ACOUSTIC STUDY FOR THE PROPOSED NAED PEAK POWER GENERATOR

NORTH ATTLEBOROUGH, MASSACHUSETTS

May 2019

North Attleborough Electric Department

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ACOUSTIC STUDY FOR THE PROPOSED NAED PEAK POWER GENERATOR

NORTH ATTLEBOROUGH, MASSACHUSETTS

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1.0 EXECUTIVE SUMMARY

This study's objective is to demonstrate that the proposed future peak power generator in North Attleborough (the "Project") will comply with the Massachusetts Department of Environmental Protection ("MassDEP") Noise Policy for both broadband and tonal noise at the nearest residential property lines and residences and will comply with the North Attleborough Board of Health Noise Regulations. The Project is located at the North Attleborough Electric Department (NAED) substation property on 280 Landry Avenue. The Project includes a 2.5-MW generator for peak power production located on the northern half of the site. The site is located on the eastside of Landry Avenue. Directly abutting land uses are commercial and industrial properties to the west and south, Interstate 95 to the east, and a National Grid power line easement to the north. The nearest residences to the project site are houses to the north along Landry Avenue and Thyme Lane, and further to the east on Westfield Drive

The first step of the study was to measure sound levels at locations near the Project site to document the existing acoustic environment prior to construction of the proposed project. The second step was to use the Cadna-A acoustic model, based on International Standard ISO 9613, to calculate sound level impacts from the future peak power generators in operation. The predicted sounds levels at the nearby residences were then compared with limits established by the MassDEP Noise Policy and by the North Attleborough Board of Health Noise Regulations. The Cadna-A acoustic modeling assumed simultaneous operation of all equipment. The potential sources of sound at the facility are:

- A CAT G3520 2.5 MW gas-fired peaking power generator, or equal, with an engine enclosure capable of reducing mechanical sound to 65 dBA +/- 3 dB at 50 feet (i.e. approximately 25 dB reduction);
- A "super quiet" radiator emitting 57 dBA at 50 feet; and
- Engine exhaust mitigated to produce a sound level of 80 dBA at 5 feet.

Existing 1-hour sound levels were measured near the north property boundary of the NAED property from Wednesday, April 24, 2019 through Monday, April 24, 2019. Short-term sound measurements for comparison were collected near the closest residences on Landry Avenue, Thyme Lane and Westfield Drive. The one-hour background levels (L_{90}) near the north property boundary, during times when the

peak power generators would operate, ranged from 42 to 55 dBA. The lowest one-hour L_{90} level of 42 dBA (10:00 p.m. to 11:00 p.m.) on Sunday, April 28, 2019 was selected as the existing background sound level. This sound level was used to represent ambient conditions at site property boundary. Short-term baseline sound levels were also measured at four monitoring locations representative of the nearest residences. The background levels (L_{90}) measured at the nearest residences ranged from 45 to 57 dBA. Ambient sound levels collected at the long-term monitoring location were lower outside of the times when the short-term monitoring was conducted. So, it is possible that ambient sound levels are, at times, less than those collected at each residential monitoring location. To be conservative, the measured short-term sound levels were calibrated to the concurrent on-site long-term monitoring data, and were adjusted to account for the possibility that ambient sound levels are lower than were measured. The adjusted ambient sound levels at the four residential locations range from 39 to 51 dBA.

The MassDEP Noise Policy regulates sound from mechanical equipment operation on the site, limiting the increase in the ambient level to no more than 10 dBA at the nearest residences. The Noise Policy also prohibits the creation of a pure tone at these same locations. The modeling results demonstrate full compliance with the MassDEP Noise Policy. The Project will not produce a pure tone, and will increase the ambient level by 6 dBA or less at the nearest residences.

The Town of North Attleborough Board of Health has adopted Noise Regulations include limits applicable to the Project that are synonymous with sound impact limitations associated with the MassDEP Noise Policy. Therefore, compliance with the MassDEP Noise Policy infers compliance with the North Attleborough Board of Health Noise Regulations.

2.0 COMMON MEASURES OF COMMUNITY NOISE

Audible sound is reported as a sound pressure level[1] in decibels (dB). The decibel scale is logarithmic to accommodate the wide range of sound intensities to which the human ear is subjected. A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (or 73 dB), not a doubling to 140 dB. Thus, every 3-dB increase represents a doubling of sound energy. For broadband sounds, a 3-dB change is the minimum change perceptible to the human ear. Table 1 below gives the perceived change in loudness of different changes in sound pressure levels.[2]

TABLE 1

SUBJECTIVE EFFECT OF CHANGES IN SOUND PRESSURE LEVELS

CHANGE IN SOUND LEVEL	APPARENT CHANGE IN LOUDNESS
3 dB	Just perceptible
5 dB	Noticeable
10 dB	Twice (or half) as loud

The acoustic energy level of a source is known as its sound power level (L_w), which is also measured on a decibel scale. The sound power level of a source is the same at any distance; therefore, L_w values do not have reference distances. In contrast, sound pressure levels vary with distance from the source. Sound power levels are typically greater than 100 dBA; these large L_w numbers should not be confused with the sound pressure levels we hear.

Non-steady noise exposure in a community is commonly expressed in terms of the A-weighted sound level (dBA); A-weighting approximates the frequency response of the human ear. Levels of many

[1] The sound pressure level is defined as $20*\log_{10}(P/P_o)$ where P is the sound pressure and P_o is the reference pressure of 20 micro-Pascals (20 μPa), which by definition corresponds to 0 dB.

[2] American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1989 ASHRAE Handbook--Fundamentals (I-P) Edition, Atlanta, GA, 1989.

sounds change from moment to moment. Some are sharp impulses lasting 1 second or less, while others rise and fall over much longer periods of time. There are various measures of sound pressure designed for different purposes. To establish the background sound level in an area, the $\mathbf{L_{90}}$ metric, which is the sound level exceeded 90 percent of the time, is typically used. The $\mathbf{L_{90}}$ can also be thought of as the level representing the quietest 10 percent of any time period. This is a broadband sound pressure measure, i.e., it includes sounds at all frequencies. The $\mathbf{L_{eq}}$, or equivalent sound level, is the steady-state sound level over a period of time that has the same acoustic energy as the fluctuating sounds that actually occurred during that same period. It is commonly referred to as the average sound level. The $\mathbf{L_{max}}$, or maximum sound level, represents the one second peak level experienced during a given time period.

Sound level measurements typically include an analysis of the sound spectrum into its various frequency components to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis examines eleven octave bands from 16 to 16,000 Hz. MassDEP Noise Policy states that a source creates a pure tone if acoustic energy is concentrated in a narrow frequency range and one octave band has a sound level 3 dB greater than both adjacent octave bands.

The acoustic environment in a suburban area such as North Attleborough results from numerous sources and the major source is motor vehicle traffic on Interstate 95. Typical sound levels associated with various activities and environments are presented in Table 2.

TABLE 2

COMMON SOUND LEVELS

Sound Level (dBA)	Common Indoor Sounds	Common Outdoor Sounds
110	Rock Band	Jet Takeoff at 1000’
100	Inside NYC Subway Train	Chain Saw at 3’
90	Food Blender at 3’	Impact Hammer (Hoe Ram) at 50’
80	Garbage Disposal at 3’	Diesel Truck at 100’
70	Vacuum Cleaner at 10’	Lawn Mower at 100’
60	Normal Speech at 3’	Auto (40 mph) at 100’
50	Dishwasher in Next Room	Busy Suburban Area at night
40	Empty Conference Room	Quiet Suburban Area at night
25	Empty Concert Hall	Rural Area at night

3.0 NOISE REGULATIONS

3.1 Massachusetts DEP Noise Policy

The Massachusetts Department of Environmental Protection (MassDEP) regulates noise through 310 CMR 7.10, "Air Pollution Control". In these regulations "air contaminant" is defined to include sound and a condition of "air pollution" includes the presence of an air contaminant in such concentration and duration as to "cause a nuisance" or "unreasonably interfere with the comfortable enjoyment of life and property". Regulation 7.10 prohibits "unnecessary emissions" of noise. The MassDEP Noise Policy (Policy Statement 90-001, February 1, 1990) interprets a violation of this noise regulation to have occurred if the source causes either:

1) An increase in the broadband sound pressure level of more than 10 dBA above the ambient, or

2) A "pure tone" condition.

The "ambient level" is defined as the lowest 1-hout L_{90} level measured during facility operating hours. However, the proposed peak power generators will only operate during the time period of 2:00 p.m. to 11:00 p.m. and for evaluating their sound impacts the ambient level is defined as the lowest 1-hour L_{90} sound level in that time period. A "pure tone" condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more. The limits are applied at the nearest residence and residential property line. The Noise Policy does not apply to uninhabited areas where there is no possibility of residential construction.

3.2 North Attleborough Noise Regulations

The Town of North Attleborough Board of Health has adopted Noise Regulations[3]. Those regulations contain the following noise limits established under Section 4: Noise Thresholds and Exclusions:

1. Between the hours of 11:00 p.m. and 7:00 a.m., no person shall engage in any continuous intermittent, recurring, scheduled or seasonal activity which generates noise from a building,

3 Approved August 4, 1994, https://www.nattleboro.com/board-of-health/pages/regulations.

device, explosive, machine, vehicle or any other man-made source if that noise is likely to exceed normal ambient noise levels by five (5) dBA.

2. At other times of day, no person shall engage in any continuous, intermittent, recurring, scheduled or seasonal activity which generates noise from a building, device, explosive, machine, vehicle or any other man-made source if that noise, when recorded at a distance of fifty (50) feet from its source, exceeds a level of eighty-five (85) dBA, or when recorded from the boundary of the property of one or more complainants, exceeds normal ambient noise levels by more than ten (10) dBA.

Since the peak power generator will only operate anytime between 2:00 p.m. and 11:00 p.m., the limits included in item #1 above, are not applicable. And, compliance with the MassDEP Noise Policy infers compliance with sound impact limitations contained in item #2 above. Therefore, compliance with the MassDEP Noise Policy infers compliance with the North Attleborough Board of Health Noise Regulations.

4.0 PRE-CONSTRUCTION SOUND LEVEL MEASUREMENTS

Pre-construction sound level monitoring was performed on both a long-term and short-term basis. The monitoring methodology and results are presented below.

4.1 Long-term Sound Monitoring

To identify the lowest L_{90} background level of the nearest residential areas surrounding the Project site, a long-term sound analyzer was used to measure hourly sound levels over a six-day period to provide a complete picture of 24-hour sound conditions at the site. These baseline measurements were performed at the site property boundary closest to the nearest residences on Thyme Lane. The long-term sound analyzer measured hourly sound levels and octave band levels from Wednesday, April 24, 2019 through Monday, April 29, 2019. The location of the long-term sound level measurements (LT-1) is presented in Figure 1.

The long-term measurements were collected with a Larson Davis 831 sound level analyzer. This analyzer is equipped with a 1/2" precision condenser microphone and has an operating range of 5 dB to 140 dB, and an overall frequency range of 3.5 to 20,000 Hz. This analyzer meets or exceeds all requirements set forth in the American National Standards Institute (ANSI) Type 1 Standards for quality and accuracy. Prior to and immediately following the measurement session, the sound analyzer was calibrated (no level adjustment was required; therefore, it was monitoring accurately) with an ANSI Type 1 calibrator, which has an accuracy traceable to the National Institute of Standards and Technology (NIST). For the measurement session, the microphone was fitted with a 7-inch windscreen to negate the effect of air movement across microphone diaphragm. All data were downloaded to a computer following the measurement session for further analysis.

A summary of the long-term background L_{90} sound measurement results is provided in Table 3. Table 3 only presents the measured L_{90} sound levels between 2:00 p.m. and 11:00 p.m., when the proposed peak power generator would operate. The one-hour background levels (L_{90}) ranged from 42 to 55 dBA. One-hour average sound levels (L_{eq}) ranged from 45 to 68 dBA, and maximum sound levels (L_{max}) ranged from 55 to 100 dBA during those same hours.

The lowest one-hour L_{90} level of 42 dBA (10:00 p.m. to 11:00 p.m.) on Sunday, April 28, 2019 was selected as the existing background sound level. This sound level was used to represent ambient conditions at site property boundary. Weather conditions at this time were acceptable for accurate acoustic measurements. Skies were clear with no precipitation; the temperature was 41°F and winds were 5 to 10 mph out of the west.[4] Appendix A presents a summary of the L_{max}, L_{eq} and L_{90} sound level measurements for the entire sampling period. The overall sound levels measured are typical of a suburban area located near busy roads and with surrounding commercial/industrial areas.

TABLE 3

SUMMARY OF LONG-TERM BASELINE SOUND LEVELS (L_{90}, dBA)
Wednesday, April 24, 2019 to Sunday, April 28, 2019, 2:00 p.m. to 11:00 p.m.

Hour Starting	Measured L_{90} Broadband Hourly Sound Levels (dBA)				
	Wed. 4/24/19	Thur. 4/25/19	Fri. 4/26/19	Sat. 4/27/19	Sun. 4/28/19
2 p.m.	49	49	55	50	46
3 p.m.	49	52	53	50	45
4 p.m.	50	53	53	49	44
5 p.m.	51	55	53	49	46
6 p.m.	50	55	54	49	45
7 p.m.	46	54	54	47	46
8 p.m.	45	53	53	46	44
9 p.m.	43	52	51	45	42
10 p.m.	43	52	52	47	42

4 https://mesowest.utah.edu, North Central State Airport (KSFZ, Pawtucket, RI), downloaded May 1, 2019.

4.2 Short-term Sound Monitoring

Short-term baseline sound levels were measured during the late morning and early afternoon hours on Wednesday, April 24, 2019 at four monitoring locations. Weather conditions were acceptable for accurate acoustic measurements during the short-term monitoring sessions. Skies were clear with no precipitation; the temperature ranged from 57°- 62°F, and wind speeds were light to moderate[4]. The approximate locations of the short-term sound level measurements are presented in Figure 1. One set of sound level measurements, of 20 minutes in duration, was collected during the late morning and early afternoon hours (10:28 a.m. to 12:01 p.m.) at each of these locations. Broadband A-weighted L_{max}, L_{eq} and L_{90} sound levels were measured at each location to provide a complete picture of sound conditions in the residential areas surrounding the site.

All short-term (20-minute) sound level measurements were collected by an acoustic engineer using a Bruel and Kjaer 2250 ANSI Type 1 (high precision) real-time sound level analyzer, which was equipped with a precision condenser microphone, windscreen, and frequency analyzer. This analyzer is equipped with a 1/2" precision condenser microphone and has an operating range of 5 dB to 140 dB, and an overall frequency range of 3.5 to 20,000 Hz. This analyzer meets or exceeds all requirements set forth in the American National Standards Institute (ANSI) Type 1 Standards for quality and accuracy. Prior to and immediately following each measurement session, the sound analyzer was calibrated (no level adjustment was required; therefore, it was monitoring accurately) with an ANSI Type 1 calibrator, which has an accuracy traceable to the National Institute of Standards and Technology (NIST). For each measurement session, the microphone was fitted with a 7-inch windscreen to negate the effect of air movement across the microphone diaphragm. All data were downloaded to a computer following the measurement session for further analysis. Concurrent observations of audible activity from sound-producing sources was recorded by the acoustic engineer.

Summaries of the short-term sound measurement results are provided in Table 4. The average sound levels (L_{eq}) ranged from 50 to 59 dBA, maximum sound levels (L_{max}) ranged from 63 to 77 dBA, and background levels (L_{90}) ranged from 45 to 57 dBA. The dominant sources of sound were distant and local traffic, pedestrians, and natural sounds such as birds. The overall sound levels measured are typical of a suburban area located near busy roads and with surrounding commercial/industrial areas.

TABLE 4

SUMMARY OF SHORT-TERM SOUND LEVELS (dBA)
SURROUNDING THE PROJECT SITE

Wednesday, April 24, 2019
10:28 a.m. to 12:01 p.m.

Sound Level Measurement	**(Location #1) 211 Landry Ave 11:14 a.m. – 11:34 a.m.**	**(Location #2) 1 Thyme Lane 10:28 a.m.- 10:48 a.m.**	**(Location #3) 51 Thyme Lane 10:50 a.m. – 11:10 a.m.**	**(Location #4) 82 Westfield Dr 11:41 a.m. – 12:01 p.m.**
Broadband (dBA)				
Background (L_{90})	50.4	45.2	46.6	57.0
Average (L_{eq})	57.8	49.7	52.9	59.4
Maximum (L_{max})	73.0	62.8	76.9	68.6
Octave Band L_{90} (dB)				
16 Hz	54.6	56.4	56.5	59.6
31.5 Hz	55.0	56.6	57.7	61.5
63 Hz	55.1	55.1	56.8	62.4
125 Hz	50.2	48.1	50.5	57.0
250 Hz	45.0	40.7	42.5	48.0
500 Hz	45.4	39.0	41.2	49.8
1000 Hz	46.3	41.7	42.9	54.5*
2000 Hz	42.3	36.1	37.3	49.1
4000 Hz	34.3	29.6	29.6	37.1
8000 Hz	25.7	17.5	21.5	23.0
16000 Hz	14.9	11.2	11.2	12.6
Pure Tone?	No	No	No	Yes

* Pure tone associated with I-95 traffic noise.

Figure 1. Long-Term and Short-Term Monitoring Locations
NAED Peak Power Generator
280 Landry Avenue, North Attleborough, MA

4.3 Lowest Ambient Sound Levels

Ambient sound levels collected at the long-term monitoring location were lower outside of the times when the short-term monitoring was conducted. So, it is possible that ambient sound levels are, at times, less than those collected at each residential monitoring location and are presented in Table 4. To be conservative, the measured short-term sound levels were calibrated to the concurrent on-site long-term monitoring data, and were adjusted to account for the possibility that ambient sound levels are lower than were measured. The adjusted ambient sound levels are presented in Table 5 for the time period when the peak power generator will operate (i.e. between 2:00 p.m. and 11:00 p.m.). Table 5 also lists the residential sound level limits under the MassDEP Noise Policy, namely the estimated lowest ambient sound level (L_{90}) + 10 dBA. Continuous sound levels from the proposed Facility may not exceed these levels.

TABLE 5

ADJUSTED BASELINE SOUND LEVEL MEASUREMENTS (L_{90}, dBA)
NORTH ATTLEBOROUGH, MASSACHUSETTS
During Peak Power Operation - 2:00 p.m. to 11:00 p.m.

Sound Level Measurement	(Location #1) 211 Landry Ave	(Location #2) 1 Thyme Lane	(Location #3) 51 Thyme Lane	(Location #4) 82 Westfield Dr
Short-Term Measurement	50	45	47	57
Concurrent On-Site via Long-Term	48	48	48	48
Lowest Measured by Long-Term	42	42	42	42
Estimated Lowest Ambient	44	39	40	51
MassDEP Noise Policy Limit	**54**	**49**	**50**	**61**

5.0 FUTURE SOUND SOURCES

The future peak power generator in North Attleborough is expected to include a gas-fired engine and associated generator set with a radiator cooling system. The engine and generator will operate inside of a weatherproof and sound attenuated enclosure. The sound emitted from the exhaust stack will be mitigated with an exhaust silencer, or series of exhaust silencers. The radiator cooling system will be outside of the engine and generator enclosure, and at ground-level. This unit will typically operate between 2:00 p.m. and 11:00 p.m. when peak energy demands are highest.

The potential sources of sound at the facility are:

- A CAT G3520 2.5 MW gas-fired peaking power generator, or equal, with an engine enclosure capable of reducing mechanical sound to 65 dBA +/- 3 dB at 50 feet (i.e. approximately 25 dB reduction);
- A “super quiet” radiator emitting 57 dBA at 50 feet; and
- The engine exhaust mitigated to produce a sound level of 80 dBA at 5 feet.

6.0 CALCULATED FUTURE SOUND LEVELS

6.1 Acoustic Modeling of Facility Operations

Predicted future sound levels at the upper story windows of the nearest residences were calculated with the Cadna-A acoustic model, assuming simultaneous operation of all equipment at their maximum loads. Cadna-A is a sophisticated 3-D model for sound propagation and attenuation based on International Standard ISO 9613[5]. Atmospheric absorption is the process by which sound energy is absorbed by the air and was calculated using ANSI S1.26-1995.[6] Absorption of sound assumed standard day conditions and is significant at large distances and at high frequencies. ISO 9613 was used to calculate propagation and attenuation of sound energy by hemispherical divergence with distance, surface reflection, ground, and shielding effects by barriers, buildings, and ground topography. Offsite topography was determined using official USGS digital elevation data for the study area.

Predicted future sound levels were calculated at the upper story windows of the nearest residents on Landry Avenue, Thyme Lane and Westfield Drive. All acoustic modeling results are included in Appendix B.

[5] International Standard, ISO 9613-2, Acoustics – Attenuation of Sound During Propagation Outdoors, -- Part 2 General Method of Calculation.

[6] American National Standards Institute, ANSI S1.26-1995, American National Standard Method for the Calculation of the Absorption of Sound by the Atmosphere, 1995.

6.2 MassDEP Noise Policy Compliance Determination

The results presented below include the acoustic modeling results at the four (4) representative residential locations where the short-term monitoring was conducted. These locations are illustrated in Figure 2 and are as follows:

- Location #1: 211 Landry Avenue (Animal Crackers Nursery)
- Location #2: 1 Thyme Lane
- Location #3: 51 Thyme Lane
- Location #4: 82 Westfield Drive

The results of these calculations, presented in Table 6, demonstrate that the Project will fully comply with the MassDEP Noise Policy at those noise-sensitive locations. Compliance with the MassDEP Noise Policy infers compliance with the North Attleborough Board of Health Noise Regulations. The Project will increase the ambient levels at upper story windows of the nearest residences by 6 dBA or less. The acoustic modeling calculations (see Appendix B) also confirm that the Project will not create any pure tones. (Note that octave band results in Appendix B are un-weighted or linear decibels.)

Figure 2. Project Location and Acoustic Modeling Locations
NAED Peak Power Generator
280 Landry Avenue, North Attleborough, MA

TABLE 6

SUMMARY OF MASSDEP NOISE COMPLIANCE DEMONSTRATION AT THE UPPER STORY WINDOWS OF THE NEAREST NOISE SENSITIVE AREAS

Receptor Locations	Ambient Sound Level (L_{90})	Predicted Project Sound Levels	Total Future Sound Level	Predicted Sound Level Increase	Complies with MassDEP Noise Policy?
#1: 211 Landry Avenue	44 dBA	39 dBA	45 dBA	+1 dBA	Yes
#2: 1 Thyme Lane	39 dBA	42 dBA	44 dBA	+5 dBA	Yes
#3: 51 Thyme Lane	40 dBA	45 dBA	46 dBA	+6 dBA	Yes
#4: 82 Westfield Drive	51 dBA	29 dBA	51 dBA	+0 dBA	Yes

6.3 Figure of Project Operational Sound Levels

Figure 3 shows color-coded decibel contours (5 feet above ground level) for the operation of the Project. These contours display the predicted continuous sound levels for Project. The results in Figure 3 demonstrate compliance with the MassDEP Noise Policy and the North Attleborough Board of Health Noise Regulations at all nearby residences.

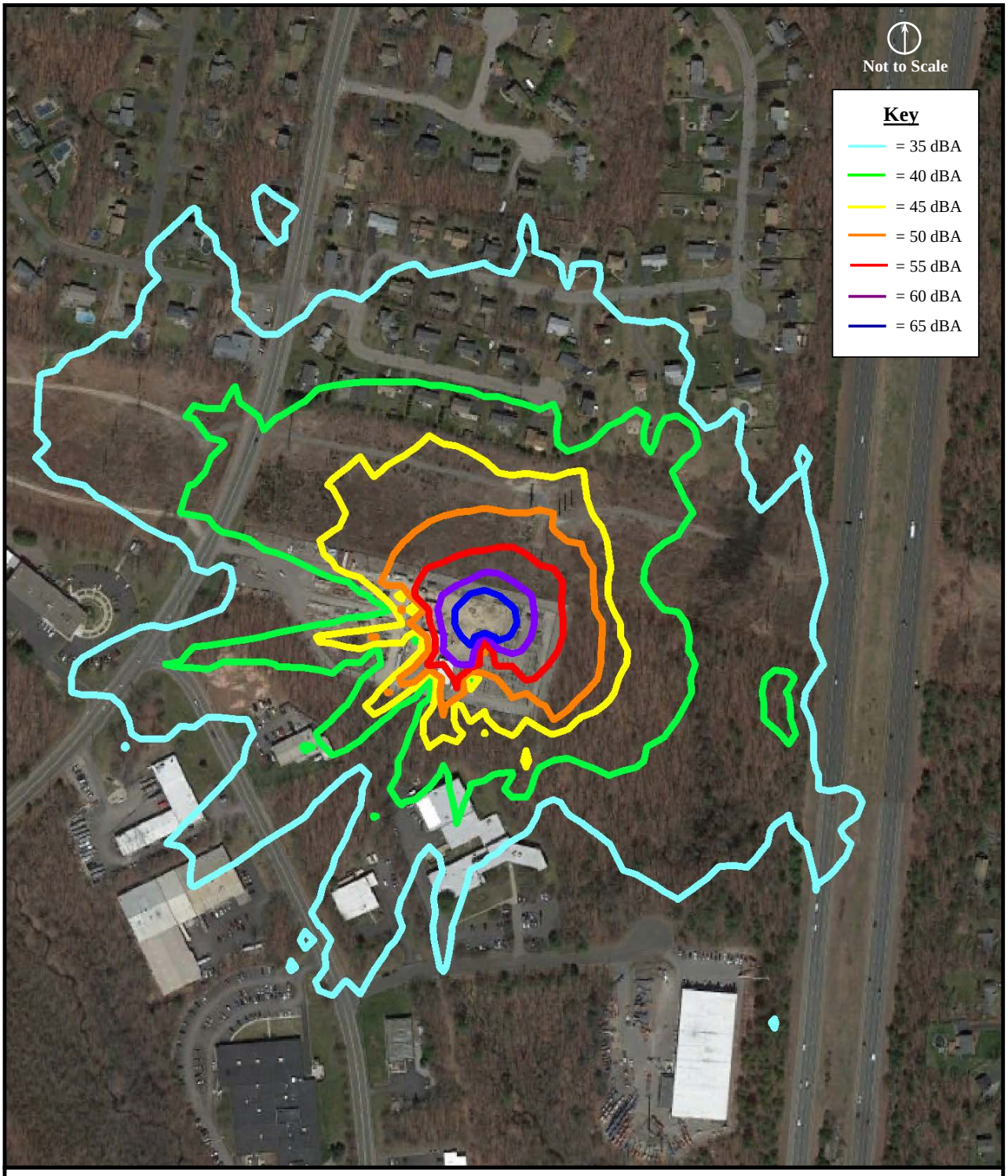

Figure 3. Predicted Future Operational Sound Levels
NAED Peak Power Generator
280 Landry Avenue, North Attleborough, MA

Conclusions

The results of the acoustic modeling analysis show that the proposed peak power generator will fully comply with the MassDEP Noise Policy and the North Attleborough Board of Health Noise Regulations, and will not create a nuisance in the nearby residential areas in North Attleborough. In order to ensure that sound levels from the facility comply with the MassDEP Noise Policy and the North Attleborough Board of Health Noise Regulations, the following noise mitigation elements are included in the Project design:

- Engine enclosure will reduce mechanical sound to 65 dBA +/- 3 dB at 50 feet.
- Employ a "super quiet" radiator emitting no more than 57 dBA at 50 feet.
- Mitigate the engine exhaust to produce a sound level of no more than 80 dBA at 5 feet from the top of the exhaust stack.

APPENDIX A

BASELINE SOUND LEVEL MEASUREMENTS

Hour Starting	L_{max}	L_{EQ}	L_{90}
Wednesday, April 24, 2019			
11:00 a.m.	61.4	51.4	47.8
12:00 p.m.	74.8	54.7	48.8
1:00 p.m.	70.1	52.7	48.3
2:00 p.m.	65.0	52.6	49.0
3:00 p.m.	71.1	53.1	48.9
4:00 p.m.	68.4	53.4	50.1
5:00 p.m.	69.5	54.1	50.5
6:00 p.m.	68.3	53.0	49.8
7:00 p.m.	61.4	49.6	46.2
8:00 p.m.	60.8	48.6	44.7
9:00 p.m.	60.3	47.0	43.4
10:00 p.m.	55.4	45.3	42.7
11:00 p.m.	57.4	43.3	39.9
Thursday, April 25, 2019			
12:00 a.m.	53.7	43.3	40.7
1:00 a.m.	54.0	42.7	40.0
2:00 a.m.	55.9	42.7	40.3
3:00 a.m.	53.5	42.9	40.5
4:00 a.m.	61.0	49.2	43.9
5:00 a.m.	58.6	50.0	48.2
6:00 a.m.	70.2	52.0	48.4
7:00 a.m.	61.9	51.6	48.8
8:00 a.m.	61.9	51.9	49.2
9:00 a.m.	56.4	49.6	47.2
10:00 a.m.	63.2	49.0	46.2
11:00 a.m.	64.4	49.7	47.1
12:00 p.m.	59.7	49.9	47.1
1:00 p.m.	62.2	50.0	46.9

2:00 p.m.	57.3	51.9	49.2
3:00 p.m.	62.0	54.2	51.8
4:00 p.m.	61.5	54.5	52.5
5:00 p.m.	70.2	57.4	55.2
6:00 p.m.	63.2	56.6	54.8
7:00 p.m.	65.0	56.4	54.1
8:00 p.m.	68.5	54.9	52.7
9:00 p.m.	62.5	53.7	52.0
10:00 p.m.	58.0	53.1	51.6
11:00 p.m.	58.0	52.4	50.6
Friday, April 26, 2019			
12:00 a.m.	56.3	49.5	47.5
1:00 a.m.	57.0	48.7	46.5
2:00 a.m.	53.8	48.4	46.1
3:00 a.m.	55.3	48.6	46.0
4:00 a.m.	56.6	52.1	50.0
5:00 a.m.	60.7	54.1	52.2
6:00 a.m.	61.0	55.2	53.7
7:00 a.m.	59.9	54.7	53.2
8:00 a.m.	63.1	54.6	52.4
9:00 a.m.	66.4	58.5	55.7
10:00 a.m.	64.0	58.8	56.4
11:00 a.m.	66.2	59.0	56.1
12:00 p.m.	65.6	58.9	56.8
1:00 p.m.	67.8	58.4	56.2
2:00 p.m.	68.7	57.6	55.2
3:00 p.m.	61.6	55.1	53.2
4:00 p.m.	61.9	54.0	52.5
5:00 p.m.	63.5	54.5	53.2
6:00 p.m.	59.6	55.1	53.6

7:00 p.m.	100.4	68.0	54.2
8:00 p.m.	84.1	59.1	52.6
9:00 p.m.	63.3	53.4	51.2
10:00 p.m.	58.6	53.3	51.6
11:00 p.m.	63.0	52.3	49.9
Saturday, April 27, 2019			
12:00 a.m.	67.2	55.4	50.7
1:00 a.m.	64.4	54.5	51.4
2:00 a.m.	64.1	54.8	51.9
3:00 a.m.	60.3	53.0	50.0
4:00 a.m.	58.5	51.0	48.3
5:00 a.m.	58.7	48.9	44.3
6:00 a.m.	66.8	49.2	45.4
7:00 a.m.	61.7	52.5	48.3
8:00 a.m.	81.0	56.6	51.4
9:00 a.m.	63.0	53.8	50.4
10:00 a.m.	72.4	54.2	50.7
11:00 a.m.	64.5	54.0	51.1
12:00 p.m.	65.7	54.2	50.8
1:00 p.m.	67.1	53.1	50.0
2:00 p.m.	63.0	53.0	49.7
3:00 p.m.	68.6	53.0	49.5
4:00 p.m.	64.2	53.5	49.4
5:00 p.m.	65.3	53.2	49.2
6:00 p.m.	83.3	54.3	48.5
7:00 p.m.	87.5	54.8	46.7
8:00 p.m.	82.3	54.9	45.9
9:00 p.m.	86.2	54.4	45.4
10:00 p.m.	85.5	58.2	46.6
11:00 p.m.	83.0	51.4	42.6

Sunday, April 28, 2019			
12:00 a.m.	56.1	44.3	40.6
1:00 a.m.	55.3	42.2	39.3
2:00 a.m.	56.9	43.3	39.0
3:00 a.m.	87.3	52.4	38.2
4:00 a.m.	58.9	45.6	41.4
5:00 a.m.	59.0	46.2	40.4
6:00 a.m.	52.8	45.0	40.9
7:00 a.m.	58.6	46.6	41.4
8:00 a.m.	62.9	47.6	43.5
9:00 a.m.	58.4	48.8	46.1
10:00 a.m.	59.8	48.9	45.4
11:00 a.m.	65.2	51.1	47.6
12:00 p.m.	92.9	59.7	47.9
1:00 p.m.	64.2	50.1	47.1
2:00 p.m.	64.8	49.1	45.9
3:00 p.m.	59.5	48.1	45.2
4:00 p.m.	55.1	47.9	44.1
5:00 p.m.	56.6	49.0	45.5
6:00 p.m.	59.5	48.6	45.4
7:00 p.m.	58.0	49.6	46.1
8:00 p.m.	62.4	48.5	43.8
9:00 p.m.	62.0	45.8	42.0
10:00 p.m.	59.1	45.9	41.6
11:00 p.m.	59.5	44.4	41.4
Monday, April 29, 2019			
12:00 a.m.	55.1	43.8	41.4
1:00 a.m.	60.3	46.7	42.1
2:00 a.m.	51.2	42.6	39.3
3:00 a.m.	68.1	46.2	41.1

4:00 a.m.	66.1	50.7	46.7
5:00 a.m.	62.1	50.2	47.8
6:00 a.m.	63.2	51.3	48.9
7:00 a.m.	69.8	52.5	49.4
8:00 a.m.	62.6	51.6	49.1
9:00 a.m.	68.6	51.4	46.7
10:00 a.m.	65.2	50.4	46.1
11:00 a.m.	65.2	49.0	45.7
12:00 p.m.	64.6	49.2	45.3
1:00 p.m.	58.7	48.1	45.3

Location:	211 Landry Road
Date:	4/24/19 11:14 AM
Duration:	00:19:50
Sound Sources:	Traffic from Landry Avenue as well as recess at Animal Crackers Nursery.

	Wt	LEQ	L90	L50	L10	LFMAX	LFMIN
Total	A	57.8	50.4	55.9	60.9	73.0	43.9
Frequency (Hz)							
16	Z	61.3	54.6	57.5	63.5		
32	Z	61.5	55.0	58.3	64.5		
63	Z	66.5	55.1	59.6	67.5		
125	Z	58.1	50.2	54.4	61.0		
250	Z	53.4	45.0	49.6	55.9		
500	Z	52.2	45.4	49.3	55.0		
1,000	Z	53.6	46.3	51.2	56.6		
2,000	Z	50.4	42.3	47.7	53.6		
4,000	Z	48.4	34.3	44.2	52.8		
8,000	Z	36.3	25.7	33.4	40.2		
16,000	Z	34.5	14.9	25.6	38.8		

Location:	1 Thyme Lane
Date:	4/24/19 10:28 AM
Duration:	00:20:16
Sources:	Predominantly traffic from Landry Avenue.

	Wt	LEQ	L90	L50	L10	LFMAX	LFMIN
Total	A	49.7	45.2	48.8	52.2	62.8	41.1
ıency (Hz)							
16	Z	59.9	56.4	58.4	61.5		
32	Z	60.7	56.6	59.9	62.6		
63	Z	59.8	55.1	57.3	60.9		
125	Z	52.8	48.1	50.9	54.6		
250	Z	46.9	40.7	44.9	49.0		
500	Z	44.0	39.0	42.4	46.4		
1,000	Z	46.7	41.7	46.0	49.3		
2,000	Z	41.2	36.1	40.3	43.7		
4,000	Z	36.6	29.6	34.4	38.9		
8,000	Z	27.4	17.5	22.3	28.8		
16,000	Z	12.4	11.2	11.9	14.9		

Location:	51 Thyme Lane						
Date:	4/24/19 10:50 AM						
Duration:	00:19:40						
	Landry Avenue traffic.						
Sound Sources:							
	Wt	**LEQ**	**L90**	**L50**	**L10**	**LFMAX**	**LFMIN**
Total	A	52.9	46.6	48.5	52.6	76.9	44.1
Frequency (Hz)							
16	Z	61.9	56.5	59.6	65.0		
32	Z	60.4	57.7	59.8	62.5		
63	Z	61.1	56.8	59.3	63.6		
125	Z	55.5	50.5	54.6	58.0		
250	Z	49.6	42.5	45.6	51.0		
500	Z	50.6	41.2	43.2	46.7		
1,000	Z	48.1	42.9	44.8	47.4		
2,000	Z	44.7	37.3	39.8	46.1		
4,000	Z	38.1	29.6	34.4	41.0		
8,000	Z	30.5	21.5	24.6	33.5		
16,000	Z	14.4	11.2	12.6	19.4		

Location:	82 Westfield Drive						
Date:	4/24/19 11:41 AM						
Duration:	00:20:14						
	Traffic from I-95.						
Sound Sources:							
	Wt	**LEQ**	**L90**	**L50**	**L10**	**LFMAX**	**LFMIN**
Total	A	59.4	57.0	59.2	61.0	68.6	53.0
Frequency (Hz)							
16	Z	64.6	59.6	63.2	67.3		
32	Z	65.7	61.5	64.7	68.1		
63	Z	68.0	62.4	65.5	70.4		
125	Z	62.9	57.0	60.8	66.3		
250	Z	54.7	48.0	52.3	58.0		
500	Z	54.0	49.8	53.1	56.5		
1,000	Z	56.9	54.5	56.8	58.6		
2,000	Z	51.2	49.1	51.0	52.7		
4,000	Z	40.2	37.1	39.3	41.9		
8,000	Z	28.0	23.0	25.1	29.7		
16,000	Z	14.8	12.6	13.6	17.0		

APPENDIX B

ACOUSTIC MODELING RESULTS

Name	M.	ID	Level Lr		Limit. Value		Octave Band Day								Land Use			Height		Coordinates		
			Day	Night	Day	Night	31	63	125	250	500	1000	2000	4000	8000	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)				(m)		(m)	(m)	(m)
211 Landry Rd (Animal Crackers Nursery)		Res	39.1	39.1	0	0	37.7	49.1	40.5	32.8	32.6	34.4	33.2	29	11.1			Total	1.52	r	216672.24	860110.31	70.84
1 Thyme Lane		Res	42.1	42.1	0	0	38.4	51.3	42.8	38	36.8	36.9	35.5	33	21.2			Total	4.57	r	216754.21	860082.02	72.62
51 Thyme Lane		Res	44.6	44.6	0	0	36.8	51.4	45.5	40.3	38.4	38.7	38.1	36.8	29.8			Total	4.57	r	216892.96	860044.8	72.55
82 Westfield Drive		Res	29	29	0	0	26.8	39.5	32.1	27.6	25.4	24.1	21.8	13.5	-17.7			Total	4.57	r	217215.49	859735.7	59.01

MassDEP Pure Tone Analysis:

	Octave Band (Hz)									
	31	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A-Wtd**
Future Peak Power Plant	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dB)**	**(dBA)**
51 Thyme Lane	36.8	51.4	45.5	40.3	38.4	38.7	38.1	36.8	29.8	44.5
Corrected Ambient Sound Level	51.3	50.4	44.1	36.1	34.8	36.5	30.9	23.2	15.1	39.6
Total Sound Level	51.5	53.9	47.8	41.7	40.0	40.7	38.9	37.0	29.9	45.8
MassDEP Pure Tone?		No	No	No	No	No	No	No		