



EVALUATION OF SITE SOUND EMISSIONS

PROPOSED DISTRIBUTION FACILITIES Pompano Beach, FL

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INTRODUCTION

Ostergaard Acoustical Associates (OAA) was asked to assist with evaluation of potential sound emissions from two new distribution facilities located in the City of Pompano Beach, Broward County, FL. The site is located southwest of the intersection of Race Track Road (SW 3rd Street) and a railroad right-of-way for the Tri-Rail commuter rail. The site currently accommodates the eastern portion of the Isle Casino Pompano Park. This property will be demolished and redeveloped to accommodate the distribution facilities, as well as the new Live! Resorts Pompano mixed-use development west of the site. The northern onsite building will be used as a delivery station while the larger southern building would be used as a sortation facility. Throughout this report, the term “site” refers to the parcel that accommodates these two projects.

The site is located in a mixed-use area containing multiple industrial uses to the north and east; residential uses are located nearby to the south and further to west. The delivery station is planned in the northern half of the site with truck docks along the eastern façade, while the sortation facility will be located in the southern portion of the site with truck docks along the western, southern, and eastern façades. This report addresses the on-site noise radiated by both facilities to off-site receptors, however the focus of this report concentrates on the sortation facility as it is in proximity to potentially noise-sensitive residential receptors. A separate, high-level, sound study report discussing only the delivery station was carried out and documented in our reported dated 19 November 2021.

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. Research indicates that there are no quantitative local and County noise codes that apply to motor vehicles, and State codes are easily met by vehicles in good working order. Hence, a project noise goal was established to ensure compliance with the intent of all relevant codes and reduce the acoustical impact of the site. Sound produced by the site comprises steady sound from rooftop HVAC equipment as well as intermittent sound from truck and car¹ movements.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Staff Engineer Daniel J. Young. The representative at Scannell Properties coordinating the project is Matt Boone, P.E.

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 heavy trucks such as over-the-road or line-haul trucks.

SITE AND VICINITY

Figure 1 is an aerial image obtained from Google Earth outlining the site property line in red. The site currently accommodates a portion of the Isle Casino Pompano Park and is located within the PCD, Planned Commercial/Industrial District, zone. Our understanding of zoning/land uses in the various cardinal directions is as follows:

- ❑ West of the site are properties of the Isle Casino Pompano Park, in the PCD zone. The property will be redeveloped to accommodate the new Live! Resorts Pompano. At this time, approved non-noise sensitive uses include a Topgolf and Live! Casino which borders the site to the west. Plans for the rest of this property includes various mixed-uses including hotels, retail, and condominiums. Further west, across Powerline Road, are multi-family residences, a hotel, and commercial properties in the RM-45 (Multiple-Family Residence), B-3/PCI (General Business Planned Industrial Overlay), and B-3 (General Business) zones, respectively. The nearest existing residential receptors are about 2,500 feet from the site in this direction.
- ❑ North of the site, across Race Track Road, are industrial properties in the B-3/PCI and I-1/PCI (General Industrial Planned Industrial Overlay) zones. Beyond these is State Road 814 (W Atlantic Boulevard), as well as a single-family residential community, about 2,000 feet away, in the RS-4, Single-Family Residence, zone.
- ❑ Boarding the site to the east is a railroad right-of-way for the Tri-Rail commuter rail. Just beyond are industrial properties in the I-1 (General Industrial) and I-1X (Special Industrial) zones.
- ❑ South of the site, across Cypress Bend Drive, are multi-family residential and commercial properties in the RM-45 and B-2 (Community Business) zone. Also, to the southwest is a hotel also in the RM-45 zone. Residential receptors are about 300 feet from the site in this direction.

Site access will be provided via three driveways to the north from Race Track Road and four driveways to the west from the new North Palm Aire Drive. Trucks for both the delivery station and sortation facility will enter and exit using the central and eastern driveways via Race Track Road. Personnel vehicles will primarily use the westernmost and southernmost driveways via North Palm Aire Drive and westmost driveway via Race Track Road to travel directly to and from their respective parking lots. Delivery vehicles will use appropriate driveways to reach dedicated delivery parking areas.



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Figure — Google Earth image showing the proposed distribution facilities site and vicinity in Pompano Beach, FL. The site property line is outlined in red.

Site specific traffics counts indicate that both uses are expected to operate at all hours of the day. Delivery activity will occur primarily during the daytime hours; personnel activity occurs during the day and night but is concentrated around shift changes. Heavy truck operations will be dispersed across all hours of the day, but primarily concentrated during the nighttime and evening hours. Acoustically, the main difference in the two sites is the frequency of activity; delivery stations see far fewer heavy truck trips. The sortation facility also utilizes box trucks, which are smaller and lower in sound level than a traditional line-haul tractor trailer.

REGULATIONS/GOALS

When developing a site of this type, it is appropriate to consider how sound from the facilities will likely be received, especially by noise-sensitive receptors. Sound produced by distribution facilities, whether a sortation facility or delivery station, is characterized by motor vehicle activity, such as idling and vehicle movement, as well as steady HVAC equipment. The major sound sources were evaluated and compared to applicable noise code limits. 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 goal of the sound study is to minimize the site's acoustical impact on the surrounding area.

State, county, and local noise codes were reviewed. The State of Florida regulates motor vehicle noise under Title XXIII: Motor Vehicles, Chapter 316: State Uniform Traffic Control, Section 316.293: Motor Vehicle Noise. Vehicles with a gross weight of 10,000 pounds or more are limited to 86 dB(A) at 50 feet when traveling at speeds of 35 mph or less. At speeds greater than 35 mph, these vehicles are limited to 90 dB(A) at 50 feet. For vehicles less than 10,000 pounds, the limit for speeds of 35 mph or less is 72 dB(A) at 50 feet and 79 dB(A) for speeds greater than 35 mph. These limits are easily met by modern vehicles in good working condition.

The City of Pompano Beach discusses noise quantitatively in Chapter 97: *Noise Control* of its code. All limits are not to be exceeded for 10% of the observation period, which unless otherwise indicated must be a minimum of ten minutes. Specifically, at or within the boundary of multi-family residential properties the sound levels must not exceed 55 dB(A) during the daytime hours of 0700-to-2200, and 50 dB(A) during the respective nighttime hours. At commercial and industrial properties, the limits are 65 dB(A) at all hours. For continuous noise maximum levels, the limits are increased by 10 dB(A) for commercial and residential sources during the daytime and 5 dB(A) for residential sources during the nighttime. However, this code also states that sound from motor vehicles is to be regulated and controlled by the State of Florida Chapter 316 code. For HVAC noise within a residential area, the level must not exceed the limit of 60 dB(A) for 50%

of the observation period. Also provided are prohibited acts in relation to the generation of unnecessary noise including the sounding of any horn or signaling device except as a danger warning and engaging in construction work during the hours of 2300-to-0800.

Broward County also discusses noise quantitatively in Chapter 27, Article VII: *Noise* of its code. This code states that noise produced by industrial and commercial facilities received at residential properties may not exceed 55 dB(A) for 50% of the measurement period and a maximum level of 65 dB(A). At commercial or governmental facilities, these limits are increase by 10 dB(A). Also, a sound shall not be considered in violation of these limits if it is less than five dB(A) above the background sound level. Enumerated exemptions include the noise in connection with loading and unloading during the hours of 0700-to-1900, as well as the operation of motor vehicles on a public and private right-of-way and the sounding of safety devices at all times.

Onsite steady HVAC sound is required to me the relevant limits in these codes. Specifically, to comply with both the local and County codes, HVAC noise should not exceed a maximum level of 50 dB(A) at nearby residential and commercial properties. However, given the language in the local and County codes, onsite motor vehicle noise is only regulated by the State code. These limits are easily met by vehicles in good working order; therefore, a project goal should be established to reduce the acoustical impact of the site. Specifically, OAA recommends that maximum nighttime on-site sound from intermittent vehicle activity should strive to not exceed 55 dB(A) at nearby residences. These goals are based on professional experience as well as nearby residences' proximity to major roads and aligns with the intent of the State, County, and local codes; meeting this goal will minimize the potential for noise complaints. Specific daytime noise goals are typically not warranted as ambient sounds are higher in level and sensitivity is low. Project goals are also not warranted at industrial, commercial, or undeveloped, properties as these uses not considered noise-sensitive.

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. In the model, buildings are white and the site property line is outlined in red. Structures for the approved Topgolf and Live! Casino are shown in the model. Elevations for the distribution facilities were based on drawings. Elevations for the Topgolf and Casino were estimated. Existing structures in the area were based on information

available from Google Earth and Google Street View. North is pointing up in all figures. Plans call for a noise barrier along the southern part of the site; this is shown in light blue in the model. This barrier is approximately 1,870 feet in length and will be carried to a height of 20 feet above grade. Also shown in light blue is the delivery station canopy covering the loading area, located on the southern building façade.

The acoustical model shows resulting site sound emissions graphically as A-weighted sound level contours, in 1 dB increments, and tabulates the summed A-weighted sound levels at five discrete locations at the façade of nearby potentially sensitive receptors. Sound level contours are at ear height, 5 feet above grade. Residential receptors are shown at Locations B through E at 35 feet above grade and Location F shows the nearby hotel also at 35 feet above grade; these elevations typify upper story receptors. Location A is not used and reserved for future use.

Rooftop HVAC Sound

Based on OAA's experience with other similar projects, a good approximation for facilities of this size is to assume 1 ton of cooling per 725 square feet of building. This equates to about thirty (30) 25-ton HVAC units for the sortation facility and 8 units for the delivery station. 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.

The noise from the 38 rooftop units was included in the HVAC acoustical model and were placed 4 feet above and evenly distributed across the rooftops. Sound from the sources was projected to nearby receptors. Figure 2 shows the results graphically and tabulates the summed A-weighted sound levels at the five discrete Locations. HVAC noise sources are shown in the model as blue "+"s. The results show that with all rooftop units operating, HVAC sound levels are in the 30-to-43 dB(A) range at all Locations.

This analysis shows that there is little concern regarding HVAC sound. HVAC sound is sufficiently controlled via distance and roof edge shielding effects so that this noise meets the multi-family 55 dB(A) nighttime noise limit for steady sound by wide margins at nearby residences. While not shown graphically, there will also be full compliance at single-family receptors to the north. No additional mitigation measures are needed provided planned equipment is acoustically aligned with what was modelled.

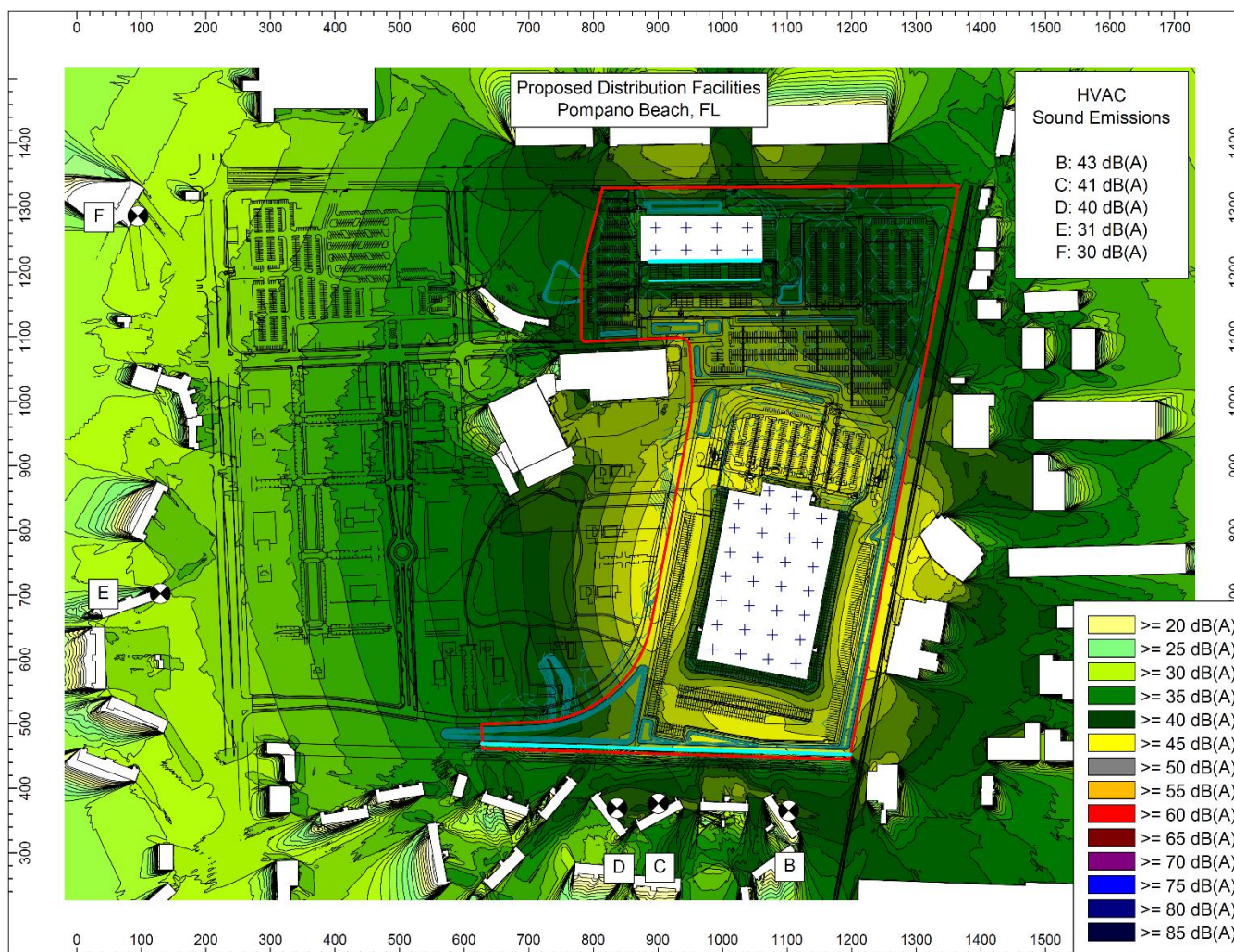


Figure 2 — A-weighted sound emission contours, 5 feet above grade, for sound from rooftop HVAC equipment. Each of the 38 rooftop units shown with a blue “+” sign. Buildings shown in white. Noise control barrier and building canopy shown in light blue. Locations B through F are 35 feet above grade.

Truck Activity

OAA has had the opportunity to visit various distribution and logistics facilities over the years to survey and document the sounds of truck activity. Truck noise in typical dock and trailer parking areas can routinely produce maximum sound levels of 79 dB(A) at 50 feet. 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. A driving truck exhibits slightly lower maximum sound levels of 74 dB(A) at 50 feet. Box trucks exhibit lower maximum sound levels of 70 dB(A) at 50 feet. Personnel and delivery vehicles typically produce maximum sound levels of 59 dB(A) and are low enough in level to not be an acoustical issue.

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. 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 only occur for a short duration and are not representative of the constant sound level produced by on-site trucks.

Site specific traffic counts for the sortation facility call for a maximum of 14 trucks arriving in any one hour during typical operating conditions. For the delivery station, trucks are significantly lower in quantity and amount to less than 1 truck per hour. While there will certainly be multiple trucks onsite at any given time, it is most appropriate to model 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.

Heavy truck activity was modelled at various on-site locations that are nearest to receptors. While box trucks may also be on site, they are lower in level and hence will result in lower levels than shown in the Figures below. Figures 3 through 7 show the resulting worst-case site sound emissions contributed by heavy truck activity. Truck yard activity is shown as white "+"s and modelled with a level of 79 dB(A) at 50 feet. HVAC noise sources were also included in the model to represent worst-case conditions, and are shown as blue "+"s. Several conclusions can be drawn from these models.

- ❑ Figure 3 shows a truck in the southern portion of the delivery station truck court (Truck Position 1). All nearby receptors are either industrial or commercial in nature, and the nearest noise sensitive residences will see levels significantly below the project goal.
- ❑ Figure 4 models a truck in the eastern portion of the southern trailer parking area for the sortation facility (Truck Position 2). At this location, worst-case site sound emissions are 55 dB(A) at Location B, meeting the project goal due to the proposed sound wall. Emissions of this magnitude will be brief in nature and intermittent; emissions at all other locations will be significantly lower in level.
- ❑ Figure 5 shows that a truck in the southern trailer parking area for the sortation facility (Truck Position 3) will produce a maximum level of 53 dB(A) at the residences to the south, Location C and Location D. All other residential receptors receive levels well below the project goal.
- ❑ Figure 6 shows a truck in the western trailer parking area of the sortation facility (Truck Position 4). Emissions received at all Locations meet the maximum project goal by margins of 4 dB(A) or more.

The results show that site sound emissions are well controlled by distance and the strategically placed noise control barrier to meet the project goal at all nearby noise-sensitive receptors. As a result, no negative acoustical impact is expected at any existing residential receptor.

A discussion about the Live! Resorts Pompano multi-use development is needed. Plans call for potential hotels and multi-family condominiums. While approval and final location of these uses remains to be seen, it is helpful to discuss potential impacts on these receptors. Using distance alone, heavy truck sound emissions will meet the 55 dB(A) project goal at distances of 750 feet or more from truck activity. Hence any residential uses outside of this distance are of no acoustical concern. Although they accommodate sleeping, hotels closer than 750 feet are also not a concern as their design typically accounts for improved façade construction to mitigate exterior noise. Windows at upper stories are also typically not operable. This project should coordinate with this adjacent development to minimize any potential acoustical issues through design.

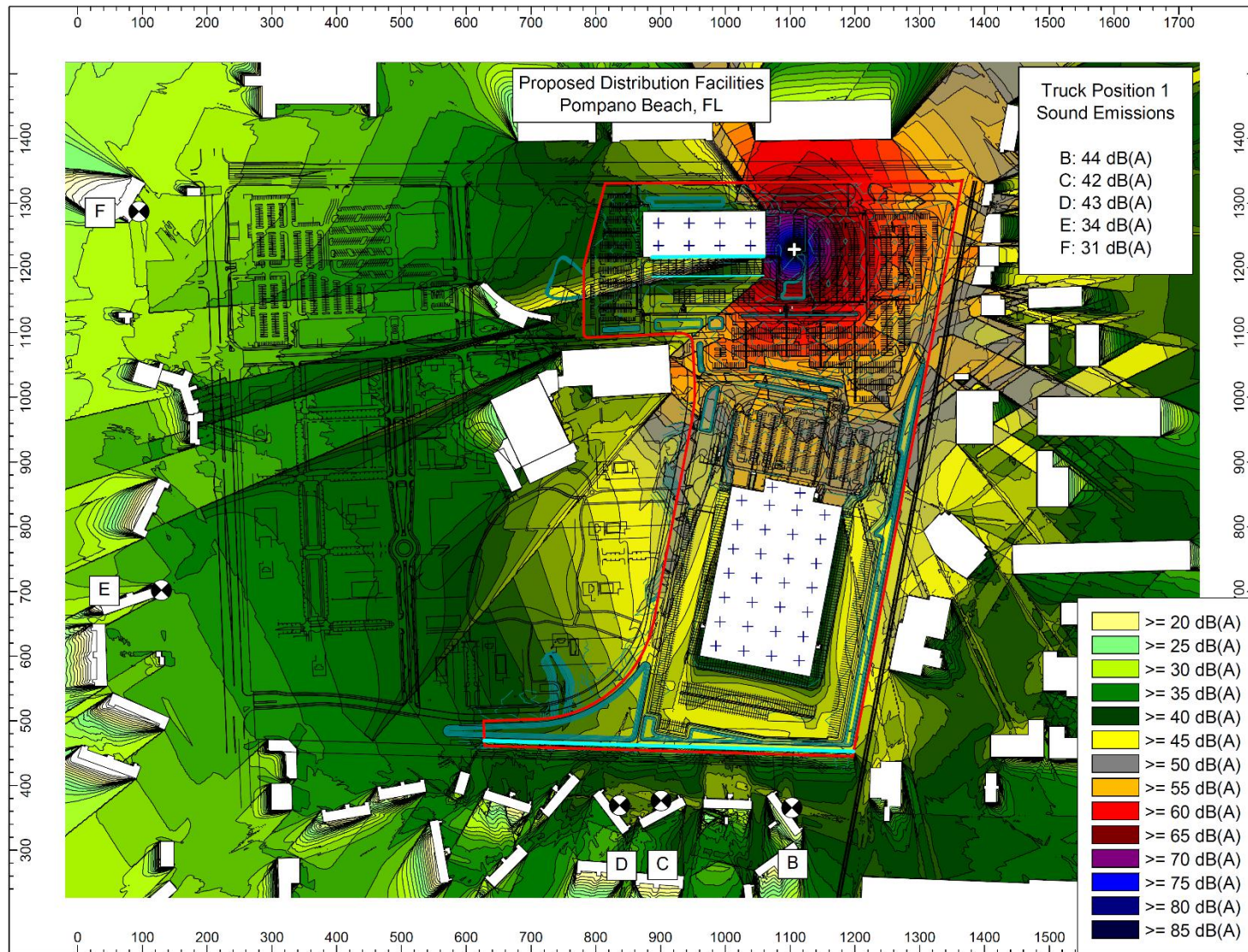


Figure 3 — A-weighted sound level contours 5 feet above grade expected for truck activity at Position 1 (white "+"). Buildings shown in white. Noise control barrier and building canopy shown in light blue. Locations B through F are 35 feet above grade.

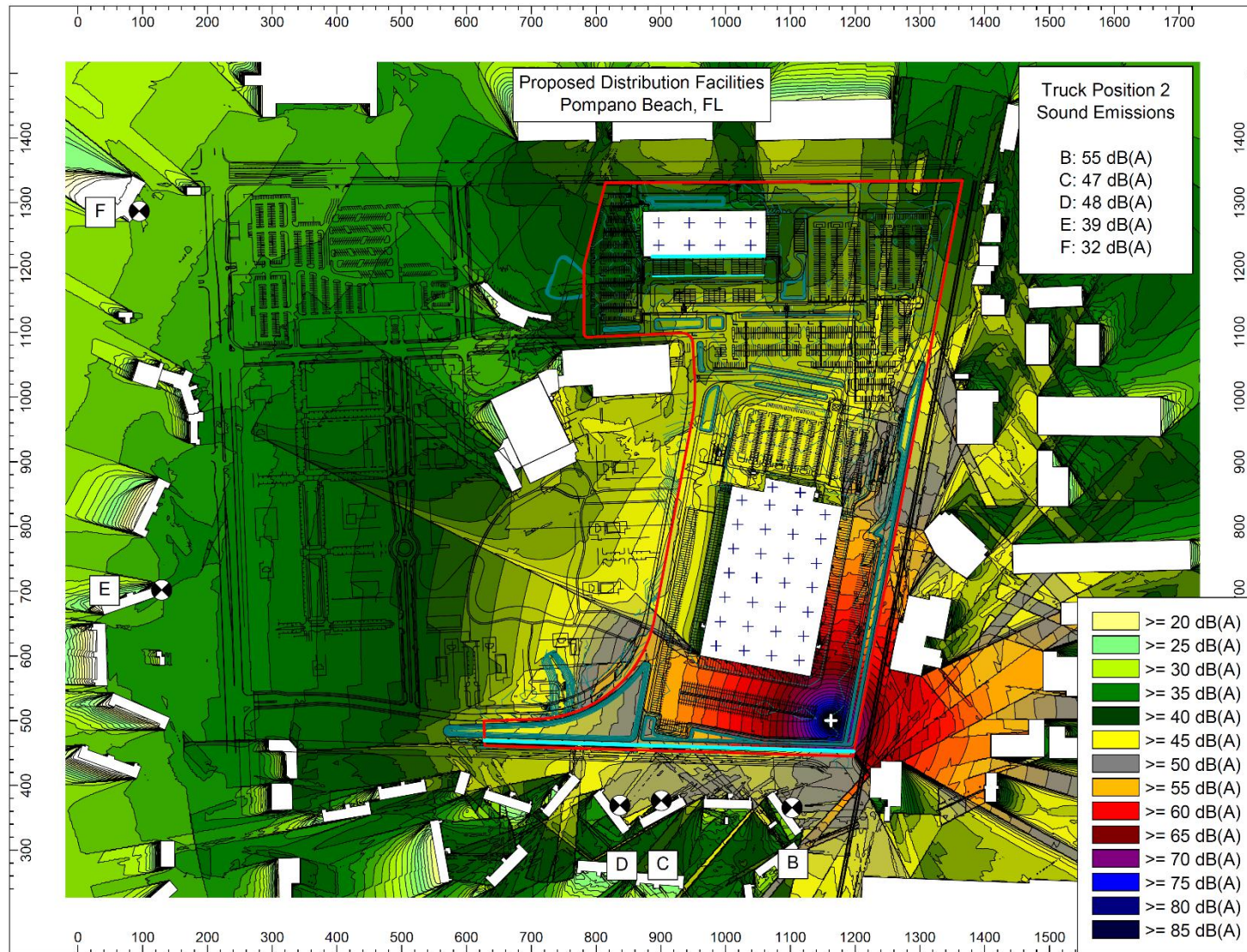


Figure 4 — A-weighted sound level contours 5 feet above grade expected for truck activity at Position 2 (white "+"). Buildings shown in white. Noise control barrier and building canopy shown in light blue. Locations B through F are 35 feet above grade.

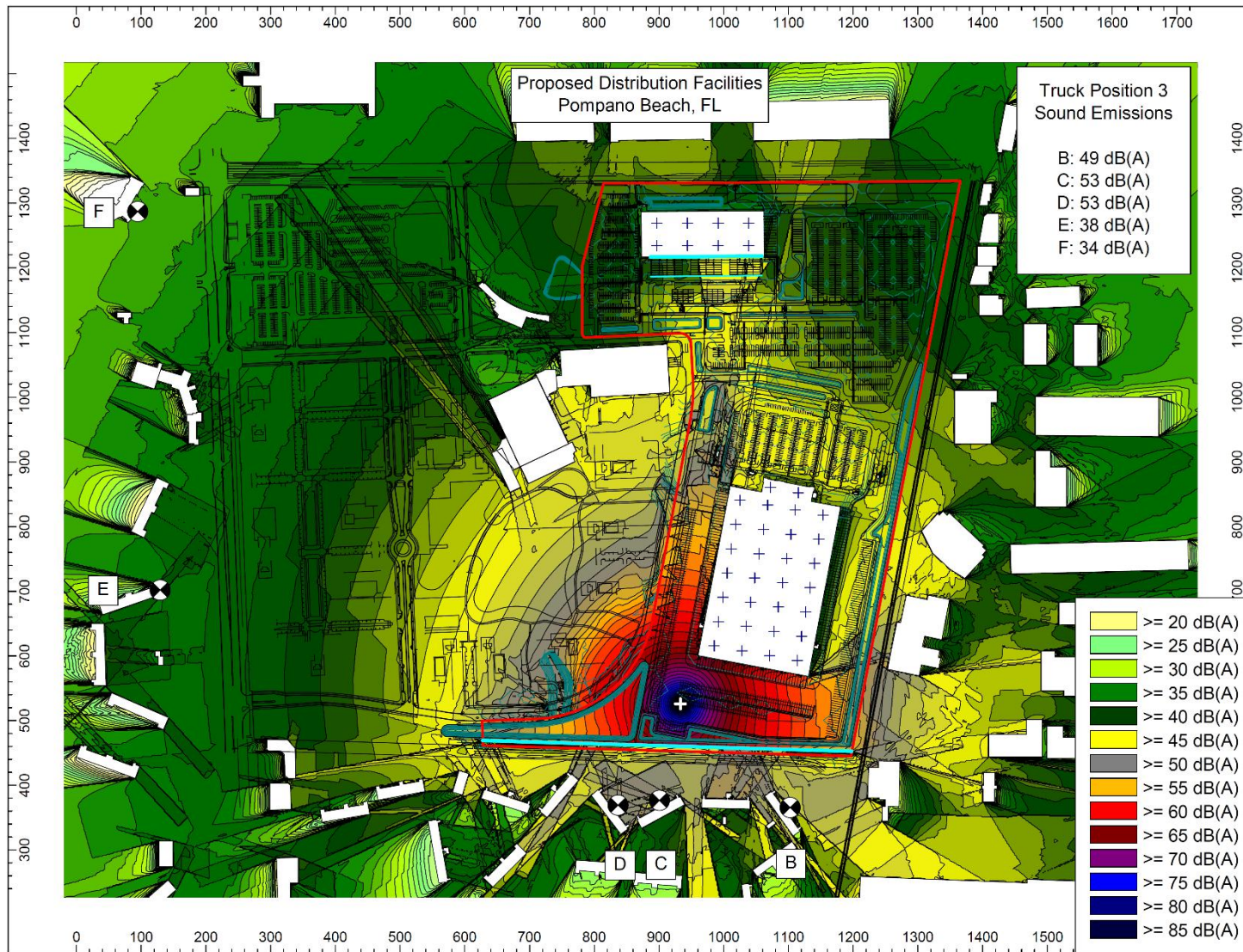


Figure 5 — A-weighted sound level contours 5 feet above grade expected for truck activity at Position 3 (white “+”). Buildings shown in white. Noise control barrier and building canopy shown in light blue. Locations B through F are 35 feet above grade.

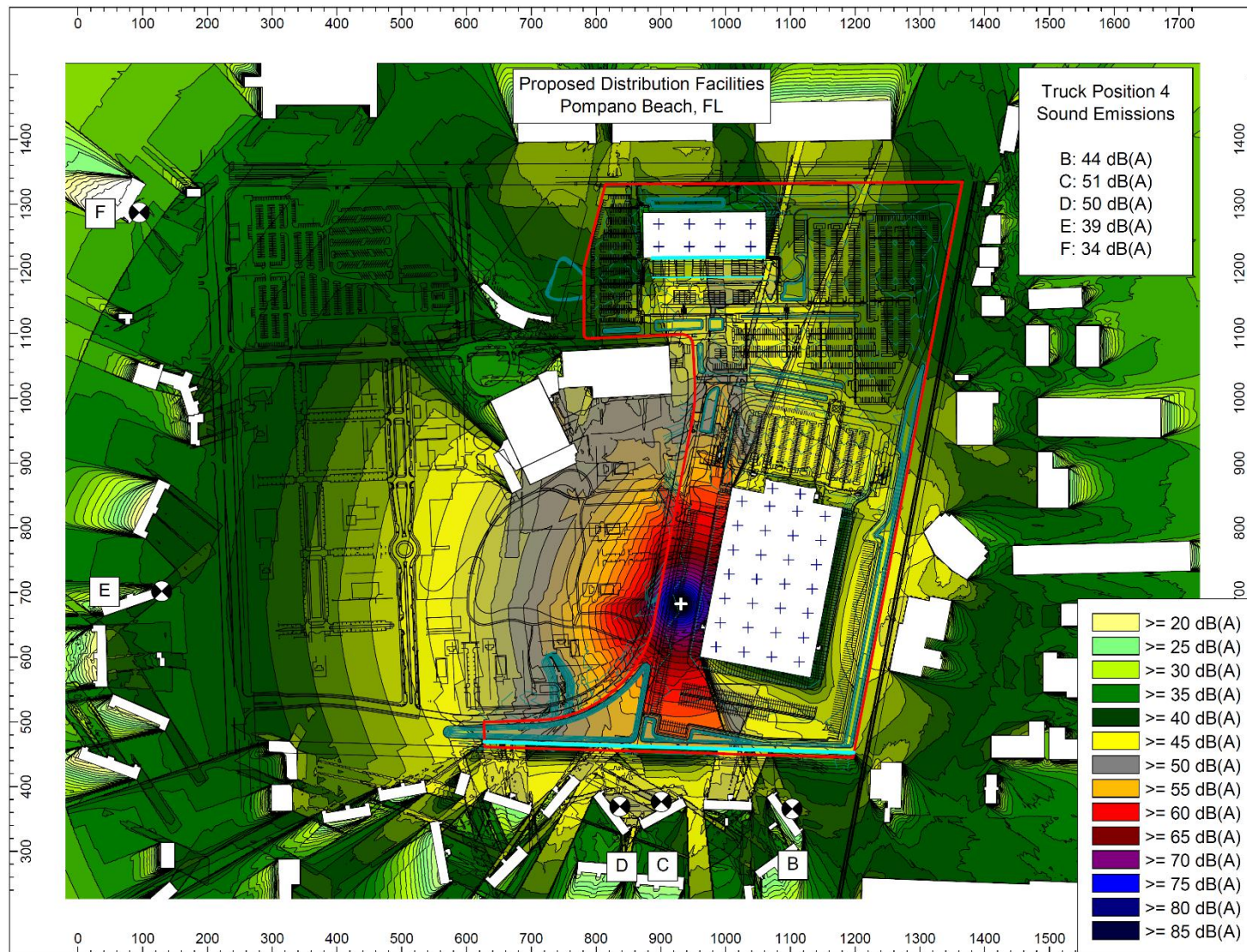


Figure 6 — A-weighted sound level contours 5 feet above grade expected for truck activity at Position 4 (white "+"). Buildings shown in white. Noise control barrier and building canopy shown in light blue. Locations B through F are 35 feet above grade.

While not regulated, it is also helpful to review off-site truck routes to assess any potential acoustical impact. Actual truck routes are not known but all truck activity is expected to travel to and from the site via Interstate 95 to the east. The nearest interchange for the Interstate is via State Road 814 (W Atlantic Boulevard) to the north. From here trucks should then travel via State Road 811A (S Andrews Avenue) and SW 3rd Street to access the site. This route passes by mainly industrial and commercial receptors and will not have any negative acoustical impact on the area. Trucks should avoid travelling west to Powerline Road during the nighttime hours to minimize potential impacts at residential uses in this area. Given the nearby major roads and lack of residential receptors along this route, no acoustical issues from offsite truck routes are expected.

RECOMMENDATIONS

1. To ensure the intent of the project goal is met at residential receptors and to minimize the potential for noise complaints, plan to construct the onsite noise barrier along the entirety of the southern property line of the site. The barrier, shown in light blue in the figures above, should be carried to a height of 20 feet above grade and should run a total length of 1,870 feet. Note that to be acoustically effective, the noise barrier wall 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 to control low frequency truck noise is 7 lbs/ft².
 - ❑ Appropriate materials of construction for the barriers include $\frac{5}{8}$ -inch thick sheet steel piling, precast or poured-in-place concrete, acoustical metal panels, pressure treated wood, or other hybrid system specifically manufactured for the purpose. Often noise control barriers are provided with an interior sound absorptive face, but this feature is not critical for this project.

- ❑ The barrier, being solid, must be designed to resist wind load. Hence it is a structure that requires engineered footings, the design of which will need to be overseen by structural professionals. Additional features, such as emergency vehicle access will need to be coordinated with design professionals.

- 2. Back-up alarms can be the cause of noise complaints. To minimize any potential complaints from back-up alarms, we generally recommend outfitting trucks owned and controlled by the site with smart, ambient sensing, multi-frequency back-up alarms. This is especially effective on on-site terminal tractors/yard jockeys as these trucks are responsible for the majority of back-up movements at sites like this. Acceptable back-up alarms are available from a variety of manufacturers, such as Ecco, specifically Model EA9724. These devices reduce annoyance generated from constant level, pure tone back-up alarms. The reduction in annoyance is accomplished in two ways:
 - ❑ A broadband sound is less intrusive and annoying than a pure tone sound since, at a distance, it can blend in easier with other ambient sounds.
 - ❑ The smart, ambient-sensing feature allows back-up alarms to operate safely and effectively at far lower sound levels than typical brute-force, constant level devices. The smart alarms sample ambient noise and adjust the warning signal to be 5-to-10 dB higher than the ambient, therefore reducing levels nearby and off-site.

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

CONCLUSION

Two distribution facilities, a sortation facility and a delivery station, are planned for development in Pompano Beach, FL. Noise sources on-site will comprise personal/delivery vehicles, heavy trucks, and rooftop HVAC units. Applicable noise codes regulate steady HVAC sound but were less helpful for carrying out an acoustical impact analysis for motor vehicles. Therefore, a project criterion was developed for mobile sources to protect nearby residences. Steady site sound emissions should meet the more stringent local and County limit during the nighttime hours at residences. Specifically, codes call for steady sound to not exceeding 50 dB(A) at single-family receptors and 55 dB(A) at multifamily receptors. A project noise goal of 55 dB(A) was recommended for maximum sound levels from on-site motor vehicles, including trucks. A project noise goal for on-site motor vehicles is not warranted for non-sensitive receptors such as industrial or commercial properties, and undeveloped land.

Analyses show that HVAC sound emissions meet code limits by appropriate margins. All motor vehicles are expected to readily comply with the State motor vehicle sound limits. Maximum heavy truck sound emissions also meet the project goal at all nearby existing residential receptors with the inclusion of a 20-foot-tall wall along the southern property line. Off-site truck routes are in place to allow them to access major roadways without impacting residential receptors. We recommend continued coordination with the redevelopment of the property to the west to ensure acoustical compatibility is maintained. Given the above, the potential for noise complaints directed at the site is low from all existing receptors in the area. Site activity will blend in with other industrial uses and no negative acoustical impact is expected.