OSTERGAARD ACOUSTICAL ASSOCIATES

EVALUATION OF SITE SOUND EMISSIONS

PROPOSED DISTRIBUTION FACILITY
San Leandro, CA

Revision 2

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INTRODUCTION

Ostergaard Acoustical Associates (OAA) was asked to assist with the evaluation of potential sound emissions from a proposed speculative distribution facility planned for construction in San Leandro, Alameda County, California. The project site is located southeast of the Hester Street cul-de-sac and currently comprises an industrial warehouse. Plans call for all existing structures on site to be removed and the construction of a distribution facility in the southeastern portion of the site. This report addresses on-site noise radiated to nearby potentially noise-sensitive receptors.

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 the City of San Leandro does have a noise code, but it generally discusses noise in a qualitative manner and provides no applicable quantitative limits. The County noise code has merit and while not enforceable within City limits, was used as a foundation for development of project noise goals. Therefore, expected site sound emissions from the facility were evaluated against criteria recommended by OAA based the County noise code limits, professional experience, and information available on existing ambient conditions. The objective of the project goal is to protect potentially noise sensitive receptors and meet the intent of the City noise code. Sound produced by the site comprises steady sound from rooftop HVAC equipment as well as intermittent sound from truck and car[1] movements.

Work by OAA was overseen by Benjamin C. Mueller, P.E., with assistance from OAA Staff. The representative at Prologis Inc. coordinating this project is Ms. Claudia Tarpin.

[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 and most of the surrounding area currently comprise industrial properties in the IG, Industrial General, district. Many uses in the vicinity also utilize heavy trucks. Certain properties in the area are in the IP, Industrial Park, district and accommodate non-noise-sensitive industrial uses. West of the site, across Doolittle Drive, is a golf course located in Oakland. About ¾ of a mile beyond is the Oakland International Airport; the site is in line with two of the runways. Abutting the site to the east are other industrial uses. A railroad right-of-way is 500 feet to the east with residences fronting on Tudor Court in the RS, Residential Single-Family, district beyond. Adjacent to these residences to the south are other IP and IG district uses; just east of this residential neighborhood is Interstate-880. Given the surroundings, the area is expected to be regularly exposed to moderately high sound levels, and therefore, nearby residences are not assumed to be particularly noise-sensitive. Nevertheless, site noise should still be evaluated at these receptors to assess any acoustical impact.

Plans call for the existing industrial use and all structures to be removed and a new 239,573 ft^2 distribution facility constructed roughly in the same location as the previous building. Office space will accommodate about 10,000 ft^2 of the building footprint. The remaining 229,573 ft^2 will be used for warehouse storage. The proposed building will be 50 feet tall. Existing site access will remain via Hester Street to the northwest and an unnamed street connecting to Doolittle Drive to the southwest. These driveways will accommodate both cars and trucks. Onsite driveways circle the building, allowing truck access to the truck court located along the north and south sides of the building. There are approximately 27 dock doors along the north side of the building and 37 dock doors along the south side. Associate parking is provided in a triangular lot on the west side of the building; trailer parking is provided north of the building.

Specific traffic counts depend on the end user tenant. While the extent of onsite traffic and the hours of operation are unknown, the sound study has followed the same conservative assumptions made in the traffic study, based on the size of the site and proposed building. Typical warehouses operate 24/7 with much of the activity during the daytime hours; nighttime operations are generally used to prepare for the next day. The focus of this study is to analyze potential nighttime activity as this is generally when residential receptors are most sensitive and code limits are more stringent.

Figure 1 — Google Earth image showing the proposed distribution facility site and vicinity in San Leandro, CA. The site property line is approximately outlined in red.

REGULATIONS/GOALS

When developing a site of this type, it is appropriate to consider how sound from the project will likely be received, especially by noise-sensitive receptors. Sound produced by distribution facilities is characterized by motor vehicle activity, such as idling and vehicle movement, as well as steady HVAC equipment. These 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. When vehicles are departing or approaching the facility, they are expected to blend in with existing traffic flow sound in the area.

City, County, and State codes were reviewed for applicable noise regulations. The City of San Leandro discusses noise in Chapter 4.1: *Noise*. The code prohibits disturbing, excessive, and offensive noise and specifically prohibits certain acts in connection with loud noise, but none are relevant to the site. All discussions of noise are in a qualitative manner and do not include quantitative limits. Zoning code Section 4-1670: *Performance Standards* also call for compliance with Chapter 4-1. Sections 2-740 and 2-741 provide additional performance standards that apply to industrial activities within 200 feet of a residential district. Because this site is 500 feet away from a residential district, these are not applicable. Alameda County also has a noise code, found under Chapter 6.60: *Noise*. While it does not apply to incorporated areas of the County, it was reviewed for thoroughness. The County noise code limits apply at receiving properties based on their use, and sets various limits based on the duration of the noise. Higher limits are allowed for shorter periods of time. In summary, steady sound is limited at residential receptors to 50 dB(A) during the day hours (0700-to-2200 hours) and 45 dB(A) during the corresponding night hours. During the night, levels up to 60 dB(A) are allowed for up to 1 minute, 55 dB(A) for up to 5 minutes, and 50 dB(A) for up to 15 minutes in a given hour. Daytime noise code limits for residences are 5 dB higher in level. Commercial noise code limits are 15 dB higher in level than residential limits. The County does not provide any limits for industrial receptors. There is also a provision that says if the ambient sound is greater than the provided limits, then the code limits shall be equal to the ambient sound level. It is not clear whether this code applies to on-site motor vehicles or not. The State of California does not have any site noise regulations but does regulates motor vehicle noise in California Vehicle Code Sections 27150 and 27200. These codes require all motor vehicle to have exhaust mufflers and provide maximum allowable sound levels for various types of vehicles at a distance of 50 feet. In particular, for heavy trucks manufactured after 1987, the maximum sound pressure level permitted is 80 dB(A) at 50 feet. This limit is readily met by vehicles in good working condition.

A brief discussion of the relevant noise codes is needed. The City code does not provide any quantitative limits for site sound emissions, and State codes for motor vehicles are relative to the vehicle, not the receptor. The County noise code has merit; while not enforceable within the City jurisdiction, it was used as a basis for development of project noise goals. OAA finds that a limit of 45 dB(A) for a residential receptor during the night is generally acceptable for steady noise sources. However, given the density and make-up of the area, it is likely overly stringent if applied here. Based on experience, an urban area such as this would naturally have ambient sound levels far greater than this limit. In our opinion, the County code allowance for excursions that occur between 1 minute and 15 minutes of 55-to-60 dB(A) are nominally acceptable at residential receptors during the night, especially for dwellings nearby well-travelled roadways.

Based on experience, OAA would typically set a project goal for steady HVAC sound of 50 dB(A) at residences during the night. Intermittent maximum sound levels from truck activity should strive to not exceed 55 dB(A). This approach is supported by the County noise code as well as the expected ambient sound levels currently present. While OAA has not carried out our own ambient sound survey, this project noise goal is acceptable and appropriate based on professional experience and several online references that provide ambient sound information for the area. Site maximum sound levels of this magnitude will be far lower in level than sound produced by the active railway adjacent to the nearby residences.

Various references support this logic. The National Transportation Noise Map of the City of San Leandro shows that the area around the site is expected to experience 24-hour average sound levels of 50-to-60 dB(A), based on data collected in 2018. This is shown graphically in Figure 2 below. In addition, a review of the City of San Leandro 2035 General Plan discusses existing and future ambient noise in Chapter 7: Environmental Hazards Element. Figure 7-6 of this report shows that residences east of the site are within the 60 dB(A) CNEL contour given their distance from Interstate-880. The report qualifies this contour as being normally or conditionally acceptable in Chart 7-2. Note that the General Plan uses the CNEL (Community Noise Equivalent Level) metric, which is calculated from 24-hour data; this metric is commonly used to assist in planning and zoning and is not a metric that is appropriate to evaluate the potential for acoustical impacts or complaints. OAA introduced this reference merely to support the conclusion that this area is inherently active and justify the project noise goal. Using a 24-hour metric for a distribution facility would potentially diminish the presence of the short-term maximum sound levels associated with truck activity and is not recommended.

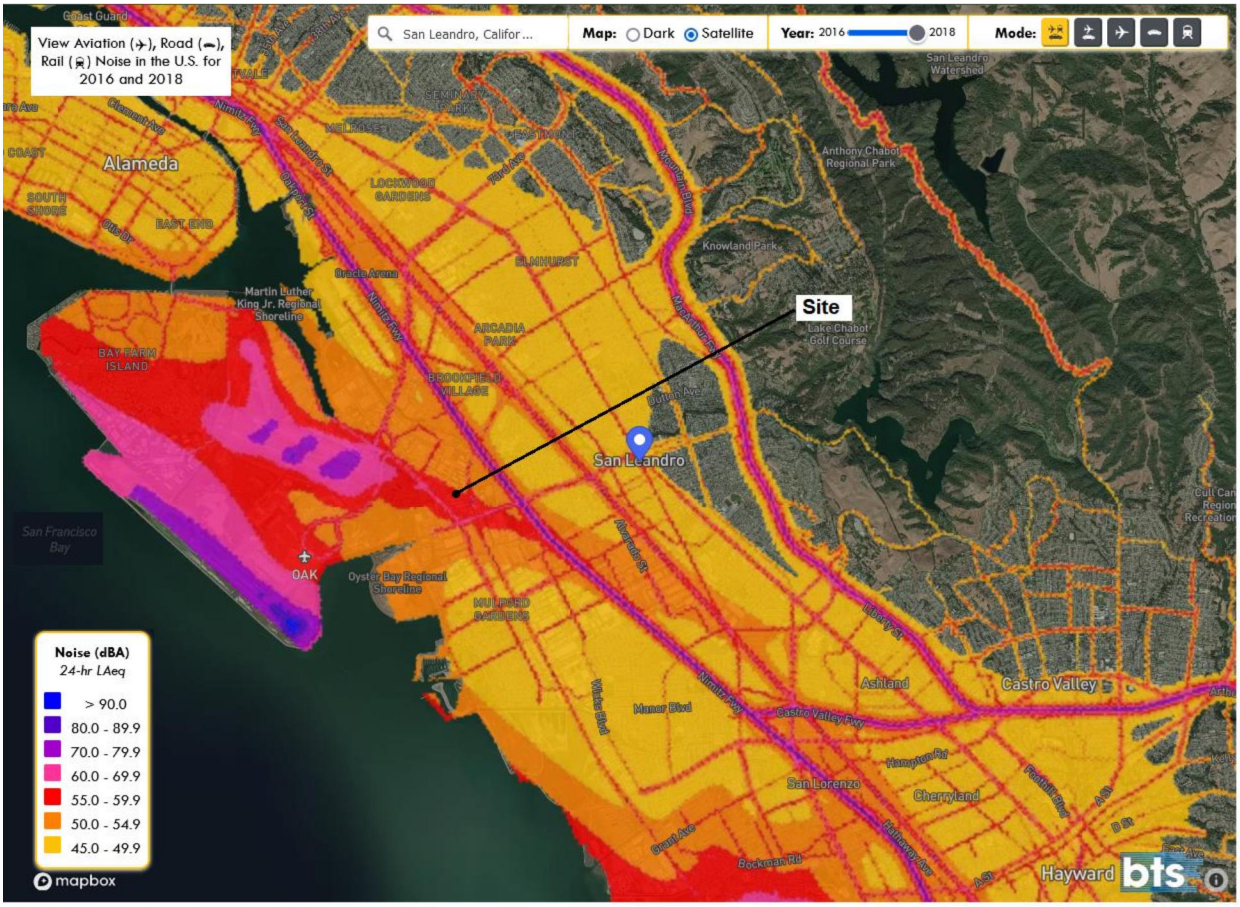

Figure 2 — Image taken from the National Transportation Noise map of San Leandro. Site location is identified on the map.

We understand that, while our recommendations are based on experience and cited references, they are considered speculative. To minimize this speculation, OAA has defaulted to using the County code nighttime limit of 45 dB(A) for steady site sound and 55 dB(A) for maximum intermittent truck sounds for residential receptors. The intermittent limit is appropriate since maximum truck operations will not occur for durations over 5 minutes in a given hour. Rational supporting this is provided in subsequent sections. Project noise goals are not warranted for industrial uses at any time, as they are not considered particularly noise-sensitive receptors.

It should be noted that a specific analysis was not carried out for personal motor vehicles. Based on experience, while they may be greater in quantity, they are significantly lower in level than heavy trucks. Hence, if on-site truck analyses are shown to meet project goals, personal motor vehicle sound will as well.

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. Model results show only the sound emissions of the site, which are directly comparable to project noise goals; ambient sound is not included in the model. In the model, buildings are white, and the site property line is outlined in red. North is pointing generally up in all acoustical modelling 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 five discrete locations at the façade of nearby residential receptors. Sound level contours are at ear height, 5 feet above grade. Location B is at 15 feet above grade to typify an upper story receptor; Locations C through F typify single story receptors at 5 feet above grade. Location A is not used and reserved for future use.

Rooftop HVAC Sound

Rooftop HVAC equipment produces noise that is nominally steady in nature, and hence will not vary significantly over time. Based on similar projects, a conservative estimation is to assume 1 ton of cooling capacity for every 725 ft^2 of building area. This equates to about fourteen (14) 25-ton HVAC units evenly distributed on top of the building. The sound power level for each 25-ton unit is assumed to be 93 dB(A) re 1 picowatt based on typical manufacturer's sound data.

The noise from the 14 rooftop units was included in the HVAC sound model. Noise sources were placed 4 feet above the rooftop, and sound was projected off site. Figure 3 shows the results graphically and tabulates the summed A-weighted sound levels at the five residential receptor Locations. The results show that, with all rooftop units operating, HVAC sound levels at off-site receptors are in the 38-to-40 dB(A) range.

This analysis shows that there is little concern about HVAC sound. HVAC sound is sufficiently controlled via distance and roof shielding effects so that this noise meets the 45 dB(A) project noise goal at all residences by wide margins. Note that for these model results to be realized, acoustical performance of HVAC equipment must be acoustically aligned with what was modelled.

Figure 3 — A-weighted sound emission contours, 5 feet above grade, from rooftop HVAC equipment. Each of the rooftop units shown with a blue + sign. Buildings shown in white. Site property line outlined in red. Location B is at 15 feet above grade; all other Locations are at 5 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. Distribution facilities will have over-the-road line-haul trucks as well as terminal tractors (yard tractors) active on site. Line-haul trucks deliver trailers from off-site whereas terminal tractors do not leave the site and move trailers between the docks and parking areas. Terminal tractors are responsible for the majority of back-up movements on-site. From an acoustical aspect, terminal tractors and line-haul trucks are acoustically equivalent.

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 based on OAA field data, 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. Personnel vehicles produce typical maximum sound levels of 59 dB(A) at 50 feet, and hence are traditionally not an acoustical concern. 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.

While there will certainly be multiple trucks on-site at any given time, experience shows that off-site maximum sound levels are governed by specific individual truck activity that occurs closest to a given receptor. Several factors support this. Due to maximum levels being dynamic and short in duration, it is unlikely that multiple truck sound level maximums will occur at the exact same time and location. In addition, safe practices prevent more than one truck from operating at the same time and in the same vicinity. Hence, two short duration maximum sound levels overlapping in a manner that exacerbates the situation is very improbable. Should this extremely rare alignment occur, with two similar sources occurring at the same time and vicinity, emissions would only be 3 dB higher due to the logarithmic nature of sound pressure level addition.

Trucks were modelled at various on-site locations. Of particular interest are the worst-case truck locations; these occur at the eastern portions of the site. Truck yard activity was modelled in areas of the truck yard closest to residential receptors and modelled as a white "+". A driving truck was also modelled along the onsite driveway east of the building and is shown as a pink "+". Figures 4 through 6 take the HVAC sound model and add the intermittent maximum sound emissions contributed by on-site heavy truck activity. These figures show the following results:

- Figure 4 shows truck yard activity in the northeast portion of the site. Worst-case maximum sound emissions are 55 dB(A) at Location D and 56 dB(A) at Location E.

- Figure 5 provides the results for driving truck activity along the eastern onsite driveway. Maximum sound emissions range from 51-to-55 dB(A) at all Locations.

- Figure 6 shows sound emissions from truck yard activity in the south of the building. Worst-case emissions are 54 dB(A) at Locations B and C.

Overall, model results show that worst-case truck activity will be no greater than 56 dB(A) at off-site residential receptors. Note that Figures show the worst-case truck positions; most activity onsite will occur farther west than presented in this report and will benefit from shielding provided by intervening buildings and additional distance. As such, most activity onsite will be substantially lower than the results presented in this report. In addition to sufficiently low magnitude sound levels, a review of the traffic study, prepared by Kimley Horn and dated January 2024, shows that the proposed project expects approximately 46 truck trips, or 23 individual trucks, daily for this use. That distills down to about 1 truck each hour if spread out equally across the day; in reality, uses such as this will typically have more daytime activity than night. These low trip counts mean that should maximum sound levels occur from truck activity, that they would be infrequent and short in duration. This also supports that maximum sound levels would occur for durations of less than 1 minute in an hour; hence, modelled results would fully comply with the County noise code. OAA finds that even if the worse-case scenario of 56 dB(A) were to occur for a period of 5 minutes, that this would meet the intent of the County code goals and not result in any negative acoustical impact for this project.

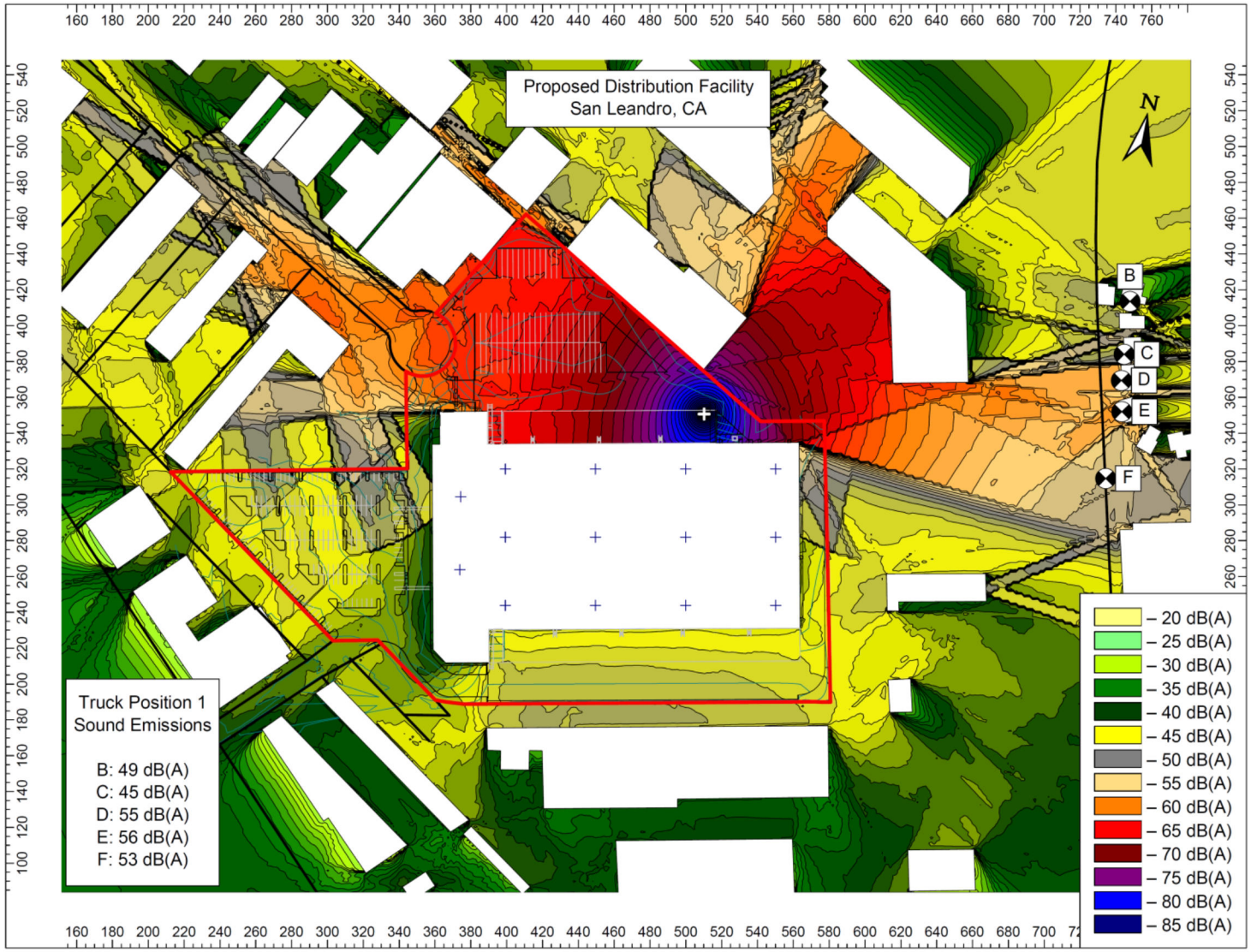

Figure 4 — A-weighted sound level contours 5 feet above grade expected for rooftop equipment and Truck Position 1. Rooftop units shown with a blue "+" sign. Heavy truck yard activity shown with a white "+" sign. Buildings shown in white. Site property line outlined in red. Location B is at 15 feet above grade; all other Locations are at 5 feet above grade.

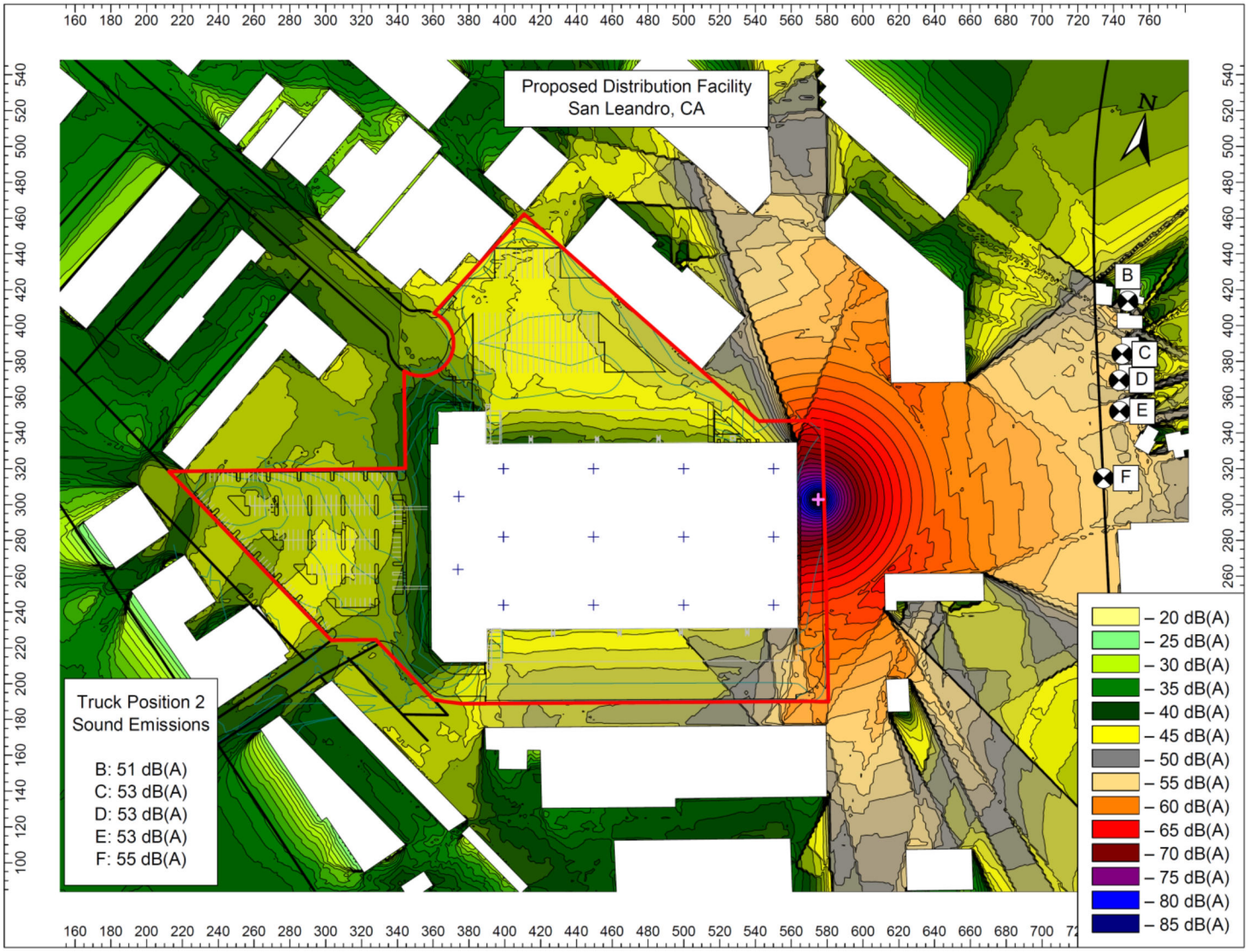

Figure 5 — A-weighted sound level contours 5 feet above grade expected for rooftop equipment and Truck Position 2. Rooftop units shown with a blue "+" sign. Driving truck shown with a pink "+" sign. Buildings shown in white. Site property line outlined in red. Location B is at 15 feet above grade; all other Locations are at 5 feet above grade.

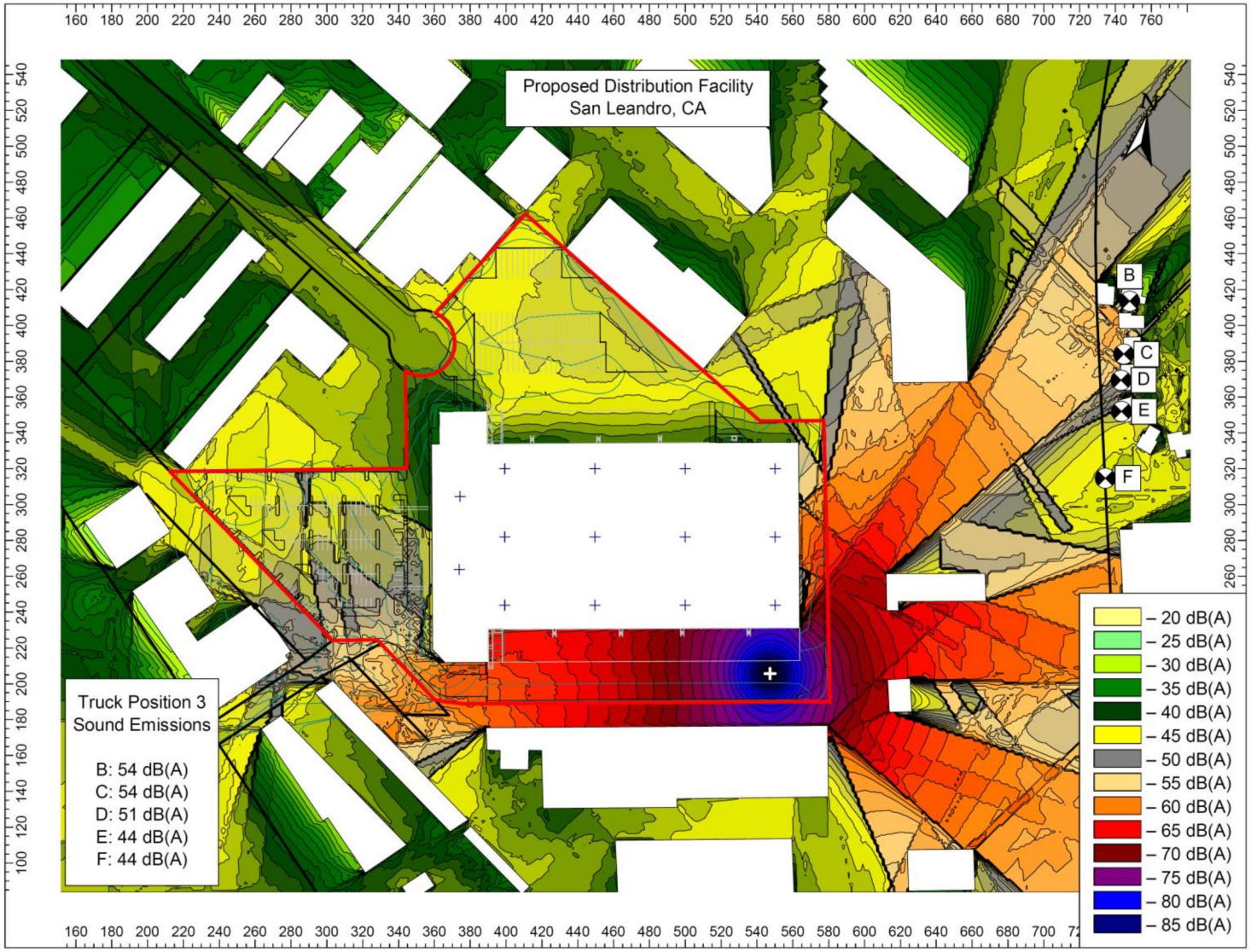

Figure 6 — A-weighted sound level contours 5 feet above grade expected for rooftop equipment and Truck Position 3. Rooftop units shown with a blue "+" sign. Heavy truck yard activity shown with a white "+" sign. Buildings shown in white. Site property line outlined in red. Location B is at 15 feet above grade; all other Locations are at 5 feet above grade.

ADDITIONAL IMPACT EVALAUTIONS

While the focus of this study is on site sound emissions from the proposed use and the possible acoustical impact, we understand that environmental reviews traditionally also examine other types of impacts. Specifically, off-site traffic, construction noise, vibration, and airport noise have been analyzed.

Off-site Traffic

While off-site truck routes are not regulated by noise codes, they were reviewed to evaluate their potential for acoustical impact. Actual truck routes are not known but it is logical to assume that all trucks will access the site from Nimitz Freeway (Interstate-880) to the northeast via Davis Street and Doolittle Drive. These are major roads in the area and assumed to be well-travelled at all hours. While this route is in proximity to a few residences, these residences are assumed to not be particularly noise-sensitive as they are adjacent to the Interstate and it's associated on/off ramps. Given all the above, offsite routes are not expected to have any negative impact on the area and trucks going to and from the site will blend in with other traffic flow sound in the area.

Construction Noise

Construction noise that will occur during the development of the site is regulated by City noise codes. San Leandro Code §4-1-1115(b) states that construction activity which is adjacent to or across a street or right-of-way from a residential use is prohibited except between 0700-to-1900 hours during the week and between 0800-to-1900 hours on a weekend. No construction is permitted on Federal holidays. The premise of this ordinance is to contain construction activities during the daytime hours when ambient sound is higher in level and residential sensitivity is reduced.

Although construction activity is exempt from noise limits during allowable hours and are temporary in nature, it is worth discussing considerations to minimize the acoustical impact of this activity. The proposed building is almost 590 feet from the nearest dwelling. Earth moving equipment used during the civil construction phase of the project could be slightly 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 450 feet from nearby receptors, maximum construction activity sound levels would be in the low-60s. Levels of this magnitude are not uncommon in an active developed area and are not expected to illicit noise complaints or impact the health, safety, and welfare of the

public. Regardless, to minimize receptor exposure to construction noise during this phase, the following best practice construction mitigation measures will be considered:

- ❑ Limit all heavy equipment operation to non-noise-sensitive daytime hours and follow allowable town construction hours as applicable.

- ❑ If possible, limit the number of equipment operating near one receptor at a given time. Avoid exposing any one receptor to high sound levels for an extended period of time.

- ❑ 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 with town representatives and provide advance notice to residences as feasible.

Specific noise issues can be individually evaluated for tailored noise mitigation recommendations should traditional methods above not be sufficient.

Vibration

No City code vibration regulations were found. There is a provision in the County noise code, §6.60.050(B.8), that requires that no individual shall operate or permit the operation of any device that creates vibration which is above the vibration perception threshold at or beyond the property boundary of the source. While the County code does not apply within the City limits, this is a typical approach to evaluating vibration impacts and hence was used as criterion for this project. Off-site vibrations are challenging to quantify; as a result, it is best to discuss vibration comparatively and subjectively to determine if there may be negative impacts. The following were facts were considered:

- ❑ There are no major vibration producing equipment or activities proposed on site. The primary noise source on site is truck activity. Trucks have rubber tires which significantly reduce any vibration transmitted into the ground and off-site receptors.

- This site has historically been an industrial use for decades. The proposed use is not dramatically different than other uses in the area, which also accommodate heavy trucks. Many of these existing industrial uses are closer to residences than this project.

- The dominant source of vibration will continue to be rail activity, which is between nearby residences and this project.

Given the above, we conclude there will be no negative impact from vibrations associated with this project.

Airport Noise

Environmental impact studies generally focus on whether the proposed project might have impacts on the surrounding area. When evaluating airport noise, the focus is on whether the airport might have a negative impact on the project.

The project site is in line with, and approximately 4,500 feet east of, Runways 10L/28R and 10R/28L at Oakland International Airport. The site is about 9,000 feet northeast of Oakland International Airport's longest runway, Runway 12/30.

The Oakland International Airport implements a noise management program which monitors airport noise and mitigates complaints. Extensive information about the program as well as documents and study results can be found online at https://flyquietoak.com/. A review of the resources listed here indicates that runways in line with the site are infrequently used, between 4-12% of the time. In addition, a long-term sound monitor terminal (Monitor #10) is located on Tudor Court, which coincides with the residences closest to this project. Aircraft Noise Summary portal data show that the majority of maximum aircraft activity here is around 64 dB(A), which is driven by airport arrivals. Data also show that aircraft passovers can produce levels in excess of 80 dB(A). Despite this, the Noise Complaint Dashboard portal data show there have been 27 noise complaints from 7 individuals in San Leandro during the 2023 year. None of these complaints are in the vicinity of the site. Based on these details, OAA concludes that airport operations will not have any negative impact on this industrial use.

CONCLUSION

Plans call for the development of a distribution facility in the San Leandro, Alameda County, California. Noise sources on-site will comprise personal vehicles, heavy trucks, and rooftop HVAC units. Our review concludes that the City and State codes provide some direction but are of limited use. The County noise code has merit, despite not being enforceable within city limits. Because of this, a project noise goal at potentially sensitive receptors was established based on the County noise code, expected ambient sound levels, and professional experience. Compliance with project goals will meet the intent of the City noise code. Given the surrounding area, steady HVAC site sound emissions should strive to not exceed 45 dB(A) during the nighttime hours at nearby receptors to minimize the potential for complaints. Similarly, intermittent on-site truck activity sound levels should strive to not exceed 55 dB(A). A project noise goal is not warranted for nearby commercial and industrial properties as these properties are not considered noise-sensitive.

Analyses show that HVAC sound emissions meet the 45 dB(A) project goal via distance attenuation and roof shielding effects by wide margins. HVAC sound is expected to be below existing average ambient sound levels, and hence, will not able to be detected at nearby residential receptors. Maximum sound levels produced by on-site heavy truck activity meets the intent of project goals at all nearby existing receptors. Off-site truck routes are also of little acoustical concern to the area as trucks leaving the site will blend in with the existing traffic flow sound in the area and not be discernable from existing activity in the area. Given the above, it is our professional opinion that this project will not have any negative acoustical impact on the surrounding area. Existing sound sources in the area, such as the active railroad corridor and local and distant traffic flow will continue to dominate sound in the area. The project layout represents good acoustical planning and will put the site in a position to minimize the potential for noise complaints.