NOISE IMPACT ANALYSIS

ROUTE 66 TRUCK PARKING & CARGO TERMINAL PROJECT

COUNTY OF SAN BERNARDINO, CALIFORNIA

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NOISE SETTING

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most associated with sound, "dB" is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called "A-weighting," written as dB(A). Any further reference in this discussion to decibels written as "dB" should be understood to be A-weighted.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called LEQ), or alternately, as a statistical description of the sound pressure level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to quiet time noise levels in a 24-hour noise descriptor called the Ldn (day-night) or the Community Noise Equivalent Level (CNEL). The CNEL metric has gradually replaced the Ldn factor, but the two descriptors are essentially identical.

CNEL-based standards are generally applied to transportation-related sources because local jurisdictions are pre-empted from exercising direct noise control over vehicles on public streets, aircraft, trains, etc. The County of San Bernardino therefore regulates the noise exposure of the receiving property through land use controls.

For "stationary" noise sources, or noise sources emanating from private property, such as a HVAC equipment, the County does have legal authority to establish noise performance standards designed to not adversely impact adjoining uses. These standards are typically articulated in the jurisdictional County Code. These standards recognize the varying noise sensitivity of both transmitting and receiving land uses. The property line noise performance standards are normally structured according to land use and time-of-day.

NOISE COMPATIBILITY GUIDELINES

Siting standards for noise exposure for sources that are pre-empted from local control are articulated in the Noise Element of the County Development Code shown in Table 1. These standards apply to transportation noise such as roadways or railways. Industrial uses are not considered noise sensitive. Guidelines consider most non-residential uses to be "compatible with

noise environments up to 65 dB(A) CNEL. Sensitive receptors such as residential uses are recommended to achieve a 60 dB CNEL or lower thresholds.

Table 1

Table 83-3
Noise Standards for Adjacent Mobile Noise Sources

Land Use		Ldn (or CNEL) dB(A)	
Categories	Uses	Interior (1)	Exterior (2)
Residential	Single and multi-family, duplex, mobile homes	45	60 (3)
Commercial	Hotel, motel, transient housing	45	60 (3)
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:
(1) The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.
(2) The outdoor environment shall be limited to:
- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7 p.m. to 10 p.m. and 10 decibels to sound levels in the night from 10 p.m. to 7 a.m.

NOISE STANDARDS

San Bernardino County, in Section 83.01.080 of the County Code, has developed noise performance standards for a variety of land uses that are designed to achieve acceptable interior and/or exterior noise exposures for the affected use. These guidelines for exposure from stationary sources are designed to regulate the level of sound that one use may broadcast across the property line of an adjacent use. Source regulations most commonly use the energy-weighted noisiest single hour called “Leq”. The applicable one-hour allowable maximum property line exposures in San Bernardino County for stationary sources are shown below. If the background already exceeds any of the specified levels in the table below, the allowable thresholds are adjusted upward to equal the background. The industrial property line standard is 70 dB(A) Leq. These standards are shown in Table 2.

Table 2
County of San Bernardino Noise Ordinance Limits – Private Property and Stationary Sources

Affected Land Uses (Receiving Noise)	**7 a.m. to 10 p.m. Leq[1] dB(A)[2]**	**10 p.m. to 7 a.m. Leq[1] dB(A)[2]**
Residential	55	45
Professional Services	55	55
Other Commercial	60	60
Industrial	70	70

[1]Leq=(Equivalent Energy Level): The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically 1.8 or 24 hours.
[2]dB(A)=(A-weighted Sound Pressure Level): The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.

Source: County of San Bernardino General Design Standards, Section 87.0905.

These standards shall apply for a cumulative period of 30 minutes in any hour, as well as plus 5 dBA for a cumulative period of more than 15 minutes in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute in any hour, or the standard plus 20 dBA for any period of time.

Noise from temporary construction activities is exempt from the above ordinance levels if the construction activities are between the hours of 7 a.m. and 7 p.m., Monday through Saturday, with no activity on Sundays or Federal Holidays.

PROJECT BACKGROUND

The project proposes development of a truck parking and truck terminal that would enable truckers to stage loads and redistribute goods. The proposed use would support surrounding uses. The project would develop the proposed truck parking and terminal within a net 9.2-acre site located along Cajon Boulevard in Unincorporated San Bernardino County

The adjacent zoning is as follows:

Location	Existing Land Use	Land Use Zoning District
North	Vacant	Heavy Industrial (HI)
South	Vacant	Corridor Industrial (CI)
East	Train tracks, high cube warehouse	Corridor Industrial (CI) and Heavy Industrial (HI)
West	Vehicle storage	Corridor Industrial (CI)

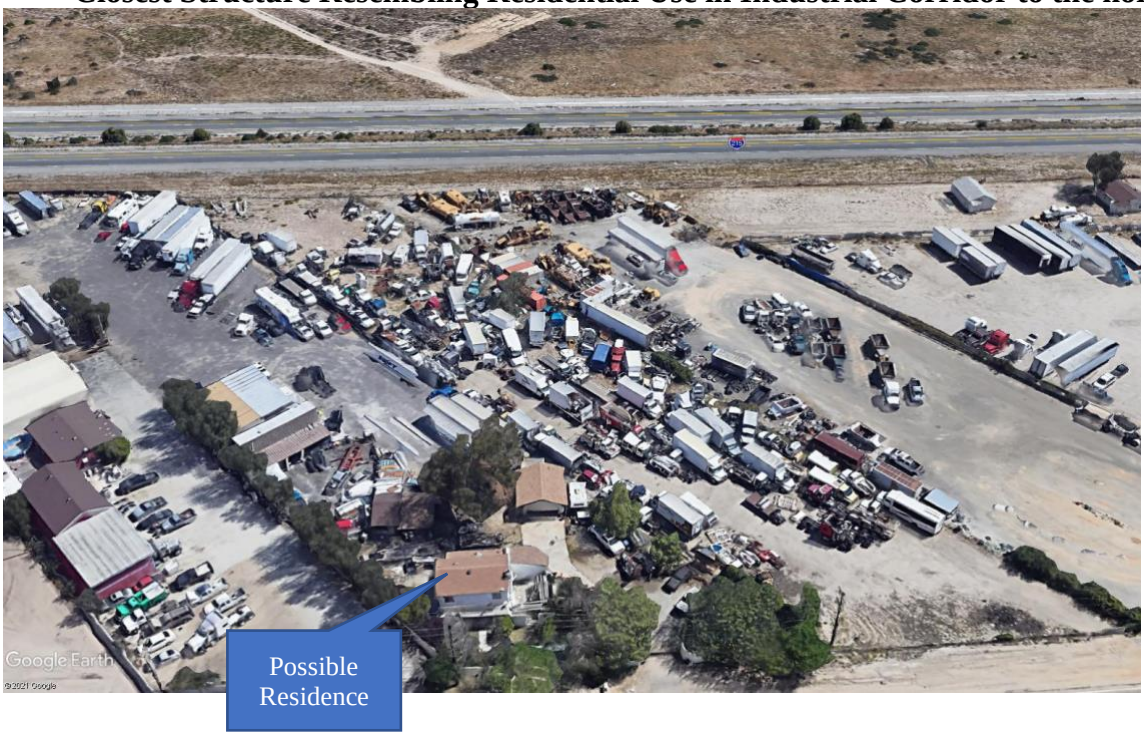
Close to the site are other distribution centers and trucking facilities.

There are three structures that could be residential uses to the north of the site in the heavily industrial area as shown below in Figure 1.

Figure 1
Adjacent Structures in Industrial Corridor that Could be Residential Uses

The structure closest to the site, as shown below, is surrounded by staged trailers, heavy trucks and equipment and it is not known if this house is used as a residence or for business.

Figure 2
Closest Structure Resembling Residential Use in Industrial Corridor to the north



Although the use of this structure is unknown, for the purpose of this analysis it is treated as the closest sensitive use. The structure is 350 feet from the closest project property line. The terminal itself is 150 feet south of the property line. Therefore, the structure is 500 feet from the closest loading dock façade.

BASELINE NOISE MEASUREMENTS

Short term on-site noise measurements were made to document baseline levels in the project area. These help to serve as a basis for projecting future noise exposure from the project upon the surrounding community. Noise measurements were conducted on Wednesday, July 21, 2021, in the early afternoon at the locations indicated below. A map of the locations is provided in Figure 3.

Measured Noise Levels (dBA)

Site No.	Location	Leq	Lmax	Lmin
1	50 feet E of Cajon Blvd	57.3	67.0	50.0
2	150 feet W of tracks during SB train passage	67.5	79.0	50.0
3	30 ft E of Kendall Drive at closest home	56.0	67.0	52.0

The noise monitoring shows that noise levels in the project vicinity are fairly low even during a commuter train pass by. Most of the train noise was from the wheels clacking as they passed over the track expansion joints.

FIGURE 3
NOISE MEASUREMENT LOCATIONS

LAND USE NOISE IMPACTS

NOISE SIGNIFICANCE CRITERIA

According to the current CEQA Appendix G guidelines, noise impacts are considered potentially significant if they result in:

1. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of a project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

2. Generation of excessive groundborne vibration or groundborne noise levels?

3. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The terms "substantial" or "excessive" are not defined in most environmental compliance guidelines. Noise analysis methodology is accurate only to the nearest whole decibel and the human ear can only clearly detect changes of around 3 dBA; changes of less than 3 dBA, while audible under controlled circumstances, are not readily discernable in an outdoor environment. Thus, a change of 3 dBA is considered as a perceptible audible change. It would require a doubling of traffic to create a +3 dBA noise increase due to the logarithmic nature of noise calculations. The project is not within the vicinity of an airport and because it is an industrial use it would not be impacted by associated noise.

CONSTRUCTION THRESHOLDS

Section 83.01.080 of the County Code exempts construction noise from the noise level standards if it occurs between the hours of 7:00a.m. to 7:00 p.m. except on Sundays and Federal holidays.

However, neither the County of San Bernardino General Plan or County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a *substantial temporary or periodic noise increase.*

To evaluate whether the project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction-related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3-dBA increase, the exposure time is cut in half. This results in noise thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. For the purposes of this analysis, the lowest, more conservative construction noise level

threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential project-related construction noise level impacts at the closest sensitive receiver location discussed earlier.

PROJECT CONSTRUCTION

In 2006, the Federal Highway Administration (FHWA) published the Roadway Construction Noise Model that includes a national database of construction equipment reference noise emissions levels. In addition, the database provides an acoustical usage factor to estimate the fraction of time each piece of construction equipment is operating at full power during a construction phase. The usage factor is a key input variable that is used to calculate the average Leq noise levels.

Table 4 identifies highest (Lmax) noise levels associated with each type of equipment identified for use, then adjusts this noise level for distance to the closest sensitive receptor and the extent of equipment usage (usage factor), which is represented as Leq. The table is organized by construction activity and equipment associated with each activity

Quantitatively, the primary noise prediction equation is expressed as follows for the hourly average noise level (Leq) at distance D between the source and receiver (dBA):

Leq = Lmax @ 50’ – 20 log (D/50’) + 10log (U.F%/100) – I.L.(bar)
Where:
Lmax @ 50’ is the published reference noise level at 50 feet
U.F.% is the usage factor for full power operation per hour
I.L.(bar) is the insertion loss for intervening barriers

For a construction project such as the proposed project, the construction fleet would include equipment such as shown in Table 3**,** which describes the noise level for each individual piece of equipment at a reference 50-foot distance.

As discussed, there are three potential locations with residential use in the project proximity. The closest is 350 feet from the site perimeter which would afford a -21 dBA attenuation due to distance.

Table 3
Construction Equipment Noise Levels

Phase Name	Equipment	Usage Factor[1]	Measured Noise @ 50 feet (dB)	Cumulative Noise Level @ 50 feet (dB))	Noise at Closest Potential Sensitive Receptor
Site Prep	Dozer	40%	82	78	57
	Loader/Backhoe	37%	78	74	53
Grading	Grader	40%	85	81	60
	Dozer	40%	82	78	57
	Loader/Backhoe	37%	78	74	53
Building Construction	Forklift	20%	75	68	47
	Gen Set	50%	81	78	57
	Loader/Backhoe	37%	78	74	53
	Crane	16%	81	73	52
	Welder	46%	74	71	50
Paving	Paver	50%	77	74	53
	Paving Equip	40%	76	72	51
	Roller	38%	80	76	55

Source: FHWA's Roadway Construction Noise Model, 2006
Estimates the fraction of time each piece of equipment is operating at full power during a construction operation
Represents the actual hours of peak construction equipment activity out of a typical 8-hour day

The highest construction noise levels at the maximally impacted residential receiver location is expected to approach 60.0 dBA Leq and will satisfy the NIOSH 85 dBA Leq significance threshold during temporary construction activities. The noise impact due to unmitigated construction noise levels is, therefore, considered a less than significant impact at all nearby sensitive receiver locations.

CONSTRUCTION ACTIVITY VIBRATION

Construction activities and street traffic are some of the most common external sources of vibration that can be perceptible inside adjacent sensitive uses. Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Within the "soft" sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels. The range of vibration decibels (VdB) is as follows:

65 VdB	-	threshold of human perception
72 VdB	-	annoyance due to frequent events
80 VdB	-	annoyance due to infrequent events
94-98 VdB	-	minor cosmetic damage

To determine potential impacts of the project's construction activities, estimates of vibration levels induced by the construction equipment at various distances are presented below:

	Approximate Vibration Levels (VdB)*		
Equipment	**25 feet**	**50 feet**	**350 feet**
Pile Driver	93	87	67
Large Bulldozer	87	81	61
Loaded Truck	86	80	60
Jackhammer	79	73	53
Small Bulldozer	58	52	32

* (FTA Transit Noise & Vibration Assessment, Chapter 12, Construction, 2006)

A pile driver is not anticipated for use at this site. The nearest sensitive use is 350 feet from the closest site perimeter. Therefore, construction vibration will be well below any structural damage threshold and less than the threshold of human perception. Project vibration is considered to be less than significant.

OPERATIONAL NOISE IMPACT

Long-term operational noise concerns from the Route 66 Truck Parking and Cargo Terminal center on heavy diesel vehicles entering and leaving the site as well as activity at the loading docks. Project related traffic was obtained from the Trip Generation Analysis prepared by Urban Crossroads for this project. According to the traffic study, the project will generate the following quantity of trips and vehicle types for which the associated noise levels were calculated. The worst-case peak hour for either AM or PM was used.

Type of Vehicles	Peak Hour	# Daily
Passenger Cars	6	54
2 Axle Truck	1	6
3, and 4 Axle Trucks	3	46
Noise Level @ 25 mph @ 50 ft	54.5 dBA Leq	59.8* dBA CNEL

*assumes approximately 50% of trips are during the night (10 pm to 7 am) and 50% are during the day (7 am -7 pm) with night trips incurring a +10 dBA per hour penalty

During the peak hour, the noise level at 50 feet from the drive aisle is 54.5 dBA Leq. The driveway entry and exit for the site are along Cajon Boulevard, almost 800 feet from the closest residence.

At this distance the noise level would decay by 12 dBA for a net noise level of 42 dBA Leq for the peak hour and 47 dBA for a daily average which would not be audible due to ambient noise levels including the adjacent train tracks and freeway. In addition, the project structure itself will assist with noise attenuation though no credit was taken for this analysis.

Loading and unloading will take place at the terminal building in the center of the site. The closest loading dock façade is 150 to the property line, and 500 feet to the closest possible residence to the north.

The reference noise level for loading docks is intended to describe the expected operational noise sources that may generally include idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods. Giroux & Associates, in past studies measured a noise level of 67 dBA Leq at a reference distance of 50 feet at a big box retailer. However, this was for refrigerated trucks and warehouses. A non-refrigerated operation would be approximately 4-5 dBA less. This is consistent with measurements used by other noise studies[1].

A noise level of 60 dBA Leq at 50 feet was adjusted to the distance of the closest residence (500 feet) which would provide -25 dBA of noise attenuation for a net noise level of 35 dBA Leq. The County of San Bernardino noise ordinance standards, presented in Table 2 are referenced below. The industrial noise standard is 70 dBA which would be met at a distance of even 50 feet. The potential residential uses in the industrial neighborhood north of the project could require application of the residential noise standards even though zoning is industrial. However, as shown below, because of distance separation to the site, even the residential nocturnal noise standard would be met.

County of San Bernardino Noise Ordinance Limits – Private Property and Stationary Sources

Affected Land Uses (Receiving Noise)	**7 a.m. to 10 p.m. Leq dB(A)**	**10 p.m. to 7 a.m. Leq dB(A)**
Residential Noise Standard	55	45
Industrial Noise Standard	70	70
Project Peak Hour Loading Dock Noise	38 dBA Leq	

Therefore, because site entry and egress are along the Cajon Boulevard frontage (the area furthest from possible sensitive receptors to the north) and because of the distance to the closest sensitive receptors to the loading docks, project noise levels at potential sensitive uses will be below the County of San Bernardino residential or industrial noise standards.

[1] https://www.cityofperris.org/Home/ShowDocument?id=1573

SUMMARY

Construction activities are mitigated by required compliance with grading/construction permits. Considerations required for compliance include:

- No construction is to take place between the hours from 7 a.m. to 7 p.m.

- All construction equipment shall use properly operating mufflers.

Trucks entering and leaving the site will use the drive aisle off Cajon Boulevard which is 800 feet to the closest potential sensitive use. Both the peak hourly noise level, and the daily average CNEL, will be low due to distance separation. It was assumed that half of the trucks would be entering/leaving during the nocturnal hours of greatest noise sensitivity which, when calculating a CNEL weighted average noise level incur a 10 dBA penalty.

There are loading docks on both the north and south side of the terminal. Those on the northern façade are closest to possible off-site sensitive uses but are still located at a 500-foot setback distance. The peak hour noise level would be 38 dBA Leq at the properties north of Kendall Drive. Even if the peak hour occurred at night both the industrial and much more stringent residential nocturnal noise standards would be met.