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# MEMORANDUM

**DATE:** October 1, 2024

**TO:** Daniel Patneaude, Civil Engineer, DRP Enterprises, LLC

**FROM:** J.T. Stephens, Executive Vice President
Dana Kwan, Noise and Vibration Analyst

**SUBJECT:** Preliminary Acoustical Memorandum for the proposed 4424 Ijams Road Tentative Tract Map Project, Stockton, California

## INTRODUCTION AND PROJECT DESCRIPTION

This Preliminary Acoustical Memorandum has been prepared to evaluate the potential impacts associated with the proposed 4424 Ijams Road Tentative Tract Map Project (project) in Stockton, California. This memorandum is intended to satisfy the City of Stockton's (City) land use compatibility of the proposed project through compliance with exterior and interior noise standards for residential type uses. Future noise level impacts are based on the noise measurement data gathered in the vicinity of the project site (from September 10, 2024, to September 11, 2024).

### Location and Description

The project site is at 4424 Ijams Road in Stockton, California. The project site has a total area of approximately 1.34 Acres and is currently a vacant lot. Figures 1 and 2 (all figures provided in Attachment B) show the project location and the site plan, respectively.

The proposed project consists of 8 residential lots and 1 common lot for private street. The General Plan zoning designation of the project is RL (Residential, Low Density).

## CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

## Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units (e.g., inches or pounds), decibels are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 decibels (dB) is 10 times more intense than 1 dB, 20 dB is 100 times more intense than 1 dB, and 30 dB is 1,000 times more intense than 1 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 1 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single-point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Similarly, line sources with intervening absorptive vegetation or line sources that are located at a great distance to the receptor would decrease 4.5 dB for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level ($L_{eq}$) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the $L_{eq}$ and Community Noise Equivalent Level (CNEL) or the day-night average noise level ($L_{dn}$) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly $L_{eq}$ for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours), and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). $L_{dn}$ is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and $L_{dn}$ are within 1 dBA of each other and are normally interchangeable. The City uses the $L_{dn}$ noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level ($L_{max}$), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by $L_{max}$, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale or noise standards in terms of percentile noise levels in noise ordinances for enforcement purposes. For example, the $L_{10}$ noise level represents the noise level exceeded 10 percent of the time during a stated period. The $L_{50}$ noise level represents the median noise level (i.e., half the time the noise level exceeds this level, and half the time it is less than this level). The $L_{90}$ noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the $L_{eq}$ and $L_{50}$ are approximately the same.

### Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160–165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying less developed areas.

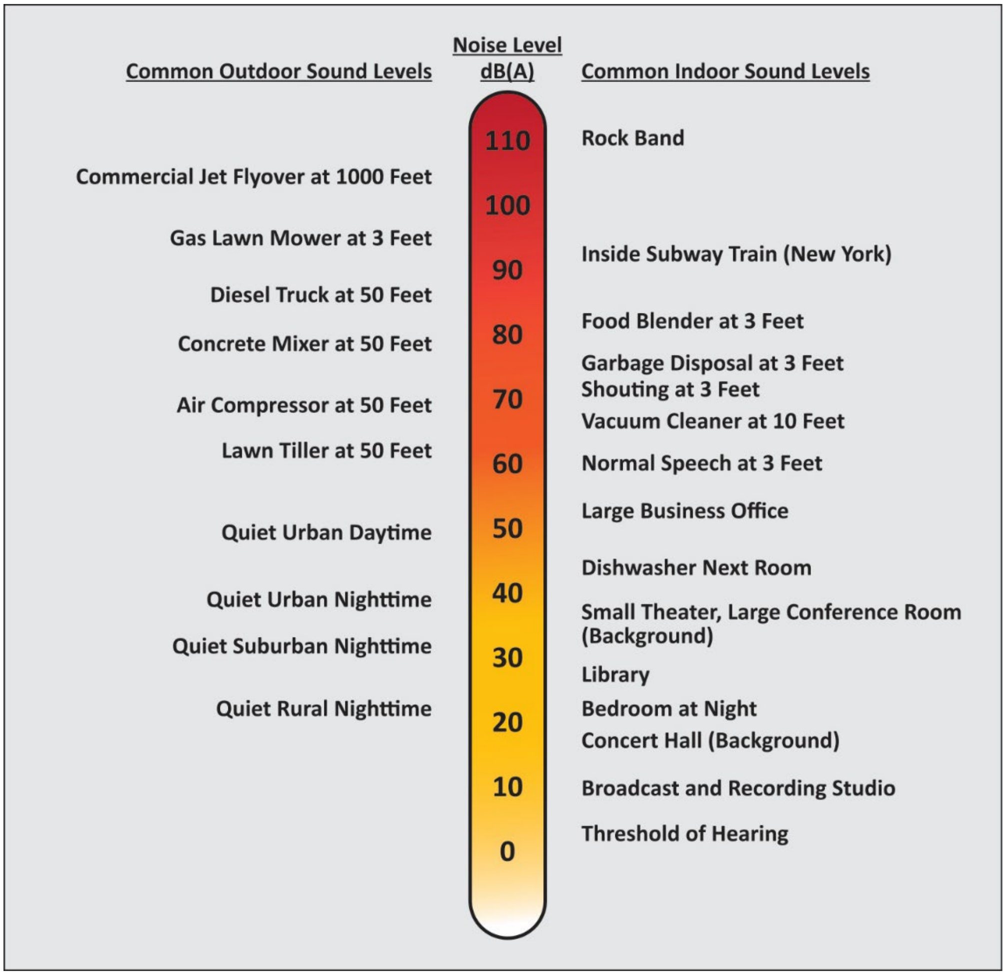
Table A lists full definitions of acoustical terms as defined in the Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (Caltrans 2013) and Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (2018) (FTA Manual), and Table B shows common sound levels and their sources.

## Table A: Definitions of Acoustical Terms

| Term | Definitions |
|---|---|
| Decibel, dB | A unit of level that denotes the ratio between two quantities proportional to power, the number of decibels is 10 times the logarithm (to the base 10) of this ratio. |
| Frequency, Hz | Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second). |
| A-Weighted Sound Level, dBA | The sound level obtained by use of A-weighting. The A-weighting filter deemphasizes the very low and very high frequency components of the sound in a manner similar to the frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this assessment are A-weighted, unless reported otherwise. |
| $L_{01}$, $L_{10}$, $L_{50}$, $L_{90}$ | The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period. |
| Equivalent Continuous Noise Level, $L_{eq}$ | The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound. |
| Community Noise Equivalent Level, CNEL | The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dB to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dB to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m. |
| Day/Night Noise Level, $L_{dn}$ | The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dB to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m. |
| $L_{max}$, $L_{min}$ | The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging. |
| Ambient Noise Level | The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant. |

Source: Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (Caltrans 2013), Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (2018).

### Table B: Common Sound Levels and Noise Sources




Source: LSA (2016).

## APPLICABLE NOISE STANDARDS

The following information provides standards to which potential noise impacts will be compared. Where exceedances have been identified, impacts are described, and regulatory compliance measures are recommended.

### California Code of Regulations

Interior noise levels for residential habitable rooms are regulated by Title 24 of the California Code of Regulations (CCR) California Noise Insulation Standards. Title 24, Chapter 12, Section 1206.4, of the 2019 California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 dBA $L_{dn}$/CNEL in any habitable room. A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (Title 24 CCR, Chapter 12, Section 1206.4).

### City of Stockton Municipal Code

Section 16.60.040, Standards, of the City's Municipal Code sets the maximum allowable noise exposure for noise-sensitive land uses. For residential type uses, the noise limit for outdoor activity areas is 65 dBA $L_{dn}$ and 45 dBA $L_{dn}$ for indoor spaces. Section 16.60.040 (C) 1. states " Noise-sensitive land uses which are approved for development or expansion on noise-impacted infill sites shall only be required to mitigate the existing and projected noise levels from those sources so that the resulting noise levels within the interior of the noise-sensitive land uses do not exceed the indoor space standards in Table 3-7, Part I." Therefore, mitigation is required to meet the interior noise standards of 45 dBA $L_{dn}$.

## OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are train pass-bys on adjacent Southern Pacific Railroad in addition to occasional vehicle traffic on Ijams Road and background vehicle traffic on West Lane.

To assess the existing noise conditions in the area, noise measurements were conducted at the project site. Two long-term, 24-hour measurements were taken from September 10, 2024, to September 11, 2024, in the vicinity of the project site. The locations of the noise measurements are shown on Figure 3, and Table C summarizes the results. Noise measurement data are provided in Attachment C of this analysis.

### Table C: Existing Noise Level Measurements

| Location Number | Location Description | Noise Levels (dBA $L_{eq}$) | | Average Daily Noise Levels (dBA $L_{dn}$) | Primary Noise Sources |
|---|---|---|---|---|---|
| | | Daytime[1] | Nighttime[2] | | |
| LT-1 | On a tree near the southeastern corner of the project site, approximately 40 ft away from the railroad centerline. | 44.8 – 80.5 | 43.5 – 79.9 | 82.3 | Train pass-bys on Southern Pacific Railroad |
| LT-2 | On a powerline pole near the northwestern corner of the project site, approximately 25 ft away from the Ijams Road centerline. | 40.6 – 65.2 | 43.4 – 68.7 | 68.6 | Train pass-bys on Southern Pacific Railroad |

Source: Compiled by LSA (September 2024).
[1] Daytime Noise Levels = noise levels during the hours of 7:00 a.m. to 10:00 p.m.
[2] Nighttime Noise Levels = noise levels during the hours of 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
ft = foot/feet
$L_{dn}$ = day-night noise level
$L_{eq}$ = equivalent continuous sound level
LT = long-term

## ON-SITE LAND USE COMPATIBILITY ANALYSIS

The proposed project is located adjacent to a railroad line. For this reason, this analysis relies on the existing measured noise levels to provide the most accurate description of the noise environment related to noise impacts.

As described in the City's Municipal Code, due to the infill nature of the proposed project, this analysis only focuses on sound attenuation measures necessary to reduce interior noise to a maximum of 45 dBA $L_{dn}$.

### On-Site Exterior Noise Assessment

Based on the monitoring results shown in Table F, noise levels are expected to reach 82.3 dBA $L_{dn}$ at the property line of Lots 5 and 6 closest to the Southern Pacific Railroad. An 8 ft wall along the eastern border of the project site is proposed and would reduce noise levels by approximately 6 dBA, resulting in an exterior noise level of 76.3 dBA $L_{dn}$. All other lots will experience lower exterior noise levels due to distance attenuation and shielding from the proposed residential units.

### On-Site Interior Noise Impacts

In addition to the exterior noise level standards, the project must demonstrate compliance with the interior noise standard of 45 dBA $L_{dn}$. Based on the noise measurements above, the second floor of the façade of the proposed homes at the exterior would be approximately 82 dBA $L_{dn}$.

Based on the Environmental Protection Agency's *Protective Noise Levels* (1974), with windows and doors open, interior noise levels would be 70 dBA (i.e., 82 dBA – 12 dBA = 70 dBA), which would exceed the 45 dBA $L_{dn}$ interior noise standard.

The program INSUL was used to estimate the window ratings to ensure that compliance is achieved. Based on the exterior wall type as presented in the project plan details, the following elements make up the assumed exterior wall assembly:

- 7/8-inch Stucco plaster
- One layer of 0.375-inch-thick plywood
- 2-inch x 6-inch wood stud wall channels spaced at 16 inches and a minimum of R-21 fiberglass insulation
- One layer of 5/8-inch-thick Type X gypsum board

The proposed project includes an HVAC system that would allow windows to remain closed. In order to achieve the required noise reduction, based on reference information from transmission loss test reports for Greenworld Windows (Greenworld Windows 2018), standard construction listed above with upgraded window in the range of STC 36 would yield an estimated interior noise level of 55 – 56 dBA $L_{dn}$. Because this level exceeds the City's requirement of 45 dBA Ldn, additional measures would be needed. The following are preliminary recommendations to aide in the achievement of required interior noise levels:

- Ensure that no noise sensitive rooms (i.e. bedrooms, living rooms, dining rooms) are along the eastern façade of the lots closest to the train tracks.

- Upgraded building construction is likely necessary for the lots near the existing train tracks. This could include the use of resilient channels, rubber isolation clips, upgraded gypsum board, or some combo thereof.

- Windows should be avoided where possible with a line of site to the existing train tracks.

One final architectural plans are available, a review of the floor plans along with wall details and windows chosen should be completed and summarize in a final acoustical memorandum. Attachment D presents the preliminary modeling outputs.

Attachments: A: References
B: Figure 1—Project Location
Figure 2—Site Plan
Figure 3—Noise Monitoring Locations
C: Noise Measurement Data
D: INSUL Modeling Results

# ATTACHMENT A

## REFERENCES

City of Stockton. 2024. *Municipal Code.* March 19. Website: https://ecode360.com/ST5019 (accessed September 2024).

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. Office of Planning and Environment. Report No. 0123. September.

Greenworld Windows. 2018. *Various Acoustical Performance Test Reports – Greenworld Windows*.

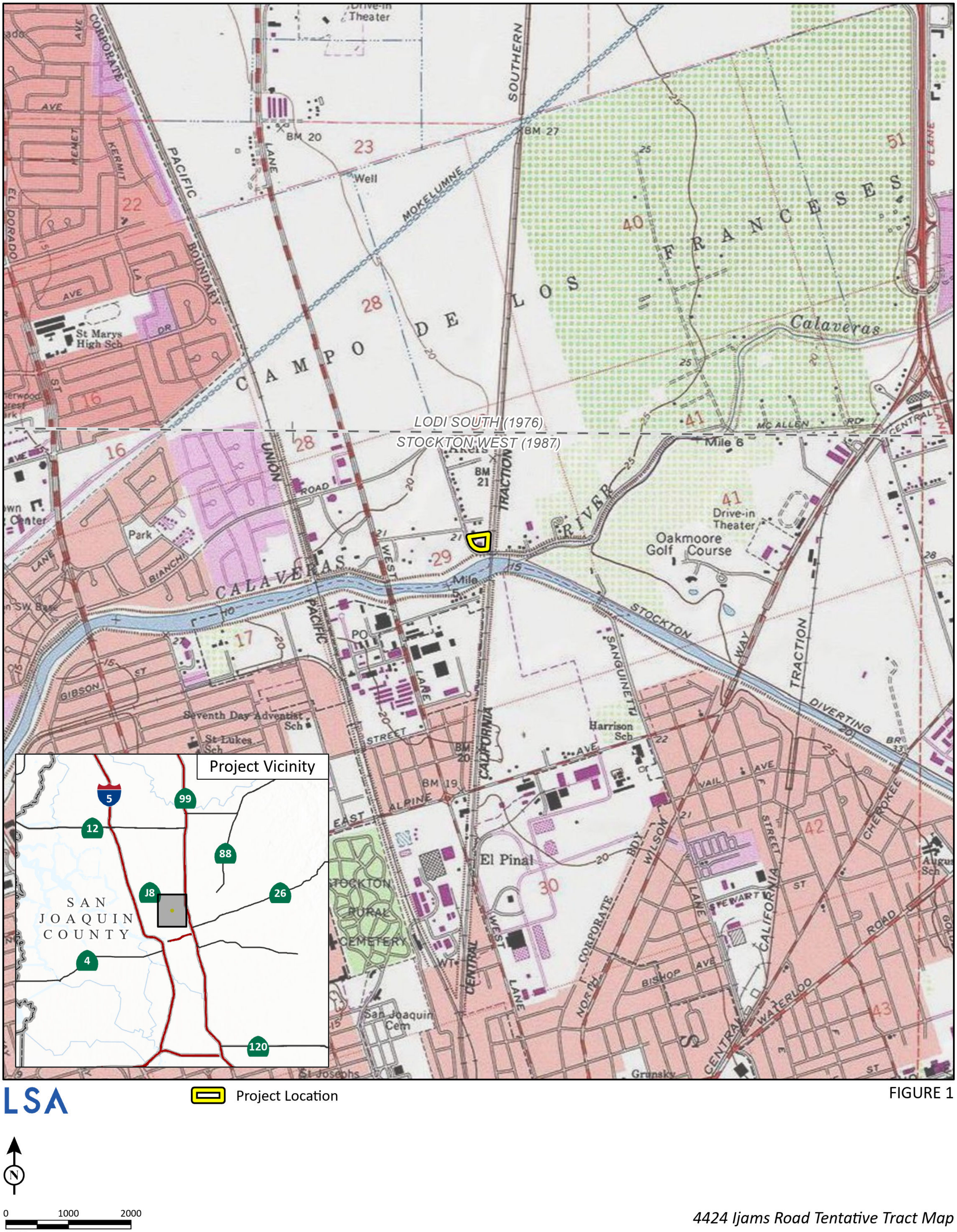
United States Environmental Protection Agency (EPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. December 31.

______. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety.* Office of Noise Abatement and Control.

# ATTACHMENT B

# FIGURES

ATTACHMENT D




LSA

FIGURE 1

*4424 Ijams Road Tentative Tract Map*

Project Location

SOURCE: *Lodi South CA and Stockton West CA*, 7.5' Quad (USGS 1976 and 1987)

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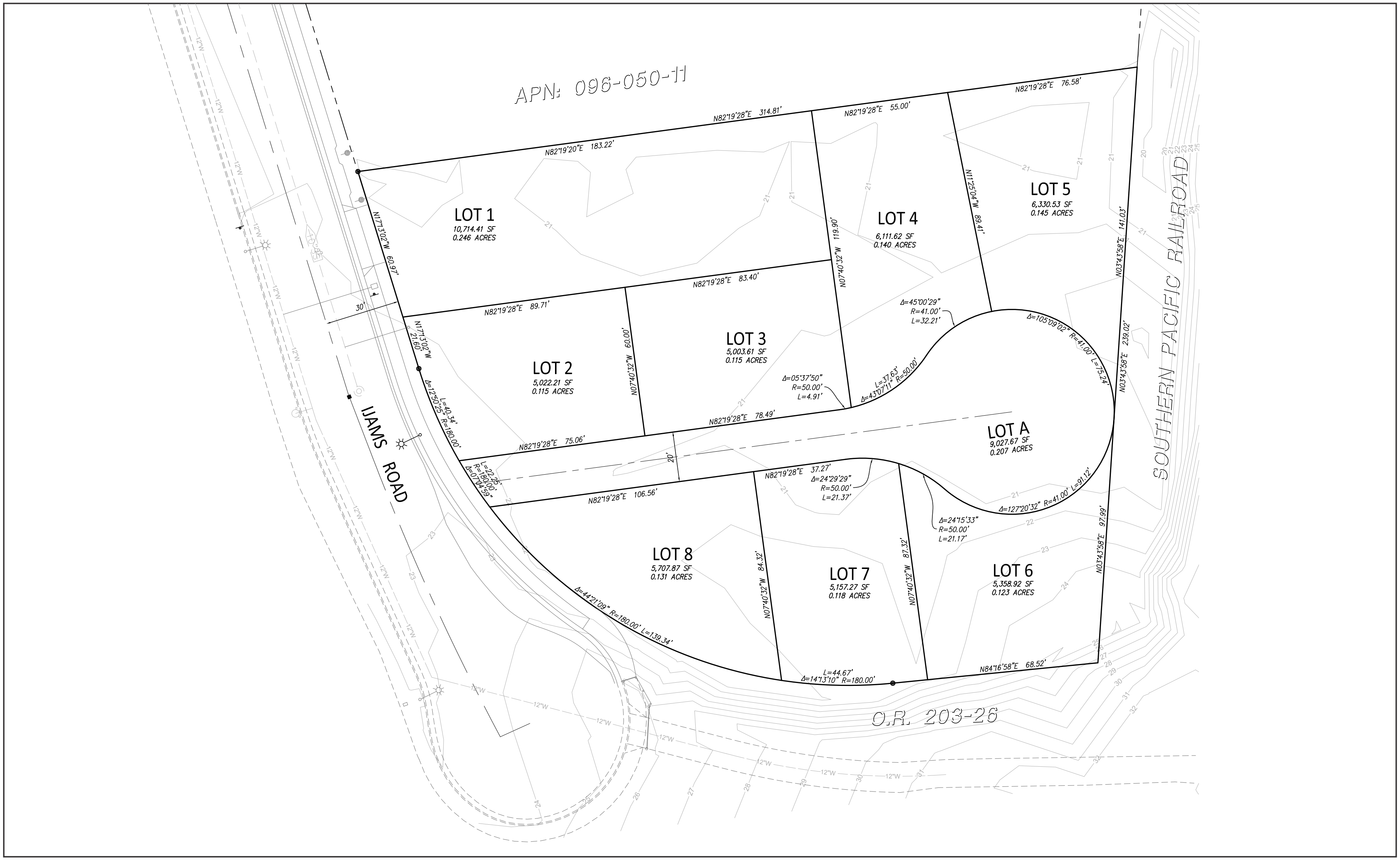
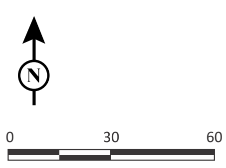



FIGURE 2




*4424 Ijams Road Tentative Tract Map*

Site Plan

SOURCE: DRP Enterprises

I:\2024\20241977\G\Site_Plan.ai (9/17/2024)


LSA

Project Location

Noise Monitoring Location

FIGURE 3

N

0 50 100

FEET

SOURCE: Google Maps (2023)

*4424 Ijams Road Tentative Tract Map*

Noise Monitoring Locations

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# ATTACHMENT C

# NOISE MEASUREMENT DATA

# Noise Measurement Survey – 24 HR

Project Number: 20241977
Project Name: 4424 Ijams Road

Test Personnel: Moe Abushanab
Equipment: Spark 706RC (SN:18906)

Site Number: LT-1 Date: 9/10/24

Time: From 2:00 p.m. To 2:00 p.m.

Site Location: On a tree near southeast corner of project site, approximately 40 ft away from the railroad centerline.

Primary Noise Sources: Southern Pacific Railroad – train passbys

Comments:

Photo:

## Long-Term (24-Hour) Noise Level Measurement Results at LT-1

| Start Time | Date | Noise Level (dBA) | | |
|---|---|---|---|---|
| | | $L_{eq}$ | $L_{max}$ | $L_{min}$ |
| 2:00 PM | 9/10/24 | 72.2 | 105.3 | 41.9 |
| 3:00 PM | 9/10/24 | 80.3 | 111.5 | 42.0 |
| 4:00 PM | 9/10/24 | 77.8 | 109.1 | 41.4 |
| 5:00 PM | 9/10/24 | 54.0 | 72.1 | 43.3 |
| 6:00 PM | 9/10/24 | 50.7 | 70.0 | 42.8 |
| 7:00 PM | 9/10/24 | 72.6 | 103.4 | 41.9 |
| 8:00 PM | 9/10/24 | 71.0 | 104.1 | 42.6 |
| 9:00 PM | 9/10/24 | 68.6 | 95.9 | 41.6 |
| 10:00 PM | 9/10/24 | 79.9 | 112.2 | 41.9 |
| 11:00 PM | 9/10/24 | 76.9 | 108.4 | 40.5 |
| 12:00 AM | 9/11/24 | 47.6 | 64.2 | 39.2 |
| 1:00 AM | 9/11/24 | 77.8 | 110.0 | 39.6 |
| 2:00 AM | 9/11/24 | 74.3 | 104.9 | 39.2 |
| 3:00 AM | 9/11/24 | 74.8 | 106.6 | 39.8 |
| 4:00 AM | 9/11/24 | 43.5 | 51.1 | 40.7 |
| 5:00 AM | 9/11/24 | 75.5 | 107.0 | 42.2 |
| 6:00 AM | 9/11/24 | 77.7 | 108.4 | 43.2 |
| 7:00 AM | 9/11/24 | 77.8 | 108.2 | 44.3 |
| 8:00 AM | 9/11/24 | 44.9 | 55.8 | 40.3 |
| 9:00 AM | 9/11/24 | 44.8 | 58.7 | 40.8 |
| 10:00 AM | 9/11/24 | 46.5 | 61.9 | 40.1 |
| 11:00 AM | 9/11/24 | 78.4 | 106.9 | 41.7 |
| 12:00 PM | 9/11/24 | 72.6 | 104.9 | 41.8 |
| 1:00 PM | 9/11/24 | 80.5 | 110.6 | 43.2 |

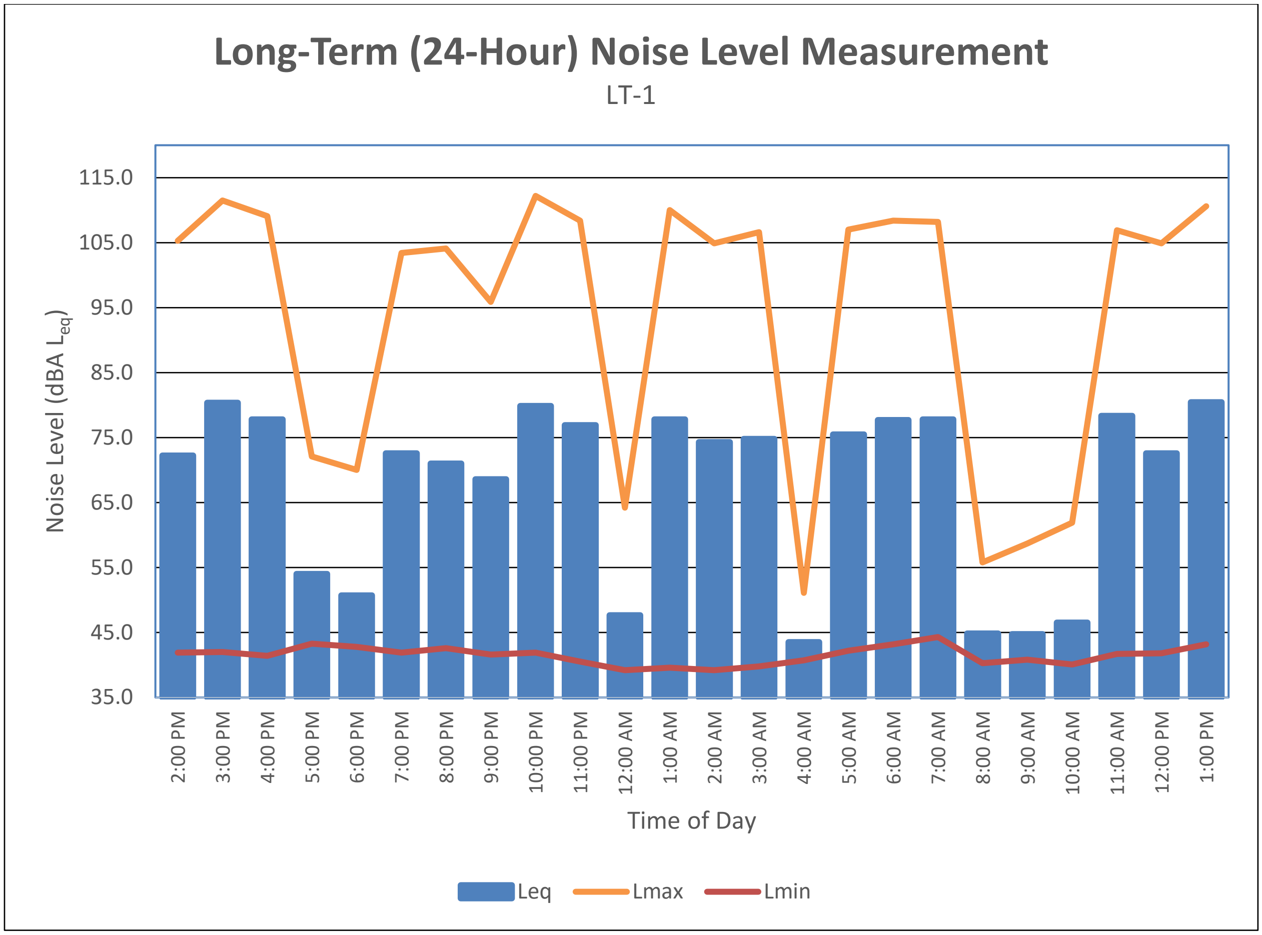
Source: Compiled by LSA Associates, Inc. (2024).

dBA = A-weighted decibel

$L_{eq}$ = equivalent continuous sound level

$L_{max}$ = maximum instantaneous noise level

$L_{min}$ = minimum measured sound level


Long-Term (24-Hour) Noise Level Measurement
LT-1
115.0
105.0
95.0
85.0
75.0
65.0
55.0
45.0
35.0
Noise Level (dBA Leq)
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
Time of Day
Leq
Lmax
Lmin

# Noise Measurement Survey – 24 HR

Project Number: 20241977
Project Name: 4424 Ijams Road

Test Personnel: Moe Abushanab
Equipment: Spark 706RC (SN:17815)

Site Number: LT-2 Date: 9/10/24

Time: From 2:00 p.m. To 2:00 p.m.

Site Location: On a powerline pole near northwestern corner of project site, approximately 25 ft away from the Ijams Road centerline

Primary Noise Sources: Southern Pacific Railroad – Train passbys (primary), occasional vehicle traffic on Ijams Road and background vehicle traffic on West Lane (secondary)

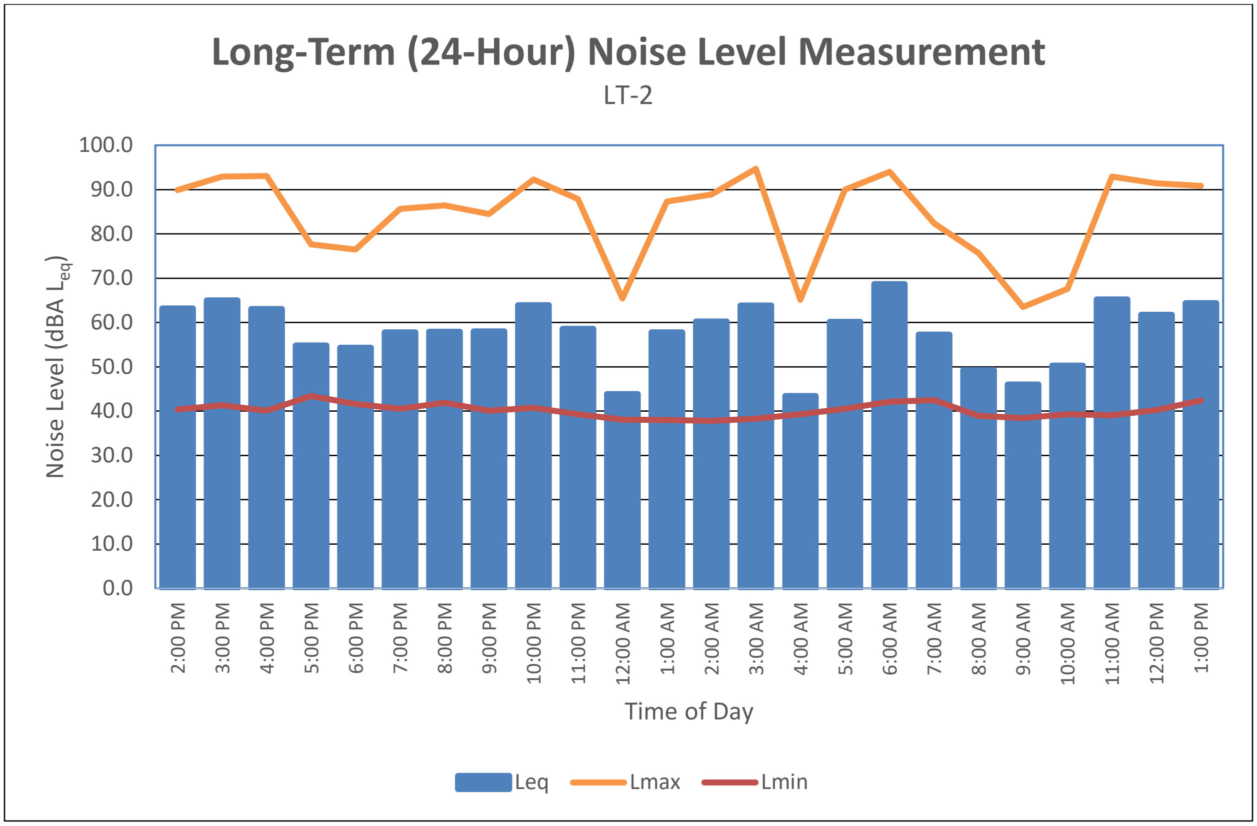
Comments:

Photo:

## Long-Term (24-Hour) Noise Level Measurement Results at LT-2

| Start Time | Date | Noise Level (dBA) | | |
|---|---|---|---|---|
| | | $L_{eq}$ | $L_{max}$ | $L_{min}$ |
| 2:00 PM | 9/10/24 | 63.2 | 89.9 | 40.4 |
| 3:00 PM | 9/10/24 | 65.0 | 92.9 | 41.3 |
| 4:00 PM | 9/10/24 | 63.1 | 93.1 | 40.1 |
| 5:00 PM | 9/10/24 | 54.8 | 77.6 | 43.4 |
| 6:00 PM | 9/10/24 | 54.3 | 76.5 | 41.6 |
| 7:00 PM | 9/10/24 | 57.8 | 85.6 | 40.5 |
| 8:00 PM | 9/10/24 | 57.9 | 86.4 | 41.9 |
| 9:00 PM | 9/10/24 | 58.0 | 84.5 | 40.1 |
| 10:00 PM | 9/10/24 | 63.9 | 92.3 | 40.7 |
| 11:00 PM | 9/10/24 | 58.5 | 87.9 | 39.3 |
| 12:00 AM | 9/11/24 | 43.8 | 65.4 | 38.1 |
| 1:00 AM | 9/11/24 | 57.8 | 87.3 | 38.0 |
| 2:00 AM | 9/11/24 | 60.3 | 88.9 | 37.8 |
| 3:00 AM | 9/11/24 | 63.8 | 94.7 | 38.3 |
| 4:00 AM | 9/11/24 | 43.4 | 65.1 | 39.3 |
| 5:00 AM | 9/11/24 | 60.1 | 90.0 | 40.5 |
| 6:00 AM | 9/11/24 | 68.7 | 94.0 | 42.1 |
| 7:00 AM | 9/11/24 | 57.2 | 82.4 | 42.5 |
| 8:00 AM | 9/11/24 | 49.2 | 75.7 | 38.9 |
| 9:00 AM | 9/11/24 | 46.0 | 63.5 | 38.4 |
| 10:00 AM | 9/11/24 | 50.3 | 67.6 | 39.3 |
| 11:00 AM | 9/11/24 | 65.2 | 92.9 | 39.1 |
| 12:00 PM | 9/11/24 | 61.7 | 91.4 | 40.2 |
| 1:00 PM | 9/11/24 | 64.4 | 90.8 | 42.4 |

Source: Compiled by LSA Associates, Inc. (2024).
dBA = A-weighted decibel
$L_{eq}$ = equivalent continuous sound level
$L_{max}$ = maximum instantaneous noise level
$L_{min}$ = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-2
Noise Level (dBA Leq)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
Time of Day
Leq
Lmax
Lmin

# ATTACHMENT D

# INSUL MODELING RESULTS

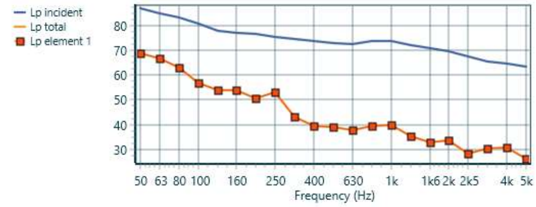
# Outdoor To Indoor Sound Transmission (v10.0.4)

ATTACHMENT D

INSUL


Margin of error is generally within ±3 dB
 - Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:10/1/2024
File Name:B4.inz

Comment:




| | Octave Band Centre Frequency (Hz) | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Source** | | 63 | | | 125 | | | 250 | | | 500 | | | 1k | | | 2k | | | 4k | | Overall dBA |
| Incident sound level (freefield) | 87.0 | 85.0 | 83.3 | 80.9 | 77.9 | 77.2 | 76.7 | 75.4 | 74.4 | 73.6 | 73.0 | 72.7 | 73.6 | 73.8 | 72.2 | 70.8 | 69.6 | 67.5 | 65.6 | 64.8 | 63.3 | 82 |
| **Path** | | | | | | | | | | | | | | | | | | | | | | |
| Element 1 , STL | -19 | -19 | -21 | -25 | -25 | -24 | -27 | -23 | -32 | -35 | -35 | -36 | -35 | -35 | -38 | -39 | -37 | -40 | -36 | -35 | -38 | |
| Facade Shape factor Level diff. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Insertion Loss | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Area(+10LogA) [99 $ft^2$] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | |
| Element sound level contribution | 69 | 67 | 63 | 57 | 54 | 54 | 51 | 53 | 43 | 39 | 39 | 38 | 39 | 40 | 35 | 33 | 33 | 28 | 30 | 31 | 26 | 56 |
| **Receiver** | | | | | | | | | | | | | | | | | | | | | | |
| Room volume(-10LogV) [990 $ft^3$] | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | |
| Reverberation time (s) | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | |
| RT (+10LogT) | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | |
| Equation Constant | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | |
| Room sound level | 69 | 67 | 63 | 57 | 54 | 54 | 51 | 53 | 43 | 39 | 39 | 38 | 39 | 40 | 35 | 33 | 33 | 28 | 30 | 31 | 26 | 56 |
| **Level difference** | | | | | | | | | | | | | | | | | | | | | | D2m,nT,w |
| D2m,nT | 19 | 19 | 21 | 25 | 25 | 24 | 27 | 23 | 32 | 35 | 35 | 36 | 35 | 35 | 38 | 39 | 37 | 40 | 36 | 35 | 38 | 36 |

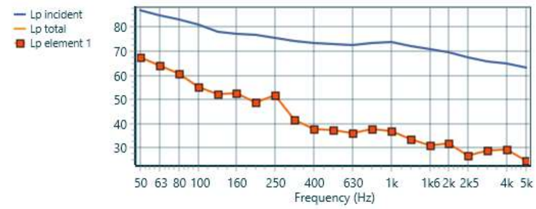
** Element descriptions: #1:

# Outdoor To Indoor Sound Transmission (v10.0.4)

ATTACHMENT D


Margin of error is generally within ±3 dB
 - Key No. 4862
Job Name:
Job No.: Initials:JStephens
Date:10/1/2024
File Name:MB2.inz

Comment:




| | Octave Band Centre Frequency (Hz) | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Source** | | 63 | | | 125 | | | 250 | | | 500 | | | 1k | | | 2k | | | 4k | | Overall dBA |
| Incident sound level (freefield) | 87.0 | 85.0 | 83.3 | 80.9 | 77.9 | 77.2 | 76.7 | 75.4 | 74.4 | 73.6 | 73.0 | 72.7 | 73.6 | 73.8 | 72.2 | 70.8 | 69.6 | 67.5 | 65.6 | 64.8 | 63.3 | 82 |
| **Path** | | | | | | | | | | | | | | | | | | | | | | |
| Element 1 , STL | -19 | -20 | -22 | -25 | -25 | -24 | -27 | -23 | -32 | -35 | -35 | -36 | -35 | -36 | -38 | -39 | -37 | -40 | -36 | -35 | -38 | |
| Facade Shape factor Level diff. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Insertion Loss | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Area(+10LogA) [142 ft$^2$] | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | |
| Element sound level contribution | 67 | 64 | 61 | 55 | 52 | 52 | 49 | 52 | 42 | 38 | 37 | 36 | 38 | 37 | 33 | 31 | 32 | 27 | 29 | 29 | 25 | 55 |
| **Receiver** | | | | | | | | | | | | | | | | | | | | | | |
| Room volume(-10LogV) [2056 ft$^3$] | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | -33 | |
| Reverberation time (s) | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | |
| RT (+10LogT) | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | -5.2 | |
| Equation Constant | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | |
| Room sound level | 67 | 64 | 61 | 55 | 52 | 52 | 49 | 52 | 42 | 38 | 37 | 36 | 38 | 37 | 33 | 31 | 32 | 27 | 29 | 29 | 25 | 55 |
| **Level difference** | | | | | | | | | | | | | | | | | | | | | | D2m,nT,w |
| D2m,nT | 21 | 22 | 24 | 27 | 27 | 26 | 29 | 25 | 34 | 37 | 37 | 38 | 37 | 38 | 40 | 41 | 39 | 42 | 38 | 37 | 40 | 38 |

** Element descriptions: #1: