a plan that incorporates effective noise mitigation provisions facilitates the Department's technical and environmental review and minimizes or negates the imposition of permit conditions by the Department. Adherence to these plans becomes a condition of a permit.

Noise avoidance and mitigation measures may also be imposed directly as conditions of permit issuance. This guidance will review the statutory authority under which the Department can require the mitigation of noise effects.

III. POLICY

In the review of an application for a permit, the Department of Environmental Conservation is to evaluate the potential for adverse impacts of sound generated and emanating to receptors outside of the facility or property. When a sound level evaluation indicates that receptors may experience sound levels or characteristics that produce significant noise impacts or impairment of property use, the Department is to require the permittee or applicant to employ reasonable and necessary measures to either eliminate or mitigate adverse noise effects. Options to be used to fulfill this guidance should be implemented within the existing regulatory and environmental review framework of the agency.

Regulatory authority for assessing and controlling noise effects are contained in both SEQR and specific Department program regulations. Specific regulatory references are as follows:

Section 3-0301(1)(i) of the Environmental Conservation Law (ECL) states that the commissioner shall have the power to: "i. Provide for prevention and abatement of all water, land and air pollution including but not limited to that related to particulates, gases, dust, vapors, noise, radiation, odor, nutrients and heated liquids."

To comply with Article 8 of the ECL and 6 NYCRR Part 617, State Environmental Quality Review Act, consideration of all relevant environmental issues must be undertaken in making a determination of environmental significance. Noise impact potential is one of many potential issues for consideration in a SEQR review.

Environmental Conservation Law (ECL) Article 23, Title 27, Mined Land Reclamation Law (MLRL), requires applicants for permits to prepare and submit a mined land use plan to the Department for approval. The plan must describe, "the applicant's mining method and measures to be taken to minimize adverse environmental impacts resulting from the mining operation." The provisions to be incorporated in a Mined Land Use Plan, as specified in 6 NYCRR Section 422.2, include the control of noise as a component of the plan.

The solid waste regulations at 6 NYCRR Subdivision 360-1.14(p), establish A-weighted decibel levels that are not to be exceeded at the property line of a facility.

The Division of Air Resources has regulations in 6 NYCRR Parts 450 through 454 that regulate the allowable sound level limits on certain motor vehicles. The statutory authority for these regulations is found in the New York State Vehicle and Traffic Law, Article 10, Section 386.

This guidance does not supercede any local noise ordinances or regulations.

IV. RESPONSIBILITY

The environmental analyst, acting as project manager for the review of applications for permits or permit modifications and working in concert with the program specialist, is responsible for ensuring that sound generation and noise emanating from proposed or existing facilities are properly evaluated. For new permits or significantly modified permits, there should be a determination as to the potential for noise impacts, and establishment of the requirements for noise impact assessment to be included in the application for permit. Where the Department is lead agency, the analyst is responsible for making a determination of significance pursuant to SEQR with respect to potential noise impacts and include documentation for such determination.

Where impacts are to be avoided or reduced through mitigation measures, the analyst, or where there are program requirements to address noise, the program specialist, should determine the effectiveness and feasibility of those measures and ensure that the permit conditions contain specific details for such measures. It should also be determined if additional measures to control noise are to be imposed as a condition of permitting. Appropriate permit language for the permit conditions should be developed by the program specialist and the analyst. The results of noise impact evaluations and the effectiveness of mitigation measures shall be incorporated into SEQR documents and, where necessary, permit conditions shall be placed in final permits to ensure effective noise control.

When it is determined that potential noise effects, as well as other issues, warrant evaluation of impacts and mitigation measures in a Draft Environmental Impact Statement (EIS) prepared pursuant to SEQR, the environmental analyst with the Division of Environmental Permits assumes responsibility for determining the level of evaluation needed to assess sound level generation, noise effects, and mitigation needs and feasibility.

For existing facilities, the program specialist will determine the need for additional mitigation measures to control noise effects either in response to complaints or other changes in circumstances such as new noise from existing facilities or a change in land-use proximal to the facility.

The applicant or their agent, in preparing an application for a permit and supporting documentation, is responsible for assessing the potential noise impacts on area receptors. When potential adverse noise impacts are identified, the applicant should incorporate noise avoidance and reduction measures in the construction or operating plans. The applicant's submittal should also assess the effectiveness of proposed mitigation measures in eliminating adverse noise reception. Where noise effects are determined to be a reason in support of a SEQR positive declaration, the applicant shall assess noise impacts, avoidance, and mitigation measures in a Draft EIS using methodologies acceptable to this Department.

V. PROCEDURE

The intent of this section is to: introduce terms related to noise analyses; describe some of the various methods used to determine the impacts of sound pressure levels on receptors; identify some of the various attenuators of noise; and list some of the mitigative techniques that can be used to reduce the effects of noise on a receptor. At the end of the section three levels of analysis are described. The first level determines the potential for adverse noise impacts based on noise characteristics and sound pressure increases solely on noise attenuation over distance between the source and receptor of the noise. The second level factors other considerations such as topography and noise abatement measures in determining if adverse noise impacts will occur. The third level evaluates noise abatement alternatives and their effectiveness in avoiding or reducing noise impacts.

The environmental effects of sound and human perceptions of sound can be described in terms of four characteristics:

1. Sound Pressure Level (SPL may also be designated by the symbol L_p) or perceived loudness is expressed in decibels (dB) or A-weighted decibel scale dB(A) which is weighted towards those portions of the frequency spectrum, between 20 and 20,000 Hertz, to which the human ear is most sensitive. Both measure sound pressure in the atmosphere.
2. Frequency (perceived as pitch), the rate at which a sound source vibrates or makes the air vibrate.
3. Duration i.e., recurring fluctuation in sound pressure or tone at an interval; sharp or startling noise at recurring interval; the temporal nature (continuous vs. intermittent) of sound.
4. Pure tone which is comprised of a single frequency. Pure tones are relatively rare in nature but, if they do occur, they can be extremely annoying.

Another term, related to the average of the sound energy over time, is the Equivalent Sound Level or $L_{eq.}$ The L_{eq} integrates fluctuating sound levels over a period of time to express them as a steady state sound level. As an example, if two sounds are measured and one sound has twice the energy but lasts half as long, the two sounds would be characterized as having the same equivalent sound level. Equivalent Sound Level is considered to be directly related to the effects of sound on people since it expresses the equivalent magnitude of the sound as a function of frequency of occurrence and time. By its derivation L_{eq} does not express the maximum nor minimum SPLs that may occur in a given time period. These maximum and minimum SPLs should be given in the noise analysis. The time interval over which the L_{eq} is measured should always be given. It is generally shown as a parenthetic; $L_{eq\ (8)}$ would indicate that the sound had been measured for a period of eight hours.

Equivalent Sound Level (L_{eq}) correlates well and can be combined with other types of noise analyses such as Composite Noise Rating, Community Noise Equivalent Level and day-night noise levels characterized by L_{dn} where an $L_{eq(24)}$ is measured and 10 dBA is added to all noise levels measured between 10 pm and 7 am. These different types of noise analyses basically combine noise measurements into measures of cumulative noise exposure and may weight noise occurring at different times by adding decibels to the actual decibel level. Some of these analyses require more complex noise analysis than is mentioned in this guidance. They may be used in a noise analyses prepared for projects.

Designations for sound levels may also be shown as $L_{(10)}$ or $L_{(90)}$ in a noise analysis. These designations refer to the sound pressure level (SPL) that is exceeded for 10% of the time over which the sound is measured, in the case of $L_{(10)}$, and 90% of the time, in the case of $L_{(90)}$. For example, an $L_{(90)}$ of 70 dB(A) means that 70 dB(A) is exceeded for 90% the time for which the measurement was taken.

A. Environmental Setting and Effects on Noise Levels

1. Sound Level Reduction Over Distance - It is important to have an understanding of the way noise decreases with distance. The decrease in sound level from any single noise source normally follows the “inverse square law.” That is, SPL changes in inverse proportion to the square of the distance from the sound source. At distances greater than 50 feet from a sound source, every doubling of the distance produces a 6 dB reduction in the sound. Therefore, a sound level of 70 dB at 50 feet would have a sound level of approximately 64 dB at 100 feet. At 200 feet sound from the same source would be perceived at a level of approximately 58 dB.

2. Additive Effects of Multiple Sound Sources - The total sound pressure created by multiple sound sources does not create a mathematical additive effect. Below Table A is given to assist you in calculating combined noise sources. For instance, two proximal noise sources that are 70 dBA each do not have a combined noise level of 140 dBA. In this case the combined noise level is 73 dBA. Since the difference between the two sound levels is 0 dB, Table A tells us to add 3 dB to the sound level to compensate for the additive effects of the sound. To find the cumulative SPL assess the SPLs starting with the two lowest readings and work up to the difference between the two highest readings. For several pieces of equipment, operating at one

time, calculate the difference first between the two lowest SPLs, check Table A and add the appropriate number of decibels to the higher of the two sound levels. Next, take the sound level that was calculated using Table A and subtract the next lowest sound level to be considered for the operation. Consult Table A again for the additive effect and add this to the higher of the two sound levels. Follow this process until all the sound levels are accounted for. As an example, let us say that an area for a new facility is being cleared. The equipment to be used is: two chainsaws, one operating at 57 dBA and one at 60 dBA; a front end loader at 80 dBA; and a truck at 78 dBA. Start with the two lowest sound levels: 60 dBA - 57 dBA = 3 dBA difference. Consulting the chart add 2 dBA to the higher sound level. The cumulative SPL of the two chainsaws is 62 dBA. Next, subtract 62 dBA from 78 dBA. 78 dBA - 62 dBA = 16 dBA. In this case, 0 dBA is added to the higher level so we end up with 78 dBA. Lastly, subtract 78 dBA from the 80 dBA. 80 dBA - 78 dBA = 2 dBA a difference of 2 dBA adds 2 dBA to the higher SPL or 82 dBA. The SPL from these four pieces of equipment operating simultaneously is 82 dBA.

Table A

Approximate Addition of Sound Levels

Difference Between Two Sound Levels	Add to the Higher of the Two Sound Levels
1 dB or less	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0 dB

(USEPA, Protective Noise Levels, 1978)

3. Temperature and Humidity - Sound energy is absorbed in the air as a function of temperature, humidity and the frequency of the sound. This attenuation can be up to 2 dB over 1,000 feet. Such attenuation is short term and, since it occurs over a great distance, should not be considered in calculations. Higher temperatures tend to increase sound velocity but does

not have an effect on the SPL. Sound waves bend towards cooler temperatures. Temperature inversions may cause temporary problems when cooler air is next to the earth allowing for more distant propagation of sound. Similarly, sound waves will bend towards water when it is cooler than the air and bounce along the highly reflective surface. Consequently large water bodies between the sound source and the receptor may affect noise attenuation over distance.

4. Time of Year - Summer time noises have the greatest potential for causing annoyance because of open windows, outside activities, etc. During the winter people tend to spend more time indoors and have the windows closed. In general, building walls and windows that are closed provide a 15 dB reduction in noise levels. Building walls with the windows open allow for only a 5 dB reduction in SPL.

5. Wind - Wind can further reduce the sound heard at a distance if the receptor is upwind of the sound. The action of the wind disperses the sound waves reducing the SPLs upwind. While it is true that sound levels upwind of a noise source will be reduced, receptors downwind of a noise source will not realize an increase in sound level over that experienced at the same distance without a wind. This dispels the common belief that sound levels are increased downwind due to wind carrying noise.

6. Land forms and structures - In certain circumstances, sound levels can be accentuated or focused by certain features to cause adverse noise impacts at specified locations. At a hard rock mine, curved quarry walls may have the potential to cause an amphitheater effect while straight cliffs and quarry walls may cause an echo. Buildings that line streets in cities can cause a canyon effect where sound can be reflected from the building surfaces similar to what might happen in a canyon. Consideration of noise impacts associated with these types of conditions may require specialized expertise to evaluate impact potential and to formulate suitable mitigation techniques.

Consideration of existing noise sources and sound receptors in proximity to a proposed activity can be important considerations even when the activity under review is not a noise source. Topography, vegetation, structures and the relative location of noise receptors and sources to these features are all aspects of the environmental setting that can influence noise impact potential. As such, land alteration may also indirectly create an adverse noise impact where natural land features or manmade features serve as a noise barrier or provide noise attenuation for existing sources of noise, i.e. highway, railroads, manufacturing activity. Removal of these features, i.e. hills, vegetation, large structures or walls, can expose receptors to increased sound pressure levels causing noise problems where none had previously existed.

B. Impact Assessment

1. Factors to Consider

Factors to consider in determining the impact of noise on humans, are as follows:

a. Evaluation of Sound Characteristics

(1) Ambient noise level - A noise can only intrude if it differs in character or SPL from the normal ambient sound. Most objective attempts to assess nuisance noise adopt the technique of comparing the noise with actual ambient sound levels or with some derived criterion.

(2) Future noise level - The ambient noise level plus the noise level from the new or proposed source.

(3) Increase In Sound Pressure Level - A significant factor in determining the annoyance of a noise is Sound Pressure Level (SPL). SPLs are measured in decibels.

(4) Sharp and Startling Noise - These high frequency and high intensity noises can be extremely annoying. When initially evaluating the effects

of noise from an operation, pay particular attention to noises that can be particularly annoying. One such noise is the back-up beepers required to be used on machinery. They definitely catch one's attention as they were meant to do. Continual beeping by machinery can be mitigated (see Section V.C. Mitigation - Best Management Practices). Another impulse noise source that can be very annoying is the exhaust from compressed air machinery. This exhaust is usually released in loud bursts. Compressed air exhaust can also be mitigated if it causes a noise problem by using readily available mufflers or specifically designed enclosures.

(5) Frequency and Tone - Frequency is the rate at which a sound source vibrates or makes the air vibrate. Frequency is measured in Hertz (Hz). Frequency can also be classified as high ("sharp"), low ("dull"), and moderate. Pure tones are rare in nature. Tonal sounds usually consist of pure tones at several frequencies. Pure tones and tonal sounds are discerned more readily by the human ear. Pure tones and tonal sounds are compensated for in sound studies by adding a calculated number of dB(A) to the measured sound pressure.

(6) Percentile of Sound Levels - Fluctuations of SPLs can be expressed as a percentile level designated as $L_{(n)}$ where a given decibel level is exceeded *n* % of the time. A designation of $L_{(10)}$ = 70 dBA means the measured SPLs exceeded 70 dBA 10% of the time. A designation of $L_{(90)}$ = 70 dBA means the measured SPLs were exceeded 90% of the time. $L_{(90)}$ is often used to designate the background noise level.

(7) Expression of Overall Sound - Part of the overall assessment of sound is the *Equivalent Sound Level* (L_{eq}) which assigns a single value of sound level for a period of time in which varying levels of sound are experienced over that time period. The L_{eq} value provides an indication of the effects of sound on people. It is also useful in establishing the ambient sound levels at a potential noise source.

In order to evaluate the above factors in the appropriate context, one must identify the following: 1) appropriate receptor locations for sound level calculation or measurement; 2) ambient sound levels and characteristics at these receptor locations; and 3) the sound pressure increase and characteristics of the sound that represents a significant noise effect at a receptor location.

b. Receptor Locations

Appropriate receptor locations may be either at the property line of the parcel on which the facility is located or at the location of use or inhabitance on adjacent property. The solid waste regulations require the measurements of sound levels be at the property line. The most conservative approach utilizes the property line. The property line should be the point of reference when adjacent land use is proximal to the property line. Reference points at other locations on adjacent properties can be chosen after determining that existing property usage between the property line and the reference point would not be impaired by noise, i.e., property uses are relatively remote from the property line. The location of the facility should be shown on a map in relation to each potential receptor. Any future expansion should be described in a narrative as well as depicted on a map. The map and narrative should also include the distance of the operation to each point of reception including the distance at the point in time when an expanding operation will be closest to the receptors.

c. Thresholds for Significant Sound Pressure Level (SPL) Increase

The goal for any permitted operation should be to minimize increases in sound pressure level above ambient levels at the chosen point of sound reception. Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive of receptors are present. Sound pressure increases of more than 6 dB may require a closer analysis of impact potential depending on existing SPLs and the character of surrounding land use and receptors. SPL increases approaching 10 dB result in a perceived doubling of SPL. The perceived doubling of the SPL results from the fact that SPLs are measured on a logarithmic scale. An increase of 10 dB(A) deserves consideration of avoidance and mitigation measures in most cases. The above thresholds as indicators of impact potential should be viewed as guidelines subject to adjustment as appropriate for the specific circumstances one encounters.

Establishing a maximum SPL at the point of reception can be an appropriate approach to addressing potential adverse noise impacts. Noise thresholds are established for solid waste management facilities in the Department's Solid Waste regulations, 6 NYCRR Part 360. Most humans find a sound level of 60 - 70 dB(A) as beginning to create a condition of significant noise effect (EPA 550/9-79-100, November 1978). In general, the EPA's "Protective Noise Levels" guidance found that ambient noise levels # 55 dBA $L_{(dn)}$ was sufficient to protect public health and welfare and, in most cases, did not create an annoyance (EPA 550/9-79-100, November 1978). In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the "upper end" limit since 65 dB(A) allows for undisturbed speech at a distance of approximately three feet. Some outdoor activities can be conducted at a SPL of 65 dB(A). Still lower ambient noise levels may be necessary if there are sensitive receptors nearby. These goals can be attained by using the mitigative techniques outlined in this guidance.

Ambient noise SPLs in industrial or commercial areas may exceed 65 dB(A) with a high end of approximately 79 dB(A) (EPA 550/9-79-100, November 1979). In these instances mitigative measures utilizing best management practices should be used in an effort to ensure that a facility's generated sound levels are at a minimum. The goal in an industrial/commercial area, where ambient SPLs are already at a high level, should be not to exceed the ambient SPL. Remember, if a new source operates at the same noise level as the ambient, then 3 dB(A) must be added to the existing ambient noise level to obtain the future noise level. If the goal is not to raise the future noise levels the new facility would have to operate at 10 dB(A) or more lower than the ambient.(see Table A)

Table B

HUMAN REACTION TO INCREASES IN SOUND PRESSURE LEVEL

Increase in Sound Pressure (dB)	**Human Reaction**
Under 5	Unnoticed to tolerable
5 - 10	Intrusive
10 - 15	Very noticeable
15 - 20	Objectionable
Over 20	Very objectionable to intolerable

(Down and Stocks - 1978)

Impact assessment will vary for specific project reviews, but must consist of certain basic components for all assessments. Additional examination of sound generation and noise reception are necessary, where circumstances warrant. Sound impact evaluation is an incremental process, with four potential outcomes:

- exemption criteria are met and no noise evaluation is required;
- noise impacts are determined to be non-significant (after first-level evaluation);
- noise impacts are identified as a potential issue but can be readily mitigated (after second level evaluation); or
- noise impacts are identified as a significant issue requiring analysis of alternatives as well as mitigation (third level evaluation).

All levels of evaluation may require preparation of a noise analysis. The required scope of noise impact analysis can be rudimentary to rather sophisticated, depending on circumstances and the results obtained from initial levels of evaluation. Recommendations for each level of evaluation are presented below.

2. Situations in Which No Noise Evaluation is Necessary

When certain criteria are satisfied, the need for undertaking a noise impact analysis at any level is eliminated. These criteria are as follows:

a. The site is contained within an area in which local zoning provides for the intended use as a "right of use". It does not apply to activities that are permissible only after an applicant is granted a special use permit by the local government; and

b. The applicant's operational plan incorporates appropriate best management practices (BMPs [see Section V.C. Mitigation - Best Management Practices]) for noise control for all facets of the operation.

Where activities may be undertaken as a "right of use", it is presumed that noise has been addressed in establishing the zoning. Any residual noise that is present following BMP implementation should be considered an inherent component of the activity that has been found acceptable in consideration of the zoning designation of the site.

3. First Level Noise Impact Evaluation

The initial evaluation for most facilities should determine the maximum amount of sound created at a single point in time by multiple activities for the proposed project. All facets of the construction and operation that produce noise should be included such as land clearing activities (chain saw and equipment operation), drilling, equipment operation for excavating, hauling or conveying materials, pile driving, steel work, material processing, product storage and removal. Land clearing and construction may be only temporary noise at the site whereas the ongoing operation of a facility would be considered permanent noise. An analysis may be required for various phases of the construction and operation of the project to assure that adverse noise effects do not occur at any phase.

To calculate the sound generated by equipment operation, one can consult the manufacturers' specifications for sound generation, available for various types of equipment. Another option for calculating the sound to be generated by equipment is to make actual measurements of sound generated by existing similar equipment, elsewhere.

Tables C and D summarize noise measurements from some common equipment used in construction and mining. Table E summarizes the noise level, in decibels (dB[A]), from some common sources. This information can be used to assist Department staff in relating potential noise impacts to sound levels produced by commercial and industrial activities. Use of these tables in the first level of analysis will help determine whether or not noise will be an issue and whether actual measurements should be made to confirm noise levels.

Table C

PROJECTED NOISE LEVELS

Noise Source	Measurements	1,000 feet	2,000 feet	3,000 feet
Primary and secondary crusher	89 dB(A) at 100 ft	69.0 dB(A)	63.0 dB(A)	59.5 dB(A)
Hitachi 501 shovel loading	92 dB(A) at 50 ft	66.0 dB(A)	60.0 dB(A)	56.5 dB(A)
Euclid R-50 pit truck loaded	90 dB(A) at 50 ft	64.0 dB(A)	58.0 dB(A)	54.4 dB(A)
Caterpillar 988 loader	80 dB(A) at 300 ft	69.5 dB(A)	63.5 dB(A)	60.0 dB(A)

(The Aggregate Handbook, 1991)

Table D
Common Equipment Sound Levels

EQUIPMENT	**DECIBEL LEVEL**	**DISTANCE** in feet
Augered earth drill	80	50
Backhoe	83-86	50
Cement mixer	63-71	50
Chain saw cutting trees	75-81	50
Compressor	67	50
Garbage Truck	71-83	50
Jackhammer	82	50
Paving breaker	82	50
Wood Chipper	89	50
Bulldozer	80	50
Grader	85	50
Truck	91	50
Generator	78	50
Rock drill	98	50

(excerpt and derived from Cowan, 1994)

Table E

Sound Source	dB(A)°	Response Criteria
	150	
Carrier Deck Jet Operation	140	
	130	Painfully Loud Limit Amplified Speech
Jet Takeoff (200 feet) Discotheque Auto Horn (3 feet) Riveting Machine	120	
	110	Maximum Vocal Effort
Jet Takeoff (2000 feet) Shout (0.5 feet)	100	
N.Y. Subway Station Heavy Truck (50 feet)	90	Very Annoying Hearing Damage (8 hours, continuous exposure)
Pneumatic Drill (50 feet)	80	Annoying
Freight Train (50 feet) Freeway Traffic (50 feet)	70	Telephone Use Difficult Intrusive
Air Conditioning Unit (20 feet)	60	
Light Auto Traffic (50 feet)	50	Quiet
Living Room Bedroom	40	
Library Soft Whisper (15 feet)	30	Very Quiet
Broadcasting Studio	20	
	10	Just Audible
	0	Threshold of Hearing

(The Aggregate Handbook, 1991)

The sound level at receptor locations should be calculated using the inverse square rule whereby sound is attenuated over distance. Again, each doubling of the distance from the source of a noise decreases the SPL by 6 dB(A) at distances greater than 50 feet. This calculation should first consider the straight line distance between the point of noise generation and the point of noise reception with the presumption that no natural or manmade features exist along the transect between the two points that would further attenuate sound level. Calculations should be performed for each point of reception in all directions being careful to evaluate the worst case noise impact potential by considering activities at the point where they would be closest to a receptor. The sound level calculated for the point of reception should be related to ambient sound levels. Ambient sound levels can be either measured or assumed based on established references for the environmental setting and land use at the point of reception. For estimation purposes, ambient SPLs will vary from approximately 35 dB(A) in a wilderness area to approximately 87 dB(A) in a highly industrial setting. A quiet seemingly serene setting such as rural farm land will be at the lower end of the scale at about 45 dB(A), whereas an urban industrial area will be at the high end of this scale at around 79 dB(A) (EPA 550/9-79-100, November 1978). If there is any concern that levels based on reference values do not accurately reflect ambient SPL, field measurements should be undertaken to determine ambient SPLs.

Where this evaluation indicates that sound levels at the point of reception will not be perceptible, similar to or only slightly elevated as compared to ambient conditions, no further evaluation is required. When there is an indication from this initial analysis that marginal or significant noise impact may occur, further evaluation is required. In determining the potential for an adverse noise impact, consider not only ambient noise levels, but also the existing land use, and whether or not an increased noise level or the introduction of a discernable sound, that is out of character with existing sounds, will be considered annoying or obtrusive. (see B.1.a Evaluation of Sound Characteristics)

4. Second Level Noise Impact Evaluation

Further refine the evaluation of noise impact potential by factoring in any additional noise attenuation that will be provided by existing natural topography, fabricated structures such as buildings, walls or berms or vegetation located between the point of noise generation and noise reception. This analysis may require consideration of future conditions and the loss of natural noise buffers over time.

Dense vegetation that is at least 100 feet in depth will reduce the sound levels by 3 to 7 dB(A). Evergreens provide a better vegetative screen than deciduous trees. Keep in mind that if a vegetative screen does not currently exist, planting a vegetative screen may require 15 or more years of growth before it becomes effective.

The degree to which topography attenuates noise depends on how close the feature is located to the source or the receptor of the noise. Topography can act as a natural screen. The closer a hill or other barrier is to the noise source or the receptor, the larger the sound shadow will be on the side opposite the noise source. Certain operations such as mining and landfills may be able to use topography to maintain a screen between the operation and receptors as they progress. Mining operations may be able to create screens by opening a mine in the center of the site using and maintaining the pit walls as barriers against sound (Aggregate Handbook, 1991).

If after taking into account all the attenuating features the potential still exists for adverse noise impact, other types of noise analyses or modeling should be used to characterize the source. An Equivalent Sound Level (L_{eq}) analysis or a related type of noise analysis may better define activities or sources that require more mitigation or isolation so that noise emanating from these sources will not cause an adverse impact.

Where it is demonstrated that noise absorbing or deflecting features further attenuate sound reception to a level of no significant increase, no further analysis is necessary. Where it is determined that noise level or the character of the noise may have a significant adverse effect on receptors, other noise mitigation measures should be evaluated in an expanded noise analysis.

5. Third Level - Mitigation Measures

When the above analyses indicate significant noise effects may or will occur, the applicant should evaluate options for implementation of mitigation measures that avoid, or diminish significant noise effects to acceptable levels (see Section V.C. Mitigation - Best Management Practices). Adequate details concerning mitigation measures and an evaluation of the effectiveness of the mitigative measures through additional sound level calculations should be provided in a noise analysis. These calculations are to factor in the noise reduction or avoidance capabilities of the mitigation measures. In circumstances where noise effects cannot readily be reduced to a level of no significance by project design or operational features in the application, the applicant must evaluate alternatives and mitigation measures in an environmental impact statement to avoid or reduce impacts to the maximum extent practicable per the requirements of the State Environmental Quality Review Act (SEQR).

The noise analysis should be part of the application or a supplement to it, and will be part of the SEQR environmental assessment by reference. Duplicative noise analysis information is not required for the permit application and the assessment of impacts under SEQR. A proper analysis can satisfy information needs for both purposes.

C. Mitigation - Best Management Practices (BMP) for Reducing Noise

Various noise abatement techniques are available for reducing frequency of sound, duration of sound or SPLs at receptor locations. The mitigation techniques given below are listed according to what sound characteristic they mitigate.

1. Reduce noise frequency and impulse noise at the source of generation by:

   a. Replacing back-up beepers on machinery with strobe lights (subject to other requirements, e.g., OSHA and Mine Safety and Health Administration, as applicable). This eliminates the most annoying impulse beeping;

   b. Using appropriate mufflers to reduce the frequency of sound on machinery that pulses, such as diesel engines and compressed air machinery;

   c. Changing equipment: using electric motors instead of compressed air driven machinery; using low speed fans in place of high speed fans;

   d. Modifying machinery to reduce noise by using plastic liners, flexible noise control covers, and dampening plates and pads on large sheet metal surfaces; and

2. Reduce noise duration by:

   a. Limiting the number of days of operation, restricting the hours of operation and specifying the time of day and hours of access and egress can abate noise impacts.

   b. Limiting noisier operations to normal work day hours may reduce or eliminate complaints.

   Limiting hours of construction or operation can be an effective tool in reducing potential adverse impacts of noise. The impacts of noise on receptors can be significantly reduced by effectively managing the hours at which the loudest of the operations can take place.

Implementation of hours of operation does not reduce the SPL emanating from a facility. Determining whether or not hours of operation will be effective, mitigation requires consideration of: public safety, for example road construction at night may reduce traffic concerns and facilitate work; duration of the activity, is it a one time event necessary to meet a short term goal or will the activity become an ongoing operation; and surrounding land use, consider what type(s) of land use is proximal to the activity and at what time(s) might a reduction of noise levels be necessary. There may be other factors to consider due to the uniqueness of a given activity or the type of land use adjacent to the activity. Hours of operation should also consider weekend activities and legal holidays that may change the types of land use adjacent to the permitted activity or increase traffic levels in an area.

The best results from using hours of operation as a mitigative measure will be obtained if the hours are negotiated with the owner or operator of the facility. The less noisy aspects of an operation may not have to be subject to the requirements of hours of operation such as preparing, greasing and maintaining machinery for the upcoming day's operation. The more noisy operations can be scheduled to begin when people in the receptor area are less likely to be adversely effected. Hours of operation should be included in the operation plans for a facility that becomes part of the permit, or in the event that there is no operation plan, can be included as a permit condition.

3. Reduce Noise sound pressure levels by:

    a. Increasing the setback distance.
    b. Moving processing equipment during operation further from receptors.
    c. Substituting quieter equipment (<u>example</u> - replacing compressed air fan with an electric fan could result in a 20 dB reduction of noise level).

d. Using mufflers selected to match the type of equipment and air or gas flow on mechanical equipment.
e. Ensuring that equipment is regularly maintained.
f. Enclosing processing equipment in buildings (<u>example</u> - enclosing noisy equipment could result in an 8-10 dB noise level reduction, a 9 inch brick wall can reduce SPL by 45-50 dB).
g. Erecting sound barriers such as screens or berms around the noise generating equipment or near the point of reception. The angle of deflection also increases as the height of a screen or barrier increases. Screens or barriers should be located as close to the noise source or the receptor as possible. The closer the barrier is located to the source or the receptor, the greater the angle of deflection of the sound waves will be creating a larger "sound shadow" on the side opposite the barrier. Stockpiles of raw material or finished product can be an effective sound barrier if strategically placed.
h. phasing operations to preserve natural barriers as long as possible.
i. altering the direction, size, proximity of expanding operations.
j. Designing enclosed facilities to prevent or minimize an SPL increases above ambient levels. This would require a noise analysis and building designed by a qualified engineer that includes adequate ventilation with noise abatement systems on the ventilation system.

Public notification of upcoming loud events can also be used as a form of mitigation although it doesn't fit easily into the categories above. People are less likely to get upset if they know of an upcoming event and know that it will be temporary.

The applicant should demonstrate that the specific mitigation measures proposed will be effective in preventing adverse noise effects on receptors.

D. <u>Decision Making - Conditioning Permits to Limit Noise Impacts</u>

Preferably, the mitigation measures as outlined in the construction and operational plans should be relied upon to mitigate the effects of noise on receptors. The permit should state that the activity will be conducted in accordance with the approved plan. Otherwise, mitigation measures and BMP's can be imposed within specific permit conditions.

It is not the intention of this guidance to require decibel limits to be established for operations where such limits are not required by regulation. There are, however, instances when a decibel limit may be established for an operation to ensure activities do not create unacceptable noise effects, as follows:

1. The review of a draft and final environmental impact statement demonstrates the need for imposition of a decibel limit;
2. A decibel limit is established by the Commissioner's findings after a public hearing has been held on an application;
3. The applicant asks to have a decibel limit to demonstrate the ability to comply; or
4. A program division seeks to establish a decibel limit as a permit condition, when necessary to demonstrate avoidance of unacceptable noise impact.

Ultimately, the final decision must incorporate appropriate measures to minimize or avoid significant noise impacts, as required under SEQR. Any unavoidable adverse effects must be weighed along with other social and economic considerations in deciding whether to approve or deny a permit.

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