Noise Study Report
GOLDEN STATE CORRIDOR DEVELOPMENT

This Noise Study Report (NSR) has been prepared for the purpose of identifying potential noise impacts that may result from the proposed Golden State Corridor Development (Project). The proposed area of study is along Golden State Boulevard, a 14.2-mile stretch of Old Highway 99 generally from American Avenue to the Tulare County line.

1.0 INTRODUCTION

1.1 DESCRIPTION OF THE PROJECT/REGION

The proposed Project limits are approximately 200 feet south of American Avenue in Fowler, to the terminus point of Golden State Boulevard near Mission Street in Kingsburg. The Project width is 300 feet wide, centered on the current Golden State Boulevard centerline. The area of study passes through the cities of Fowler, Selma, and Kingsburg, and unincorporated areas under the responsibility of the County of Fresno.

The proposed Project lies within the central portion of the San Joaquin Valley. The proposed Project is located on the Valley floor at an elevation of approximately 300 feet above sea level with the surrounding area mostly flat. Figures 1-1 and 1-2 show the location of the Project along with major roadways and highways.

1.2 PURPOSE AND NEED

The purpose of the Golden State Corridor Development is to maximize the economic development potential of the Golden State Corridor. This corridor contains the “Old Highway 99”, a historic four-lane roadway that connects the three cities. The four jurisdictions, along with Council of Fresno County Governments (Fresno COG), have developed a common vision and goals for the Corridor that encompass the desires of the adjacent communities in the areas and land use, preserving the agricultural industry, protecting the environment, promoting tourism and recreation, encouraging and supporting economic development, and fostering new partnerships focused on economic success.

1.3 EXISTING ROADWAY NETWORK

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the type of service they are intended to provide. Fundamental to this process is the recognition that individual streets and highways do not serve travel independently in any major way. Rather, most travel involves movement through a network of roads. Local major roadways within the vicinity of the proposed Project include:

- **State Routes** - are roadway facilities maintained by the Caltrans. Caltrans manages more than 50,000 miles of California's highway and freeway systems.

Regional Location

Figure 1-1

Legend

★ Project Location

Project Location

Figure 1-2

Legend

🟥 Project Location

  - **State Route 201 –** currently exists as a two-lane highway from east of State Route 99 to Kingsburg to State Route 245 in Elderwood. It has a posted speed limit of 35 mph within the City of Kingsburg and a posted speed limit of 55 mph east of Kingsburg.
  - **State Route 99 –** currently exists as a six-lane freeway from Kingsburg to Fowler, and includes a total of 9 interchanges. According to the California Department of Transportation's website, the average annual daily traffic (AADT) along SR 99 in this area consisted of approximately 74,000 trips in 2010.

- **Expressways** – are high-speed, four- to six-lane divided roadways, primarily servicing through and cross-town traffic, with no direct access to abutting property and at-grade intersections located at approximately half-mile intervals.

  - **Mountain View Avenue (East of SR 99) -** currently a divided four-lane road without bike lanes, with a posted speed limit of 45 mph.
  - **Temperance Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 30 mph.

- **Super Arterials** – Four-to six-lane divided roadways with a primary purpose of moving traffic to and from major traffic generators and between community plan areas. Access will typically be limited to right-turn entrance and exit vehicular movements.

  - **Golden State Boulevard –** currently a divided four-lane road with bike lanes at various sections, with a posted speed limit of 35 – 65 mph.
  - **Highland Avenue –** currently a divided four-lane road without bike lanes, with a posted speed limit of 40 mph.

- **Arterials** – Four- to six-lane divided roadways, with somewhat limited access to abutting properties, and with the primary purpose of moving traffic within and between community plan areas and to and from freeways and expressways.

  - **American Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 45 mph.
  - **Manning Avenue –** currently a divided four-lane road without bike lanes, with a posted speed limit of 50 mph.
  - **Mountain View Avenue (West of SR 99) -** currently a divided four-lane road without bike lanes, with a posted speed limit of 45 mph.
  - **Floral Avenue –** currently an undivided four-lane road without bike lanes, with a posted speed limit of 40 mph.
  - **2nd Street –** currently an undivided four-lane road without bike lanes, with a posted speed limit of 30 mph.
  - **Dinuba Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 40 mph.
  - **Highland Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 35 mph.
  - **Kamm/Bethel Avenue –** currently an undivided two-lane road without bike lanes, with a speed limit of 40 mph.
  - **Draper Street –** currently an undivided two-lane road without bike lanes, with a posted

speed limit of 25 mph.

  - **Whitson Street -** currently a divided four-lane road without bike lanes, with a posted speed limit of 40 mph.
  - **Clovis Avenue -** currently a divided four-lane road with bike lanes, with a posted speed limit of 45 mph.

- **Local Routes** – Two to four-lane undivided roadways, with the primary function of connecting local streets and arterials and neighborhood traffic generators and providing access to abutting properties.

  - **Adams Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 35 mph.
  - **Mariposa Street –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 30 mph.
  - **Merced Street –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 35 mph.
  - **Vine Street –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 30 mph.
  - **South Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 40 mph.
  - **Valley Drive –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 35 mph.
  - **Thompson Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 25 mph.
  - **Nebraska Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 35 mph.
  - **Dockery Avenue –** currently an undivided two-lane road without bike lanes, with a posted speed limit of 15 mph.
  - **Saginaw Avenue –** currently an undivided two-lane road without bike lanes, with a speed limit of 40 mph.
  - **Stroud Avenue –** currently an undivided two-lane road without bike lanes, with a speed limit of 40 mph.
  - **Sierra Street –** currently an undivided four-lane road without bike lanes, with a speed limit of 35 mph.
  - **De Wolf Avenue –** currently an undivided two-lane road without bike lanes, with a speed limit of 30 mph.
  - **Clayton Avenue -** currently an undivided two-lane road without bike lanes, with a speed limit of 35 mph.

1.4 SOUND AND THE HUMAN EAR

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude. Sound pressure amplitude is measured in units of micro-Newton per square meter (N/m2), also called micro-Pascal (µPa). One µPa is approximately one-hundred billionth (0.00000000001) of normal atmospheric pressure. The pressure of a very loud sound may be 200 million µPa, or 10 million times the pressure of the weakest audible sound (20 µPa). Because expressing sound levels in terms of µPa would be very cumbersome, sound pressure level (SPL) is used instead to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander Graham Bell. To provide a finer resolution, a bel is subdivided into 10 decibels, abbreviated dB.

1.4.1 A-Weighted Decibels

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear. Human hearing is limited not only in the range of audible frequencies but also in the way it perceives the SPL in that range. In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound of higher or lower frequency with the same magnitude. To approximate the frequency response of the human ear, a series of SPL adjustments is usually applied to the sound measured by a sound level meter. The adjustments (referred to as a weighting network) are frequency dependent. The A-scale weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-scale, C-scale, D-scale), but these scales are rarely, if ever, used in conjunction with highway traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted dBAs. In environmental noise studies, A-weighted SPLs are commonly referred to as noise levels.

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance, and habituation to noise over differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment, referred to as the "ambient" environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by the hearers. With regard to increases in A-weighted noise level, knowledge of the following relationships will be helpful in understanding this report:

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans.
- Outside of the laboratory, a 3 dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected.
- A 10 dB change is subjectively heard as approximately a doubling in loudness.

1.4.2 Sound Pressure Levels and Decibels

Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels. The sound pressure level in decibels is calculated by taking the log of the ratio between the actual sound pressure and the reference sound pressure squared. The reference sound pressure is considered the absolute hearing threshold. In addition, because the human ear is not equally sensitive to all sound frequencies, a specific frequency-dependent rating scale was devised to relate noise to human sensitivity. A dBA scale performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. The basis for comparison is the faintest sound audible to the average ear at the frequency of maximum sensitivity. This dBA scale has been chosen by most authorities for purposes of environmental noise regulation. Typical indoor and outdoor noise levels are presented in Figure 1-3.

1.4.3 Sound, Noise, and Acoustics

Sound is a disturbance created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid and is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a hearing organ, such as a human ear. For traffic sound, the medium of concern is air. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. Sound is actually a process that consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Likewise, without a medium to transmit sound pressure waves, there is also no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound.

1.4.4 Frequency and Hertz

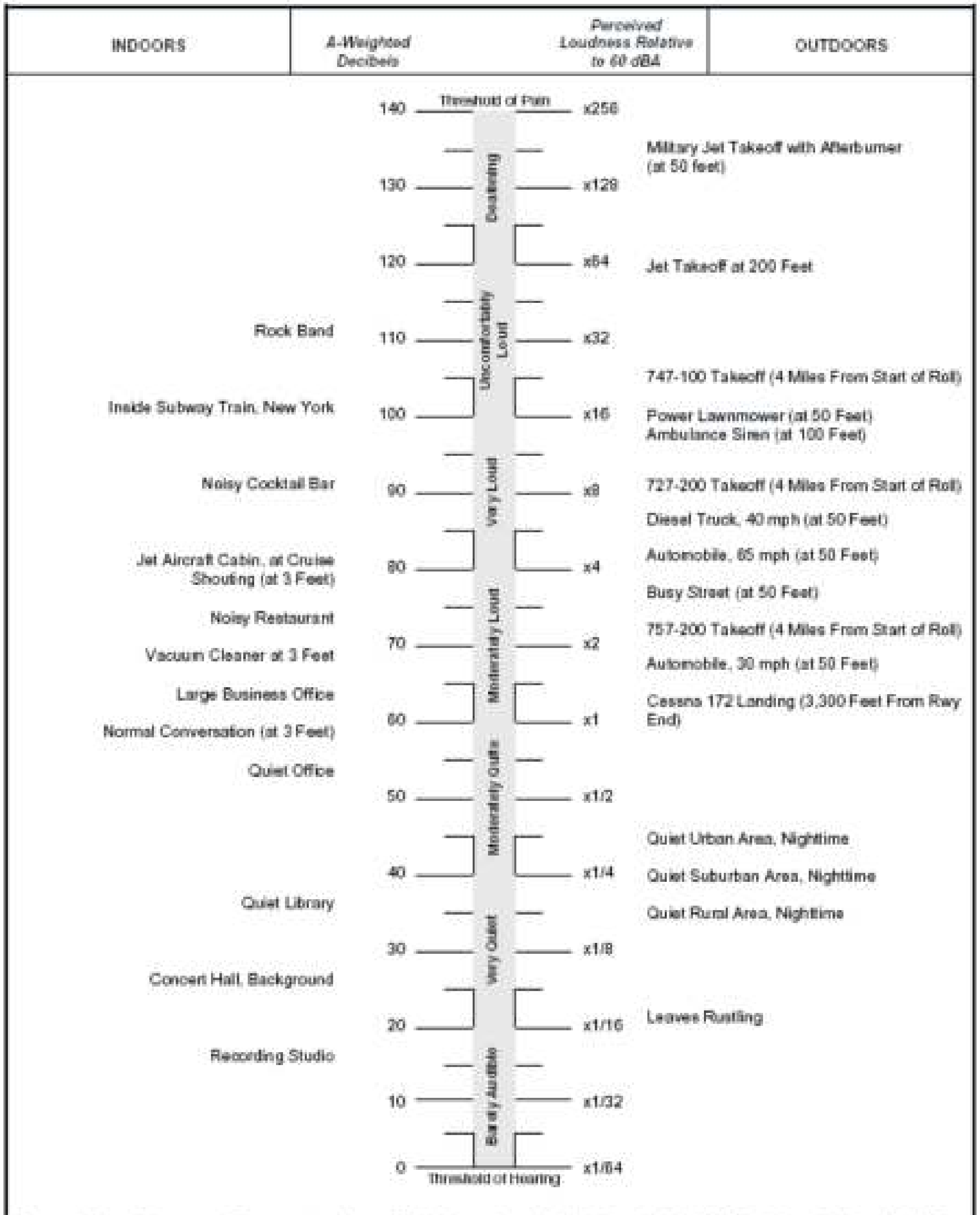
A continuous sound can be described by its frequency (pitch) and its amplitude (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilo-Hertz (kHz), or thousands of Hertz. The extreme range of frequencies that can be heard by the healthiest human ear spans from 16–20 Hz on the low end to about 20,000 Hz (or 20 kHz) on the high end.

1.4.5 Addition of Decibels

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dBA as it passes an observer, two cars passing simultaneously would not produce 140 dBA; they would, in fact, combine to produce 73 dBA. When two sounds of equal SPL are combined, they will produce a combined SPL 3 dBA greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3 dBA increase. If two sound levels differ by 10 dBA or more, the combined SPL is equal to the higher SPL; in other words, the lower sound level does not increase the higher sound level.

1.5 CHARACTERISTICS OF SOUND PROPAGATION AND ATTENUATION

Noise can be generated by a number of sources, including mobile sources such as automobiles, trucks, and airplanes, and stationary sources such as construction sites, machinery, and industrial operations. Noise generated by mobile sources typically attenuates (is reduced) at a rate between 3.0 and 4.5 dBA per doubling of distance. The rate depends on the ground surface and the number or type of objects between



Sources: California Department of Transportation, January 2002, *California Airport Land Use Planning Handbook*; M. David Egan, McGraw Hill, 1972, *Concepts in Architectural Acoustics*; and U.S. Department of Housing and Urban Development, Office of Community Planning and Development, *The Noise Guidebook*.

Common Environmental Sound Levels

Figure 1-3

Legend

the noise source and the receiver. Hard and flat surfaces, such as concrete or asphalt, have an attenuation rate of 3.0 dBA per doubling of distance. Soft surfaces, such as uneven or vegetated terrain, have an attenuation rate of about 4.5 dBA per doubling of distance. Noise generated by stationary sources typically attenuates at a rate between 6.0 and about 7.5 dBA per doubling of distance. Sound levels can be reduced by placing barriers between the noise source and the receiver. In general, barriers contribute to decreasing noise levels only when the structure breaks the “line of sight” between the source and the receiver. Buildings, concrete walls, and berms can all act as effective noise barriers. Wooden fences or broad areas of dense foliage can also reduce noise, but are less effective than solid barriers.

1.5.1 Noise Descriptors

Noise in the daily environment fluctuates over time. Some of the fluctuations are minor; some are substantial. Some noise levels occur in regular patterns; others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely; others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a list of the noise descriptors most commonly used in traffic noise analysis:

- **Equivalent Sound Level (Leq) -** Leq represents an average of the sound energy occurring over a specified period. Leq is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The one-hour A-weighted equivalent sound level, Leq(h), is the energy average of the A-weighted sound levels occurring during a one-hour period and is the basis for the Noise Abatement Criteria (NAC) used by the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA).
- **Percentile-Exceeded Sound Level (Lx) -** Lx represents the sound level exceeded for a given percentage of a specified period. For example, L10 is the sound level exceeded 10 percent of the time, and L90 is the sound level exceeded 90 percent of the time.
- **Maximum Sound Level (Lmax) -** Lmax is the highest instantaneous sound level measured during a specified period.

1.5.2 Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise reduces with distance depends on the following factors:

- **Geometric Spreading -** Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of six dBA for each doubling of distance. Highway noise is not a single, stationary point source of sound. The movement of the vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a line source) rather than a point. This line source results in cylindrical spreading rather than the spherical spreading that results from a point source. The change in sound level from a line source is three dBA per doubling of distance.
- **Ground Absorption -** Most often, the noise path between the highway and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been

expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 60 m (200 ft), prediction results based on this scheme are sufficiently accurate. For acoustically hard sites (i.e., those sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between the source and the receiver), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

- **Atmospheric Effects -** Research by Caltrans and others has shown that atmospheric conditions can have a significant effect on noise levels within 60 m (200 ft) of a highway. Wind has been shown to be the most important meteorological factor within approximately 150 m (500 ft) of the source, whereas vertical air temperature gradients are more important for greater distances. Other factors such as air temperature, humidity, and turbulence also have significant effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur as a result of temperature inversion conditions (i.e., increasing temperature with elevation).
- **Shielding by Natural and Human-Made Features -** A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction.

1.6 METHODOLOGY

When preparing an NSR, guidelines set by affected agencies must be followed. Acoustical terminology used for this NSR is documented in Appendix A. In analyzing noise levels, the FHWA Highway Traffic Noise Prediction methodology must be applied. Safety concerns must also be analyzed to determine the need for appropriate mitigation resulting from increased noise due to increased traffic and other evaluations such as the need for noise barriers and other noise abatement improvements. Unless otherwise stated, all sound levels reported are in A-weighted decibels (dBA). 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 use A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

1.6.1 California Environmental Quality Act

CEQA requires a strictly no-build versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless such measures are not feasible.

1.6.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is a federal law that establishes environmental policy for the nation, provides an interdisciplinary framework for federal agencies to prevent environmental damage, and contains action-forcing procedures to ensure that federal agency decision makers take environmental factors into account. Under the NEPA, impacts and measures to mitigate adverse impacts must be identified, including the identification of impacts for which no mitigation or only partial mitigation is available. The FHWA regulations discussed below constitute the federal noise standard. Projects complying with this standard are also in compliance with the requirements stemming from NEPA.

1.6.3 FHWA Regulations

Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) provides procedures for conducting highway project noise studies and implementing noise abatement measures to help protect the public health and welfare, supply NAC, and establish requirements for information to be given to local officials for use in planning and designing highways. Under this regulation, noise abatement must be considered for a Type I project if the project is predicted to result in a traffic noise impact. A traffic noise impact is considered to occur when the project results in a substantial noise increase or when the predicted noise levels approach or exceed the NAC specified in the regulation. Title 23, Part 772 of the Code of Federal Regulations does not specifically define what constitutes a substantial increase or the term approach; rather, it leaves interpretation of these terms to the states. Before adoption of a final environmental document, Caltrans shall identify noise abatement measures that are feasible and reasonable as well as noise impacts for which no apparent solution is available. Noise abatement measures that are feasible and reasonable are then incorporated into the project's plans and specifications to reduce or eliminate the noise impact on existing activities, developed lands, or undeveloped lands for which development is planned, designed, and programmed. Table 1-1 summarizes the FHWA NAC.

1.6.4 Study Methods and Procedures

Site Selection

Developed and undeveloped land uses in the project vicinity were identified through land use maps, aerial photography, and site inspection. Within each land use category, sensitive receptors were then identified. Land uses in the project vicinity include single-family residences, industrial, agricultural, and commercial uses. The generalized land use data and location of particular sensitive receptors were the basis for the selection of the noise monitoring and analysis sites. A total of nine (9) receptor locations were modeled to represent residences, industrial, agricultural, and commercial land uses in the project vicinity. These modeled receptor locations are shown in Figures 1-4a through 1-4c.

Noise Level Measurement Program

Existing noise levels in the project vicinity were sampled during the PM peak hour. All measurements were made using an Extech Type 2 sound level meter datalogger.

Table 1-1

Noise Abatement Criteria

ACTIVITY CATEGORY	ACTIVITY Leq[h]1	EVALUATION LOCATION	DESCRIPTION OF ACTIVITIES
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	Undeveloped lands that are not permitted.

Source: Federal Highway Administration. Highway Traffic Noise Analysis and Abatement Policy and Guidance. FHWA 23 CFR 772.

1: The Leq(h) activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

2: Includes undeveloped lands permitted for this activity category.

Receptor Location

Figure 1-4a

Legend

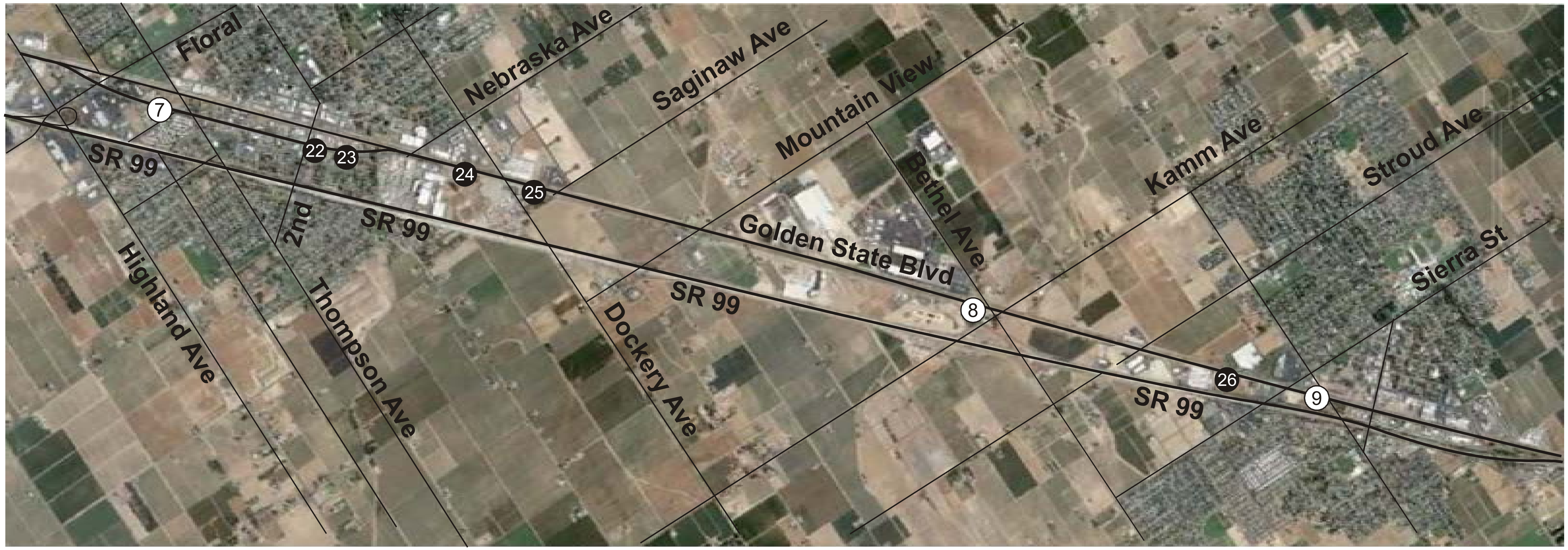
- ⓘ Field Receptor Sites
- ● Model Receptor Sites

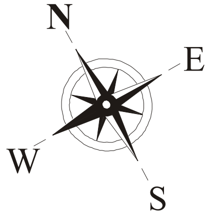
Receptor Location

Figure 1-4b

Legend

○	Field Receptor Sites
●	Model Receptor Sites





NOT TO SCALE

Receptor Location

Figure 1-4c

Legend

- ○ Field Receptor Sites
- ● Model Receptor Sites

The following measurement procedure was utilized:

- Calibrate sound level meter.
- Set up sound level meter at a height of 1.5 m (5 ft).
- Commence noise monitoring.
- Collect site-specific data such as date, time, direction of traffic, and distance from sound level meter to the right-of-way.
- Count passing vehicles for a period of 15 minutes. Vehicles were split into three categories: Heavy Trucks, Medium Trucks, and Automobiles. Traffic counts and vehicle speeds are shown in Table 2-1.
- Stop measurement after 15 minutes.
- Calibrate sound level meter.
- Proceed to next monitoring site and repeat.

2.0 EXISTING CONDITIONS

2.1 EXISTING NOISE CONDITIONS

Existing traffic noise levels are established based on previously collected traffic data (Table 2-1) and using Traffic Noise Model (TNM) Version 2.5. TNM 2.5 is an FHWA Traffic Noise Prediction Program. Once existing levels are established, future levels, based on expected traffic growth, are calculated and compared to both the existing noise level and the maximum allowable noise level requiring abatement consideration based on the FHWA Noise Abatement Criteria. Referencing Table 1-1, the FHWA Noise Abatement Criteria shows that abatement must be considered when the exterior noise exposure level of 67 Leq dB for residential and sport activity areas is approached or exceeded. For interior areas abatement must be considered when the noise exposure level of 52 Leq dB is approached or exceeded for FHWA criteria. Levels reported in this section are in terms of A-weighted levels.

Existing traffic noise levels were evaluated using TNM 2.5. Traffic volumes collected from the traffic report completed for this project and average vehicle speeds along Golden State Boulevard, were entered into the model to estimate noise levels at various receptors that would be affected by the proposed Project.

To assess the traffic noise impacts from the project on the adjacent receptors, the first step is to determine the baseline or the existing noise condition. The second is to then compare the baseline to future level results, based on expected traffic growth, and the FHWA Noise Abatement Criteria.

To assess existing noise conditions, VRPA Technologies staff compiled current traffic counts and existing geometric conditions. Staff conducted noise level measurements within the project site on May 19, 2011. The weather during the time of the noise measurements consisted of sunshine and wind speeds of less than 5 mph. The purpose of the measurements was to evaluate the accuracy of the model in describing traffic noise exposure within the project site.

The locations for each receptor are described below in Table 2-2 and are geographically depicted in Figures 1-4a through 1-4c.

Table 2-1
Field Data/Traffic Counts

Receptor Location	Date of Count	Directional movement	15 minute count			Avg. Speed
			Auto's	Medium Trucks	Large Trucks	
1	5/19/2011	NB	42	12	6	50 mph
		SB	90	6	9	50 mph
2	5/19/2011	NB	60	3	6	50 mph
		SB	48	6	6	50 mph
3	5/19/2011	NB	48	9	6	50 mph
		SB	69	12	6	50 mph
4	5/19/2011	NB	69	0	3	50 mph
		SB	99	3	6	50 mph
5	5/19/2011	NB	96	0	3	50 mph
		SB	99	0	0	50 mph
6	5/19/2011	NB	57	0	0	65 mph
		SB	60	3	3	65 mph
7	5/19/2011	NB	111	6	0	40 mph
		SB	120	6	0	40 mph
8	5/19/2011	NB	42	0	3	65 mph
		SB	57	0	2	65 mph
9	5/19/2011	NB	18	3	4	35 mph
		SB	42	2	7	35 mph

Table 2-2
Existing Noise Levels

Receiver I.D. No.	Location	Type of Development	Noise Abatement Criterion NAC dBA Leq(h)	Existing Noise Level Leq(h) dBA
1	Industrial area. 25 feet west of Golden State Boulevard southbound center-line	Industrial	--	57
2	Residential Homes. 75 feet west of Golden State Boulevard southbound center-line.	Residential	67	61
3	Industrial area. 75 feet west of Golden State Boulevard southbound center-line.	Industrial	--	59
4	Motel site. 25 feet west of Golden State Boulevard southbound center-line	Motel	67	63
5	Industrial building. 25 feet west of Golden State Boulevard southbound center-line.	Industrial	--	65
6	Vicinity of residential homes. 25 feet east of Golden State Boulevard northbound center-line.	Residential	67	60
7	Vicinity of residential homes. 15 feet west of Golden State Boulevard southbound center-line.	Residential	67	62
8	Industrial building. 25 feet west of Golden State Boulevard southbound center-line.	Industrial	--	64
9	Restaurant site. 15 feet west of Golden State Boulevard southbound center-line	Restaurant	72	62

In order to calibrate the TNM 2.5 model, the existing counts (expanded to one hour), site geometry, and any other pertinent existing conditions were added to the model. The noise level measurements taken at the project site were then compared to the noise levels computed by the model. The difference between the measured and modeled noise levels, referred to as the "K constant", is then added to the future calculated noise levels to obtain the predicted noise levels.

Noise measurements were conducted in terms of the equivalent energy sound level (L_{eq}). Measured L_{eq} were compared to L_{eq} values calculated (predicted) by TNM 2.5. Traffic volumes, truck mix and vehicle speeds were used as inputs to the model. The results of this comparison are shown in Table 2-3 with existing Sound Level TNM printouts included in Appendix B.

Table 2-3

Traffic Noise Impacts for Existing Conditions

Receiver I.D. No.	Existing Noise Level Leq(h) dBA	Existing Noise Level Modeled Leq(h) dBA	K - Factor (Measured - Modeled = K)	Existing Plus Build Noise Level Leq(h) dBA	Noise Increase (+) or Decrease (-)	Impact *(S, A/E, or None)
1	57	68	11.0	57	0	None
2	61	64	3.0	60	-1	None
3	59	65	6.0	60	1	None
4	63	70	7.0	62	-1	None
5	65	74	9.0	65	0	None
6	60	70	10.0	60	0	None
7	62	68	6.0	62	0	None
8	64	71	7.0	64	0	None
9	62	64	2.0	62	0	None

* Impact: S = Substantial Increase (12dBA or more)
A/E = Approach or Exceed NAC

For the Existing Plus Build scenario, seventeen (17) additional sensitive receptors were added to the model to evaluate the impacts to other sensitive receptors located within the Project study area. The results are identified in Table 2-4.

Table 2-4

Traffic Noise Impacts for Existing Plus Build Conditions

Receiver I.D. No.	Existing Plus Build Noise Level Leq(h) dBA	Noise Abatement Criterion NAC dBA Leq(h)	Impact *(S, A/E, or None)
10	50	67	None
11	53	67	None
12	59	67	None
13	63	72	None
14	63	72	None
15	60	72	None
16	58	67	None
17	59	72	None
18	56	67	None
19	61	72	None
20	58	67	None
21	55	67	None
22	58	67	None
23	58	67	None
24	60	67	None
25	60	67	None
26	66	72	None

* Impact: S = Substantial Increase (12dBA or more)
A/E = Approach or Exceed NAC

3.0 FUTURE YEAR CONDITIONS

Impacts in the Project area resulting from 25 years of growth and development (through 2035) are described in this Section. In this scenario forecasted traffic volumes for the year 2035 were used in the model to analyze future year conditions. Results are identified in Table 3-1.

3.1 EXTERIOR NOISE ANALYSIS

When the Project is added to the background or existing noise levels, an increase in noise level is expected to occur in the City of Fowler area where Golden State Boulevard is realigned to 8th Street. Table 3-1 shows that sensitive receptors 14 and 15 increase by 2 L_{eq} dB as a result of the realignment. Under Future Year conditions, none of the sensitive receptor locations in both build and no build project models exhibit predicted noise impacts that approach or exceed the NAC of 67 L_{eq} dB.

3.2 CONSTRUCTION NOISE IMPACTS

The proposed project has the potential to result in short-term construction noise impacts to surrounding land uses due to the grading and construction activities. Construction noise represents a short-term impact on ambient noise levels. Although most of the types of exterior construction activities associated with the proposed project will not generate continually high noise levels, occasional single-event disturbances from grading and construction activities are possible. Table 3-2 depicts typical construction equipment noise. Construction equipment noise is controlled by the Environmental Protection Agency's Noise Control Program (Part 204 of Title 40, Code of Federal Regulations).

During the construction phase of the project, noise from construction activities will add to the noise environment in the immediate area. Activities involved in construction would generate maximum noise levels, as indicated in Table 3-2, ranging from 85 to 88dB at a distance of 50 feet. Construction activities will be temporary in nature and are expected to occur during normal daytime working hours. Construction noise impacts could result in annoyance or sleep disruption for nearby residences if nighttime operations occurred, or if unusually noisy equipment was used.

In order to minimize the construction noise impacts for sensitive receptors near the Project area, Caltrans Standard Special Provisions Section 5.1 will be implemented. These provisions follow:

"Sound control shall conform to the provisions in Section 7-1.01I, (Sound Control Requirements,) of the Standard Specifications and these special provisions. The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA at a distance of 15 m (50 ft). This requirement in no way relieves the contractor from responsibility for complying with local ordinances regulating noise level. The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixer or transient equipment that may or may not be owned by the contractor. The use of loud signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel. Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional will be allowed therefore."

Table 3-1

Traffic Noise Impacts for Future Year Conditions

Receiver I.D. No.	Future Year 2035 No Build Noise Level Leq(h) dBA	Future Year 2035 Build Noise Level Leq(h) dBA	Noise Increase (+) or Decrease (-)	Impact *(S, A/E, or None)
1	59	59	0	None
2	62	63	1	None
3	62	62	0	None
4	65	65	0	None
5	68	68	0	None
6	63	63	0	None
7	65	65	0	None
8	66	66	0	None
9	64	64	0	None
10	52	52	0	None
11	56	56	0	None
12	62	62	0	None
13	66	66	0	None
14	63	65	2	None
15	61	63	2	None
16	61	61	0	None
17	61	61	0	None
18	59	59	0	None
19	64	64	0	None
20	61	61	0	None
21	58	58	0	None
22	61	61	0	None
23	61	61	0	None
24	62	62	0	None
25	62	62	0	None
26	68	68	0	None

* Impact: S = Substantial Increase (12dBA or more)
A/E = Approach or Exceed NAC

Table 3-2

Construction Equipment Noise

TYPE	MAXIMUM LEVEL, dB AT 50 FEET
Bulldozers	87
Heavy Trucks	88
Backhoe	85
Pneumatic Tools	85

Source: Environmental Noise Pollution, 1977.

3.3 UNION PACIFIC RAILROAD NOISE

The Union Pacific Railroad (UP) is an operating subsidiary of Union Pacific Corporation. It is the largest railroad in North America, operating in the western two-thirds of the United States. The railroad serves 23 states, linking every major West Coast and Gulf Coast port and provides service to the east through its four (4) major gateways in Chicago, St. Louis, Memphis and New Orleans. Additionally, Union Pacific operates key north/south corridors and is the only railroad to serve all six (6) major gateways to Mexico. UP also interchanges traffic with the Canadian rail systems.

The UP mainline runs parallel to the Project along Golden State Boulevard with the exception of the downtown area in the City of Selma. The typical speed of trains is 50 to 65 miles per hour with approximately 19 to 29 daily train movements within the Project area. Train operators are required to sound the warning horn when approaching within approximately 1,000 feet of a grade crossing. As a result, train noise levels are higher at locations near grade crossings.

APPENDIX A

Acoustical Terminology

ACOUSTICAL TERMINOLOGY

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

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 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micro-newtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition often decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
L_{eq}(h):	The hourly value of $L_{eq.}$
L_{max}:	The maximum noise level recorded during a noise event
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). L_{10} equals the level exceeded 10 percent of the time.
L_n(h):	The hourly value of L_n.
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 micropascals 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.

Note: *CNEL and DNL represent daily levels of noise exposure averaged on an annual basis,* while L_n *represents the average noise exposure for a shorter time period, typically one hour.*

APPENDIX B

TNM 2.5 Sound Level Worksheets