Bethel Avenue and California Ave Subdivision
Acoustical Analysis
Tract 6504



Prepared For:

Ranjeet Singh Maan
Maan Farms Corporation
17401 Road 400
Madera, CA 93636



Prepared by:

Kheng Vang, PE 63824, TE
Vang Inc. Consulting Engineers
4010 N. Chestnut Ave Ste 101
Fresno, California 93726
PHONE (559) 775-0023
FAX (559) 775-0016

Date:
May 21, 2025

THIS PAGE LEFT BLANK INTENTIONALLY

Table of Contents

1.0 Introduction 1
2.0 Noise Scales 2
3.0 Laws, Ordinances, Regulations, and Standards 4
3.1 California Environmental Quality Act (CEQA) 4
3.2 City of Fresno General Plan 4
4.0 Methodology and Existing Conditions 5
4.1 Field Measurements 5
4.2 FHWA Traffic Noise Model 7
5.0 Acoustical Analysis 8
5.1 Project Site Noise Exposure 9
5.2 Predicted Traffic Noise Levels 10
5.3 Noise Mitigation 12
5.3.1 Exterior Noise Exposure and Mitigation 12
5.3.2 Interior Noise Exposure and Mitigation 12
6.0 Conclusions and Recommendations 15

Figures

Figure 1 – Site Location 1
Figure 2 – Site Map 6

Tables

Table 1 -Typical Noise Levels 3
Table 2 - Maximum Allowable Noise Exposure 4
Table 3 – Summary of Noise Measurements 10
Table 4 – Predicted Traffic Noise Levels 10
Table 5 – Noise Levels Adjusted for Distance 11

Appendices

Appendix A: Noise Measurement Data Sheets
Appendix B: Fresno COG Traffic Models
Appendix C: TNM Barrier Analysis

List of Abbreviated Terms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
FHWA	Federal Highway Administration
Hz	Hertz
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
L_{min}	Minimum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
mph	miles per hour
NAC	noise abatement criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	sound pressure level
TeNS	Caltrans' Technical Noise Supplement
TNM 3.0	FHWA Traffic Noise Model Version 3.0

ACOUSTICAL TERMINOLOGY AND DEFINITIONS

The following terminology has been used for purposes of this report:

Ambient Noise Level: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. The average equivalent 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 10p.m. and ten decibels to sound levels in the night before 7 a.m. and after 10 p.m.

Decibel, dBA: A unit for describing the amplitude of sound, equal to 10 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro pascals (20 micro-newtons per square meter).

DNL/Ldn: Day/Night Average Sound Level. The Ldn is a measure of the 24-hour average noise level at a given location. It was adopted by the U.S. Environmental Protection Agency (EPA) for developing criteria for the evaluation of community noise exposure. It is based on a measure of the average noise level over a given time period called the Leq. The Ldn is calculated by averaging the Leq's for each hour of the day at a given location after penalizing the "sleeping hours" (defined as 10:00 P.M. to 7:00 A.M.), by 10 dBA to account for the increased sensitivity of people to noises that occur at night.

Leq: Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. Leq is typically computed over 1, 8 and 24-hour sample periods.

Leq(h): The hourly value of Leq.

Lmax: The maximum noise level recorded during a noise event Ln: The sound level exceeded "n" percent of the time during a sample interval (L90, L50, L10, etc.). L10 equals the level exceeded 10 percent of the time.

Ln(h): The hourly value of Ln.

Noise Exposure Contours: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

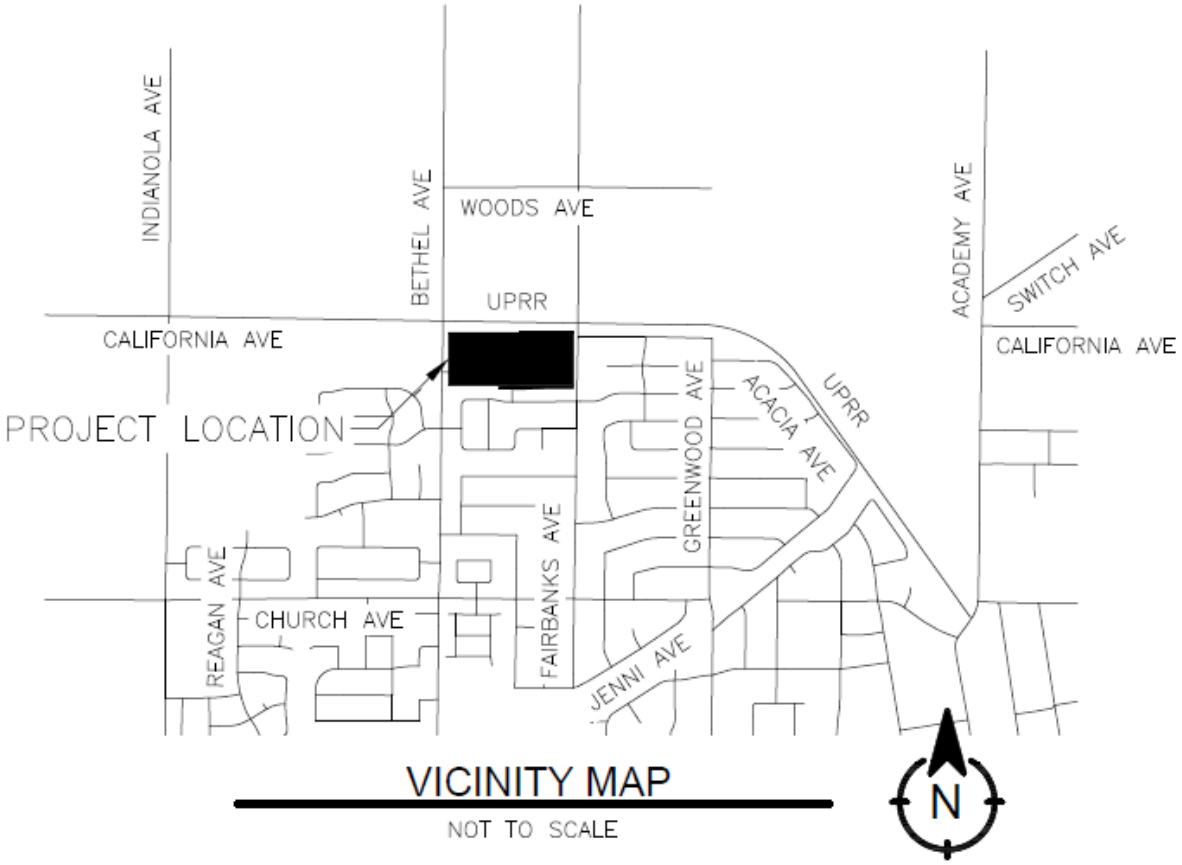
SEL or SENEL:	Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to the duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micro pascals and the reference duration of one second
Sound Level:	The sound pressure level in decibels as measured on a sound level meter using the A-weighing filter network. The A-weighing filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

1.0 Introduction

The proposed project, Tract 6504, is located within the City of Sanger. The project location is the southeast corner of California Ave alignment/Union Pacific Railroad (UPRR) and Bethel Ave, further identified as APN number 315-460-01 thru, 34 thru 40, and 49. The current City of Sanger zoning is Residential-Medium Low (R-1-7.5) The City's planned land use is Single Family Residential. The proposed zoning is R-1-7.5 district, is intended to for medium low density residential with density ranging from 4.5 du/ac to 5.8 du/ac. The project proposes to develop 79 single family residential lots.

All sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise.

Figure 1 – Site Location



2.0 Noise Scales

Human response to sound is highly individualized. Annoyance is the most common issue regarding community noise. The percentage of people claiming to be annoyed by noise will generally increase with the environmental sound level. However, many factors will also influence people's response to noise. The factors can include the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, non-acoustical factors, such as the person's opinion of the noise source, the ability to adapt to the noise, the attitude towards the source and those associated with it, and the predictability of the noise, will all influence people's response. As such, response to noise varies widely from one person to another and with any particular noise, individual responses will range from "not annoyed" to "highly annoyed."

Sound is described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is judged to be twice as loud, and 20 dBA higher four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Examples of various sound levels in different environments are illustrated on Exhibit 4, Common Environmental Noise Levels.

Many methods have been developed for evaluating community noise to account for, among other things:

- The variation of noise levels over time;
- The influence of periodic individual loud events; and
- The community response to changes in the community noise environment.

Numerous methods have been developed to measure sound over a period of time; refer to Table 1, Noise Descriptors.

Table 1 -Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft) at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. November, 2009.

3.0 Laws, Ordinances, Regulations, and Standards

Land uses deemed sensitive by the State of California (State) include schools, hospitals, rest homes, and long-term care and mental care facilities. Many jurisdictions also consider residential uses particularly noise-sensitive because families and individuals expect to use time in the home for rest and relaxation, and noise can interfere with those activities. Some jurisdictions may also identify other uses noise-sensitive uses such as churches, libraries, and parks. Land uses that are relatively insensitive to noise include office, commercial, and retail developments. There is a range of insensitive noise receptors that include uses that generate significant noise levels and that typically have a low level of human occupancy. This noise analysis was conducted in accordance with Federal, State, and local criteria described in the following sections.

3.1 California Environmental Quality Act (CEQA)

CEQA was enacted in 1970 and requires that all known environmental effects of a project be analyzed, including environmental noise impacts. Under CEQA, a project has a potentially significant impact if the project exposes people to noise levels in excess of standards established in the local general plan or noise ordinance. Additionally, under CEQA, a project has a potentially significant impact if the project creates a substantial increase in the ambient noise levels in the project vicinity above levels existing without the project. If a project has a potentially significant impact, mitigation measures must be considered. If mitigation measures to reduce the impact to less than significant are not feasible due to economic, social, environmental, legal, or other conditions, the most feasible mitigation measures must be considered.

3.2 City of Sanger General Plan

The City of Sanger Noise Element identifies various maximum exterior noise exposures for outdoor activity areas for various land uses. The proposed project lies within the City of Sanger boundaries and therefore is required to conform to City of Sanger noise ordinance, refer to Table *2*.

Table 2 - Maximum Allowable Noise Exposure

Land Use [1]	Outdoor Activity Areas Ldn/ CNEL dB [2]	Interior Spaces	
		Ldn dB	Leq dB [2]
Residential, multi family	65	45	---
Transient Lodging	65	45	---
Hospitals Nursing Homes	65	45	---
Churches, Meeting Halls	--	---	45
Office Buildings	---	---	45
School, Libraries, Museums	---	---	45

Source: City of Sanger, *Sanger 20235 General Plan*, February, 2020.
Notes:
1. Where the location of outdoor activity areas is unknown or is not applicable, the exterior noise level standard shall be applied to the property line of the receiving land use.
2. As determined for a typical worst-case hour during periods of use.

4.0 Methodology and Existing Conditions

4.1 Field Measurements

Sound level meters and sound level analyzers measure sound levels. Section 772.11(d) (3) of 23 CFR 772 calls for the use of an integrating sound level meter or analyzer, which automatically measures Leq. Components of an SLM include: a microphone with preamplifier, an amplifier, frequency weighting, input gain control, time averaging, and an output indicator or display. The accuracy of an SLM is characterized by its "class." There are three types of SLMs available: class 0, 1, and 2. Class 0 SLMs are designed for laboratory reference purposes, where the highest precision is required. Class 1 SLMs are designed for precision field measurements and research. Either class 1 or class 2 SLMs are acceptable for use in traffic noise analyses in conformance with FHWA guidelines.

Noise monitoring equipment used for the ambient noise survey consisted of a Reed Instruments R8080 Sound Level Meter/Data Logger. The monitoring equipment complies with applicable requirements of the American National Standards Institute (ANSI) for Type 2 (precision) sound level meters. The instrumentation was calibrated prior to and after each use with a Reed Instruments R8090 Sound Level Calibrator to ensure the accuracy of the measurements. The microphone was located on a tripod approximately five feet above the ground. The noise monitoring Site A was located at approximately 332 feet south of the centerline of UPRR tracks, and 46 feet west of the centerline of Bethel Avenue. Site B was located at approximately 53 feet south of the centerline UPRR tracks, and 63 feet west of the centerline of Bethel Avenue. Site C was located at approximately 121 feet south of the centerline UPRR tracks, and 34 feet west of the centerline of Fairbanks Avenue. Site D was located at approximately 569 feet south of the centerline UPRR tracks, and 24 feet west of the centerline of Fairbanks Avenue. refer to Figure 2. The height of the sound recorders was placed approximately 5.5' above the ground.

Figure 2 – Site Map



4.2 FHWA Traffic Noise Model

In March 1998, the Federal Highway Administration (FHWA) released the Traffic Noise Model, Version 1.0 (FHWA TNM). It was developed as a means for aiding compliance with policies and procedures under FHWA regulations. Since its release in March 1998, Version 1.0a was released in March 1999, Version 1.0b in August 1999, Version 1.1 in September 2000, Version 2.0 in June 2002, Version 2.1 in March 2003 and the current version, Version 2.5 in April 2004. Version 3.0 was released in February 2020. Version 3.2 was released in February 2024. The latest version TNM 3.2 was utilized to determine the noise resulting from vehicular activity along the surrounding roadways.

TNM is a state-of-the-art computer program used for predicting noise impacts in the vicinity of highways. It uses advances in personal computer hardware and software to improve upon the accuracy and ease of modeling highway noise, including the design of effective, cost-efficient noise barriers.

- TNM contains the following components:
- Modeling of five standard vehicle types, including automobiles, medium trucks, heavy trucks, buses, and motorcycles, as well as user-defined vehicles;
- Modeling of both constant-flow and interrupted-flow traffic using a 1994/1995 field measured data base;
- Modeling of the effects of different pavement types, as well as the effects of graded roadways;
- Sound level computations based on a one-third octave-band data base and algorithms;
- Graphically-interactive noise barrier design and optimization;
- Attenuation over/through rows of buildings and dense vegetation;
- Multiple diffraction analysis;
- Parallel barrier analysis; and
- Contour analysis, including sound level contours, barrier insertion loss contours, and sound-level difference contours.

5.0 Acoustical Analysis

5.1 Airport Noise Exposure

The nearest airports include the Fresno Yosemite International Airport, located approximately 8.5 miles northwest of the project site, Reedley Municipal Airport, located approximately 7.9 miles east of the project site, and the Fresno Chandler Airport, located approximately 13.8 miles west of the project site. Each of these airports is considered under the Fresno County Airport Land Use Compatibility Plan (ALUCP)[1], which guides local jurisdictions in determining appropriate compatible land uses with detailed findings and policies. The County of Fresno General Plan, is be compatible with the adopted ALUCP for Fresno County. The ALUCP includes CNEL noise contours based on projected airport and aircraft operations. The project site is located 7.9 miles west of Reedley Airport Municipal Airport, and is not within the 60 dba CNEL noise contour. Therefore, the proposed project would not result in the exposure of sensitive receptors to the excessive noise levels from aircraft noise sources.

5.2 Railroad Noise Exposure

The UPRR mainline, located 50 feet north of the project site, runs through the City of Sanger is in a east-west route. When a train is within around 1000 feet of a grade crossing, train engineers are required to sound the warning horn. Areas close to the grade crossings will have increased exposure from train noise levels. The Project is located within 1,000 feet of the railroad tracks.

According to Table 3 below, the highest sound recordings were collected at Sites B, and C, along the railroad tracks, having a sound level of 78 dBA, and 80.4 dBA. Adjusting for distance to nearest single family residential lot using Formula 1 below results in sound level of 79.5 dBA at a distance of 150 feet from the centerline of the railroad tracks. The proposed project would result in the exposure of sensitive receptors to the excessive noise levels, above 65 dBA, from railroad noise sources. The increased noise levels from the UPRR are for short durations only. According to Table 3 below, the Ldn at sites B and C, are at or below 65 dBA. Therefore, no additional mitigations are required.

5.3 Ground-borne Vibration

Residential settings generally have ambient vibration levels of 50 VdB, which are well below what humans can perceive. Humans can feel common indoor vibrations caused by the operation of heating and air conditioning systems and slamming doors. Construction work, train operations, and street traffic are the most common outdoor sources of ground vibration that people can perceive inside of homes. The Federal Transit Administration (FTA) uses a screening distance of 100 feet for high vibration sensitive buildings (e.g., hospital with vibration sensitive equipment) and 50 feet for residential uses. The Project site is located adjacent to residential uses to the north, south, and west. However, these residencies are located more than 50 feet from the proposed building to be constructed onsite.

1 Fresno Council of Governments. 2018. Fresno County Airport Land Use Compatibility Plan. Amended December 2021. Available online at: https://www.fresnocog.org/project/airport-land-use-commission-fresno-county/ (accessed March 15, 2024)

5.4 Short-Term (Construction) Impacts

Project construction would result in short-term noise impacts on nearby sensitive receptors. Maximum construction noise would be short-term, generally intermittent depending on the construction phase, and variable depending on receiver distance from the active construction zone. The duration of noise impacts generally would be from one day to several days depending on the phase (e.g., demolition, land clearing, grading, excavation, erection) of construction. Noise produced by construction equipment such as earthmovers, material handlers, and portable generators can reach high levels. Generally, the grading phase of construction involves the most equipment and generates the highest noise levels, although noise ranges are usually similar across all construction phases. Typical noise levels generated by individual pieces of construction equipment generally range from approximately 77 dBA to 90 dBA Lmax at 50 feet. Depending on the equipment required and duration of use, average-hourly noise levels associated with construction activity typically ranges from roughly 65 to 90 dBA Leq at 50 feet.

Certain land uses are considered more sensitive to noise than others. Examples of these noise sensitive receptors include residential areas, educational facilities, hospitals, childcare facilities, and senior housing. The closest sensitive receptors to the proposed project include the adjacent single family residential land uses located to the east, west, and north.

The Citys Noise Ordinance section 38-24.4.18 states “special noise regulations shall constitute nuisances whenever they occur between the hours of 10:00 p.m. and 6:00 a.m. the next morning. This limitation shall extend until 8:00 a.m. on Sunday mornings. Therefore construction activities will only be permitted outside these hours. Although construction activities associated with the proposed project could potentially result in a temporary or periodic increase in ambient noise levels in the project vicinity, construction activity would be exempt from City of Sanger’s noise regulations, as long as such activity is conducted pursuant to an applicable construction permit and occurs between 6:00 a.m. and 10:00 p.m., Monday thru Saturday. Therefore, short-term construction impacts associated with the exposure of persons to or the generation of noise levels in excess of standards established in the General Plan or noise ordinance or applicable standards of other agencies would be less than significant.

5.5 Project Site Noise Exposure

N Bethel Avenue runs along the western boundary of the project site and N Fairbanks Avenue runs along the eastern boundary of the project site. The distance from the center of N Bethel Avenue to the closest proposed buildings will be approximately 62 feet and the distance from the center of N Fairbanks Avenue will be approximately 40 feet to the closest proposed buildings.

In order to determine the ambient noise levels within the project area, 24-hour noise measurements were taken by VICE on Monday November 19, 2024 through Friday January 3, 2025. The detailed results of the field measurements are provided in Appendix A. The noise measurement sites were representative of typical existing noise exposure within project site and are shown on Figure 2. One-minute interval measurements were taken at each site, between 9:21 a.m. November 19, 2024 and 2:41 p.m. January 3, 2025. A summary of the noise measurements for each site are shown in

Table 3, below. Site B has the highest Ldn of 65.4 dBA. For the purposes of this report the existing Ldn for the project is 65.4 dBA.

Table 3 – Summary of Noise Measurements

Site	Location	Lmin [1]	Lmax [1]	L_{DN} [2]
A	+45 feet west of the centerline of Bethel Avenue	31.3	78.5	64.7
B	+22 feet west of the centerline of Bethel Avenue	31.2	78.0	65.4
C	+24 feet west of the centerline of Fairbanks Avenue	33.4	80.4	60.7
D	+23 feet west of the centerline of Fairbanks Avenue	32.9	76.4	57.8

1 Based on SEL
2 Includes 10 decibel penalty from 10:00 P.M. to 7:00 A.M.

5.6 Predicted Traffic Noise Levels

The traffic data along N. Bethel Avenue was obtained from Fresno Council of Governments (FresnoCOG). A doubling of existing traffic volumes would increase the existing DNL by 3 decibels. Table 4 shows the 2019 and future 2035 average daily trips (ADTs) for N. Bethel Avenue according to the FresnoCOG's traffic data and models. The traffic volumes are anticipated to increase by 64%, which would result in an increase of the existing Ldn by 1.91 decibel to 67.31 dBA by 2035.

Table 4 – Predicted Traffic Noise Levels

Site	**Street**	**2019 ADT**	**2035 ADT**	**% Increase**	**dBA Increase**	**2035 Ldn** dBA
A	Bethel Ave	2067	3380	64%	1.91 dBA	66.57
B	Bethel Av	2067	3380	64%	1.91 dBA	67.31
C	Fairbanks Ave	2067	3380	64%	1.91 dBA	62.58
D	Fairbanks Ave	2067	3380	64%	1.91 dBA	59.69

The field measurements were taken a distance of 22 feet, and 45 feet west of N. Bethel Avenue centerline. The distance from the center of N. Bethel Avenue to the closest proposed buildings will be approximately 62 feet. Therefore adjusting the noise levels using Formula 1, below, based on 62' from the centerline of N. Bethel Avenue yields a sound level of 67.96 dBA, and 71.81 dBA. For the purpose of the report cumulative Ldn will be 72 dBA.

Formula 1 Change in Decibel based on distance

$$\Delta Db = 10\ x \log\left(\frac{D1}{D2}\right)$$

ΔDb = change in decibles
D1 = distance at location 1 from noise source
D2 = distance at location 2 from noise source

Table 5 – Noise Levels Adjusted for Distance

Site	Distance form measured site to centerline of street	Distance to nearest property/building from centerline of street	L_{DN} [2]
A	+45 feet west of the centerline of Bethel Avenue	62 feet from the centerline of Bethel Avenue	67.96
B	+22 feet west of the centerline of Bethel Avenue	62 feet from the centerline of Bethel Avenue	71.81
C	+24 feet west of the centerline of Fairbanks Avenue	30 feet from the centerline of Fairbanks Avenue	63.55
D	+23 feet west of the centerline of Fairbanks Avenue	30 feet from the centerline of Fairbanks Avenue	60.84

Outdoor activity areas for the proposed single family residential subdivision land uses would be considered rear yards. Based on the modeling results, the single-family residential subdivision closest to N. Bethel Avenue would exceed the City of Sanger standard of 65 dBA without implementation of mitigation measures.

5.7 Generation of excessive ground-borne vibration or ground-borne noise levels?

Ground-borne vibration impacts were evaluated by identifying potential vibration sources and measuring the distance between vibration sources and surrounding structure locations. It should be noted that City of Sanger does not have established criteria for vibration impacts. However, Caltrans has established vibration thresholds in terms of human annoyance of 0.04 in/sec PPV as documented in Caltrans' Transportation and Construction Vibration Guidance Manual. The vibration threshold of 0.04 in/sec PPV was used to estimate the impact of vibrations from construction activities associated with the Project. Table 8 lists some typical ground vibration sources along with their correlation to human perception.

The predicted vibration velocity levels for the residences to the west and south of the Project are predicted to approach 0.035 in/sec PPV using the Large Bulldozer vibration level reported in Table 6 (PPV 0.089). The level of vibration generated by the Project's construction phase is considered less than significant based on the vibration velocity levels indicated in Table 8. As a result, mitigation measures are not required.

Table 6 – Vibration Sound levels

Equipment	PPV at 25 ft (in/sec)	PPV at 50 ft (in/sec)	PPV at 100 ft (in/sec)
Hoe Ram	0.089	0.031	0.011
Large Bulldozer	0.089	0.031	0.011
Caisson Drilling	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Jackhammer	0.035	0.012	0.004
Small Bulldozer	0.003	0.001	0.000

Source: Transit Noise and Vibration Impact assessment, United States Department of Transportation, Office of Planning Environment

5.8 Noise Mitigation

5.8.1 Exterior Noise Exposure and Mitigation

The City of Sanger Noise Element sets 65 dB DNL or less as the acceptability criterion for exterior noise levels for sensitive land uses.

The project proposes a single-family residential subdivision. The single-family residential subdivision is located approximately 62' feet east of the centerline of N. Bethel Avenue, approximately 30 feet west of the centerline of N. Fairbanks Avenue, and approximately 70 feet south of the centerline of UPRR mainline. The projects

A sound wall barrier insertion was modeled using TNM 3.2 to calculate the insertion loss (noise reduction) provided by a combined 2 feet high landscape berm and 6 feet high block wall. The model calculates the insertion loss of a wall of given height based on the effective height of the noise source, height of the receiver, distance from the receiver to the wall, and distance from the noise source to the wall. The standard height of a residential receiver is five feet above the building pad elevation. The model indicated that a sound wall and landscape berm with a combined height of 8 feet, would reduce the projects' noise exposure by 8 dBA, to 65 dBA at the property line. The block wall should be continuous without gaps or openings along the north, west, and south property lines.

5.8.2 Interior Noise Exposure and Mitigation

The City of Sanger's interior noise level standard is 45 dB DNL. A specific analysis of interior noise levels was not performed. However, it is generally accepted that commercial construction methods complying with current building code requirements will reduce exterior noise levels by a least 20-25 dB, if windows and doors are closed.

With inclusion of the 2 feet high landscape berm and 6 feet high block wall along Bethel Avenue the any single story homes adjacent to Bethel Avenue will not need any additional mitigation, as the indoor noise levels will be below 45 dBA, using standard construction materials.

If two story homes are proposed adjacent to Bethel Avenue, then the construction of the buildings second story shall be capable of providing an outdoor-to-indoor noise level reduction (NLR) of approximately 26.8 dB (71.8-45=26.8).

For any proposed buildings further than 62' from the centerline of N. Bethel Avenue, no additional mitigation is needed as the indoor noise levels will be below 45 dBA, using standard construction materials.

Sound dampening can be accomplished by various methods, which sound dampening in the walls, insulation may be necessary on-air conditioning, and/or mechanical equipment ventilation will be required. This can be accomplished with any combination of window glazing, Outdoor-Indoor Transmission Class (OITC) rated construction materials, and windows.

Window Glazing

Sound transmission into building spaces is generally through the windows. Glazing designs strengthen the windows and increase the ability of windows to resist sound transmission into building spaces. The resistance of a building material to the transmission of sound is called the sound transmission loss (TL). When usual glazing configurations are not sufficient to limit the transmission of sound into building spaces, glazing configurations with enhanced sound transmission losses, or acoustical glazing, must be considered.

There is no specific definition of acoustical glazing, but most acoustical glazing makes use of some combination of polyvinyl butyral (PVB) plastic interlayer, and an air space between multiple panes of glass. Although sound insulation varies with frequency and is very different for various types of partitions, it is convenient to compare the effectiveness of two partitions using a method of rating insulation that can be represented by a single number.

Outdoor-Indoor Transmission Class Rating

The Outdoor-Indoor Transmission Class (OITC) is a standard used for indicating the rate of transmission of sound between outdoor and indoor spaces in a structure. It is based on the ASTM E-1332 Standard Classification for the Determination of Outdoor-Indoor Transmission Class. An alternative similar standard for determining the rate of acoustic isolation of a separation between spaces is Sound Transmission Class (STC). While STC is based on a noise spectrum targeting speech sounds, OITC utilizes a source noise spectrum that considers frequencies down to 80 Hz (Aircraft/Rail/Truck traffic) and is weighted more to lower frequencies.

OITC ratings are a single number rating system for the sound attenuation effectiveness of a partition or window that separates the outdoor from the indoor environment. This rating is an A-weighted sound reduction value that takes into account the average frequency content of typical outdoor noise sources (e.g., vehicular, aircraft, and rail traffic) and the characteristic response of specific wall components (i.e., windows, doors, walls, windows, or roofs). OITC can be derived by the measurement methods described in ASTM E 90-90 or ASTM 966-90, Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Façade Elements. ASTM E 90-90 assumes a diffuse field (equal sound energy in all directions) incident on the test panel whereas ASTM E 966-90 allows for provisions in the incident sound field characteristics.

OITC is used to rank order sound insulation ratings of building envelope components according to their effectiveness as judged by occupants. A simple wood-stud wall with lightweight surfaces (e.g., gypsum board and oriented strand board [OSB]) would have an OITC of about 25 dB while the same wall with brick added to the exterior would have an OITC of about 40 dB; sound insulation values ranging from mediocre to superior.

OITC Rated Windows

Typical windows with double glazing (two layers of 3-mm glass with a 13-mm air space) have an OITC rating of about 22 dB. The greatest improvement in the sound insulation of windows can be achieved by using thicker glass and a larger air space. The details of the frame, as well as the type

of mounting and the size of the glass panes, further influence the total sound insulation provided by the window. Laminated glass and special gases in the cavity can provide small improvements at higher frequencies. However, the actual sound insulating properties of a particular window can only be confirmed by standard laboratory tests (ASTM E90 test).

For operable windows, a vinyl dual vertical sliding double bypass window assembly can achieve maximum noise reduction by using heavy duct seal putty around the perimeter on both sides. The exterior window should be at least ¾-inches thick dual glazed units (7/32 inch laminated glass, 3/8 inch air space, and 1/8 inch double strength glass). The interior window should consist of two operable panels glazed with 7/32 inch laminated glass. All laminated glass should have a 0.030 inch interlayer.

Transmission of sound through a hollow window-frame can significantly reduce the sound insulation in windows. This reduction can be minimized by drilling one or more holes in the hollow frame and pumping a mastic material to fill the hollow frame. The following is a listing of various window types that are utilized on typical residential structures:

- Single Glazing (Unlaminated). The sound insulation provided by single glazing improves with increasing glass thickness. However, the increase is limited in the mid-frequency range by the stiffness of the glass. A single, unlaminated layer of solid glass usually does not provide a rating above 20 for a sealed window and 16 for an operable window.

- Laminated Glass. Laminated glass is two or more layers of glass bonded together by thin plastic interlayers. It can provide higher values of sound transmission class than solid glass of equal thickness. This is because the sound insulation versus thickness of single sheets of glass exhibits a dip at a frequency determined by the stiffness of the glass. The improvement in sound insulation is primarily due to damping by the plastic interlayers that reduce the magnitude of the dip.

- Dual Glazing. Dual glazing is two panes of glass with airspace between them. Dual glazing provides greater sound insulation at high frequencies than does single glazing or laminated glass. The wider the airspace, the greater the sound attenuation.

OITC values increase with the increasing thickness of glass. For glass of a given thickness, sealed windows provide greater sound insulation than operable windows. The overall improvement provided by dual glazing depends primarily on the separation of the layers and glass thickness. Additionally, the use of soft resilient gaskets can reduce sound transmission through cracks around operable windows and may improve their sound attenuating capability drastically. Therefore, this type of weather-stripping can improve transmission loss.

Heating Ventilation and Air Conditioning

In a Heating Ventilation and Air Conditioning (HVAC) system, the components that generate the most sound power are the supply fan (in the air supply system) and the return fan (in the return air system). By definition, a fan is a device for moving air, which utilizes a power-driven rotating impeller. A fan has at least one inlet opening and at least one outlet opening. The opening may or

may not be provided with connections to ductwork.

If an HVAC system does not have good aerodynamic design and efficient operation of the various components, the noise level of fan noise sources may increase in level. The airflow at the entrance and exit of a fan should be as smooth as possible to minimize the generation of turbulence; turbulence results in the generation of noise and an increased static pressure drop in the system. It is recommended that the following measures would be implemented to reduce noise levels associated with HVAC equipment:

- Fittings (such as elbows and transitions) should not be placed closer than 3 to 6 duct diameters downstream from a fan;
- For an HVAC system having a constant volume of airflow, operate the fans generally close to their maximum efficiency;
- For a variable-volume system, a variable-speed drive should be considered to maintain operating efficiency for low volume;
- Avoid any obstruction close to the fan inlet or fan outlet;
- Provide a minimum space of 1.5 duct diameters at the fan inlet or fan outlet;
- Consider the installation of bell-shaped inlet to provide better airflow conditions at the fan; and
- Avoid offsets, abrupt or nonsymmetrical transitions, or offset flexible duct connectors in ductwork since they will be source of turbulence and therefore noise sources.

6.0 Conclusions and Recommendations

The project will comply with the exterior and interior noise level requirements of the City of Sanger provided the following mitigation measures are incorporated into the final project design;

1. Install 6’ Block wall and 2’ landscape berm along the Bethel Avenue and Fairbanks Avenue property lines.
2. With inclusion of the 2 feet high landscape berm and 6 feet high block wall along Bethel Avenue the any single story homes adjacent to Bethel Avenue will not need any additional mitigation, as the indoor noise levels will be below 45 dBA, using standard construction materials.
3. If two story homes are proposed adjacent to Bethel Avenue, then the construction of the buildings second story shall be capable of providing an outdoor-to-indoor noise level reduction (NLR) of approximately 26.8 dB (71.8-45=26.8).
4. For any proposed buildings further than 62’ from the centerline of N. Bethel Avenue, no additional mitigation is needed as the indoor noise levels will be below 45 dBA, using standard construction materials.

The conclusions and recommendations of this acoustical analysis are based upon the best information available at the time the analysis was prepared concerning the proposed site plan, project grading, building construction and road traffic. Any significant changes in these factors will require a re-evaluation of the findings of this report.

Appendix A: Noise Measurement Data Sheets

Site A

SITE A

date	time	dbA	Leq	Leq 15	dbA 15min	Leq h	Leq h	Leq (24 hr)	Lmin	Lmax	leq+10 pm	leq dn	ldn
11/19/2024	12:58:29 PM	59.1	812830.5					61.8	31.3	78.5			64.7
11/19/2024	1:12:29 PM	61.5	1412537.5	818262.3	59.1								
11/19/2024	1:27:29 PM	59.5	891250.9	627083.8	58.0								
11/19/2024	1:42:29 PM	56.6	457088.2	305799.3	54.9								
11/19/2024	1:57:29 PM	55.5	354813.4	1486835.1	61.7	809495.1	59.1				59.1	809495.1	
11/19/2024	2:12:29 PM	66	3981071.7	2318970.3	63.7								
11/19/2024	2:27:29 PM	52.1	162181.0	875406.6	59.4								
11/19/2024	2:42:29 PM	60.8	1202264.4	1364463.0	61.3								
11/19/2024	2:57:29 PM	71.7	14791083.9	2756844.8	64.4	1828921.2	62.6				62.6	1828921.2	
11/19/2024	3:12:29 PM	73.7	23442288.2	2907242.9	64.6								
11/19/2024	3:27:29 PM	51.8	151356.1	2455335.6	63.9								
11/19/2024	3:42:29 PM	60.6	1148153.6	4789216.3	66.8								
11/19/2024	3:57:29 PM	54	251188.6	1718488.7	62.4	2967570.8	64.7				64.7	2967570.8	
11/19/2024	4:12:29 PM	60.3	1071519.3	1621858.5	62.1								
11/19/2024	4:27:29 PM	65	3162277.7	1615721.0	62.1								
11/19/2024	4:42:29 PM	67.3	5370318.0	6195663.9	67.9								
11/19/2024	4:57:29 PM	52	158489.3	2632247.3	64.2	3016372.7	64.8				64.8	3016372.7	
11/19/2024	5:12:29 PM	48.3	67608.3	3990645.9	66.0								
11/19/2024	5:27:29 PM	63.5	2238721.1	2627708.1	64.2								
11/19/2024	5:42:29 PM	48.9	77624.7	3683984.5	65.7								
11/19/2024	5:57:29 PM	65.7	3715352.3	1509795.3	61.8	2953033.5	64.7				64.7	2953033.5	
11/19/2024	6:12:29 PM	52.7	186208.7	1032779.5	60.1								
11/19/2024	6:27:29 PM	66.8	4786300.9	1737808.1	62.4								
11/19/2024	6:42:29 PM	56.8	478630.1	369823.2	55.7								
11/19/2024	6:57:29 PM	47.5	56234.1	766817.6	58.8	976807.1	59.9				59.9	976807.1	
11/19/2024	7:12:29 PM	40.2	10471.3	782262.5	58.9								
11/19/2024	7:27:29 PM	57.1	512861.4	1555766.6	61.9								
11/19/2024	7:42:29 PM	60.5	1122018.5	1463934.5	61.7								
11/19/2024	7:57:29 PM	38.1	6456.5	351743.4	55.5	1038426.8	60.2				60.2	1038426.8	
11/19/2024	8:12:29 PM	44.5	28183.8	417521.4	56.2								
11/19/2024	8:27:29 PM	51.3	134896.3	464879.3	56.7								
11/19/2024	8:42:29 PM	55.9	389045.1	226743.7	53.6								
11/19/2024	8:57:29 PM	40.6	11481.5	857500.3	59.3	491661.2	56.9				56.9	491661.2	
11/19/2024	9:12:29 PM	51.5	141253.8	544744.4	57.4								
11/19/2024	9:27:29 PM	46.3	42658.0	2378555.0	63.8								
11/19/2024	9:42:29 PM	47.1	51286.1	235595.6	53.7								
11/19/2024	9:57:29 PM	47.7	58884.4	101185.6	50.1	815020.1	59.1				69.1	8150201.4	
11/19/2024	10:12:29 PM	56.4	436515.8	1423049.0	61.5								
11/19/2024	10:27:29 PM	52.4	173780.1	656366.8	58.2								
11/19/2024	10:42:29 PM	49.6	91201.1	2985554.5	64.8								
11/19/2024	10:57:29 PM	34.7	2951.2	18018.5	42.6	1270747.2	61.0				71.0	12707472.1	
11/19/2024	11:12:29 PM	37.3	5370.3	45947.4	46.6								
11/19/2024	11:27:29 PM	42.1	16218.1	75234.2	48.8								
11/19/2024	11:42:29 PM	48.4	69183.1	46136.3	46.6								
11/19/2024	11:57:29 PM	34.4	2754.2	39618.7	46.0	51734.1	47.1				57.1	517341.5	
11/20/2024	12:12:29 AM	37	5011.9	40613.9	46.1								
11/20/2024	12:27:29 AM	42.5	17782.8	404005.7	56.1								
11/20/2024	12:42:29 AM	31.3	1349.0	98439.3	49.9								
11/20/2024	12:57:29 AM	57.6	575439.9	83311.1	49.2	156592.5	51.9				61.9	1565925.0	
11/20/2024	1:12:29 AM	33.4	2187.8	35366.6	45.5								
11/20/2024	1:27:29 AM	37.2	5248.1	11364.3	40.6								
11/20/2024	1:42:29 AM	43.6	22908.7	147907.8	51.7								
11/20/2024	1:57:29 AM	37.5	5623.4	132617.3	51.2	81814.0	49.1				59.1	818140.0	
11/20/2024	2:12:29 AM	40.8	12022.6	19208.4	42.8								
11/20/2024	2:27:29 AM	32.9	1949.8	8457.5	39.3								
11/20/2024	2:42:29 AM	37.9	6166.0	72639.4	48.6								
11/20/2024	2:57:29 AM	48.5	70794.6	98760.1	49.9	49766.3	47.0				57.0	497663.4	
11/20/2024	3:12:29 AM	45.8	38018.9	91771.8	49.6								
11/20/2024	3:27:29 AM	49.6	91201.1	44334.2	46.5								
11/20/2024	3:42:29 AM	37.5	5623.4	83113.6	49.2								
11/20/2024	3:57:29 AM	51.5	141253.8	167158.9	52.2	96594.6	49.8				59.8	965946.3	
11/20/2024	4:12:29 AM	42.8	19054.6	30654.9	44.9								
11/20/2024	4:27:29 AM	42.4	17378.0	472830.2	56.7								
11/20/2024	4:42:29 AM	49.1	81283.1	1104684.4	60.4								
11/20/2024	4:57:29 AM	49.8	95499.3	357654.0	55.5	491455.9	56.9				66.9	4914559.0	
11/20/2024	5:12:29 AM	59.4	870963.6	821620.3	59.1								
11/20/2024	5:27:29 AM	52.5	177827.9	115340.1	50.6								
11/20/2024	5:42:29 AM	67.8	6025595.9	805737.4	59.1								
11/20/2024	5:57:29 AM	52.9	194984.5	590326.4	57.7	583256.0	57.7				67.7	5832560.3	
11/20/2024	6:12:29 AM	64.8	3019951.7	895507.3	59.5								
11/20/2024	6:27:29 AM	49.8	95499.3	1064736.1	60.3								
11/20/2024	6:42:29 AM	60.6	1148153.6	939780.5	59.7								
11/20/2024	6:57:29 AM	69.6	9120108.4	1692403.0	62.3	1148106.7	60.6				70.6	11481067.4	
11/20/2024	7:12:29 AM	56.3	426579.5	6394365.9	68.1								
11/20/2024	7:27:29 AM	63.6	2290867.7	2372195.0	63.8								
11/20/2024	7:42:29 AM	67.3	5370318.0	2117136.3	63.3								
11/20/2024	7:57:29 AM	56.4	436515.8	5275843.3	67.2	4039885.1	66.1				66.1	4039885.1	
11/20/2024	8:12:29 AM	59.7	933254.3	2357670.4	63.7								
11/20/2024	8:27:29 AM	57.5	562341.3	1730339.7	62.4								

SITE A

date	time	dbA	Leq	Leq 15	dbA 15min	Leq h	Leq h	Leq (24 hr)	Lmin	Lmax	leq+10 pm	leq dn	ldn
11/20/2024	8:42:29 AM	59.3	851138.0	1696972.0	62.3								
11/20/2024	8:57:29 AM	62.3	1698243.7	1906893.0	62.8	1922968.8	62.8				62.8	1922968.8	
11/20/2024	9:12:29 AM	63.5	2238721.1	2927676.1	64.7								
11/20/2024	9:27:29 AM	78.5	70794578.4	9616978.6	69.8								
11/20/2024	9:42:29 AM	69	7943282.3	7788145.3	68.9								
11/20/2024	9:57:29 AM	63.1	2041737.9	3830455.7	65.8	6040813.9	67.8				67.8	6040813.9	
11/20/2024	10:12:29 AM	68.4	6918309.7	4022943.2	66.0								
11/20/2024	10:27:29 AM	60.5	1122018.5	4718035.1	66.7								
11/20/2024	10:42:29 AM	55.3	338844.2	2913526.0	64.6								
11/20/2024	10:57:29 AM	61.7	1479108.4	536608.9	57.3	3047778.3	64.8				64.8	3047778.3	
11/20/2024	11:12:29 AM	44.8	30199.5	1290531.1	61.1								
11/20/2024	11:27:29 AM	44.5	28183.8	151908.0	51.8								
11/20/2024	11:42:29 AM	44.8	30199.5	535133.3	57.3								
11/20/2024	11:57:29 AM	68.3	6760829.8	738377.1	58.7	678987.4	58.3				58.3	678987.4	
11/20/2024	12:12:29 PM	55.4	346736.9	3311313.1	65.2								
11/20/2024	12:27:29 PM	47	50118.7	1189036.5	60.8								
11/20/2024	12:42:29 PM	49	79432.8	1514103.0	61.8								
11/20/2024	12:57:29 PM	46.9	48977.9	943790.5	59.7	1739560.8	62.4				62.4	1739560.8	
11/20/2024	12:58:29 PM	58.4	691831.0										

Site B

SITE B

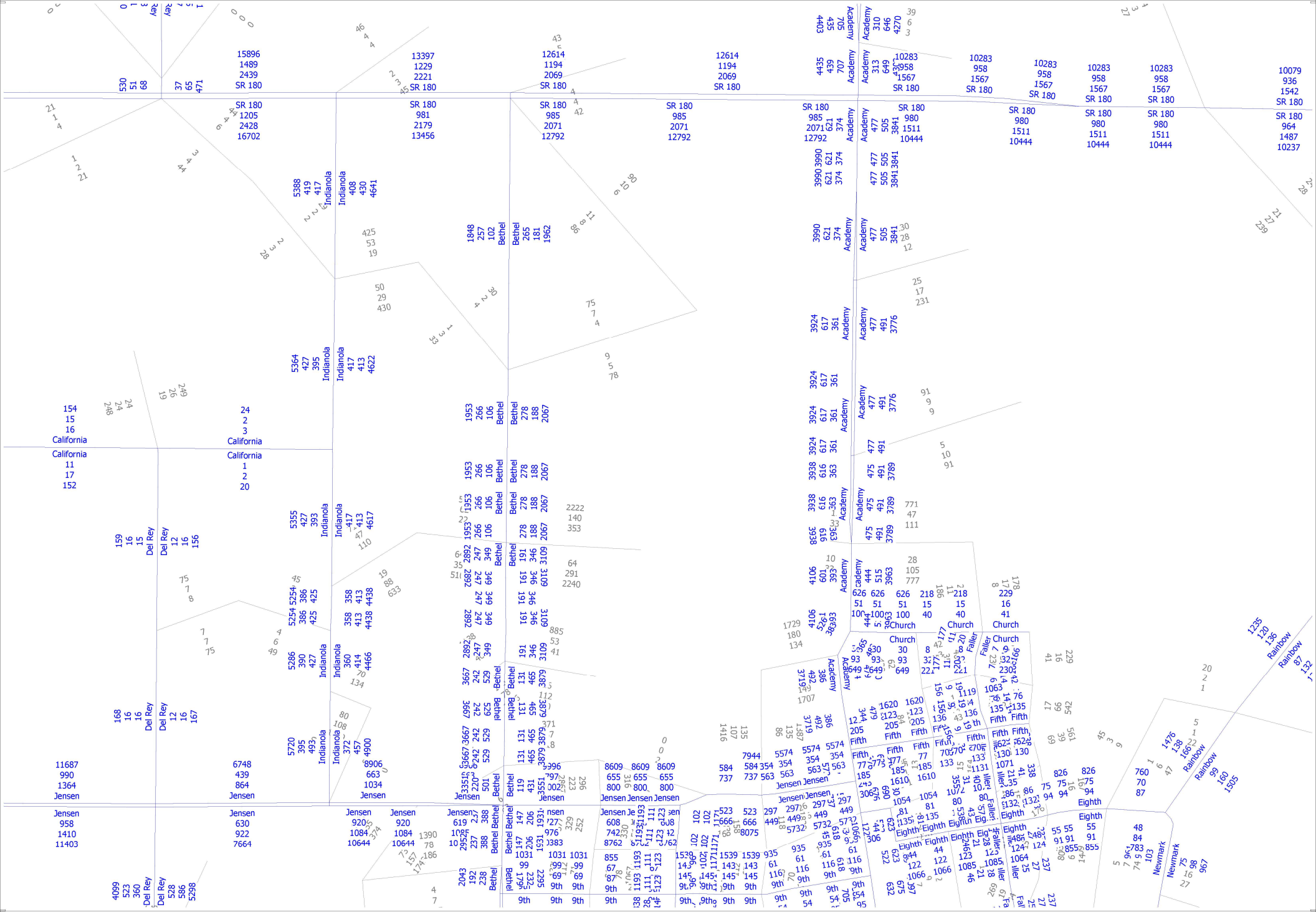
date	time	dbA	Leq	Leq 15	dbA 15min	Leq h	Leq h	Leq (24 hr)	Lmin	Lmax	leq+10 pm	leq dn	ldn
11/19/2024	9:21:42 AM	36.00	3981.1					60.3	31.2	78.0			65.4
11/19/2024	9:35:42 AM	58.80	758577.6	637677.7	58.0								
11/19/2024	9:50:42 AM	49.60	91201.1	696462.3	58.4								
11/19/2024	10:05:42 AM	50.60	114815.4	1073951.1	60.3								
11/19/2024	10:20:42 AM	47.40	54954.1	938713.4	59.7	836701.1	59.2				59.2	836701.1	
11/19/2024	10:35:42 AM	43.30	21379.6	400097.5	56.0								
11/19/2024	10:50:42 AM	68.60	7244359.6	920156.2	59.6								
11/19/2024	11:05:42 AM	49.40	87096.4	265500.8	54.2								
11/19/2024	11:20:42 AM	44.80	30199.5	961280.3	59.8	636758.7	58.0				58.0	636758.7	
11/19/2024	11:35:42 AM	60.90	1230268.8	1120785.3	60.5								
11/19/2024	11:50:42 AM	43.00	19952.6	833048.5	59.2								
11/19/2024	12:05:42 PM	56.30	426579.5	405470.2	56.1								
11/19/2024	12:20:42 PM	60.00	1000000.0	277260.8	54.4	659141.2	58.2				58.2	659141.2	
11/19/2024	12:35:42 PM	42.40	17378.0	5572765.4	67.5								
11/19/2024	12:50:42 PM	47.20	52480.7	787404.5	59.0								
11/19/2024	1:05:42 PM	46.30	42658.0	695008.0	58.4								
11/19/2024	1:20:42 PM	44.20	26302.7	952531.0	59.8	2001927.2	63.0				63.0	2001927.2	
11/19/2024	1:35:42 PM	53.10	204173.8	1329589.0	61.2								
11/19/2024	1:50:42 PM	54.10	257039.6	664647.9	58.2								
11/19/2024	2:05:42 PM	53.80	239883.3	892082.1	59.5								
11/19/2024	2:20:42 PM	64.20	2630268.0	387961.1	55.9	818570.0	59.1				59.1	818570.0	
11/19/2024	2:35:42 PM	54.00	251188.6	787838.5	59.0								
11/19/2024	2:50:42 PM	47.00	50118.7	959581.8	59.8								
11/19/2024	3:05:42 PM	59.10	812830.5	1404308.6	61.5								
11/19/2024	3:20:42 PM	64.20	2630268.0	2210346.7	63.4	1340518.9	61.3				61.3	1340518.9	
11/19/2024	3:35:42 PM	63.00	1995262.3	1039271.6	60.2								
11/19/2024	3:50:42 PM	62.00	1584893.2	3122597.1	64.9								
11/19/2024	4:05:42 PM	68.70	7413102.4	2826487.4	64.5								
11/19/2024	4:20:42 PM	56.80	478630.1	872270.1	59.4	1965156.6	62.9				62.9	1965156.6	
11/19/2024	4:35:42 PM	60.40	1096478.2	3894191.7	65.9								
11/19/2024	4:50:42 PM	62.20	1659586.9	2584944.7	64.1								
11/19/2024	5:05:42 PM	61.30	1348962.9	1280460.3	61.1								
11/19/2024	5:20:42 PM	60.70	1174897.6	2233845.5	63.5	2498360.6	64.0				64.0	2498360.6	
11/19/2024	5:35:42 PM	67.90	6165950.0	1296622.6	61.1								
11/19/2024	5:50:42 PM	53.70	234422.9	1727741.3	62.4								
11/19/2024	6:05:42 PM	58.90	776247.1	1353466.4	61.3								
11/19/2024	6:20:42 PM	60.70	1174897.6	1188492.7	60.7	1391580.8	61.4				61.4	1391580.8	
11/19/2024	6:35:42 PM	55.60	363078.1	1830513.1	62.6								
11/19/2024	6:50:42 PM	54.00	251188.6	644774.4	58.1								
11/19/2024	7:05:42 PM	39.60	9120.1	1033185.3	60.1								
11/19/2024	7:20:42 PM	55.60	363078.1	1107383.8	60.4	1153964.2	60.6				60.6	1153964.2	
11/19/2024	7:35:42 PM	58.80	758577.6	825784.3	59.2								
11/19/2024	7:50:42 PM	38.60	7244.4	665563.5	58.2								
11/19/2024	8:05:42 PM	40.40	10964.8	866717.6	59.4								
11/19/2024	8:20:42 PM	52.00	158489.3	2568082.1	64.1	1231536.9	60.9				60.9	1231536.9	
11/19/2024	8:35:42 PM	44.00	25118.9	774454.8	58.9								
11/19/2024	8:50:42 PM	59.90	977237.2	625322.9	58.0								
11/19/2024	9:05:42 PM	39.90	9772.4	196482.0	52.9								
11/19/2024	9:20:42 PM	52.30	169824.4	358765.2	55.5	488756.2	56.9				56.9	488756.2	
11/19/2024	9:35:42 PM	45.40	34673.7	225039.5	53.5								
11/19/2024	9:50:42 PM	43.80	23988.3	40570.4	46.1								
11/19/2024	10:05:42 PM	39.00	7943.3	382579.2	55.8								
11/19/2024	10:20:42 PM	57.10	512861.4	507859.2	57.1	289012.1	54.6				64.6	2890120.8	
11/19/2024	10:35:42 PM	46.70	46773.5	827569.1	59.2								
11/19/2024	10:50:42 PM	53.20	208929.6	66888.6	48.3								
11/19/2024	11:05:42 PM	47.60	57544.0	128940.8	51.1								
11/19/2024	11:20:42 PM	58.50	707945.8	143292.1	51.6	291672.7	54.6				64.6	2916726.7	
11/19/2024	11:35:42 PM	36.20	4168.7	1344684.9	61.3								
11/19/2024	11:50:42 PM	64.80	3019951.7	262324.4	54.2								
11/20/2024	12:05:42 AM	55.10	323593.7	484072.3	56.8								
11/20/2024	12:20:42 AM	43.40	21877.6	202101.1	53.1	573295.7	57.6				67.6	5732957.0	
11/20/2024	12:35:42 AM	35.90	3890.5	314775.0	55.0								
11/20/2024	12:50:42 AM	41.60	14454.4	29754.2	44.7								
11/20/2024	1:05:42 AM	55.50	354813.4	81431.5	49.1								
11/20/2024	1:20:42 AM	50.70	117489.8	28016.5	44.5	113494.3	50.5				60.5	1134942.8	
11/20/2024	1:35:42 AM	44.90	30903.0	17009.1	42.3								
11/20/2024	1:50:42 AM	38.50	7079.5	312689.9	55.0								
11/20/2024	2:05:42 AM	35.70	3715.4	25087.0	44.0								
11/20/2024	2:20:42 AM	32.70	1862.1	39736.0	46.0	98630.5	49.9				59.9	986305.2	
11/20/2024	2:35:42 AM	35.40	3467.4	64784.5	48.1								
11/20/2024	2:50:42 AM	58.50	707945.8	450307.2	56.5								
11/20/2024	3:05:42 AM	51.20	131825.7	44392.2	46.5								
11/20/2024	3:20:42 AM	43.00	19952.6	104034.6	50.2	165879.6	52.2				62.2	1658796.0	
11/20/2024	3:35:42 AM	33.50	2238.7	37586.4	45.8								
11/20/2024	3:50:42 AM	56.70	467735.1	105253.6	50.2								
11/20/2024	4:05:42 AM	42.20	16595.9	79015.0	49.0								
11/20/2024	4:20:42 AM	53.10	204173.8	265051.2	54.2	121726.5	50.9				60.9	1217265.1	
11/20/2024	4:35:42 AM	60.70	1174897.6	1201088.4	60.8								
11/20/2024	4:50:42 AM	58.00	630957.3	238615.0	53.8								

SITE B

date	time	dbA	Leq	Leq 15	dbA 15min	Leq h	Leq h	Leq (24 hr)	Lmin	Lmax	leq+10 pm	leq dn	ldn
11/20/2024	5:05:42 AM	42.60	18197.0	940708.9	59.7								
11/20/2024	5:20:42 AM	61.90	1548816.6	662593.2	58.2	760751.4	58.8				68.8	7607513.7	
11/20/2024	5:35:42 AM	55.90	389045.1	600227.3	57.8								
11/20/2024	5:50:42 AM	57.50	562341.3	4801392.0	66.8								
11/20/2024	6:05:42 AM	61.10	1288249.6	777504.6	58.9								
11/20/2024	6:20:42 AM	60.30	1071519.3	1054210.1	60.2	1808333.5	62.6				72.6	18083335.2	
11/20/2024	6:35:42 AM	62.70	1862087.1	2698728.3	64.3								
11/20/2024	6:50:42 AM	49.50	89125.1	1816880.8	62.6								
11/20/2024	7:05:42 AM	57.20	524807.5	1866943.2	62.7								
11/20/2024	7:20:42 AM	66.20	4168693.8	2459832.7	63.9	2210596.3	63.4				73.4	22105962.6	
11/20/2024	7:35:42 AM	66.30	4265795.2	3462800.1	65.4								
11/20/2024	7:50:42 AM	60.20	1047128.5	1747005.1	62.4								
11/20/2024	8:05:42 AM	63.30	2137962.1	1446058.3	61.6								
11/20/2024	8:20:42 AM	59.40	870963.6	1474665.9	61.7	2032632.3	63.1				63.1	2032632.3	
11/20/2024	8:35:42 AM	64.80	3019951.7	4858695.6	66.9								
11/20/2024	8:50:42 AM	61.20	1318256.7	761954.3	58.8								
11/20/2024	9:05:42 AM	53.80	239883.3	1044563.0	60.2								
11/20/2024	9:20:42 AM	56.00	398107.2	1167108.8	60.7	1958080.4	62.9				62.9	1958080.4	
11/20/2024	9:21:42 AM	59.20	831763.8										

Appendix B: FresnoCOG Traffic Models

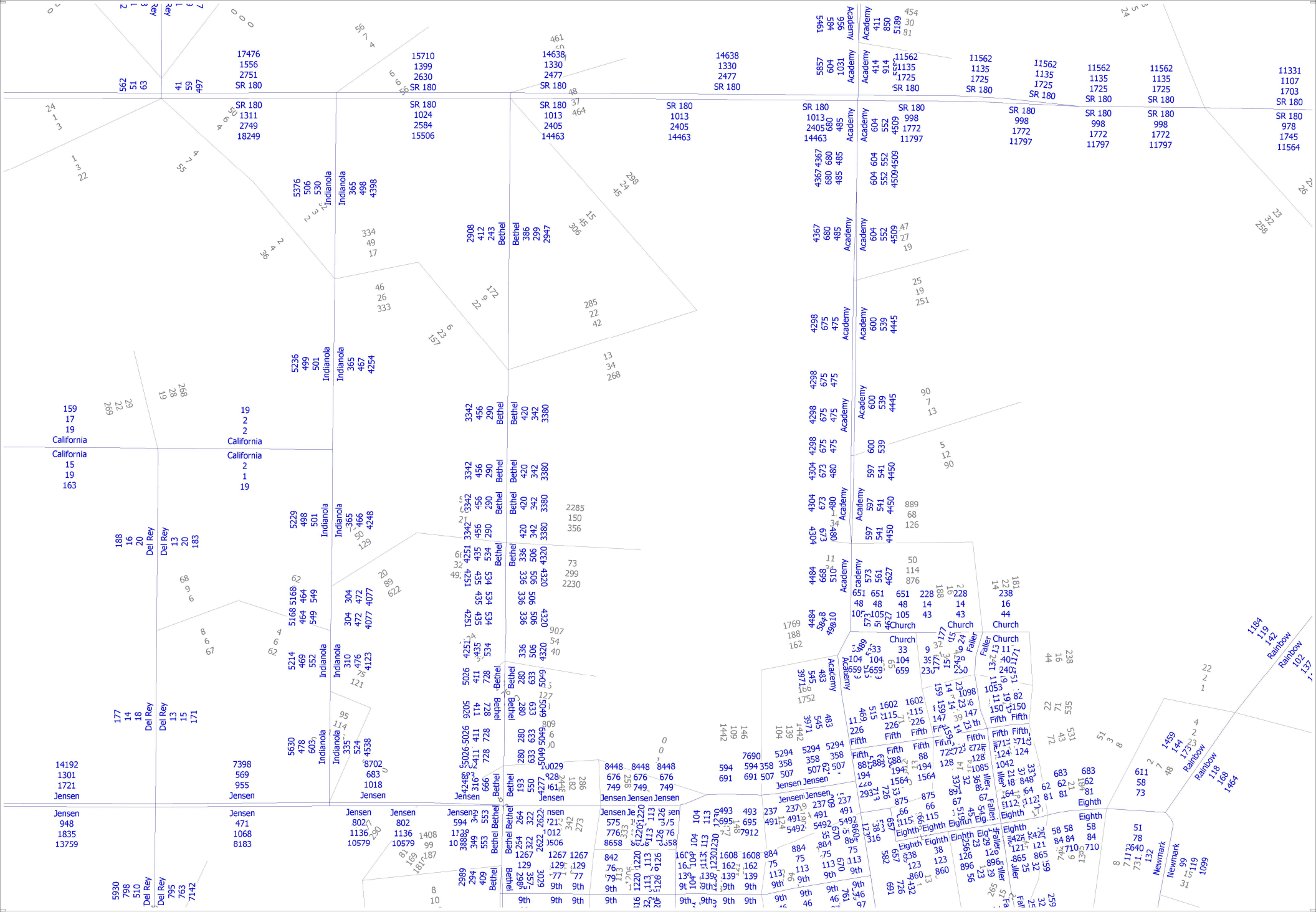
2019 FresnoCOG Traffic Models



cube

(Licensed to San Joaquin Valley Regional Planning Age)

2035 FresnoCOG Traffic Models



cube

(Licensed to San Joaquin Valley Regional Planning Age)

Appendix C: TNM BARRIER ANALYSIS

REPORT:	**Results: Sound Levels - Input Heights**		
TNM VERSION:	3.2.8741.34338	REPORT DATE:	31 January 2025
CALCULATED WITH:	TNM v3.2.8741.34338	CALCULATION DATE:	1/31/2025 11:28:03 AM
CASE:	TRACT 6504	ORGANIZATION:	VICE
ANALYSIS BY:	KEN VANG	PROJECT/CONTRACT:	24-094
DEFAULT GROUND TYPE:	HardSoil		
ATMOSPHERICS:	68°F, 50%	Average pavement type shall be used unless a state highway agency	
PAVEMENT TYPE(S) USED:	Average	substantiates the use of a different type with approval of FHWA.	

			Noise Reduction			Barrier Cost			
			Min	Avg	Max	Area / Volume	Lineal	Total	Total/DUs
Results for:		DUs	dB	dB	dB	$	$	$	$
Receivers in the Barrier Design:	All	2	0.0	5.3	10.5	1	0	1	0
	All Impacted	2	0.0	5.3	10.5	1	0	1	0
Meeting Noise Reduction Goal:	All	1	10.5	10.5	10.5	1	0	1	1
	All Impacted	1	10.5	10.5	10.5	1	0	1	1

RECIEVER 1 IS SOUND LEVEL AT ADJACENT RESIDENTIAL

SOUND LEVEL WITH WALL

				Modeled Traffic Noise L								
				All Abatement Barriers at Zero Height						With Abatement Barriers		
				LAeq		Increase over Existing				Noise Reduction		Calc.
Name	No.	DUs	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact	Calc. LAeq	Calc.	Goal	Minus Goal
			dBA	dBA	dBA	dBA	dBA		dBA	dBA	dBA	dBA
Receiver-1	1	1	54.0	75.0	65.0	21.0	10.0	Both	64.5	10.5	0.0	10.5
Receiver-3	3	1	96.0	83.3	0.0	-12.7	10.0	Sound Level	83.3	0.0	0.0	0.0

RECIEVER 3 IS SOUND LEVEL AT UPRR

SOUND LEVEL WITHOUT WALL