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EVALUATION OF SITE SOUND EMISSIONS

NEELYTOWN BUSINESS PARK
Town of Montgomery, New York

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INTRODUCTION

Ostergaard Acoustical Associates (OAA) was asked to assist with the evaluation of potential sound emissions from the Neelytown Business Park project planned for construction in the Town of Montgomery, Orange County, New York. The site currently comprises vacant woodland, located between Interstate-84 and Neelytown Road, and is proposed among several other logistics facilities to the east and west. Plans call for two warehouse-style buildings to be developed on the property, as well as a trailer parking area to the south. This report addresses the on-site noise radiated from this project to off-site nearby potentially noise-sensitive residential receptors.

While the proposed buildings do not have specific tenants, this report assumes the potential to operate at all hours of the day and night and addresses the on-site noise radiated from this project to off-site potentially noise-sensitive receptors. Sound produced by the site will comprise steady sound from rooftop HVAC equipment as well as intermittent sound from truck and car¹ movements.

The purpose of this sound study is to analyze future site sound emissions for comparison with applicable code limits and to evaluate the potential for noise complaints. Evaluations included conducting ambient sound surveys as well as developing an acoustical model of site sound emissions. Research indicates that there is no New York State noise code; however, the New York State Department of Environmental Conservation (DEC) does have guidelines for assessing and mitigating noise impacts. The Town of Montgomery provides quantitative noise code limits under Chapter 162: Noise. There are no Orange County codes relating to noise. Expected site sound emissions from the facility were evaluated against a project goal based on the DEC guidelines, local noise code limits, and our professional experience to protect potentially noise sensitive receptors.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Staff. Development of this report was coordinated with the project engineer, Colliers Engineering & Design.

¹ Note that throughout this report, the term “car” collectively refers to personal passenger vehicles including automobiles, vans, pick-ups, or SUVs. The term “truck” refers to over-the-road or line-haul trucks and tractor trailers.

SITE AND VICINITY

Figure 1 is an aerial image obtained from Google Earth showing the site outlined in red. Figure 1 also shows ambient survey locations, which are discussed in a subsequent section. The site currently comprises undeveloped wooded land in the I-1, General Industry, district. The site and all surrounding properties are also located within the Airport Overlay from the nearby Orange County Airport. Our understanding of zoning/land uses in the area is as follows:

- ❑ North of the site is Interstate 84 located in the I-1 district. Across the Interstate are commercial and residential properties and associated farmland in the RA-1, Residential Agricultural - One & Two Family Residences, district. This farmland is also in the Planned Development Overlay Zone. Orange County Airport is approximately 1.3 miles northwest of the site in the I-2, Airport Industry, district.
- ❑ Abutting the site to the east are two FedEx facilities accommodating similar trucking uses in the I-1 district. Beyond these are several smaller industrial facilities fronting on Neelytown Road, also in the I-1 district. Approximately five miles east of the site is Stewart International Airport.
- ❑ Bordering the site to south is Neelytown Road with a recycling center beyond. The recycling center is located in the I-1 district and Biomass Gasification-to-Energy Floating District. Over 2,000 feet to the southeast is a residential development fronting on Highland Avenue in the RA-1 district; beyond are residences in the Village of Maybrook. Residences in this direction are significantly far away and not an acoustical concern.
- ❑ To the West is Beaver Dam Road. Three single-family residences are located along the west side of this road. There are multiple large trucking facilities beyond. Northwest of the site is an industrial use associated with utilities. All receptors to the west are in the I-1 district.

Given the surroundings, sound in the area is expected to be dominated by distant and local traffic flow sound. The Interstate will be the primary noise source in the vicinity; receptors further from the Interstate will be more influenced by local traffic flow sound. Other contributors to sound in the area are the commercial and industrial uses along Neelytown Road. Lastly, while there are airports and railroad lines in the area, these are distant enough and expected to operate infrequently enough that they are not major contributors to the acoustical environment.

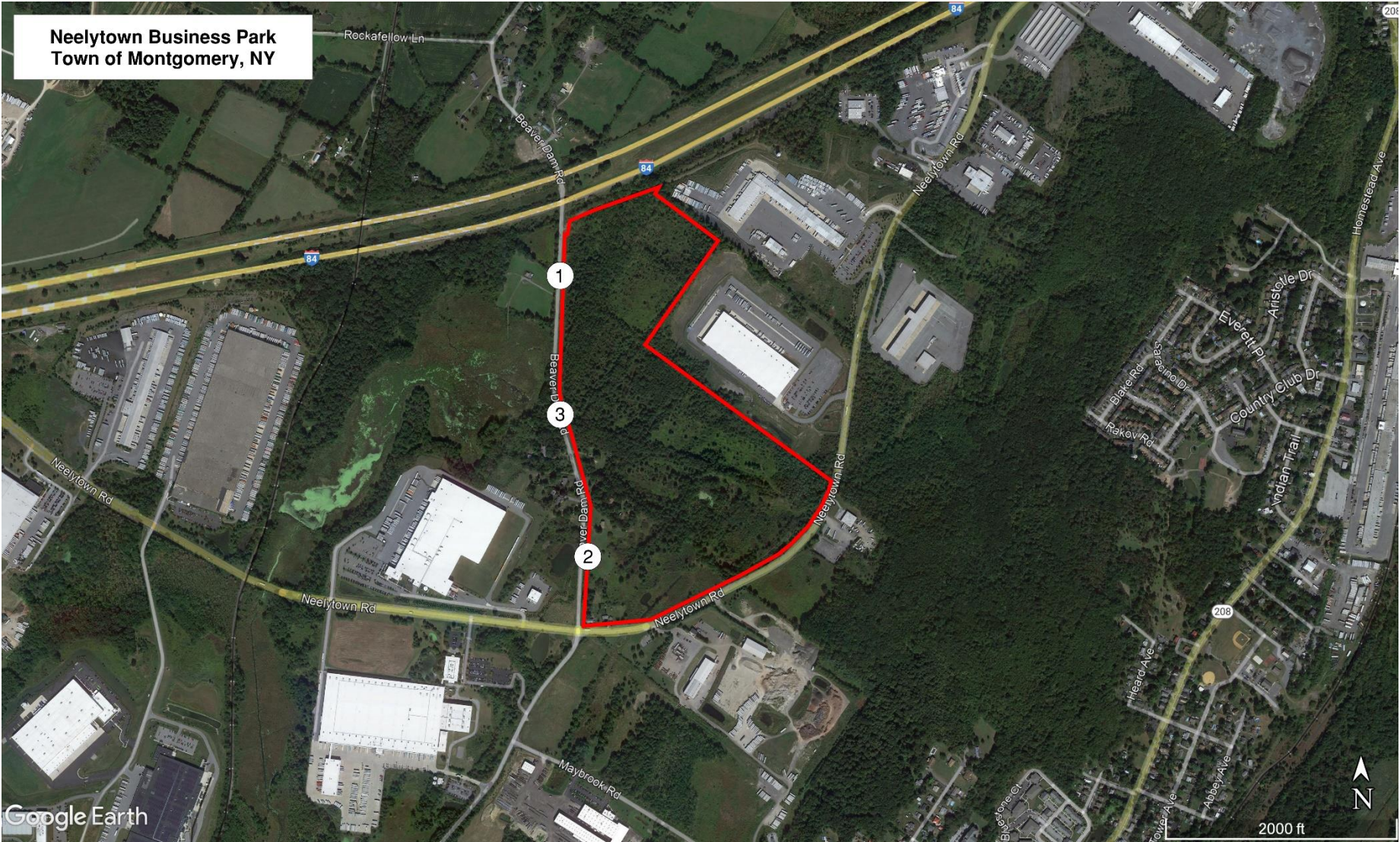


Figure 1 — Google Earth image showing the proposed industrial park site and vicinity in the Town of Montgomery, NY. The site property line is outlined in red. Ambient sound survey Locations also shown.

Plans call for the construction of an 850,000 ft² warehouse in the center of the site. A smaller, approximately 278,270 ft² building is proposed in the northern portion of the site. Truck docks are located along the southwestern and northeastern façades of the large building; docks for the smaller buildings face southeast. Personnel vehicle parking is located along the short sides of the buildings. Trailer parking is located across from the docks of the small building. Trailer parking for the large building is located in the southern portion of the site. The site will be served by driveways along Neelytown Road and Beaver Dam Road. We understand that cars and trucks will use the Neelytown Road driveway as the primary way to access the two buildings. There is one driveway on Beaver Dam Road available for personnel vehicles only. Lastly, there is a driveway that provides access to the northern building, which is to be used for emergencies only. Based on OAA findings and coordination with the design team, a 15-foot-tall noise control barrier is proposed in the western portion of the site to shield nearby receptors from activity associated with the large building. To ensure that the Town Noise Law is met to the east, a 6-foot-tall solid fence is proposed.

Specific traffic counts depend on the end user tenants. While the end users of the site are not currently known, this sound study utilizes the same database as the traffic study. The Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, gives a detailed look at quantities and hourly distribution of cars and trucks for sites such as what is proposed. These data are regularly updated based on operations of existing facilities. While a warehouse use is proposed, the traffic study used trip generation rates for ITE Land Use Code 130 Industrial Park to be conservative. Given this, the project expects 643 daily truck trips, or an average of 27 truck trips per hour. The traffic study estimates a total of 34 truck trips during the AM peak hour and 59 truck trips during the PM peak hours. It is logical that truck trips during daytime hours are well above the average truck trip number calculated. This aligns with the fact that while typical warehouse uses operate 24/7, with much of the activity during the daytime hours; nighttime operations are generally used to prepare for the next day. The hourly truck distribution data found in the ITE Trip Generation Manual (11th Edition), which are based on data from existing sites, support reduced nighttime truck activity across all land use types that accommodate trucks. Regardless, this study includes an assessment of intermittent maximum sound levels that might occur during the nighttime hours as this is generally when residential receptors are most sensitive and ambient sound levels are lower.

REGULATIONS/GOALS

When developing a site of this type, it is appropriate to consider how sound from the facility will likely be received, especially by noise-sensitive receptors. Sound produced by a typical facility such as this is characterized by motor vehicle activity, such as idling and vehicle movement, as well as steady HVAC equipment. Although there will be cars on site, they are common to the area and are not expected to be an acoustical concern; hence, cars are not a focus of this sound study. The steady sound produced by HVAC equipment and truck activity were evaluated and compared to applicable noise code limits as well as acoustical goals based on professional experience. As a general practice, when motor vehicles are on site, they are considered part of a site's sound emissions; when vehicles are on public roads, they are not.

The Town of Montgomery discusses noise in Chapter 162: *Noise*, which is called the Town Noise Law. This provision provides maximum sound level limits based on the adjacent zoning district of the source and receiver. As the site and surrounding properties are all industrial, the limit for industrial zone sources to industrial zone receptors is 70 dB(A) at all hours. Section 162-5(C)(1) allows for limits to increase in instances where background sound levels exceed code limits. These limits apply beyond the boundary of the source property; enforcement measurements are taken one foot beyond the boundary of the emitter's premises within the receptor's premises. Section 162-5(C)(2) limits impulse noise to no more than 80 dB in residential zones and 100 dB in any zone, when measured using Peak response. Impulse limits apply at the applicable zoning district boundary. Certain activities potentially relevant to the project are exempt such as blasting and construction activity during allowable hours. Vehicle horns, unless necessary as a warning, truck idling, and exhaust discharge without a muffler are all prohibited. Motor vehicle noise is discussed in Section 162-7(D). Limits are provided for music emitted from motor vehicles. The provision states that the code does not apply to motor vehicles on public highways which is regulated by State code. Noise is also mentioned in a qualitative manner in Zoning Code Section 235-9.1 Prohibited Uses Enumerated. No business or industry is allowed to produce noise so as to be dangerous or prejudicial to the public health, safety, or general welfare. Sound levels are quantified in two other sections but are not relevant to the project. No relevant quantitative Orange County codes regarding noise could be found.

New York State Vehicle and Traffic (VAT) Law states that all motor vehicles must have a muffler and must be below specific sound limits at a distance of 50 feet. Specifically, vehicles over 10,000 pounds must not exceed 86 dB(A) at speeds of 35 mph or less nor exceed 90 dB(A) at speeds above 35 mph. There are also limits for lighter weight vehicles and motorcycles. Overall, these State limits are generally easy to meet with modern, well-maintained vehicles.

The New York State Department of Environmental Conservation (DEC) has a policy “Assessing and Mitigating Noise Impacts” that provides guidance for analyzing and minimizing the acoustical impact applicable to the State Environmental Quality Review Act (SEQR) review. Guidelines require comparison of the equivalent ambient sound level to proposed site sound emissions to determine the extent of any potential acoustical impact, if any. The DEC states that an increase in ambient sound level by 0-to-3 dB should have no appreciable effect on receptors and an increase of 3-to-6 dB is tolerable but may have potential for an adverse noise impact only in cases where the most noise sensitive of receptors are present. The term “the most noise sensitive of receptors” is not defined but assumed to reference the small percent of the population who are exceptionally sensitive to noise. Increases of more than 6 dB require closer scrutiny while increases of 10 dB deserve consideration of avoidance and mitigation measures in most cases.

To comply with DEC guidelines, the site must show that site sound does not substantially deviate from existing ambient sound levels in the area at all residences, regardless of zone. Specifically, future sound in the area with the proposed site included, should not exceed existing equivalent ambient sound conditions by more than 6 dB to avoid any negative acoustical impact to the area.

A discussion of the Town Noise Code is warranted. Noise is regulated by zone, not use, which may result in more permissive limits than desired for existing non-conforming uses. This is the case for residences west of the site which are located within the industrial zone. In these instances, it can be prudent to elect project goals that are more stringent than noise code limits in an effort to minimize the potential for acoustical impacts, as feasible.

Sound Level Survey

To determine appropriate criteria for comparison to DEC guidelines, two ambient sound surveys were carried out to document existing ambient sound levels in the area. The first survey was carried out in March 2022 and comprised Locations 1 and 2 along Beaver Dam Road. A second ambient sound survey occurred during December 2022 at Locations 2 and 3. Location 2 was utilized in both surveys for use as a control, to ensure the second survey data were comparable to the first. Location 1 was placed in the northern part of the site to typify traffic flow sound along the corridor of Interstate 84. Location 1 is applicable to residences along the I-84 corridor, such as those north of the Interstate. Location 2 was placed in the southwestern part of the site to typify ambient sound levels for receptors more remote from Interstate-84 and capture the extent of intermittent traffic flow on Beaver Dam Road and Neelytown Road. Location 3 was placed west of the site, centrally located along Beaver Dam Road. OAA staff deployed the monitors on the morning of 9 March and afternoon of 14 December and retrieved them several days later. OAA uses ANSI S12.9 “Quantities and Procedures for Description and Measurement of Environmental Sound” as a guideline for all outdoor sound surveys; all measurements conform to this standard to the extent feasible. Although surveys are nearly 2 years old, based on a review of aerial photos, the immediate area is nominally unchanged, and survey results are considered to still accurately typify the soundscape of the area.

Location 1 comprised a Rion NL-52 sound level meter placed within a weather enclosure, with the microphone attached to an adjacent telephone pole. Location 2 comprised a Piccolo sound level meter placed within a weather enclosure and affixed to the “For Sale Approximately 17 Acres” sign on the east side of the road for both survey periods. Location 3 comprised a Rion NL-52 sound level meter placed within a weather enclosure, with the microphone attached to a tripod adjacent to the monitor. A windscreen was used on the microphones. The Rion NL-52 monitors were instructed to record detailed octave band time history data at one-second intervals and hourly statistics for the duration of the surveys while the Piccolo monitors were instructed to record detailed octave band time history data and statistical data at one-minute intervals. Monitors recorded data until memory was full, or batteries were depleted. In the end, 69 hours of sound data were recorded from 1700 hours on 9 March through 1300 hours on 12 March during the first survey and 54 hours of sound data were recorded from 1600 hours on 14 December through 2200 hours on 16 December. All sound levels meters were calibrated before and after deployment using an HBK Model 4231 sound level calibrator, which is calibrated by an outside calibration service annually. While this survey was not intended to be used for enforcement, equipment and procedures conform with all standards and requirements referenced in the Montgomery Noise Law. Observations during deployment and retrieval of the long-term monitors indicated that the

acoustical environment was dominated by steady local and distant traffic flow and intermittent fauna noise at all measurement locations.

Weather conditions were generally appropriate for each survey based on field notes and a review of historical data obtained from the nearest weather station at Stewart International Airport. Temperatures ranged from 29-to-69 degrees Fahrenheit for the March 2022 survey and 27-to-37 degrees Fahrenheit for the December 2022 survey, with little-to-no precipitation documented in either survey. There were occasions of high winds on 12 March and 16 December; while the weather station may record high wind speeds at times, these are generally not realized at the height of the microphones. Also note that, during deployment of both surveys, there was minor snow accumulation on the ground, but roadways were clear. No contamination of survey data was observed from either wind gusts or snow accumulation.

Acquisition of ambient sound data over the course of the measurement period results in a large amount of data. As a result, it is helpful to review data as hourly statistics to assist with observing ambient sound level trends. Important statistics include the equivalent sound level (L_{eq}), which is the metric the DEC guidelines use, and the background sound level (L_{90}), or level that occurs over 90 percent of the time. The background sound level is often best used to evaluate continuous noise sources such as project HVAC sound. The L_{10} , or level that occurs over 10 percent of the time, indicates the extent of intermittent noise sources in the area, such as dog barks, surges in traffic noise, or aircraft passbys. The L_{10} is often used to evaluate intermittent motor vehicle noise from similar projects. The L_{50} is the median sound level. L_{min} and L_{max} reflect the minimum and maximum sound levels, respectively. Maximum sound levels in the area are due to transient sources such as motor vehicles or aircraft passbys. Minimum sound levels are in the absence of these transients. The purpose of this survey was to understand the existing acoustical conditions for comparison to project emissions. These data are important for use in establishing specific project noise goals to ensure no negative acoustical impact.

A summary of the statistical sound levels recorded and linearly averaged over the entire period of the associated survey is provided in the following table:

Location	Survey	L_{max}	L_{10}	L_{eq}	L_{50}	L_{90}	L_{min}
1	1	84	58	60	54	48	42
2	1	79	59	57	51	46	40
2	2	80	57	58	52	49	46
3	2	82	57	59	53	50	47

Time history data obtained during the survey are provided graphically in the form of equivalent sound levels at 1-minute intervals in the Appendix. Survey results reveal the following:

- ❑ Control data collected at Location 2 during the second survey showed good agreement with the first survey, indicating that both survey periods are comparable. Thus, data collected at Location 3 during the second sound survey is representative of the area. The data from all surveys were reviewed collectively.
- ❑ There is general consistency between all Locations with most statistics only differing by a few decibels, regardless of survey date. The data show higher sound levels occur more regularly for vantage points closer to I-84. Minimum sound levels were slightly lower in level during the March survey. Overall, survey results indicate the area is very active.
- ❑ Equivalent sound levels (L_{eq}) were as expected for an area adjacent to an active major roadway. Hourly equivalent sound levels for Location 1 were generally around 60 dB(A) for most hours; hourly lulls during the nighttime dipped slightly below 50 dB(A). Locations 2 and 3, which were more remote from Interstate 84, saw hourly equivalent sound levels slightly lower. Equivalent sound levels at Locations 2 and 3 were generally aligned, often within a few decibels of each other throughout the second survey. Overall, average equivalent sound levels across the survey period were in the 57-to-60 dB(A) range.
- ❑ The hourly background sound levels (L_{90}) typically varied between 40-to-50 dB(A) across the first survey resulting in average background sound levels of 46-to-48 dB(A). Location 2 exhibited levels slightly lower than Location 1 due to the added distance from I-84. Second survey results were a few decibels higher for both Locations 2 and 3 indicating a slightly higher presence of steady noise in the area.
- ❑ Average L_{10} sound levels were nearly identical between the three Locations, and about 7-to-13 dB higher in level than the background sound levels. This indicates a high volume of intermittent sound sources. Of interest is that the average L_{10} was lower than the L_{eq} for all Locations, except for Location 2 during the first survey. This shows that, for the most part, maximum sound level events occurred regularly, but were short in duration. Hence these events influenced the equivalent sound level but were not frequent or long enough to influence the L_{10} statistic. Average maximum sound levels at Location 1 were about 5 dB higher in level than Location 2; average maximum sound levels at Location 3 were about 2 dB higher than Location 2.

Project Noise Goals

Of most interest in the ambient sound survey data are the equivalent sound levels documented across the survey period, as they directly correspond to DEC guidelines. Per DEC guidelines, the appropriate target is for average site sound levels to not increase the measured equivalent ambient sound levels by more than 6 dB to ensure no negative acoustical impact. This means that average site sound emissions should not increase existing equivalent sound levels so that, when the two are combined, the total increase is no more than 6 dB. Given this, and conservatively using the lowest equivalent data of 57 dB(A) measured at Location 2, future average sound levels once the project is active should not exceed 63 dB(A).

Survey results indicate that having site sound emissions below 63 dB(A) at the nearest non-conforming residential receptors to the west will result in no negative acoustical impact per DEC guidelines. The Town Noise Law prescribes that site sound (except impulse noise) should not exceed 70 dB(A) beyond the project site's boundaries, as the project site adjoins industrial zones on all four sides. Accordingly, OAA's project goal for compliance with DEC guidelines with respect to the preexisting, nonconforming residences along Beaver Dam Road considered to be sensitive receptors is more stringent than required by the Noise Law. The residential zones north of the interstate and to the southeast of the project site along Highland Avenue are not adjacent to the site. Despite this, OAA recommends that the project strive to meet the Noise Law's residential zone nighttime noise code limit of 51 dB(A) at the residential zone boundary. In addition, the project's impulse noises must comply with the 80 dB(A) standard for residential zones (i.e. north of I-84 and to the southeast of the site along Highland Avenue) as well as the 100 dB(A) standard for all zones.

In addition to meeting DEC and Town limits, OAA recommends taking additional approaches to minimize any potential acoustical impact, particularly for the western residences within the industrial zone. Scrutinizing the background sound levels (L_{90}) of the sound survey, OAA recommends that steady-state noise sources, such as HVAC equipment sound, strive to not exceed 46 dB(A) at all residential receptors to ensure that HVAC site sound is closer aligned with existing average background sound levels documented during the survey. In a similar manner, intermittent maximum sound levels from on-site truck activity are appropriate to compare to existing transient noise sources documented by the L_{10} statistic. Intermittent sounds produced on-site should strive to not exceed 57 dB(A) at western residences to blend in with what was surveyed.

In summary, based on recommended project noise goals and Town noise code limits, site sound should fully comply with the Town Noise Law of 70 dB(A) beyond the boundary of the site. Also,

in accordance with the Town Noise Law, no impulse sound shall exceed 80 dB(A) at residential zone receptors and 100 dB(A) at industrial zone receptors. Self-imposed project goals include having HVAC sound emissions not exceed 46 dB(A) and intermittent truck maximum sound levels not exceed 57 dB(A) at the western residential receptors. Maximum sound levels should not exceed 51 dB(A) at residentially zoned receptors to the north and southeast. Meeting these project noise goals will also ensure compliance with DEC criteria and Town Noise Law limits.

EXPECTED SOUND EMISSIONS

Acoustical modelling software, specifically CadnaA, was used to create and analyze site sound emissions for the site. The model takes into account relevant parameters between the noise source and receptor positions of interest to predict how sound will propagate. In addition to distance attenuation, the model accounts for the effects of terrain, various types of ground cover, shielding by structures, and reflections from buildings. Potential screening or shielding from trees or vegetation was not included in the model to be conservative. In the model buildings are white, the site property line is outlined in red, the proposed 6-foot-tall solid fence is shown in light blue, and the proposed 15-foot-tall noise control barrier is shown in pink. Elevation contour lines are shown in teal. Offsite elevation information was obtained from the [New York State Geographic Information Systems Clearinghouse](#) and was incorporated into the model. For clarity in the figures, minor contour lines were visually hidden to allow for better interpretation of the sound level contours. North is pointing up in all figures.

The acoustical model shows the results graphically as A-weighted sound level contours, in 1 dB increments, and tabulates the summed A-weighted sound levels at seven discrete locations of interest. Sound level contours are at ear height, 5 feet above grade. Receptors A and C typify upper-story receptors at 15 feet above grade while Receptors B, D, and E typify single-story receptors at 8 feet above grade. In addition, Receptors F through H represent an ear-height receptor, 5-feet above grade, one foot within an adjacent industrial zone property boundary receptor for evaluation of Town noise code limits.

Receptors F through H are shown to evaluate maximum sound outside of the site boundary, measured 1-foot within a receptor property per the Town Noise Law. Project noise goals on the other hand, were not evaluated at property line positions, but rather at where receptors receive nighttime noise, at the façade of their dwelling. Scrutiny of noise at the location of repose, where receptors are regularly present, is critical to evaluate any potential acoustical impact on receptors and for comparison to DEC guidelines. Noise generated at inaccessible or uninhabited portions

of the property is not pertinent. For these reasons, sound was also scrutinized at the facades of residences or other sensitive receptors where inhabitants are sleeping during the night hours. Locations A through E represent the upper story window of nearby residential receptors. Based on experience, and given the geometries present, evaluation at an upper story is more conservative than assessing it at a lot line. For example, the property line of Receptors B, C, and D is at a lower elevation than the dwellings. For Receptors A and E, the change in distance between property line and dwelling is inconsequential. This approach does not change the measurement protocol language in the Town Noise Law, but rather attempts to be more conservative where appropriate.

Rooftop HVAC Sound

Rooftop HVAC equipment produces noise that is nominally steady in nature, and hence will not vary significantly over time. Based on OAA's experience with other similar projects, a conservative approximation for facilities of this size is to assume 1 ton of cooling per 725 square feet of building. This equates to about sixty-four (64) 25-ton HVAC units in total. These units were evenly spread out on the rooftop of each facility and the sound power level for each of these was assumed to be 93 dB(A) re 1 picowatt based on manufacturers' data and professional experience. Note that this assumes warehouse space will be heated and cooled, which overestimates HVAC requirements as most warehouses are only heated.

The noise from the rooftop units was included in the HVAC sound model. HVAC noise sources are shown as blue "+"s. Noise sources were placed 4 feet above the rooftop, and sound was projected off site. Figure 2 shows the results graphically and tabulates the summed A-weighted sound levels at the nearby Receptors. The results show that, with all rooftop units operating, HVAC sound levels at off-site receptors ranges from 34-to-45 dB(A) at nearby receptors.

This analysis shows that there is little concern about HVAC sound. HVAC sound complies with Town noise code limits by a wide margin. HVAC sound is sufficiently controlled via distance and roof shielding effects so that noise meets the nighttime project noise goal of 46 dB(A) at all residences. "Roof shielding effects" refers to the fact that the roof acts as an acoustical barrier, screening vantage points closer to the ground when the rooftop equipment is blocked from view. Roof shielding effects are less of a factor for upper story receptor vantage points that may be higher than the HVAC equipment. Note that for these model results to be realized, acoustical performance of HVAC equipment must be aligned with what was modelled.

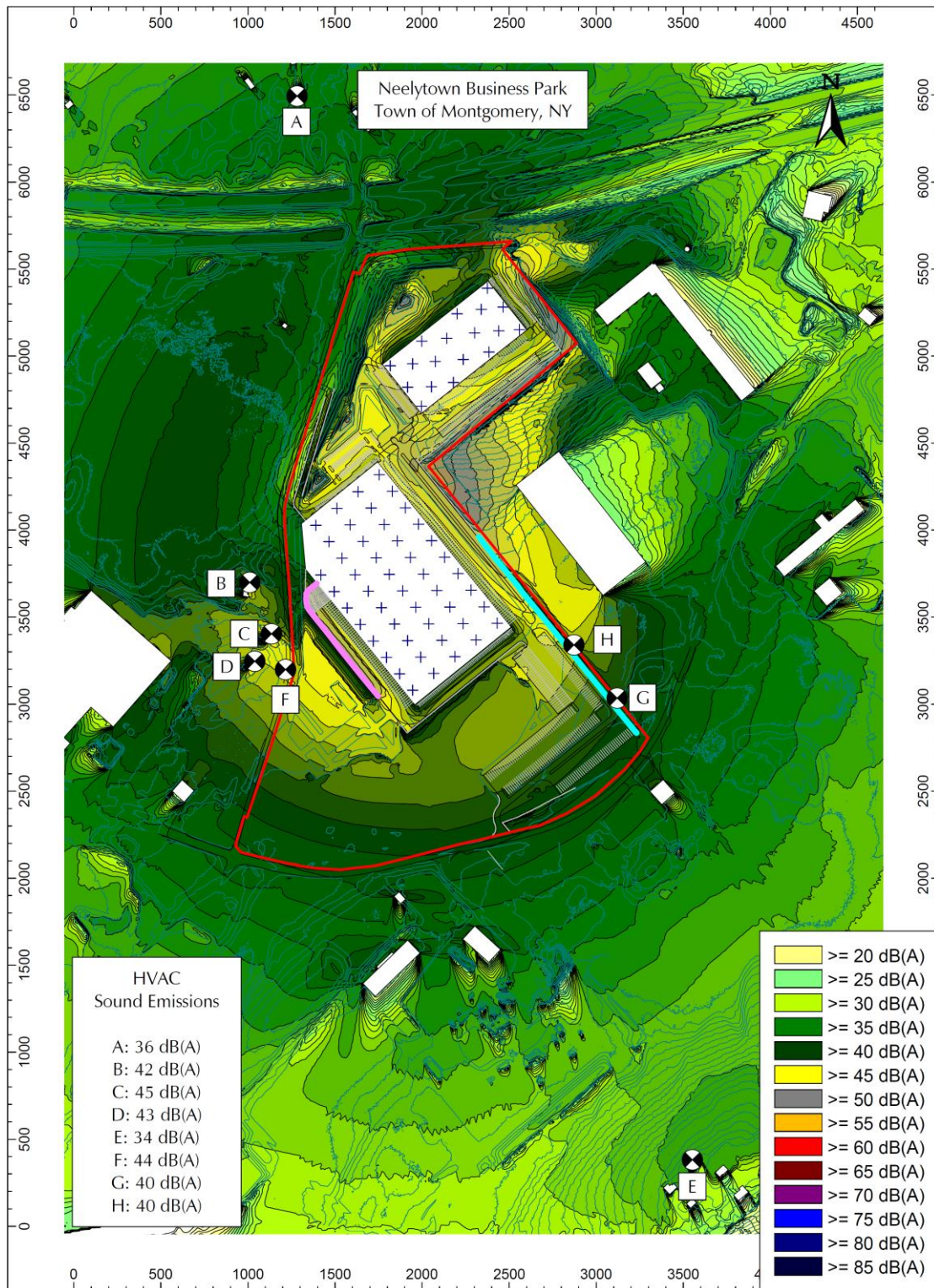


Figure 2 — A-weighted sound emission contours, 5 feet above grade, from rooftop HVAC equipment. HVAC units shown with a blue “+”. White buildings, red site property line, light blue solid fence and pink noise control barrier shown. Receptors A and C are 15 feet above grade; Receptors B, D, and E are 8 feet above grade. Receptors F through H are 5 feet above grade.

Truck Activity

OAA has had the opportunity to visit various logistics facilities and industrial parks over the years to survey and document the sounds of truck activity. The logistics center will have over-the-road line-haul trucks and potentially have terminal tractors (yard tractors) active on site. From an acoustical aspect, terminal tractors and line-haul trucks are acoustically equivalent. This project is not proposed as a refrigerated warehouse use at this time. Such a use would require specialized HVAC equipment and would likely include trucks with refrigerated trailers. This sound study was carried out based on standard warehouse operation with standard, non-refrigerated trailers.

Truck noise in a typical dock area can routinely produce maximum sound levels of 79 dB(A) when measured at a distance of 50 feet from the source. This sound level was determined by looking at a wide variety of truck activity, such as truck movement, air brakes, back-up alarms, and coupling/decoupling, and distilling it to a single conservative maximum level and spectrum for use in acoustical studies such as this. Several of these events are considered impulse noises, consistent with the definition of the term in the Noise Law, as they are of “short duration, with an abrupt onset and rapid decay. A driving truck exhibits slightly lower maximum sound levels of 74 dB(A) when measured 50 feet from the source. The height of a truck source for all truck activity is modelled at a conservative height of 8 feet above grade. OAA has found that using these maximum sound levels at this height ensures a conservative approach to evaluating truck sound within the truck court. When specific individual activities are modelled at their actual height and sound level, results are typically lower in level than predicted below. For example, many of the high sound level activities, such as back-up alarms and air brakes, occur at a height of 4 feet above grade, not 8 feet. This is a critical detail when evaluating the effectiveness of a sound barrier or berm and when considering intervening topography. It is also important to recognize that all truck noise is dynamic in nature. Maximum sound levels discussed above, including vehicle movement as well as impulse sounds, only occur for a short duration and are not representative of the constant sound level produced by on-site trucks.

While there will certainly be multiple trucks onsite at any given time, it is generally appropriate to evaluate maximum sound from an individual truck. Several factors support this. Because maximum levels are dynamic and short in duration, it is unlikely that multiple truck sound level maximums will occur at exactly the same time and location. In addition, safe practices restrict more than one truck from operating in proximity to each other in the same vicinity. Hence, off-site maximum sound levels will be driven by individual truck sources. In the unlikely event that two truck sources would contribute the same level in the same location at the exact same time,

maximum emissions would only be 3 dB higher due to the logarithmic nature of sound pressure level addition.

Despite this, to be conservative OAA has modelled six different trucks producing their maximum sound level at the same time, at various on-site positions that are nearest to off-site receptors. Truck sources were located where they would be closest to off-site residential receptors to represent worst-case conditions. Three driving trucks were added along the main eastern driveway, where they would be closest to the adjacent industrial receptor. Such an evaluation is also appropriate to evaluate Town noise code limits beyond the site boundary. Each truck contributing yard activity is shown as white "+"s and modelled with a sound pressure level of 79 dB(A) at 50 feet. Driving trucks are shown as pink "+"s and modelled with a sound pressure level of 74 dB(A) at 50 feet. HVAC noise sources are shown as blue "+"s. Figure 3 shows the resulting worst-case site sound emissions contributed by on-site truck activity.

To address concerns about multiple trucks on site across a given hour, OAA also modelled average sound levels from driving trucks around the project site. A review of the traffic study and discussion with the traffic engineer showed that based on Land Use Code 130 (Industrial Park), a total of 643 truck trips were expected daily to this site. This averages to about 27 truck trips, or almost 14 trucks, each hour. To be conservative, the PM peak truck trip count of 59 was used as input into the acoustical model to evaluate the average sound level from the site. Note that this quantity is an overestimation of nighttime activity at this site as experience and ITE hourly distribution data support the fact that the majority of truck activity occur during the daytime hours. In CadnaA, a road source was looped around the site using Standard RLS-90, which is a widely recognized standard for evaluating traffic noise. Input data comprised 59 vehicles in an hour period, with 100% being heavy weighted vehicles, i.e. trucks. Road speed was set to 15 miles per hour and the road surface was set to traditional smooth asphalt pavement. The analysis assumed that 59 truck trips occur on every site road/truck court. In reality, each building would only get a portion of this total. The results of this analysis are shown in Figure 4.

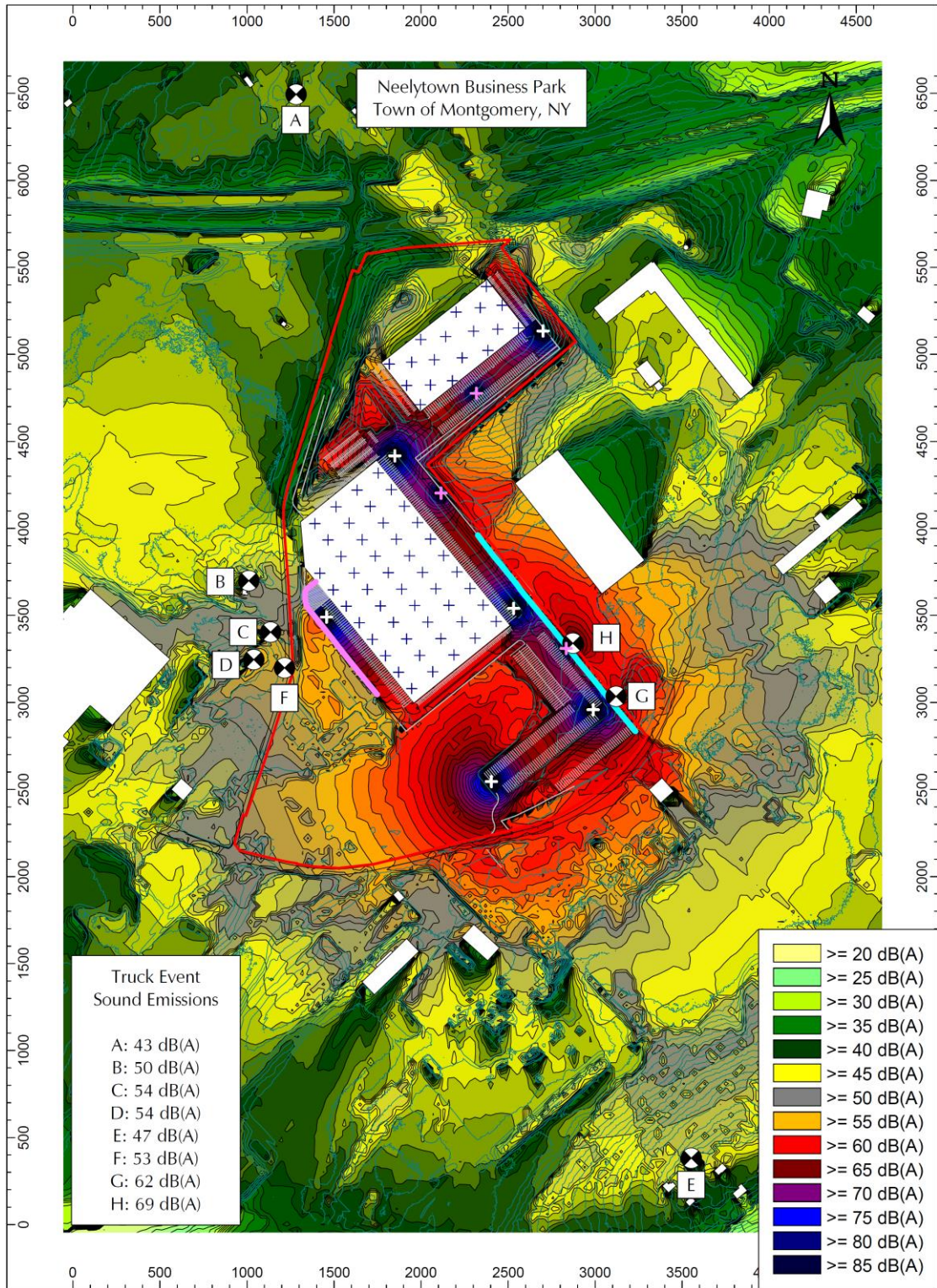


Figure 3 — Maximum A-weighted sound emission contours, 5 feet above grade for on-site truck activity (white and pink "+"). HVAC units shown with a blue "+". White buildings, red site property line, light blue solid fence and pink noise control barrier shown. Receptors A and C are 15 feet above grade; Receptors B, D, and E are 8 feet above grade. Receptors F through H are 5 feet above grade.

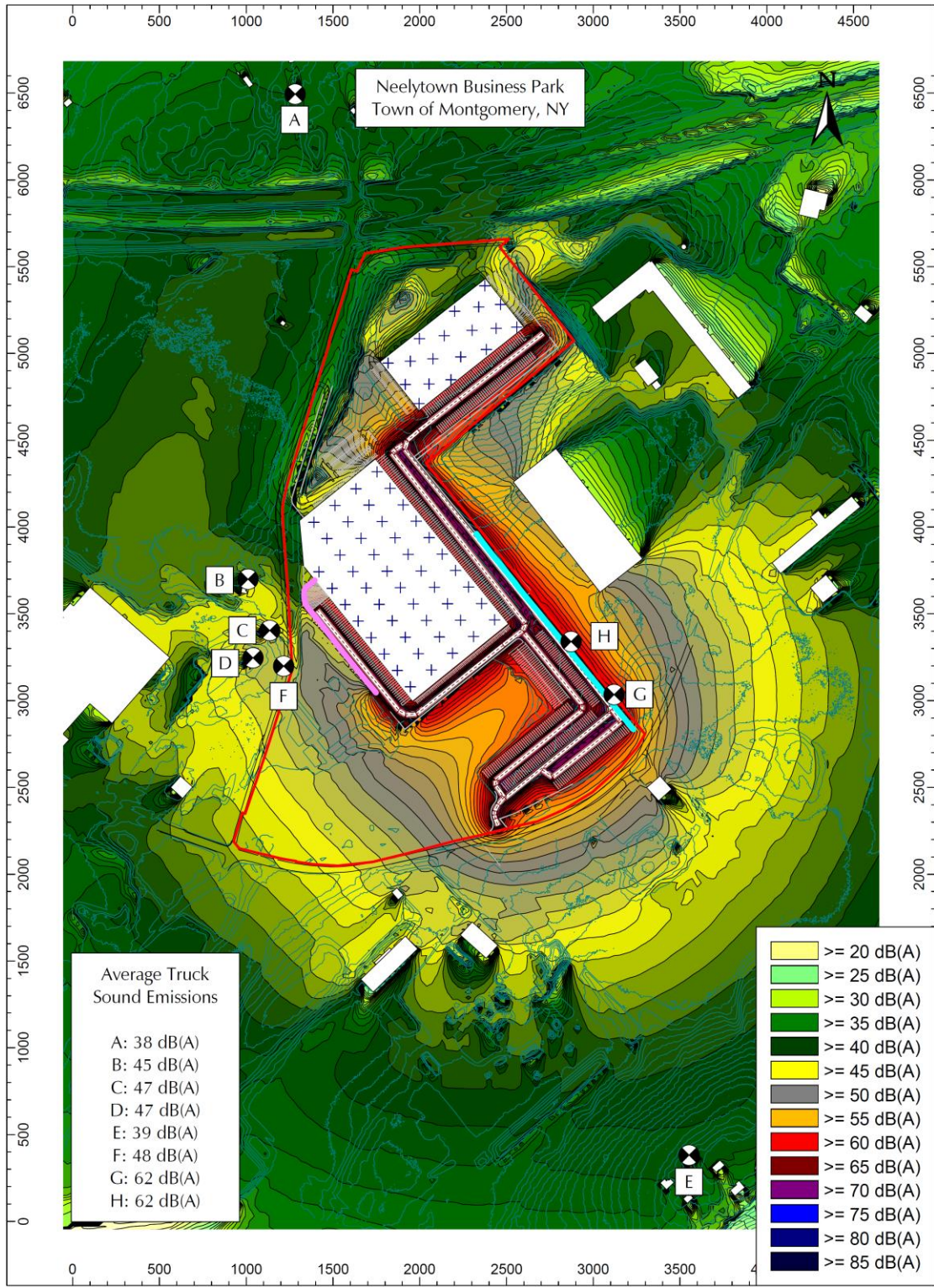


Figure 4 — Average A-weighted sound emission contours, 5 feet above grade expected for 59 truck trips in a given hour. HVAC units shown with a blue “+”. White buildings, red site property line, light blue solid fence and pink noise control barrier shown. Receptors A and C are 15 feet above grade; Receptors B, D, and E are 8 feet above grade. Receptors F through H are 5 feet above grade.

A review of the maximum sound levels in Figure 3 shows that worst-case intermittent on-site truck sound emissions will be in the 42-to-54 dB(A) range at the facades of all residential receptors. For Receptors B through D, limits are below the recommended project goal of 57 dB(A). Location F through H, which are 1-foot within an adjacent receptor boundary, fully comply with Town code limit of 70 dB(A). The purple contour representing 70 dB(A) does not leave the site. Also of note is that the white “+” modeled truck events include several impulse noise sources, such as coupling/decoupling, and air brake release activity. Given this, model results also conclude full compliance with the Town’s impulse noise code limits of 80 dB(A) at Receptors A and E and 100 dB(A) at all industrial zones. In comparison, a review of ambient sound data shows that no survey Location had an hourly maximum sound level below 60 dB(A); most hours had at least one instance of levels of 75 dB(A) or above, even during the night. Such maximum sound levels are assumed to be due to motor vehicles on public roadways. As such, events modelled in Figure 3 are not out of character for the area. Based on the ITE hourly truck distribution data discussed previously, truck trip counts for the entire site significantly reduce for most hours of the night, which minimizes the occurrences of such maximum sound levels. This discussion supports that should these maximum sound levels be realized that there will be no negative impact on the area.

Scrutinizing the results of Figure 4 shows that average truck activity across the site results in sound levels in the 38-to-47 dB(A) range at the façade of residences. Again, results comply with Town code limits at all receptors. As Figure 4 results are provided using the average metric, they can be added to the existing equivalent ambient sound levels of 57 dB(A) that was documented across the measurement period at Location 2, to determine the future equivalent sound level after the project is completed. Results can then be compared to DEC project goals. The results of these calculations are summarized in the following table. It should be noted that this analysis is most appropriate for Receptors B, C, and D, which was the focus of the ambient survey. Receptors A and E are added for discussion purposes. While ambient sound levels were not specifically characterized for these two Receptors, site sound emissions shown in the model are sufficiently low to not be an issue regardless of what the ambient sound level is at Receptors A and E. Receptors F through H are not pertinent and were not compared to DEC guidelines.

Summation of existing equivalent ambient sound level to modelled average site sound levels from addition of HVAC and driving truck activity (Figure 4). Future average sound levels are the result of that summation. Evaluation of any change also shown.

Receptor	Existing Equivalent Ambient Sound Level, dB(A)	Equivalent Site Sound Emissions (Fig. 4), dB(A)	Future Equivalent Sound Levels, dB(A)	Change from Existing to Future
A	57	38	57	<1
B	57	45	57	<1
C	57	47	57	<1
D	57	48	58	1
E	57	39	57	<1

Results in the table show that the potential change in sound levels from existing conditions to future conditions is 0-to-1 dB across all receptors. DEC guidelines state that changes of 0-to-3 dB should have no appreciable effect on receptors in the area. The results in the analyses above support that this project will have no negative acoustical impact on the surrounding area.

Lastly, while off-site truck routes are not regulated by code, they were reviewed to evaluate their potential for acoustical impact. The majority of trucks will be accessing Interstate 84 via the U.S. Route 208 interchange. These roads are currently used by trucks in the area and there are no sensitive receptors along this route. All trucks will utilize approved truck routes. Given this, trucks from this site will blend in with existing traffic flow sound in the area and are not expected to have any negative acoustical impact on the area.

Alternative Plans

As part of the Environmental Impact Statement, investigation of alternative plans is required. Three alternative plans were reviewed from an acoustical aspect. All three alternative plans propose three warehouse buildings with the same cumulative square footage as to what is proposed. For the first alternative, a 664,200 ft² warehouse is proposed in the center. Southwest of the large building is a 250,000 ft² building and to the south is a 214,000 ft² building. The trailer parking lot is moved to the northern portion of the site. A sound barrier would again screen trucks from western residences. Despite the minor changes compared to the proposed layout, the truck court is similar distance to the western residences and results are slightly lower, but comparable to the proposed plan. Emissions to the north would be increased due to the trailer parking lot. No change is substantial enough to alter the conclusion that no negative acoustical impact is expected.

A second alternative plan was reviewed which rearranged two of the three proposed warehouses. The 214,000 ft² warehouse remained the same; the westernmost warehouse increased to a 550,670 ft² warehouse and the northernmost warehouse was reduced to 363,600 ft² warehouse and moved to the northern portion of the site. Docks were placed only on one side of each building. Acoustically, this plan remains very similar to what was analyzed in this report. Trucks remain about the same distance from residences and would be similar in quantity. The main difference is that because of the building configuration, the second alternative plan is expected to require less sound barrier. Outside of this, the same conclusions in this report apply to this second alternative plan.

A third alternative plan was also reviewed. It is essentially the building sizes and locations the same as the first alternative, but modifies access from Neelytown Road into the site, primarily for the 250,000 ft² warehouse. For all intents and purposes, this the first and third alternative plans are acoustically identical, and results would remain the same.

ADDITIONAL CONSIDERATIONS

Although construction conditions are temporary in nature, they can produce high sound levels. The Town Noise Law uses the most common mitigation approach to construction noise, which is to administratively control it to occur during the least sensitive hours of the day. Construction noise is exempt from Town noise code limits during the defined daytime hours; should construction occur during the night it must seek a variance or meet applicable Town noise code limits. Despite this exemption, it is worth discussing considerations to minimize the acoustical impact of this activity. The closest proposed building is about 325 feet from the nearest dwelling. While the buildings are somewhat remote from receptors, earth moving equipment used during the civil construction phase of the project could be closer to off-site receptors temporarily. Construction equipment such as bulldozers, front end loaders, and dump trucks can typically produce maximum sound levels of 80 dB(A) at 50 feet. At assumed distances of at least 200 feet from nearby receptors, maximum construction activity sound levels would be in the upper-60s. Levels of this magnitude are not uncommon in an active developed area, are well below routine maximum sound levels documented during the ambient survey and are not expected to elicit noise complaints or impact the health, safety, and welfare of the public. In addition, these maximum sound levels would fully comply with Town noise code limits despite being exempt. As part of following good practices, consider the following construction mitigation measures to minimize receptor exposure to construction noise during this phase:

- Limit all heavy equipment operation to non-noise-sensitive daytime hours and follow allowable town construction hours if applicable.
- If possible, limit the amount of equipment operating near one receptor at a given time. Avoid exposing any one receptor to high sound levels for an extended period.
- Place stationary equipment such as generators, compressors, and office trailers away from receptors.
- Avoid having construction parking or laydown areas nearby receptors.
- Coordinate any high sound level construction activities, such as blasting, with town representatives and provide advance notice to residences, as required.
- Specific noise issues can be individually evaluated for tailored noise mitigation recommendations should traditional methods above not be sufficient.

RECOMMENDATIONS

1. Construct the site with the noise control barrier as proposed and as shown in the acoustical model above. Note that to be acoustically effective, the barrier needs to meet the following requirements:
 - ❑ The barrier needs to be solid, without openings, and be of sufficient surface weight to force sound to travel over or around the barrier and not leak through it. A recommended minimum surface weight for the barrier is 7 lbs/ft². Water drainage can be provided along the bottom of the barrier provided it is backfilled with gravel.
 - ❑ The barrier be constructed to at least 15 feet above grade and be approximately 820 feet long. The barrier should connect to the building in the northern portion and extend around the truck court and to the south, as close to the paved area as feasible.
 - ❑ Appropriate materials of construction for the barriers include ⁵/₈-inch thick sheet steel piling, precast or poured-in-place concrete, acoustical metal panels, or engineered wood. Other hybrid system specifically manufactured for the purpose are also available with an internal absorptive face, but this feature is not necessary for this site.
 - ❑ The barriers, being solid, must be designed to resist wind load. Hence, they are structures that require engineered footings, the design of which will need to be overseen by structural professionals.

2. Similarly, construct the solid 6-foot-tall fence along the east side of the eastern driveway. The fence starts at the retaining wall and travels southeast, approximately 1,445 feet. The fence should be solid, with no gaps, and should weigh at least 1 lbs/ft². A fence is not needed in the northern portion of the site due to significant grading changes. Gaps along the bottom of the fence are acceptable to facilitate drainage. Commercial grade PVC fences meet this requirement.

3. Proceed with HVAC equipment plans, keeping in mind acoustical performance to ensure modelled results are realized.

CONCLUSION

Plans call for the development of an industrial park on vacant woodland in the General Industry district along Interstate 84 in the Town of Montgomery, Orange County, New York. The project is situated between I-84 and Neelytown Road and comprises two warehouse buildings that accommodate trucking operations. While the immediate surrounding area is exclusively in the industrial zone, there are three residences within the industrial zone just west of the site. Residential zoned properties are further north and south of the site. An acoustical evaluation was carried out to ensure that site sound emissions meet applicable State and local noise codes, and that site sound will not deviate from existing sounds in the area per DEC guidelines. In addition to these regulations, project noise goals were also established for certain receptors to ensure that steady sound from HVAC equipment and maximum sound from intermittent truck activity were in line with existing ambient conditions. Meeting these project goals will ensure there is no negative acoustical impact at potentially noise sensitive receptors.

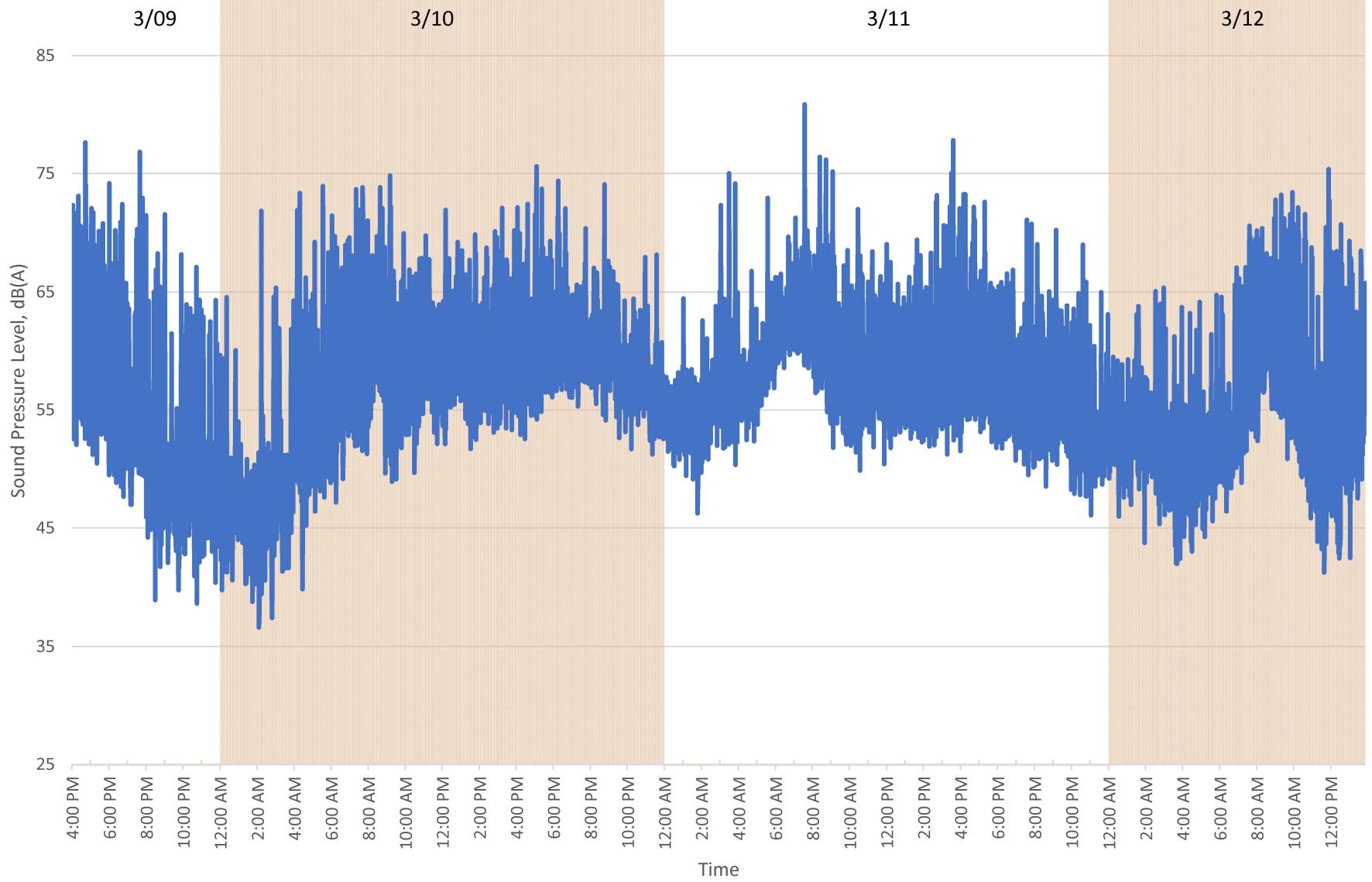
The site is well laid out and designed. Analyses show that distance, site geometry, and the proposed noise control barrier and solid fence will sufficiently attenuate on-site HVAC and vehicle noise to have no negative effect on the surroundings. Noise modelling demonstrates project compliance with the Town's Noise Law at all adjacent property boundaries, including impulse noises. More critically, the sound study concludes that the project will not result in any impacts to any nearby sensitive receptors as site sound emissions are in line with ambient conditions. There are no acoustical concerns with off-site truck routes as the site has short access to I-84 and will use approved truck routes along already well-travelled roads.

Given the results of this analysis and the prevailing ambient sound levels, future average sound levels are expected to see an insignificant increase, if any, which will result in no negative acoustical impact on the area per DEC guidelines. Based on the foregoing, the findings in this report support and conclude that the project will not create any significant adverse sound impacts and is appropriate for this site.

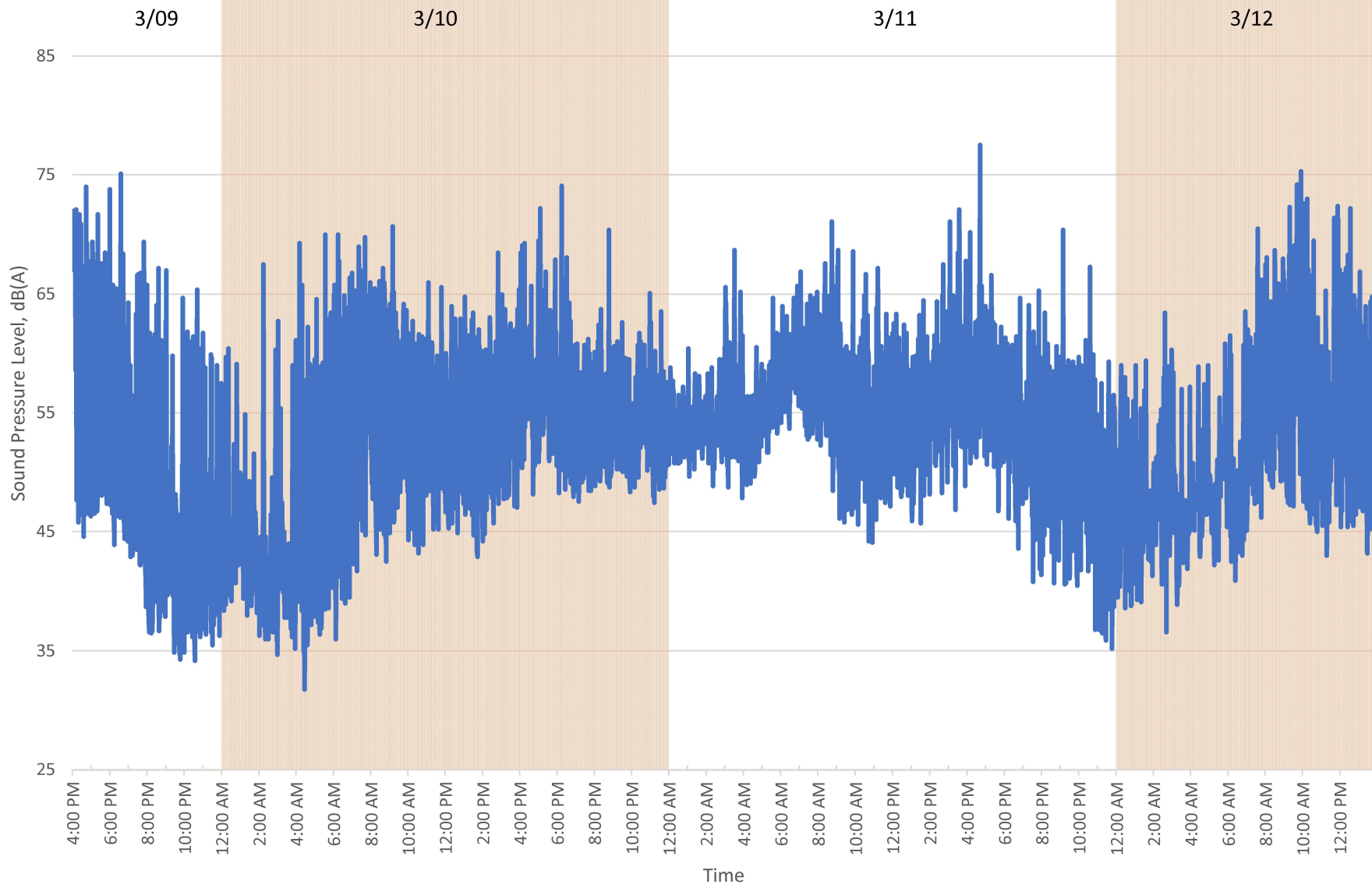
APPENDIX

1-minute L_{eq} Time History Graphs from Sound Survey

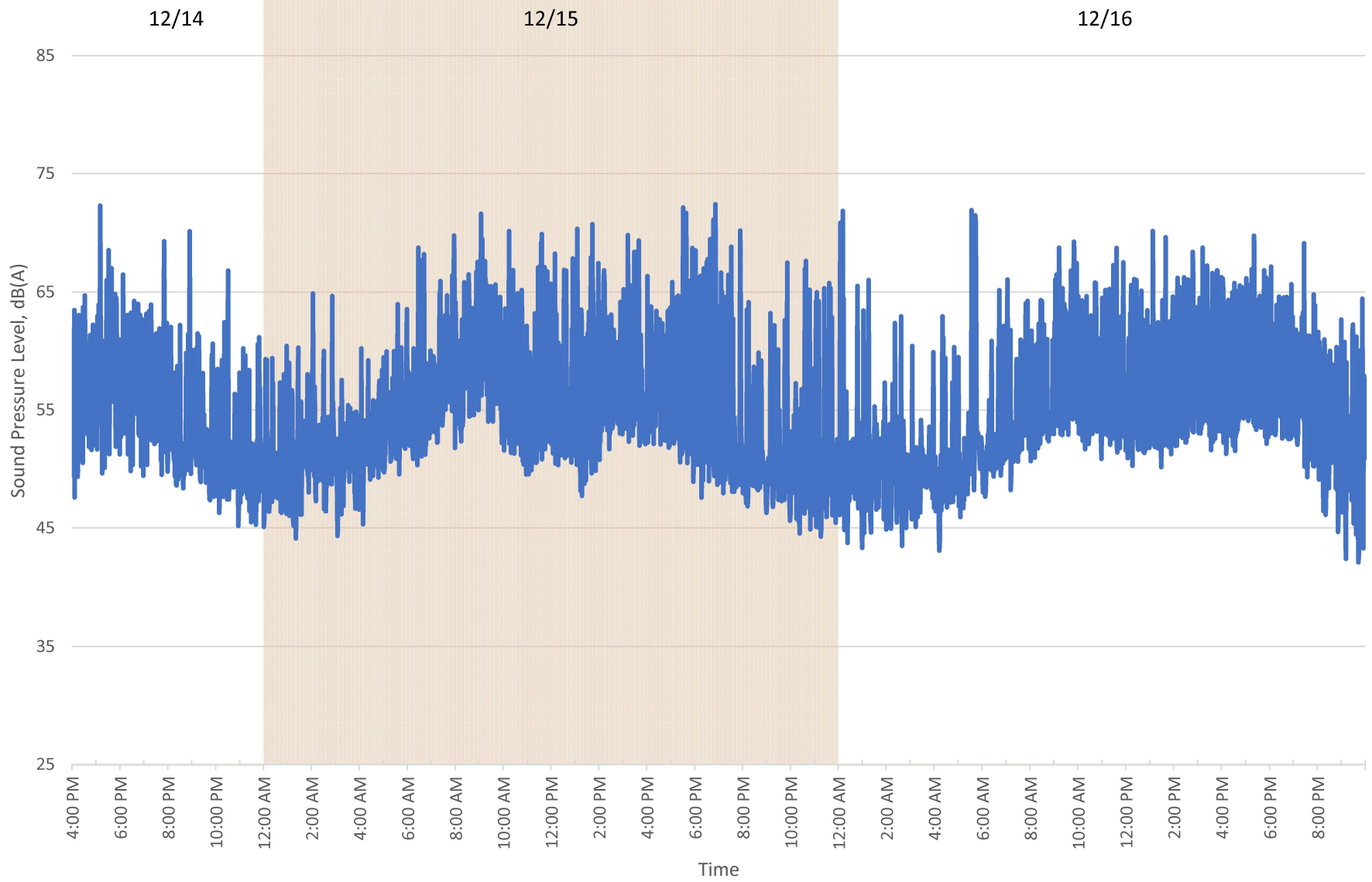
1-Minute L_{eq} Sound Pressure Level Time History at Location 1 March 9-12 2022



1-Minute L_{eq} Sound Pressure Level Time History at Location 2 March 9-12 2022



1-Minute L_{eq} Sound Pressure Level Time History at Location 2 December 14-16 2022



1-Minute L_{eq} Sound Pressure Level Time History at Location 3 December 14-16 2022

