TABLE OF CONTENTS

TABLE OF CONTENTS

Tables

TABLE OF CONTENTS

Figures

Appendices

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5.5 NOISE

Hydrogen Energy California LLC (HECA LLC) is proposing an Integrated Gasification Combined Cycle (IGCC) polygeneration project (HECA or Project). The Project will gasify a fuel blend of 75 percent coal and 25 percent petroleum coke (petcoke) to produce synthesis gas (syngas). Syngas produced via gasification will be purified to hydrogen-rich fuel, and used to generate a nominal 300 megawatts (MW) of low-carbon baseload electricity in a Combined Cycle Power Block, low-carbon nitrogen-based products in an integrated Manufacturing Complex, and carbon dioxide (CO_2) for use in enhanced oil recovery (EOR). CO_2 from HECA will be transported by pipeline for use in EOR in the adjacent Elk Hills Oil Field (EHOF), which is owned and operated by Occidental of Elk Hills, Inc. (OEHI). The EOR process results in sequestration (storage) of the CO_2.

Terms used throughout this section are defined as follows:

- **Project or HECA.** The HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes, including its linear facilities.
- **Project Site or HECA Project Site.** The 453-acre parcel of land on which the HECA IGCC electrical generation facility, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes (excluding off-site portions of linear facilities), will be located.
- **OEHI Project.** The use of CO_2 for EOR at the EHOF and resulting sequestration, including the CO_2 pipeline, EOR processing facility, and associated equipment.
- **OEHI Project Site.** The portion of land within the EHOF on which the OEHI Project will be located and where the CO_2 produced by HECA will be used for EOR and resulting sequestration.
- **Controlled Area.** The 653 acres of land adjacent to the Project Site over which HECA will control access and future land uses.

This introduction provides brief descriptions of both the Project and the OEHI Project. Additional HECA Project description details are provided in Section 2.0. Additional OEHI Project description details are provided in Appendix A of this Application for Certification (AFC) Amendment.

HECA Project Linear Facilities

The HECA Project includes the following linear facilities, which extend off the Project Site (see Figure 2-7, Project Location Map):

- **Electrical transmission line.** An approximately 2-mile-long electrical transmission line will interconnect the Project to a future Pacific Gas and Electric Company (PG&E) switching station east of the Project Site.

- **Natural gas supply pipeline.** An approximately 13-mile-long natural gas interconnection will be made with PG&E natural gas pipelines located north of the Project Site.

- **Water supply pipelines and wells.** An approximately 15-mile-long process water supply line and up to five new groundwater wells will be installed by the Buena Vista Water Storage District (BVWSD) to supply brackish groundwater from northwest of the Project Site. An approximately 1-mile-long water supply line from the West Kern Water District (WKWD) east of the Project Site will provide potable water.

- **Coal transportation.** HECA is considering two alternatives for transporting coal to the Project Site:

  - **Alternative 1, rail transportation.** An approximately 5-mile-long new industrial railroad spur that will connect the Project Site to the existing San Joaquin Valley Railroad (SJVRR) Buttonwillow railroad line, north of the Project Site. This railroad spur will also be used to transport some HECA products to market.

  - **Alternative 2, truck transportation.** An approximately 27-mile-long truck transport route via existing roads from an existing coal transloading facility northeast of the Project Site. This alternative was presented in the 2009 Revised AFC.

OEHI Project

OEHI will be installing the CO_2 pipeline from the Project Site to the EHOF, as well as installing the EOR Processing Facility, including any associated wells and pipelines needed in the EHOF for CO_2 EOR and sequestration. The following is a brief description of the OEHI Project, which is described in more detail in Appendix A of this AFC Amendment:

- **CO_2 EOR Processing Facility.** The CO_2 EOR Processing Facility and 13 satellites are expected to occupy approximately 136 acres within the EHOF. The facility will use 720 producing and injection wells: 570 existing wells and 150 new well installations. Approximately 652 miles of new pipeline will also be installed in the EHOF.

- **CO_2 pipeline.** An approximately 3-mile-long CO_2 pipeline will transfer the CO_2 from the HECA Project Site south to the OEHI CO_2 EOR Processing Facility.

In accordance with California Energy Commission (CEC) regulations, this section describes the existing noise environment on the Project Site and in the vicinity of the Project Site, and assesses potential noise impacts associated with the Project. Noise-sensitive receptors that may be affected by noise are identified, as well as the laws, ordinances, regulations, and standards (LORS) that regulate noise levels at those receptors. The following discussion describes the results of a detailed site reconnaissance, sound level measurements, acoustical calculations, and assessment of potential noise impacts. The analysis included in this section focuses on the HECA Project as well as the CO_2 pipeline associated with the OEHI Project. Potential noise impacts related to both coal transportation alternatives are evaluated in this section. The analysis of the CO_2 EOR Processing Facility associated with the OEHI Project is included in

Appendix A-1, Section 4.11, Noise and Appendix A-2, Section 2.5, Noise, of this AFC Amendment.

5.5.1 Affected Environment

5.5.1.1 Fundamentals of Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to typical environmental noise exposure levels is annoyance. The responses of individuals to similar noise events are diverse, and influenced by many factors, including the type of noise, the perceived importance of the noise, its appropriateness to the setting, the time of day, the type of activity during which the noise occurs, and the noise sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound's pitch (tone) and is measured in cycles per second (Hertz [Hz]), and amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound pressure measurement is the decibel (dB).

Hz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second, it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the healthy human ear.

As mentioned above, sound levels are expressed by reference to a specified national/international standard. This report refers to two acoustical quantities: (1) sound power level is used to express the sound energy radiated from a source; and (2) sound pressure level is used to describe sound at a specified distance or specific receptor location. In expressing sound power as a dB level, the standard reference sound power is 1 picowatt. In expressing sound pressure level on a logarithmic scale, sound pressure is compared to a reference value of 20 micropascals. These terms are different and should not be confused. Sound power level is a measure of the inherent acoustic power radiated by a source, whereas sound pressure level depends not only on the power of the source, but also the distance from the source and the acoustical characteristics of the space surrounding the source (absorption, reflection, etc.).

Outdoor sound levels decrease logarithmically as the distance from the source increases. This decrease is due to wave divergence, atmospheric absorption, and ground attenuation. Sound radiating from a source in a homogeneous and undisturbed manner travels in spherical waves. As the sound waves travel away from the source, the sound energy is dispersed over a greater area, decreasing the sound pressure of the wave. Spherical spreading of the sound wave reduces the noise level at a rate of 6 dB per doubling of distance.

Atmospheric absorption also influences the sound levels received by a listener. The greater the distance the sound travels, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound, as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries farther) at high humidity and high temperatures; and lower frequencies are less readily absorbed (i.e., sound carries farther) than higher frequencies. Over long distances, lower frequencies become dominant as the higher frequencies are more rapidly attenuated. Turbulence, gradients of wind, and other atmospheric phenomena also play a significant role in determining the degree of attenuation. For example, certain conditions such as temperature inversions can channel or focus the sound waves and result in higher noise levels than would otherwise result from simple spherical spreading.

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds that one hears in the environment do not consist of a single frequency but rather a broad band of many frequencies differing in sound level. Because of the broad range of audible frequencies, methods have been developed to quantify these values into a single number. The most common method used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that is reflective of human hearing. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process of discriminating frequencies based on human sensitivity is termed A-weighting, and the resulting dB level is termed an A-weighted decibel (dBA).

A-weighting is widely used in local noise ordinances and state and federal guidelines. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve. Unless specifically noted, the use of A-weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the "A."

In terms of human perception, a sound level of 0 dBA is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. This threshold is the reference level against which the amplitude of other sounds is compared. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort, progressing to pain at still higher levels. Humans are much better at discerning relative sound levels than absolute sound levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dBA. A 3 to 5 dBA change is readily perceived. An increase (or decrease) in sound level of about 10 dBA is usually perceived by the average person as a doubling (or halving) of the sound's loudness.

Because of the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example, 60 dB + 60 dB =

63 dB, and 80 dB + 80 dB = 83 dB. However, about a 10-decibel increase is required to double the perceived intensity of a sound, and it is interesting to note that a doubling of the acoustical energy (a 3 dB increase) is at the lower limit of readily perceived change.

5.5.1.2 Noise Metrics

Although dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from nearby and distant sources that creates an ebb and flow of sound, including some identifiable sources, plus a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is either constant or changing in level over a period of time. L_{eq} is the energy-mean dBA during a measured time interval. It is the “equivalent” constant sound level that would have to be produced by a given constant source to equal the acoustic energy contained in the fluctuating or time-varying sound level measured during the interval. The L_{eq} is the “base” metric used to establish other measures of environmental noise, such as the day-night sound level (L_{dn}) or the Community Noise Equivalent Level (CNEL).

In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This range is indicated through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}). These values represent the root-mean-square maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These descriptors are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, such as car and truck pass-bys. Sound levels are higher than this value only 10 percent of the measurement time.

L_{50} represents the median sound level during the measurement interval. Levels will be above and below this value exactly one-half of the measurement time. L_{90} is the sound level exceeded 90 percent of the time, and is therefore often used to describe ambient noise conditions because it typically represents generators of continuous sound and the aggregate of distant background environmental noise. For this reason, L_{90} is a key criterion metric used by the CEC to define noise during the quietest periods of the day and night.

The day-night sound level or L_{dn} represents the time-weighted average sound level for a 24-hour day, and is calculated from the L_{eq} by adding a 10 dB penalty to sounds that occur during the night period (10:00 p.m. to 7:00 a.m.). The L_{dn} is the descriptor of choice for nearly all federal, state, and local agencies throughout the United States to define acceptable land use compatibility with respect to noise.

Within the state of California, the CNEL is sometimes used. CNEL is similar to L_{dn}, except that an additional 5 dB penalty is applied to sounds that occur during the evening hours (7:00 p.m. to 10:00 p.m.). Because of the time-of-day penalties associated with the L_{dn} and CNEL descriptors, the L_{dn} or CNEL dBA value for a continuously operating sound source during a 24-hour period will be numerically greater than the dBA value of the 24-hour L_{eq}. Thus, for a continuously operating noise source producing a constant noise level operating for periods of 24 hours or more, the L_{dn} will be 6 dB higher than the L_{eq} value. To provide a frame of reference, common sound levels are presented in Table 5.5-1, Sound Levels of Typical Noise Sources and Noise Environments (A-Weighted Sound Levels).

5.5.1.3 Existing Conditions

Project Site Description

The Project Site is located near the unincorporated community of Tupman in western Kern County, California within Section 10 of Township 30 South, Range 24 East. The site is approximately 7 miles west of Bakersfield, California.

Adjacent land uses are agricultural. The western border of the Tule Elk State Natural Reserve is located approximately 1,700 feet to the east of the Project Site. The Kern River Flood Control Channel and California Aqueduct are located south of the Project Site. A small number of noise-sensitive residential receptors are located approximately 0.5 to 4.5 miles from the Project Site, and are comprised of widely scattered farmhouses. The nearest single-family residences are located approximately 1,400 feet to the east of the Project Site. There are no hospitals, libraries, schools, places of worship, or other public facilities where quietness is an important attribute within the area.

Ambient Noise-Level Survey

Ambient noise-level surveys were conducted in 2009 and 2012. An ambient noise-level survey was conducted on March 2 through March 3, 2009 in the vicinity of the Project Site and additional data were collected on April 28, 2009. Another ambient noise-level survey was conducted on February 28 through February 29, 2012 at several single family residences.

The purpose of the surveys was to quantify noise exposure in the Project environs, with emphasis on locations of noise-sensitive receivers that may be impacted by Project construction, operation, or Project-related transportation. The 2009 ambient noise-level survey consisted of three long-term (greater than 25-hours continuous data) (denoted as "LT") and six short-term measurement locations (denoted as "ST"). Short-term measurements included two consecutive 10-minute measurements at each location during the day (7:00 a.m.–7:00 p.m.), evening (7:00 p.m.–10:00 p.m.) and night (10:00 p.m.–7:00 a.m.).

The selected measurement sites consisted of noise-sensitive receivers located near the Project Site, or along the primary transportation corridor, and two sites located along the transmission and potable water linear routes for the purpose of assessing potential construction-related impacts. The selected sites are considered to be representative of the ambient noise environment in the vicinity of the Project. Short-term measurements at each long-term measurement site were conducted in order to verify the accuracy of long-term measurement data, and to document ambient noise sources particular times of the day, evening, and night. The 2012 ambient noise-level survey included three additional LT measurement locations. Field measurement data sheets can be found in Appendix J-1. Figure 5.5-1 illustrates the locations of all ambient noise measurement sites.

LT-1/ST-1: This location is approximately 370 feet northwest of the Project Site's nearest boundary, 3,000 feet northwest of the center of the Project Site, and is representative of the nearest noise-sensitive receptor. There are two residences located near the measurement site, consisting of one single-family residence and a mobile home. The option to purchase this 5-acre parcel adjacent to the Project Site was acquired subsequent to the 2009 Revised AFC. This parcel became part of the Controlled Area. Project Site boundaries have changed to include some areas previously within the Controlled Area, and to exclude other areas that were previously part of the Project Site. The current Project Site and Controlled Area are now 453 acres and 653 acres, respectively, rather than the previous sizes of 473 and 633 acres. These residences will not be in use during Project construction and operation. Long-term measurements were conducted near the east residence (mobile home). Noise levels at this location are representative of ambient noise levels at both residences. Long-term noise monitoring at LT-1 was conducted from 2:00 a.m. on March 3, 2009 until 3:00 a.m. on March 4, 2009.

The hourly L_{eq} values at LT-1 ranged from 35 dBA to 58 dBA. The average hourly L_{eq} was 53 dBA. The hourly L_{90} values ranged from 26 dBA to 52 dBA. The lowest average L_{90} over a consecutive 4-hour period for the entire 25-hour measurement was from 2:00 a.m. until 6:00 a.m. The average L_{90} during that period was 31 dBA. Table 5.5-2 displays the results of the measurements from LT-1.

Six short-term measurements were conducted at this location with two 10-minute measurements occurring consecutively during daytime hours, evening hours and nighttime hours. The daytime L_{eq} at ST-1 ranged from 42 to 44 dBA, and the daytime L_{90} ranged from 37 to 38 dBA. The evening L_{eq} at ST-1 ranged from 46 to 47 dBA, and the evening L_{90} ranged from 41 to 42 dBA.

The nighttime L_{eq} at ST-1 ranged from 30 to 35 dBA, and the nighttime L_{90} ranged from 27 to 29 dBA. Noise sources during the short-term surveys consisted of distant traffic noise, barking dogs, birds, aircraft, agricultural equipment, and farm animals. ST-1 sound-level measurement data are displayed in Table 5.5-3.

LT-2/ST-2: The LT-2/ST-2 location is approximately 1,400 feet east of the Project Site and 4,000 feet east of the center of the Project Site. There are two single-family residences located at this measurement site. Long-term measurements were conducted on the northwestern side of the residence (closest to the Project Site). Long-term noise monitoring at LT-2 was conducted from 6:00 p.m. on March 2, 2009 until 7:00 p.m. on March 3, 2009.

The hourly L_{eq} values at LT-2 ranged from 42 dBA to 61 dBA. The average hourly L_{eq} was 55 dBA. The hourly L_{90} values ranged from 25 dBA to 37 dBA. The lowest average L_{90} over a consecutive 4-hour period for the entire 25-hour measurement was from 1:00 a.m. until 5:00 a.m. The average L_{90} during that period was 30 dBA. Table 5.5-4 displays the measurement results at LT-2.

Six short-term measurements were conducted with two 10-minute measurements occurring consecutively during daytime, evening, and nighttime hours. The daytime L_{eq} at ST-2 ranged from 48 to 51 dBA, and the daytime L_{90} ranged from 26 to 27 dBA. The evening L_{eq} at ST-2 was 53 dBA, and the evening L_{90} ranged from 39 to 43 dBA. The nighttime L_{eq} at ST-2 ranged from 42 to 55 dBA, and the nighttime L_{90} was 34 dBA. Audible noise sources during the short-term noise measurements consisted of distant traffic, wildlife, and aircraft. ST-2 sound-level measurement data are displayed in Table 5.5-5.

LT-3/ST-3: This location is approximately 6,700 feet northeast of the Project Site's nearest boundary, and 9,900 feet northeast of the center of the Project Site. The primary purpose for this location is to determine existing noise levels along Stockdale Highway. The site is located 15 feet south of Stockdale Highway (23 feet south of the highway centerline), approximately 4,400 feet west of Morris Road. Short-term measurements were conducted at the same location as LT-3. Long-term noise monitoring at LT-3 was conducted from 7:00 p.m. on March 2, 2009 until 8:00 p.m. on March 3, 2009.

The hourly L_{eq} values at LT-3 ranged from 50 dBA to 69 dBA. The average hourly L_{eq} was 65 dBA. The hourly L_{90} values ranged from 28 dBA to 46 dBA. The lowest average L_{90} during a consecutive 4-hour period for the entire 25-hour measurement lasted from 7:00 p.m. until 11:00 p.m. The average L_{90} over that time-period was 30 dBA. Table 5.5-6 displays the long-term measurement results from LT-3.

Six short-term measurements were conducted with two consecutive 10-minute measurements occurring during daytime, evening, and nighttime hours. The daytime L_{eq} at ST-3 ranged from 64 to 66 dBA, and the daytime L_{90} was 35 dBA. The evening L_{eq} at ST-3 ranged from 53 to 59 dBA, and the evening L_{90} was 25 dBA. The nighttime L_{eq} at ST-3 ranged from 56 to 63 dBA, and the nighttime L_{90} was 30 dBA. Short-term sound-level measurement data from ST-3 are displayed in Table 5.5-7.

ST-4: ST-4 is located approximately 3,900 feet east of the Project Site's nearest boundary, and 6,600 feet east of the center of the Project Site, at the northern extent of the Tule Elk State Natural Reserve. Short-term ambient noise-level measurements were conducted along Station Road near the Tule Elk State Natural Reserve and were completed on March 2 and 3, 2009. Four short-term measurements were conducted with two 10-minute measurements occurring back-to-back during daytime and evening hours. Weather conditions, including gusty winds, had an adverse effect on the original nighttime ambient measurement results. An additional 1-hour-and-15-minute short-term ambient noise-level measurement was conducted during nighttime hours on April 28, 2009 during weather conditions acceptable for noise measurements.

Table 5.5-8 displays the results of all of the ambient noise-level measurements conducted at ST-4. The results from the April 28, 2009 noise measurement are the results that are used in the analysis of the Project. The L_{eq} was 41 dBA, and the L_{90} was 37 dBA.

ST-5: This location is approximately 3,300 feet southeast of the Project boundary and 5,900 feet south of the center of the Project Site, in the vicinity of a single-family residence. Short-term ambient noise-level measurements were completed along Tupman Road near the residence. Measurements were not conducted at the residence due to the presence of domestic animals.

Short-term ambient noise-level measurements were completed on March 3, 2009. Four short-term measurements were completed with two consecutive 10-minute measurements conducted during daytime and evening hours. Adverse weather conditions, including gusty winds, had an effect on the original nighttime ambient measurement results. An additional 1-hour-and-15-minute short-term ambient noise-level measurement was conducted during nighttime hours on April 28, 2009 in weather conditions acceptable for noise measurements.

Table 5.5-9 displays the results of all of the ambient noise-level measurements completed at ST-5. The results from the April 28, 2009 noise measurement are the results that are used in the analysis of the Project. The L_{eq} was 62 dBA and the L_{90} was 33 dBA.

ST-6: This location is approximately 10,750 feet northwest of the Project Site and 13,500 feet northwest of the center of the Project Site. Short-term ambient noise-level measurements were conducted during daytime hours along Freeborn Road near a single-family residence. Two consecutive short-term 10-minute ambient noise-level measurements were conducted on March 3, 2009. Sound-level measurements were conducted at ST-6 because of daytime construction of a pipeline taking place in the vicinity of residences located near the intersection of Freeborn Road and Adohr Road.

Table 5.5-10 displays the results of both of the short-term ambient noise-level measurements completed at ST-6. The average L_{eq} from the two measurements was 60 dBA, and the L_{90} was 24 dBA.

LT-7: This location is south of an existing railroad and south of McKittrick Highway. The primary purpose for this measurement location was to obtain ambient noise-level data near a single-family residence in close proximity to existing railroad. Long-term noise monitoring at LT-7 was conducted from 5:00 p.m. on February 28, 2012 until 6:00 p.m. on February 29, 2012.

The hourly L_{eq} values at LT-7 ranged from 54 dBA to 63 dBA. The average hourly L_{eq} was 58 dBA. The hourly L_{90} values ranged from 49 dBA to 56 dBA. The lowest average L_{90} during a consecutive 4-hour period for the entire 25-hour measurement lasted from 9:00 a.m. until 1:00 p.m. The average L_{90} over that time-period was 50 dBA. Table 5.5-11 displays the long-term measurement results from LT-7.

The primary sources of noise at this location were noise from traffic along McKittrick Highway and train noise.

LT-8: The primary purpose for this measurement location was to obtain ambient noise-level data near a single-home residence. Long-term noise monitoring at LT-8 was conducted from 6:00 p.m. on February 28, 2012 until 7:00 p.m. on February 29, 2012.

The hourly L_{eq} values at LT-8 ranged from 34 dBA to 57 dBA and the average hourly L_{eq} was 49 dBA. The hourly L_{90} values ranged from 28 dBA to 50 dBA. The lowest average L_{90} during a consecutive 4-hour period for the entire 25-hour measurement lasted from 1:00 a.m. until 5:00 a.m. Over that time-period, the average L_{90} was 30 dBA. Table 5.5-12 displays the long-term measurement results from LT-8.

The primary sources of noise at this location were local traffic during the day and distant traffic along State Route 58 and Interstate 5 during nighttime hours.

LT-9: The primary purpose for this measurement location was to obtain ambient noise-level data near a single-home residence. Long-term noise monitoring at LT-9 was conducted from 6:00 p.m. on February 28, 2012 until 7:00 p.m. on February 29, 2012.

The hourly L_{eq} values at LT-9 ranged from 44 dBA to 66 dBA. The average hourly L_{eq} was 60 dBA. The hourly L_{90} values ranged from 31 dBA to 55 dBA. The lowest average L_{90} during a consecutive 4-hour period for the entire 25-hour measurement lasted from 1:00 a.m. until 5:00 a.m. The average L_{90} over that time-period was 32 dBA. Table 5.5-13 displays the long-term measurement results from LT-9.

The primary sources of noise at this location were local traffic during the day and distant traffic along State Route 58 and Interstate 5 during nighttime hours.

Meteorological Conditions

Weather conditions appropriate for outdoor noise measurements existed on March 2, 2009. Evening temperatures averaged 70° Fahrenheit (°F). The average relative humidity was 56 percent. The average wind speed was 1 to 2 miles per hour. Nighttime temperatures averaged 65°F. The average wind speed was 1 to 2 miles per hour. The average relative humidity was 53 percent.

Weather conditions appropriate for outdoor noise measurements existed during the daytime and evening on March 3, 2009. During the daytime, the temperature averaged 66°F. The average relative humidity was 40 percent. Winds were calm. During evening hours on March 3, 2009, the average temperature was 72°F. The average relative humidity was 40 percent. The average wind speed was 2.5 miles per hour.

Weather conditions not suitable for outdoor noise measurements were encountered during nighttime measurements on March 3, 2009. Wind speeds averaged 11 miles per hour with gusts up to 18 miles per hour. These conditions exceeded the wind conditions necessary for accurate noise measurements. Nighttime temperatures averaged 70°F. The average relative humidity was 40 percent.

Additional nighttime measurements were made at noise-sensitive receptor sites ST-4 and ST-5 on April 28, 2009 under weather conditions acceptable for noise measurements. The daytime and evening measurements conducted on March 2 and 3, 2009 were conducted under weather conditions acceptable for noise measurements. The average temperature was 50°F. The average relative humidity was 50 percent. Wind speed averaged 2 miles per hour.

Weather conditions appropriate for outdoor noise measurements existed on February 28 and 29, 2012. Temperatures ranged from 43ºF to 63ºF throughout the measurement period. Relative humidity ranged from 38 percent to 70 percent throughout the measurement period. Wind speeds ranged from calm to 8 miles per hour. The sky was clear on February 28, 2012, and partly cloudy on February 29, 2012.

Instrumentation

The 25-hour continuous ambient noise-level measurements at all LT measurement locations were conducted using Larson Davis Model 820 American National Standards Institute (ANSI) Type 1 Integrating Sound Level Meters (SLM). The SLMs were calibrated before and after the measurements. The SLMs at LT-1, LT-2, LT-7 and LT-8 were mounted to fences approximately 5 feet above ground in order to simulate the average height of the human ear. The SLM at LT-3 was mounted to a telephone pole roughly 5 feet above ground and the SLM at LT-9 was mounted to a tree, also about 5 feet above ground. All short-term measurements were completed using a Brüel and Kjær Model 2250 ANSI Type 1 Integrating SLM. The sound level meter was mounted on a tripod approximately 5 feet above ground. The sound level meter was calibrated before and after the measurements. Certification of calibration for all meters and the Larson Davis CAL200 that was used to calibrate all sound level meters is provided in Appendix J-1. All SLMs were equipped with windscreens during the measurement periods.

5.5.1.4 Local Land Use and Noise Sources

The area surrounding the Project Site is comprised primarily of agricultural uses. The Project Site is bounded by Tupman Road to the east, an irrigation canal to the south, and Dairy Road to the west; agricultural land and Adohr Road are to the north.

Adjacent land uses are agricultural. The western border of the Tule Elk State Natural Reserve is located approximately 1,700 feet to the east of the Project Site while the Kern River and California Aqueduct are located to the Project Site's south. A small number of noise-sensitive residential receptors comprised of widely scattered farmhouses are located approximately 0.5 to 4.5 miles from the Project Site. The nearest single-family residences are located approximately 1,400 feet to the east of the Project Site.

The primary noise source at LT-2 was traffic along Station Road. The primary noise source at LT-3 was traffic along Stockdale Highway. The primary noise sources at LT-7 were traffic along Interstate 5 and McKittrick Highway and nearby trains to the north. The primary noise source at LT-8 was traffic along Brite Road and, during nighttime hours, distant traffic along Interstate 5 and McKittrick Highway. The primary noise source at LT-9 was traffic along Stockdale Highway and distant traffic along Interstate 5 and McKittrick Highway during nighttime hours. No operations of agricultural equipment were noted during the measurement period, and wildlife activity, other than birds, was minimal. Due to the limited activity, the documented noise levels are considered to be representative of the quietest annual periods.

5.5.1.5 Noise Level Design Goals

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (California Code Regulations, Title 14, Appendix G) sets forth characteristics that may signal a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

1. Exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies.

2. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

3. Substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

4. Substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

California Energy Commission

The CEC guidelines, in applying item 3 above, state that the area of impact to be studied should include areas where the noise of the project plus the background exceeds the existing background levels by 5 dBA or more at the nearest Noise Sensitive Area (NSA), including those receptors that are considered a minority population. In previous findings, CEC has considered it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is considered insignificant; an increase of more than 10 dBA in a residential setting is considered significant. For projects where the increase is between 5 and 10 dBA, the level of an impact depends on the particular circumstances of a case. Factors to be considered in determining the significance of an impact for this +5 to +10 dB situation include:

- Resulting noise level
- Duration and frequency of the noise
- Number of people affected
- Land use designation of the affected receptor sites
- Public concern or controversy as demonstrated at workshops or hearings, or by correspondence

Noise from construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- Construction activity is temporary
- Use of heavy equipment and noisy activities is limited to daytime hours
- All industry-standard noise abatement measures are implemented for noise-producing equipment

CEC uses the above method and threshold to protect the most sensitive populations, including any minority population.

Federal Transit Administration

The Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (FTA-VA-90-1003-06) outlines key environmental impact assessment processes and procedures for mass transit projects. The methodology outlined in this document is widely used to assess potential noise impacts from railway operations and was adopted to assess potential impacts associated with the rail spur. The noise calculations and impact criteria used by the FTA are based on the change in outdoor noise exposure using a sliding scale with three receiver categories and three degrees of impact. They were developed to respond to heightened community annoyance caused by late-night or early-morning service and they respond to varying sensitivity of communities to noise from projects during different ambient noise conditions.

For operational rail noise, FTA's three receiver land use categories are:

- **Noise Category 1**. Tracts of land where quiet is an essential element in their intended purpose, such as outdoor amphitheaters, concert pavilions and National Historic Landmarks with significant outdoor use.

- **Noise Category 2**. Residences and buildings where people normally sleep, including homes, hospitals and hotels.

- **Noise Category 3.** Institutional land use (schools, places of worship, libraries) with use typically during the daytime and evening. Other uses in this category can include medical offices, conference rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

The categories are determined from general land use information about each receiver. No Category 1 receivers are located within 1 mile of the proposed railroad spur. Outdoor hourly L_{eq} applies to Categories 1 and 3, whereas outdoor L_{dn} applies to Category 2.

Figure 5.5-2 presents the criteria for FTA's three degrees of impact: No Impact, Moderate Impact, and Severe Impact. As shown in Figure 5.5-2, the criterion for each degree of impact is on a sliding scale dependent on the existing noise exposure and the increase in noise exposure that could result from the Project.

As an example of impact evaluation, consider the FTA's sliding impact criterion for Category 2 receivers. An existing environment of 45 dBA L_{dn} would be affected if the rail project created an increase of 8 dBA to 14 dBA L_{dn} in the total noise level. An existing environment of 60 dBA L_{dn} would be impacted if the rail project created an increase of 2 dBA to 5 dBA L_{dn} in the total noise level. Those same "existing" environments (45 or 60 dBA L_{dn}) would be severely impacted (or "significantly impacted" according to NEPA) if the rail project created an increase greater than 14 dBA and 5 dBA L_{dn}, respectively.

The FTA has developed criteria for assessing potential vibration impacts related to rail projects. The criteria contained in the FTA Manual are based on community reaction to rail-related vibration and the potential for adverse effects on vibration-sensitive activities and processes. The criteria identify intensities of ground-borne vibration that may be considered significant and thus require consideration of mitigation and abatement measures.

The FTA assigns vibration-sensitive receptors to the following relevant categories:

- **Vibration Category 1**, **High Sensitivity.** Buildings where low ambient vibration is essential for operations within the building. This category includes buildings with extremely vibration-sensitive equipment, such as finely calibrated research, manufacturing, optical, and imaging systems. Actual vibration levels may be below the level of human perception.

- **Vibration Category 2**, **Residential.** Residences and buildings where people normally sleep. This category includes private dwellings, hospitals and hotels where nighttime sensitivity is assumed to be of utmost importance.

- **Vibration Category 3**, **Institutional.** Land uses with primarily daytime use including schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment.

Table 5.5-14 illustrates FTA's vibration impact criteria used in mass transit projects. Where vibration is intermittent (e.g., train pass-bys), human annoyance from ground vibration is dependent on the number and magnitude of vibration events that occur during a typical 24-hour period. Based on frequency of occurrence, the FTA Manual defines three groups of events: Frequent, Occasional, and Infrequent. "Frequent" is defined as 70 or more vibration events per day; "Occasional" is defined as 30 to 70 events per day; and "Infrequent" is defined at fewer than 30 events per day. The FTA impact criterion for infrequent ground-borne vibration events is 80 vibration decibels (VdB) for land use Category 2. The criterion will be applied to the residential dwelling on the south side of SR 58 between Tracy Lane and Brandt Road. The address of this site is 5069 SR 58. This site is known as Modeled Receptor 1 (MR-1).

If the criteria in Table 5.5-14 were to be exceeded as a result of the Project, then feasible/ effective vibration mitigation measures would need to be considered. If feasible/effective mitigation actions are not available, then significant and unavoidable impacts would occur.

The generalized Ground Surface Vibration Curves presented in Figure 5.5-3 are used to estimate ground-borne vibrations. The curves take into account typical ground-surface vibration levels assuming equipment is in good condition and speeds are 50 miles per hour for the rail systems and 30 miles per hour for buses. The levels must be adjusted to account for factors such as different speeds and different geological conditions.

Vehicular Traffic

The implementation of the HECA Project will result in increased traffic volumes in the areas around the Project Site. There are 12 intersections that are analyzed in the vicinity of the Project area where traffic volumes increase due to Project construction and operations. The noise levels generated by the estimated average daily traffic (ADT) volumes during the construction period without Project construction will be compared to estimated ADT traffic volumes with Project construction. For the operation period, noise levels generated by estimated ADT traffic volumes in 2017 without Project operations will be compared to estimated ADT traffic volumes with Project operations.

In accordance with Section 5.10 of this AFC Amendment, the 2016 construction traffic volumes were used as a worst-case scenario for evaluating traffic noise impacts resulting from construction. The change in traffic noise will be analyzed using estimated traffic mixes and the speeds along the roads. The noise metric that will be used to determine noise impacts due to traffic is the L_{dn}/CNEL metric. All of the noise-sensitive receptors are subject to the 65 dBA L_{dn} noise exposure threshold established by the respective Noise Elements of Kern County and the cities of Wasco and Shafter. An increase of 3 dBA is considered perceptible by the human ear, and therefore it would be considered a significant increase in noise level resulting from the increase in traffic during construction and operation of the HECA Project.

If the modeled "with construction" or "with Project" noise levels are: (1) greater than 65 dBA L_{dn}/CNEL at a noise-sensitive receptor due to the introduction of construction or Project-related traffic, and (2) the construction or Project-related traffic also causes an increase in L_{dn}/CNEL of 3 dBA over anticipated existing noise levels, then the noise impact would be considered significant. However, if the modeled "with construction" or "with Project" L_{dn}/CNEL is less than 65 dBA due to the introduction of construction or Project-related traffic, then there would be no noise impact at the noise-sensitive receptor.

Local

Kern County

The Noise Element of the Kern County General Plan, Section 3.2, states:

> Implementation Measures. . . F) [r]equire proposed commercial and industrial uses or operations to be designed or arranged so that they will not subject residential or other noise sensitive land uses to exterior noise levels in excess of 65 dB L_{dn} and interior noise levels in excess of 45 dB L_{dn}.

As discussed in the General Plan, an exterior noise level up to 65 dBA L_{dn} is compatible with residential land uses. Because of the weighting and averaging nature of the L_{dn}, a constant noise source produces an L_{dn} approximately 6 dBA higher than its hourly L_{eq}. Therefore, constant noise sources producing exterior noise levels up to 58 dBA L_{eq} are compatible with residential land uses based on the Noise Element of the Kern County General Plan.

The Ordinance Code of Kern County has been reviewed, including Chapter 8.36, Noise Control, and there are specific noise limits for construction noise sources that are applicable to the Project. The Noise Control Ordinance (Kern County, 2009) in Chapter 8.36 of the Kern County Code states that noise from construction should be limited to the following hours when construction takes place within 1,000 feet of a sensitive receptor:

- Weekdays: 6:00 a.m. to 9:00 p.m.
- Weekends: 8:00 a.m. to 9:00 p.m.

City of Wasco

The Noise Element for the City of Wasco General Plan (2010), Chapter 8, states:

> Policies, Standards. . . . 2.) Noise sensitive land uses should be discouraged in noise impacted areas unless effective mitigation measures are incorporated into the specific design of such projects to reduce exterior noise levels to 65 dB L_{dn} (or CNEL) or less and 45 dB L_{dn} (or CNEL) or less within interior living spaces. Noise sensitive land uses

includes hospitals, residences, schools, churches, and other uses of a similar nature as determined by the Planning Director.

Industrial, commercial or other noise-generating land uses (including roadways, railroads, and airports) are also strongly discouraged by the City of Wasco from exceeding the 65 dB L_{dn} (or CNEL) at the boundary areas of planned or zoned noise-sensitive land uses. The City of Wasco enforces the State Noise Insulation Standards (California Administrative Code, Title 24) and Uniform Building Code noise requirements.

City of Shafter

The Noise Element for the City of Shafter General Plan (2005), Chapter 7, states that the objective of the Noise Element is to "achieve and maintain exterior noise levels appropriate to planned land uses throughout Shafter, as described below":

- **Residential**
  Single-Family: 60-65 dBA CNEL in rear yards
  Multifamily: 60-65 dBA CNEL in interior open space areas
- **Schools**
  Classrooms: 60 dBA CNEL
  Play and sports areas: 70 dBA CNEL
- **Hospitals, Libraries:**
  60 dBA CNEL
- **Commercial/Industrial:**
  65-70 dBA CNEL at the front setback

Summary of Design Goals

Operations of Project Site

Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable LORS. Therefore, facility operational noise from this Project is evaluated against the CEC limit, where the Project noise level is considered insignificant if it does not exceed the ambient background noise level (L_{90}) by 5 dB or more at the nearest sensitive receptor, as detailed below.

The ambient background noise levels and the associated Project design noise levels necessary to comply with CEC guidelines are shown in Table 5.5-15.

Operations of Railroad Spur (Alternative 1)

The FTA Noise Impact Criteria, shown in Figure 5.5-2, were used to determine the thresholds for moderate and severe noise impacts from the proposed railroad spur at nearby noise-sensitive receptors. These results are shown in Table 5.5-16, which lists the existing measured noise levels at each long-term site and the noise level thresholds for moderate and severe impacts at each respective noise-sensitive receptor.

The noise-sensitive receptor located at MR-1 is to the west of the proposed railroad spur. The existing noise level of 65 dBA L_{dn} that was measured at LT-7 was used as the ambient noise level at this receptor. The thresholds for moderate and severe impacts for LT-7 are 67 and 69 dBA L_{dn}, respectively. The noise-sensitive receptor located at MR-2 is west of the proposed railroad spur. The existing noise level of 53 dBA L_{dn} that was measured at LT-8 was used as the ambient noise level at this receptor. The thresholds for moderate and severe impacts for MR-2 are 54 and 60 dBA L_{dn}, respectively. LT-8 is west of the proposed railroad spur and has a measured, existing noise level of 53 dBA L_{dn}. The thresholds for moderate and severe impacts for LT-8 are 56 and 61 dBA L_{dn}, respectively. LT-9 is west of the proposed railroad spur and has a measured, existing noise level of 67 dBA L_{dn}. The thresholds for moderate and severe impacts for LT-9 are 69 and 71 dBA L_{dn}, respectively.

There will be a horn blowing when the train encounters at-grade rail crossings, which will increase operational noise levels due to an operational railroad spur. The train will blow its horn for 20 seconds before each at-grade rail crossing, which equates to a length of approximately 733 feet. The approximate rail horn noise is calculated to be 77 dBA L_{dn} at a distance of 50 feet from the railroad spur line.

Horn noise will be added to the train noise that results from the train engines and cars passing each noise-sensitive receptor in order to produce an overall Project noise level exposure in terms of the L_{dn} metric. These modeled L_{dn} results will be compared to the moderate and severe noise impact thresholds found in Table 5.5-16.

The FTA Criteria of Impact for Human Annoyance and Interference due to Ground-Borne Vibration, found in Table 5.5-14, was used to determine the threshold for vibration impacts due to the proposed railroad spur centerline. MR-1 and MR-2 are noise-sensitive receptors located west of the proposed railroad spur centerline. MR-2 was not analyzed due to the presence of the canal between the source and the receiver.

Assuming a worst-case scenario for train operations, the train will arrive and leave the Project Site via the proposed railroad spur once a day for a total of two train events. According to FTA vibration criteria, this is considered to be "infrequent." The receptor at MR-1 is a Category 2 receptor, and therefore the vibration impact threshold is 80 VdB. It is important to note that the threshold for human perception of vibration is 65 VdB. At this threshold, the vibration effects can be slightly felt, and below this threshold, the events will not be perceived by the receptors.

Construction

Kern County does not have specific noise limits for construction noise sources that are applicable to the Project. Construction noise is exempt from 6:00 a.m. to 9:00 p.m. on weekdays and from 8:00 a.m. to 9:00 p.m. on weekends. If construction is conducted outside of these hours, the noise level limits found in the California Model Municipal Noise Ordinance (Anonymous, 1977) will be used. The California Model Municipal Noise Ordinance recommends that a 45 dBA L_{eq} noise level limit be used for nighttime hours in rural areas. If the lowest measured hourly L_{eq} during non-exempt hours is higher than 45 dBA L_{eq}, then the lowest measured hourly L_{eq} measured during non-exempt hours will be used as the noise limit for construction during non-exempt hours at all noise-sensitive receptors.

Table 5.5-17 lists each noise-sensitive receptor, the lowest measured hourly L_{eq} at long-term measurement sites or 10 minute L_{eq} for short-term measurement sites during non-exempt times, and each respective construction noise level limit at each noise-sensitive receptor. Construction noise level limits during non-exempt hours are listed because of the potential for some construction activities to be conducted 24 hours per day.

Traffic

Construction and Project traffic noise levels will be evaluated based on the increases in ADT traffic volumes along each roadway segment that branches off of the 12 intersections analyzed in the traffic study. If the modeled "with construction" or "with Project" noise levels are (1) greater than 65 dBA L_{dn}/CNEL at a noise-sensitive receptor due to the introduction of construction or Project-related traffic, and (2) the construction or Project-related traffic also causes an increase in L_{dn}/CNEL of 3 dBA over anticipated existing noise levels, then the noise impact would be considered significant. However, if the modeled "with construction" or "with Project" L_{dn}/CNEL is less than 65 dBA due to the introduction of construction or Project-related traffic, then there would be no noise impact at the noise-sensitive receptor.

5.5.2 Environmental Consequences

Noise will be produced during construction and operation of the Project. Potential noise impacts from both on-site and off-site activities are assessed in this section.

5.5.2.1 Construction Noise

Project Site Construction

The construction schedule has been estimated on a single-shift, 5-day basis, beginning at 6 a.m. Monday through Friday. Additional hours and/or a second shift may be necessary to make up schedule deficiencies or to complete critical construction activities. During Project start up and testing, some activities may continue up to 24 hours per day, 7 days per week. The construction process for the Project will be expected to generate noise during the following phases:

- Site Preparation
- Excavation
- Foundation Placement
- Project and Building Construction
- Exterior Finish and Cleanup

Equipment used during the construction process will differ from phase to phase. In general, heavy equipment (bulldozers, dump trucks, and concrete mixers) will be used during excavation and concrete-pouring activities. Most other phases involve the delivery and erection of the equipment and building components. The method of pile installation (driven, augured, or vibrated), if required for some foundations, will be determined in the final design. Noise levels of construction equipment typically used for this type of Project are presented in Table 5.5-18, Individual Equipment Noise Levels Generated by Project Construction. The equipment presented herein is not used in every phase of construction. Further, equipment used is not generally operated continuously, nor is the equipment necessarily operated simultaneously.

Project Site average sound levels for each phase of construction (from USEPA, 1971; FTA, 2006; and URS, 2012) are presented in Table 5.5-19, Aggregate Estimated Noise Levels Generated by Phase for the Project Construction Activities. This analysis takes into account the expected number of construction equipment items, their nominal usage factors, and the average sound emissions factor for each. The highest site-average sound levels (89 to 91 dBA) are associated with Foundation and Site Clearing phases of the construction schedule.[1]

The noise levels presented in Tables 5.5-18 and 5.5-19 use the equipment-specific and phase-aggregate sound levels, respectively, at 50 feet from the construction activity to predict the noise levels at the nearest noise-sensitive receptor locations that surround the Project Site. Noise associated with the construction of the Project will be attenuated by a variety of mechanisms. The most significant of these is the diversion of the sound waves with distance (attenuation by divergence). This attenuation mechanism results in a 6 dB decrease in the sound level with every doubling of distance from the source. For example, the 83 dBA average sound level associated with excavation (Table 5.5-19) will be attenuated to 77 dBA at 100 feet, 71 dBA at 200 feet, and 65 dBA at 400 feet. Attenuation for atmospheric absorption, earthen berms, or ground effects was not included in the construction noise analysis to allow for a conservative worst-case analysis. The small number of noise-sensitive receptors in the vicinity of the Project are located approximately 4,130 feet to 4.7 miles from the center of the Project process area, where the predominant amount of future construction activity will be located.

Because of the nature of construction noise, and with common fluctuations in the background noise level, construction activity occasionally would be discernible at the nearest receptors. Given some occasional atmospheric conditions, construction noise could also be discernible at the receptors located farther from the Project Site because of inversion effects. Under certain circumstances, the construction noise could be a source of annoyance to noise-sensitive individuals. Nighttime construction activities may be conducted in order to meet the construction schedule. However, if nighttime construction is needed, the Project will limit noisy construction activities (particularly pile-driving work) to daytime hours in order to minimize nighttime noise levels to the extent practical.

If construction activities at the Project Site are conducted outside of construction noise exempt times, the construction noise level limits for each noise-sensitive receptor found in Table 5.5-17 will not be exceeded.

Given the intermittent and temporary nature of construction activities, potential noise impacts are considered to be less than significant.

Linear Facility Construction

For construction of the linear facilities, the loudest construction activities are associated with pile driving. As shown on Table 5.5-18, pile driving activities generate noise levels of 101 dBA L_{eq}

[1] Excluding consideration for pile installation which is a short-term subset of the Foundation Phase.

at a distance of 50 feet. Construction noise levels associated with all other construction activities related to linear facility construction could be as high as 89 dBA L_{eq} at 50 feet. This is a conservative construction activity noise level based on information found in the Roadway Construction Noise Model's (RCNM) User Guide (FHWA RCNM, Version 1.0 User's Guide).

Electrical Transmission Line

Approximately 26 steel poles, fifteen of which will be located outside the HECA Project Site, are expected to be required for the electrical transmission line. Construction of the transmission line will consist of installing footings, poles, insulators and hardware, and pulling conductors and shield wires. Table 5.5-20 summarizes construction of the electrical transmission line without pile-driving activities. This table lists each noise-sensitive receptor location, distance to construction activities, noise levels at the receptor due to construction activities, and construction noise level limits for each noise-sensitive receptor.

If construction activities (not including pile-driving activities) associated with construction of the electrical transmission line are conducted outside of construction noise exempt hours, the construction noise level limits will be exceeded at LT-2, ST-4 and ST-5.

Although it is expected that any piles required for transmission line construction would be augered, if pile driving was required, it would be the loudest activity during transmission line construction. As shown on Table 5.5-18, pile driving activities generate noise levels of 101 dBA L_{eq} at a distance of 50 feet. Table 5.5-21 summarizes construction of the electrical transmission line with pile driving activities being conducted.

If pile driving activities associated with construction of the electrical transmission line are conducted outside of construction noise exempt hours, the construction noise level limits will be exceeded at all of the noise-sensitive receptors listed in Table 5.5-21, except at LT-7.

In summary, if construction activities associated with the installation of the electrical transmission line occur during hours when construction noise is exempt, potential noise impacts are considered to be less than significant. However, if construction activities associated with the installation of the electrical transmission line occur outside of construction noise exempt times, the construction noise level limits for seven of the eight noise-sensitive receptors listed in Table 5.5-21 will be exceeded. Therefore, if construction activities, especially those associated with pile driving, are performed during non-exempt hours, then the Project will implement mitigation measure NOISE-1 to reduce this impact to less-than-significant levels.

Potable Water Supply Pipeline

The potable water supply pipeline follows the same route as the proposed electrical transmission line. The potable water supply pipeline will cross the East Side Canal. Table 5.5-22 summarizes the noise-sensitive receptor location, distance to construction activities, noise levels at the receptor due to construction activities, and construction noise level limits associated with the construction of the potable water supply line.

If construction activities associated with the installation of the potable water supply pipeline occur during construction noise exempt times, potential noise impacts are considered to be less than significant.

Although not expected, if construction activities associated with the installation of the potable water supply pipeline occur outside of construction noise exempt times, the construction noise level limits for three of the eight noise-sensitive receptors listed in Table 5.5-22 will be exceeded. Therefore, if construction activities are performed during non-exempt hours, then the Project will implement mitigation measure NOISE-1 to reduce this impact to less-than-significant levels.

Process Water Supply Pipeline

The process water pipeline route runs from Seventh Standard Road to the Project Site, along the existing BVWSD road on the northwest side of the West Side Canal. There are several noise-sensitive receptors located within a few hundred feet of the existing BVWSD road. The nearest noise-sensitive receptor is located less than 100 feet away from process water pipeline construction activities. This single-family residence is located at Wasco Way near the West Side Canal. Noise levels associated with construction and installation of the process water pipeline have the potential to be as loud as 83 dBA L_{eq} at this location. There is a single-family residence located at the western end of Stockdale Highway. This home and the single family residence at ST-6 are located approximately 350 feet away from proposed construction activities, and these activities have the potential to generate noise levels reaching 72 dBA L_{eq} at both locations.

If construction activities related to the installation of the process water supply pipeline occur during construction noise exempt times, potential noise impacts are considered to be less than significant. However, if construction activities related to the installation of the process water supply pipeline occur outside of construction noise exempt times, the construction noise level limits for the residences described above, which are within 350 feet of the construction area, will be exceeded. The Project will implement mitigation measure NOISE-1 to reduce this impact to less than significant. For all other noise-sensitive receptors listed in Table 5.5-17, the construction noise level limits outside of the construction noise exempt times will not be exceeded and there will be no impact.

Natural Gas Supply Pipeline

There are several noise-sensitive receptors located near the proposed natural gas supply pipeline route. Construction activities associated with the natural gas supply pipeline could potentially be as loud as 70 dBA L_{eq} at one of the sensitive receptors. Since no noise measurements were conducted at this home, the 45 dBA L_{eq} construction noise level limit during non-exempt hours was used for this analysis. The 45 dBA L_{eq} construction noise level limit during non-exempt hours would be exceeded at this home.

Construction activities associated with the natural gas supply pipeline near another sensitive receptor could potentially be as loud as 83 dBA L_{eq}. Noise levels at all other noise-sensitive receptors due to construction of the natural gas supply pipeline are summarized in Table 5.5-23.

If construction activities associated with construction of the natural gas supply pipeline are conducted outside of construction noise exempt hours, the construction noise level limits would be exceeded at all noise-sensitive receptors except LT-3 and ST-6. Therefore, if construction activities are performed during non-exempt hours, the Project will implement mitigation measure NOISE-1 to reduce this impact to less-than-significant levels. If construction activities associated with the installation of the natural gas supply pipeline are conducted during construction noise exempt times, potential noise impacts would be less than significant.

CO_2 Pipeline

An approximately 3-mile CO_2 pipeline will transfer the CO_2 captured from the Project Site southeast to the OEHI CO_2 Processing Facility. HDD will be used to install the CO_2 pipeline under the Outlet Canal, the Kern River Flood Control Channel, and the California Aqueduct. If necessary, HDD activities will be conducted 24 hours per day. HDD construction activities generate noise levels of 80 dBA at a distance of 50 feet (Burge and Kitek, 2009). Additional information on noise impacts associated with the construction of the CO_2 pipeline is provided in Appendix A.

The only residence located near proposed HDD locations is the single-family residence located at ST-5, approximately 2,600 feet northeast of proposed HDD activities. Noise levels associated with HDD construction activities have the potential to be as loud as 46 dBA L_{eq} at this location. This would exceed the established 45 dBA L_{eq} nighttime exterior noise level limit by 1 dBA. Other construction activities associated with the construction of the CO_2 pipeline would generate noise levels of 89 dBA at a distance of 50 feet. Table 5.5-24 summarizes construction of the CO_2 pipeline without the HDD construction activities. Each noise-sensitive receptor location, distance to construction activities, noise levels at the receptor due to construction activities, and construction noise level limits are listed for each noise-sensitive receptor.

If construction activities associated with construction of the CO_2 pipeline are conducted outside of construction noise exempt hours, the construction noise level limits would be exceeded at LT-2 and ST-5. Therefore, if construction activities are performed during non-exempt hours, the Project will implement mitigation measure NOISE-1 to reduce this impact to less-than-significant levels. If construction activities relating to the construction of the CO_2 pipeline are conducted during construction noise exempt times, potential noise impacts are considered to be less than significant.

Railroad Spur (Alternative 1)

Construction of the railroad spur will use earthwork and track construction equipment typically used on similar rail projects throughout California and the United States. Table 5.5-25 summarizes the noise-sensitive receptor location, noise levels at the receptor due to construction activities, and construction noise level limits associated with construction of the railroad spur.

If construction activities associated with construction of the railroad spur are conducted outside of construction noise exempt hours, the construction noise level limits would be exceeded at every noise-sensitive receptor except at LT-3, ST-6, and LT-7. Therefore, if construction activities are performed during non-exempt hours, the Project will implement mitigation measure NOISE-1 to reduce this impact to less-than-significant levels.

If construction activities associated with the railroad spur occur during construction noise exempt times, potential noise impacts are considered to be less than significant.

Special Construction Activities

During final construction, a method used to clean piping and testing called "steam blows" creates substantial noise. A steam blow results when high-pressure steam is discharged through the steam piping to clean the piping. The intent of the steam blows is to heat and sweep the piping systems to remove any debris or fine particles that could damage the steam turbine generator or other equipment. Each steam blow is followed by a cool-down period. The heating and cooling cycles are expected to last 2 or 3 hours each, and will be performed several times daily over a period of 2 or 3 weeks.

Unattenuated steam blows can produce very loud noise levels at the steam discharge/clean-out point. However, for this Project, temporary silencing systems will be employed to minimize these short-term, temporary noise impacts. Typical steam blow silencing should be able to reduce noise levels by 20 dBA to 30 dBA at each receptor location. Table 5.5-26, Estimated, Silenced Steam Blow Noise Levels, summarizes the potential noise levels at each receptor location for this temporary construction activity, including the use of silencers.

In general, steam blow events will be short-term, intermittent, and temporary, and will not result in significant impacts.

OEHI Project

According to the analysis contained in Appendix A-1, Section 4.11, Noise; and Appendix A-2, Section 2.5, Noise, construction of the OEHI Project will not result in significant adverse impacts as a result of noise.

5.5.2.2 Post-Commissioning Maturation-Phase Noise

As described in Section 2.6.4 of the Project Description of this AFC Amendment, the major process units will be commissioned sequentially. For this Project, the Power Block will be commissioned ahead of the Gasification Block. The commissioning for the Project will require four distinct phases: (1) Power Block commissioning on natural gas; (2) Gasification Block and Balance of Plant (BOP) Commissioning; (3) Power Block Commissioning on hydrogen-rich fuel; and (4) Manufacturing Complex Commissioning. The steps involved in the commissioning of these four phases are given in Sections 2.6.4.1 to 2.6.4.4 of the Project Description of this AFC Amendment.

As described in Section 2.1.7 of the Project Description of this AFC Amendment, the start-up and commissioning period of the Project is expected to be completed within approximately 13 months after completion of construction. Commercial operation will start when the commissioning and startup activities are completed and the licensor/contractor guarantees and milestones have been achieved.

Commissioning periods for conventional combined-cycle systems operating on natural gas typically last only a few months. In contrast, commissioning duration for combined-cycle systems using hydrogen-rich fuel from solid feedstock such as petcoke or coal require a longer ramping duration due to the shakedown period.

After the initial Startup and basic Commissioning Phase, it is anticipated that there will be two planned gasifier starts per year. These will occur over the lifespan of the Project and can be considered as part of the operations of the Project, from a noise standpoint. Consequently, these gasifier (and related systems) start-up noise sources require noise control treatments such that their contribution to the overall Project noise profile is no greater than the contributions from the Project equipment and systems that are operating between gasifier starts. That is, steam or gas discharges, by-pass valves, eductor systems, atmospheric vents, increased flaring rates, and the like that will be used beyond the initial start-up efforts will have noise reduction features (such as casing treatments, lagging, and discharge silencers) to keep the Project's aggregate sound energy at or below the level needed to comply with the Project's noise goals.

With these general noise control measures for the Project equipment and systems (as detailed in Table 5.5-15), the aggregate noise emissions into the adjacent community will be comparable between the post-Commissioning Maturation Phase and the Operations Phase, discussed below.

5.5.2.3 Operational Noise

To evaluate the expected noise emissions from the Project and identify the need for noise control measures, a noise modeling study of the Project has been performed.[2] A computerized noise prediction program, Cadna/A, was used to simulate and model the future equipment noise emissions throughout the area. The modeling program uses industry-accepted propagation algorithms based on International Organization for Standardization (ISO) standards.[3] The calculations account for classical sound wave divergence (spherical spreading loss with adjustments for source directivity from point sources) plus attenuation factors due to air absorption, ground effects, and barrier/shielding.

Calculations were performed using octave band sound power levels (L_w) as inputs from each noise source. The computer outputs are in terms of octave band and overall A-weighted noise levels (sound pressure levels, abbreviated SPL or L_p) at discrete receptor positions or at grid map nodes (in preparation for computing a contour map). The output listing can be ranked by relative noise contribution from each noise source.

Figure 2-5, Preliminary Plot Plan (in Section 2.1 of this AFC Amendment) was used to establish the position of the noise sources and other relevant physical characteristics of the site. The noise

[2] For background information, the reader is encouraged to refer to Appendix K-2, Noise Technical Report, from the May 2009 AFC filing.

[3] ISO is the International Organization for Standardization. Algorithms and methods for this program are included in the ISO 9613, ISO 1913 (Part 1), and/or ISO 3891 standards.

source locations and noise-sensitive receptor locations were translated into input x, y, z coordinates for the noise modeling program.

Modeling Procedures, Inputs, and Assumptions

For conservatism, and as is standard practice in the description of environmental noise, the modeling assumed stable atmospheric conditions suitable for reproducible measurements (under "standard-day" conditions of 59°F and 70 percent relative humidity) that are favorable for propagation. These inherent conservative factors and assumptions result in a noise model that will tend to be biased to higher predicted values than will be expected in the actual environment around the Project.

All currently planned, continuous-operation equipment items that were deemed to be significant noise sources at the Project were included in the noise model. The major process areas of the Project include:

- Material Handling (feedstock in-flow and solids out-flow)
- Gasification (Area 010)
- Gas Treating (Area 020)
- Acid Gas Removal and Refrigeration (Area 030)
- CO_2 Compression/Purification (Area 040)
- Sulfur Recovery and Degassing (Area 050)
- Pressure Swing Adsorption (PSA) and Off-gas Compression (Area 060)
- Power Block (Area 070)
- Manufacturing Complex (Area 080)
- Water Treatment (Area 090)
- Fire Protection and Utilities (Area 100)
- Air Separation Unit (ASU) (Area 150)

Within these overall units, the set of modeled sources included:

- Power Block Cooling Towers and ASU Cooling Tower;
- Main Power Block –combined-cycle, outdoor installation;
  (Gas Turbine + Steam Turbine + Heat Generator Recovery Steam Generator [HRSG]);
- Single-shaft Generator;
- Main Transformer, plus several facility auxiliary transformers;
- Power Block Cooling Tower Main Water Pumps and Motors;
- Process Cooling Tower Main Water Pumps and Motors;
- Boiler Feed Water Pumps and Motors;
- ASU systems, primarily large compressors, and related pumps, valves, and other systems;
- Material Handling Systems, including crushers, conveyors, and transfer towers;
- Flares, thermal oxidizers, SRU furnaces, and process vents;
- Syngas, CO_2, Air, Ammonia, Tail Gas, Refrigeration, and Recycle Compressors;
- Various sources in the Gasification Area and in the Manufacturing Complex;
- Various significant Pump Systems (over 25 hp each).

The Project is assumed to operate 24 hours per day at its design capacity, which means its noise output will nominally be constant, regardless of time of day (and, thus, the statistical sound levels should nominally be the same—that is, $L_{100} = L_{90} = L_{50} = L_{10} = L_0$). Given the early stages of the Project design, only limited vendor data are available for use as noise model inputs. Consequently, conservative data and assumptions were used from similar-sized IGCC power plant configurations and from information gathered during the previous HECA AFC development efforts. As a secondary information source, model inputs derived from generic industry reference information were used.

The noise control options developed for the May 2009 Revised AFC documentation served as the starting point for this current assessment. These levels, which often included prudent and feasible noise reduction features, were converted into sound power levels (in decibels re 1 picoWatt) to serve as the initial inputs for the noise modeling program. Major buildings and structures were included as barriers to account for propagation losses due to shielding between a given noise source and a receptor location. Most tanks, as well as the perimeter earthen berms along the northern and eastern edges of the Project Site, as described in Figure 2-5, Preliminary Plot Plan, were also included as barriers in the model. The tanks and berms were included in the noise analysis as they would break the direct, line-of-sight propagation pathway from many Project noise sources to the off-site receptors.

Noise Modeling

To ensure compliance with applicable LORS during ongoing Project operations, extensive noise reduction features were incorporated into the Project design. These features, leveraged from the 2009 Revised AFC effort, were included in the noise modeling configuration for the Project Site. From an analysis viewpoint, these noise reduction features were incorporated into the model by applying reasonable adjustments to the input noise levels to account for such treatments as enclosing noisy equipment items, incorporating appropriate transmission loss characteristics on selected building walls, installing silencers on inlets/exhausts, or specifying low-noise equipment. This process resulted in an efficient and reasonably achievable[4] mix of noise course characteristics that will result in predicted compliance at all receptor locations.[5] This mix of noise reduction measures focused on the following generalized treatments:

- Putting open-top enclosures on selected non-enclosed compressors/expanders;
- Noise abatement for various noise sources associated with the gasifiers;
- Low-noise procurement or shrouded or blanketed pump trains;
- Low-noise procurement or shrouded or blanketed blowers and dust handlers;
- Reduced-noise cooling tower cells;
- Use of a stack silencer on HRSG exhaust;
- Use silencers on selected gas and steam vents to atmosphere;
- Specify low-noise package for the CT train;
- Specify low-noise package for the ST train;

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4 Assessment of achievability was based on mitigation experience efforts on similar industrial projects.

5 Per historical CEC acceptability guidelines and per the discussion in Section 5.5.1.5.

- Specify reduced-noise components on the HRSG system;
- Additional acoustical paneling of feed, transfer, and crusher enclosures/buildings;
- Refined noise emissions information for sulfur recovery unit (SRU) burners (using vendor information); and
- Refined noise emissions information for Thermal Oxidizer (using vendor information).

Noise Control Design Features

The effective noise control treatments that were used in the Project design modeling are a combination of vendor specification limits, acoustical designs in specific systems, and/or external treatments on selected equipment items or systems. These noise control design features are summarized in Table 5.5-27, Summary of Project Noise Control Design Features.

Noise source sound levels modeled for the Project Operations Phase may be found in Appendix J-2 of this document.

Noise Analysis Compared to Kern County Standards

The Project is predicted to comply with the Kern County standards, as shown in Table 5.5-28 and Table 5.5-29 for exterior and interior results, respectively.

Noise Analysis Compared to CEC Significance Thresholds

With receptor Location LT-2/ST-2 as the closest residential receptor, this location was the focus for noise control to achieve compliance with CEC noise thresholds. While this nearest location does not benefit from the current configuration of earthen berms breaking line-of-sight propagation, it is approximately 4,500 feet from the center of the Project process areas and would experience on the order of 39 dB of divergence attenuation, plus a notable amount of ground attenuation over soft or vegetated ground. The other noise-sensitive receptor locations are located between 5,000 and over 13,000 feet away from the Project process areas and would receive less noise than the nearest location due to sizable distance attenuation factors.

The results of the modeling which incorporated noise reduction features are shown in Table 5.5-30, Summary of Project Contributions with Noise Control Features Relative to CEC Noise Impact Criteria.

The results show that with the design features for controlling Project noise emissions, receptor locations LT-3/ST-3, ST-4, ST-5, ST-6, LT-7, LT-8, and LT-9 are predicted to be at or below the design goal needed to achieve compliance with the CEC thresholds. The closest off-site receptor location, LT-2/ST-2, is predicted to be 2 dB above the L_{90}+5 dB guideline (that is, it is predicted to be +7 dB with respect to the existing, late-night ambient conditions).

As indicated previously in Section 5.5.1.5, the CEC has determined that the level of potential impact for noise increases between +5 and +10 dBA depends on the particular circumstances of a project. In considering the factors for this situation, the Project would result in less-than-significant impacts at the closest receptor location (LT-2/ST-2) based on the low resulting noise levels (37 dBA) and the small number of people potentially affected.

After the results for the discrete receptor locations were predicted, the same modeling process (again using the noise control features in Table 5.5-27, Summary of Project Noise Control Design Features) was used to calculate plant noise levels at regularly-spaced grid points. From these grid results, a noise level contour map was generated. This contour map is a plot of constant, A-weighted sound levels in 5 dB increments for just the Project noise sources, and is shown in Figure 5.5-4, Noise Contours at Project Site. The figure is the graphical illustration of the predicted Project noise contributions, in terms of L_{eq}, at each noise-sensitive receiver summarized in Tables 5.5-28 and 5.5-30 above.

These extensive and comprehensive design features for controlling Project noise emissions are considered to be technically feasible, as well as reasonable and cost-effective for overall Project noise reduction. These noise reduction measures and features will be refined during detailed design phases to ensure that noise emissions resulting from the Project are as low as reasonably achievable.

OEHI Project

According to the analysis contained in Appendix A-1, Section 4.11, Noise and in Appendix A-2, Section 2.5, Noise, operation of the OEHI Project will not result in significant adverse impacts as a result of noise.

5.5.2.4 Ground-Borne Vibration

Experience at similar facilities demonstrates a very low probability for either ground-borne or airborne-induced vibration impacts to surrounding land uses. The equipment that will be used in the Project is well-balanced and designed to produce very low vibration levels throughout the life of the Project. An imbalance could contribute to ground vibration levels in the vicinity of the equipment. However, vibration-monitoring systems installed in the equipment are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event will be detected and the equipment will automatically shut down. Also, given the distances from the actual equipment to the nearest receptor locations (on the order of at least 3,000 feet), coupled with the inherently low vibration levels from the Project's well-balance machinery, ground-borne vibrations would not even be expected to be detectable above the residual background vibration environment at any of the pertinent receptor locations. As a result, impacts related to ground-borne vibrations would be less than significant.

5.5.2.5 Worker Exposure to Noise

As part of the detailed design phase, the Project will specify that nearly all components will not exceed a near-field maximum noise level of 80 dBA at 1 meter (3 feet) as the standard for equipment selection and procurement. Because there are no permanent or semi-permanent workstations located near any piece of noisy Project equipment, and because a high degree of automation will be employed for operating the Project, workers' average exposure to noise should remain within allowable levels per OSHA regulations. Nevertheless, signs requiring the use of hearing protection devices will be posted in all areas where noise levels commonly exceed 85 dBA, such as inside acoustical enclosures. Outdoor noise levels throughout the Project will typically range from 90 dBA near certain systems or sets of equipment to roughly 65 dBA in areas more distant from any major noise source.

After the Project has been constructed and employee jobs and routines determined, HECA will conduct an occupational noise survey to identify the noise-hazardous areas in the facility. The survey will be conducted, after the Project is in full operation, by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, § 5095–5100 (Article 105) and Title 29, Code of Federal Regulations, Part 1910.

5.5.2.6 Railroad Spur Operational Noise

Noise from the proposed railroad spur was assessed using the FTA Noise Impact Assessment Spreadsheet model. These results are shown in Table 5.5-31. This table lists the existing measured noise levels in terms of L_{dn} at each long-term measurement site. The table also summarizes the moderate and severe noise impact thresholds at each noise-sensitive receptor, the modeled project noise contribution due to horn noise and train engines and cars, and the resulting total noise exposure level. The total noise exposure is the sum of the measured existing noise level plus the modeled Project noise contributions due to horn noise and trains' engines and cars. The farthest column on the right states whether there is an impact and the type of impact at the noise-sensitive receptor. The analysis considered the following assumptions in regard to operations on the railroad spur:

- Number of trains per day: 1 train
- Speed of trains: 25 miles per hour
- Number of cars per train: 111 cars
- Number of engines per train: 5 engines per train
- Number of daytime train events: 0 events
- Number of nighttime train events: 2 events
- Horns will blow at the Stockdale Highway and Dairy Road crossing
- Horns will blow at the Adohr Road and Dairy Road crossing

Although trains may be received at the Project Site at any hour of the day, a worst-case scenario for train events assumes that the train will come into the Project Site during nighttime hours and leave during nighttime hours. This results in a total of two train events occurring during nighttime hours. Trains will blow their horns for 20 seconds before each at-grade rail crossing, which equates to a length of approximately 733 feet. The approximate rail horn noise is calculated to be 77 dBA L_{dn} at a distance of 50 feet from the railroad spur line.

As shown on Table 5.5-31, the modeled Project noise levels that result from the combination of horn noise and engine and rail noise would result in moderate noise impacts at MR-1 and MR-2, but a moderate impact is considered to be less than significant. No significant impacts were identified for Locations LT-8 or LT-9. Therefore, noise impacts that would result from operations of the railroad spur would be less than significant.

5.5.2.7 Railroad Spur Ground-Borne Vibration

The potential vibration effects from the proposed railroad spur operations were assessed using the methodology contained in the FTA manual (FTA, 2006), which are also discussed in Section 5.5.1.5 – Noise Level Design Goals. The table illustrating FTA's Criteria of Impact for Human Annoyance and Interference due to Ground-Borne Vibration can be found in Section 5.5.1.5 as Table 5.5-14. The projected vibration levels at MR-1 would be approximately 67 VdB. This vibration level is below the threshold of perceptibility of 80 VdB when there are fewer than 30 events per day. The results of the vibration impact analysis are present in Table 5.5-32. The vibration level thresholds will not be exceeded at any receptors due to operations on the railroad spur line. Since the vibration level at MR-1 is above the 65 VdB threshold for human perception of vibration, vibration will be slightly perceived.

If the railroad spur is constructed and used during operations of the Project, potential vibration impacts are considered to be less than significant.

5.5.2.8 Traffic Noise for Construction and Operations

Project construction and operation would result in an increase in vehicular traffic along site access roadways. Primary access roadways include Stockdale Highway, State Route 119, Morris Road, Station Road, Dairy Road, Tupman Road, and Adohr Road.

As discussed above, the CEC assesses noise exposure in terms of local General Plans, noise ordinances, and changes to the ambient noise environment. While analysis of the change in the background noise level (L_{90}) has proven to be effective for assessing noise impacts from stationary, steady-state noise sources, this metric is not reliable for assessing changes in noise levels from intermittent mobile noise sources such as highway traffic. Highway noise is most often assessed in terms of a cumulative 24-hour metric such as L_{dn}, or, in the State of California, CNEL.

There are 12 intersections that are analyzed in the vicinity of the Project area where traffic volumes would increase due to Project-related construction and operations. Each leg of the respective intersection is analyzed by the increases in CNEL due to construction and Project-related operational traffic going to and from the Project Site. The change in traffic noise is analyzed using estimated traffic mixes and the speeds along the roads. Per the Kern County Noise Element, described in Section 5.5.1.5, an impact is defined as both being above 65 L_{dn}/CNEL and having an increase of 3 dBA L_{dn}/CNEL or more above the existing noise level. An increase in L_{dn}/CNEL of 3 dBA or more is considered perceptible by the human ear.

The FHWA-RD-77-108 traffic noise model was used to model noise impacts at all 12 intersection legs for construction and operations. This model takes into account the speed limit, ADT volume, and traffic mix. Calculations were made at a distance of 50 feet from the centerline of each intersection leg.

Construction Traffic

Acoustic calculations were performed for vehicular traffic during the construction period of the HECA Project. Year 2010 ADT volumes were provided. A 2-percent increase in traffic volumes was assumed to occur each year. The construction traffic ADT volumes were added to the estimated traffic volumes for 2016 to determine the “future with Project” scenario. Adjustments to the traffic mix for the future with Project scenario were made based on the added auto, medium truck and heavy truck ADT volumes due to construction. Table 5.5-33 illustrates the change in L_{dn}/CNEL and the noise levels in L_{dn}/CNEL at a distance of 50 feet from the centerline of each intersection leg for both “no Project construction” and “with Project construction” scenarios.

The noise levels along the Project intersection legs are expected to increase up to 18 dBA above the existing traffic noise levels during construction. Only three of the 48 intersection legs would be expected to have increases of 3 dBA L_{dn}/CNEL or more and also have “with Project construction” traffic volumes that result in noise levels of 65 dBA L_{dn}/CNEL or greater.

The west leg of the intersection of Dairy Road and Stockdale Highway will have an increase in L_{dn}/CNEL of 3 dBA with a resulting noise level of 67 dBA L_{dn}/CNEL at 50 feet due to construction traffic related to the Project. There are two residences located along the north side of Stockdale Highway that will be temporarily impacted during construction. The east leg of the intersection of Stockdale Highway and Morris Road will be impacted and will see an increase in L_{dn}/CNEL of 3 dBA with resulting noise level of 67 dBA L_{dn}/CNEL at a distance of 50 feet due to construction traffic related to the Project. There are no residences close enough to this leg to be considered impacted. The west leg of the intersection of Interstate-5 SB Ramp and Stockdale Highway will be impacted and will see an increase in L_{dn}/CNEL of 3 dBA with a resulting noise level of 67 dBA L_{dn}/CNEL at 50 feet due to construction traffic related to the Project. There are no residences close enough to this leg to be considered impacted.

As long as construction traffic is limited to construction noise exempt hours, noise impacts are considered to be less than significant because construction activities will be intermittent and temporary.

Project Operational Traffic with Railroad Spur (Alternative 1, Rail Transportation)

Acoustic calculations were performed for vehicular traffic during the operational period of the HECA Project. This traffic analysis takes into account that the proposed railroad spur line will be built and operational in the year 2017. Year 2010 ADT volumes were provided. A 2 percent increase in traffic volumes were assumed to occur each year. Traffic volumes resulting from an operational HECA Project were added to the estimated year 2017 ADT volumes to determine the “future with Project” traffic scenario in order to analyze the changes in L_{dn}/CNEL along each roadway segment. Adjustments to the traffic mix for the future with Project scenario were made based on the added auto, medium trucks and heavy truck ADT volumes due to operations. Table 5.5-34 illustrates the change in L_{dn}/CNEL and the noise levels in L_{dn}/CNEL at a distance of 50 feet from the centerline of each intersection leg for both “no Project” and “with Project” scenarios for operations starting in 2017.

There will be noticeable increases in traffic noise (10 dBA or more) at the intersections of Dairy Road/Adohr Road, Dairy Road/Stockdale Highway, Tupman Road/Station Road and Stockdale Highway/Morris Road. None of the 48 intersection legs have both (1) an increase of 3 dBA or more in L_{dn}/CNEL due to the introduction of Project-related traffic and (2) a resulting noise level of 65 dBA L_{dn}/CNEL or greater due to the introduction of Project-related traffic.

Potential noise impacts during operations due to traffic are considered to be less than significant.

Project Operation Traffic without Railroad Spur (Alternative 2, Truck Transportation)

Acoustic calculations also were performed for vehicular traffic during the operational period of the Project assuming that the railroad spur is not constructed as part of the Project. The traffic noise analysis includes 100 intersection legs. Year 2010 ADT volumes were established as part of the traffic analysis presented in Section 5.10 of the AFC Amendment. To estimate traffic volumes in 2017 (i.e., the first year of operations), a 2 percent increase in existing traffic volumes was assumed to occur each year. The construction traffic ADT volumes were added to the estimated 2017 traffic volumes to determine the “with Project” scenario. Adjustments to the traffic mix for the future “with Project” scenario were made based on the added auto, medium truck, and heavy truck ADT volumes due to operation. Table 5.5-35 illustrates the changes in L_{dn}/CNEL and the noise levels in L_{dn}/CNEL at a distance of 50 feet from the centerline of each intersection leg for both “no Project” and “with Project” scenarios for operation.

Six of the 100 intersection legs will have noticeable increases in traffic noise (10 dBA or more). The west leg of the intersection of the I-5 northbound ramp and Stockdale Highway will be impacted and will have both an increase in L_{dn}/CNEL of 3 dBA and have a “with Project” L_{dn}/CNEL of greater than 65 dBA at a distance of 50 feet from the centerline. Noise-sensitive residential homes are located as close as 60 feet to the centerline along this leg. The east and west legs of the intersection of the I-5 southbound ramp and Stockdale Highway will be impacted and will see increases in L_{dn}/CNEL of 3 and 5 dBA, respectively, as well as having “with Project” L_{dn}/CNELs of greater than 65 dBA. Noise-sensitive residential homes are located as close as 60 feet to the centerline along the west leg and as close as 100 feet along the east leg of the intersection. The south and east legs of the intersection of Stockdale Highway and Morris Road will be impacted and will see increases in L_{dn}/CNEL of 19 and 5 dBA, respectively, as well as having “with Project” L_{dn}/CNELs of greater than 65 dBA.

Noise-sensitive residential homes are located as close as 60 feet to the centerline along the west leg, but there are no homes located on the south leg. There will be no noise impacts on the south leg of the intersection of Stockdale Highway and Morris Road. The east leg of the intersection of Tupman Road and Station Road will be impacted and will see an increase in L_{dn}/CNEL of 18 dBA and have a “with Project” L_{dn}/CNEL of 65 dBA or greater at a distance of 50 feet from the centerline. Noise-sensitive residential homes are located as close as 40 feet to the centerline along this leg.

If the railroad spur is not constructed, the Project’s traffic noise impacts during Project operations at certain locations are potentially significant without mitigation. The Project will implement mitigation measure NOISE-2 in order to reduce noise levels to less than significant if this alternative is chosen for the HECA Project.

5.5.3 Cumulative Impacts

Under certain circumstances, CEQA requires consideration of a project's cumulative impacts (CEQA Guidelines § 15130). A "cumulative impact" consists of an impact which is created as a result of the combination of the project under review together with other projects causing related impacts (CEQA Guidelines § 15355). CEQA requires a discussion of the cumulative impacts of a project when the project's incremental effect is cumulatively considerable (CEQA Guidelines § 15130[a]). "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CEQA Guidelines § 15065 [a][3]).

When the combined cumulative impact associated with a project's incremental effect and the effects of other projects is not significant, further discussion of the cumulative impact is not necessary (CEQA Guidelines § 15130[a]). It is also possible that a project's contribution to a significant cumulative impact is less than cumulatively considerable and thus not significant (CEQA Guidelines § 15130[a]).

The discussion of cumulative impacts should reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great a level of detail as is provided for the effects attributable to the project under consideration (CEQA Guidelines § 15130[b]). The discussion should be guided by standards of practicality and reasonableness (CEQA Guidelines § 15130[b]).

A cumulative impact analysis starts with a list of past, present, and probable future projects within a defined geographical scope with the potential to produce related or cumulative impacts (CEQA Guidelines § 15130[b]). Factors to consider when determining whether to include a related project include the nature of the environmental resource being examined, the location of the project, and its type (CEQA Guidelines § 15130[b]). For purposes of this AFC Amendment, Kern County was contacted to obtain a list of related projects, which is contained in Appendix I. Depending on its location and type, not every project on this list is necessarily relevant to the cumulative impact analysis for each environmental topic.

Only one project has been identified that could potentially influence ambient levels at noise-sensitive receptors in the vicinity of the Project Site. This is the proposed dairy farm, a 1,057-acre milk production facility that may occupy plots to the west, north, and east of the Project Site. Of the total dairy project, approximately 121 acres are slated for cattle yards and milking facilities. Although no details are currently available for this development, noise from dairy operations is estimated to be in the range of 75 to 85 dB (unweighted decibels); this is approximately equivalent to 57 to 67 dBA. For these levels of on-site dairy noise, and in consideration of the distances to the nearest sensitive receptors, the dairy facility is expected to contribute negligible, if any, additional noise levels to the environment around the Project Site. Therefore, there are no known noise sources in the area that will contribute to Project noise levels in a manner that would result in an additional cumulative impact.

For potential Project operations noise impacts to the proposed dairy facility, the 121 acres of cow yards and milking facilities were assumed, as a worst case, to be near the southeastern corner of Section 9, immediately to the west of the Project Site across Dairy Road. Project modeling for this location indicated an expected daytime contribution of 51 dBA (which is approximately equivalent to 68 dB unweighted). Because the majority of Project noise sources would be over 0.5 mile away, and based on predicted Project contributions, the estimated dairy facility self-generated noise is seen to eclipse the Project equipment noise levels by a difference of about 6 or more dB. Thus, no noise impacts from the Project are expected at the closest potential dairy facilities.

According to the analysis contained in Appendix A-1, Section 4.11, Noise and Appendix A-2, Section 2.5, Noise, construction and operation of the OEHI Project would not result in significant cumulative adverse impacts as a result of noise.

5.5.4 Mitigation Measures

The implementation of Project design features during the detailed design process will result in the operation of the Project meeting the Kern County Noise Element limits, as well as the CEC's significance impact threshold. To ensure compliance, the Project will implement the following mitigation measures.

NOISE-1

As noted in the above analysis, potentially significant impacts may occur if certain construction activities are conducted outside of construction noise exempt times. Construction noise is exempt from 6:00 a.m. to 9:00 p.m. on weekdays and from 8:00 a.m. to 9:00 p.m. on weekends. Therefore, the Project has incorporated mitigation measure NOISE-1 to reduce the construction impacts to less-than-significant levels.

During construction, the Project will implement the following measures:

- Conduct construction activities during construction noise exempt hours, when possible.
- For construction activities being conducted outside of construction noise exempt hours, the Contractor will obtain a permit from Kern County, if necessary.
- Contractor will be responsible for maintaining equipment in best possible working condition.
- Each piece of construction equipment should be fitted with efficient, well-maintained mufflers that reduce equipment noise emissions.
- Schedule truck loading, unloading, and hauling operations so as to reduce noise levels due to construction during non-exempt construction hours.
- Locate construction equipment as far as possible from nearby noise-sensitive receptors.
- Situate construction equipment so that natural berms or aggregate stockpiles are located in between the equipment and noise-sensitive receptors.
- Acoustically attenuating shielding (barriers) and shrouds should be used when possible.

NOISE-2

If the Project decides to implement Alternative 2 (truck transportation), there will be operational traffic noise impacts on the identified intersection legs where the "with Project" L_{dn}/CNEL is greater than 65 dBA and the increase in noise levels from "without Project" volumes is 3 dBA or greater. Therefore, the Project has incorporated mitigation measure NOISE-2 to reduce the noise impacts due to traffic to less-than-significant levels.

During design, the Project will evaluate the following measures to reduce noise levels during operations:

- Reduced speeds of trucks
- Soundwalls at the impacted noise-sensitive receptors
- Roadway improvements along impacted intersection legs

5.5.5 Laws, Ordinances, Regulations, and Standards

This section describes LORS for the control of noise, as summarized in Table 5.5-36, Summary of LORS—Noise.

5.5.5.1 Federal

There are no noise-related federal LORS that affect this Project. However, there are guidelines at the federal level that direct the consideration of a broad range of noise issues as listed below:

- National Environmental Policy Act, 42 United States Code (U.S.C.), § 4321 *et seq*.; Public Law PL-91-190)
- Noise Control Act of 1972 (42 U.S.C. § 4910)

The USEPA has not promulgated standards or regulations for environmental noise generated by power plants. However, USEPA has published a guideline containing recommendations for noise levels affecting residential land use. The agency is careful to stress that the recommendations contain a factor of safety and do not consider technical or economic feasibility issues, and therefore should not be construed as standards or regulations.

Occupational Safety and Health Administration. In the U.S., worker noise exposure limits are regulated by OSHA under the Occupational Safety and Health Act of 1970.[6]

The noise exposure level for workers is limited to 90 dBA over a time-weighted average (TWA) 8-hour work shift to protect hearing.[7] If there are workers exposed to a $TWA_{8\text{-hr}}$ above 85 dBA (i.e., the OSHA Action Level), then the regulations call for a worker hearing protection program that includes baseline and periodic hearing testing, availability of hearing protection devices, and training in hearing damage prevention.

Federal Transit Administration. The Transit Noise and Vibration Impact Assessment manual (FTA, 2006) outlines key environmental impact assessment processes and procedures for mass

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6 OSHA noise regulations are established in Code of Federal Regulation (CFR) Title 29, Part 1910-G, §191095, "Occupational Noise Exposure."

7 In practice, workers are routinely exposed to varying noise levels for their 8-hour shift. So, to compute the entire shift's time-weighted average (higher level means shorter duration and vice versa), the other key component of worker noise exposure—the exchange rate—comes into play. The exchange rate is simply the decibel trade-off factor for exposure duration. Under OSHA regulations, the exchange rate is 5 dB. Thus, for every 5 dB increase in sound level, the allowable exposure duration is halved (i.e., 90 dB(A) for 8 hours, 95 dB(A) for 4 hours, 100 dB(A) for 2 hours, etc.).

transit projects. The noise calculations and impact criteria used by the FTA are based on the change in outdoor noise exposure using a sliding scale with three receiver categories and three degrees of impact. They were developed to respond to heightened community annoyance caused by late-night or early morning service and they respond to varying sensitivity of communities to noise from projects during different ambient noise conditions.

The FTA has developed criteria for assessing potential vibration impacts related to rail projects. The criteria contained in the FTA Manual are based on community reaction to rail-related vibration and the potential for adverse effects on vibration-sensitive activities and processes. The criteria identify intensities of ground-borne vibration that may be considered significant and thus require consideration of mitigation and abatement measures.

5.5.5.2 State of California

California Energy Commission

Under CEC siting requirements, new-source noise impacts at residential receptors are evaluated with respect to the pre-existing background noise level or specific local performance standards. The CEC typically defines an area as negligibly impacted by a project where operation potentially increases existing ambient noise levels by 5 dBA or less. CEC defines the ambient background noise level as the lowest 4-consecutive-hour logarithmic-average L_{90} at a 25-hour measurement site, and the lowest L_{90} at a short-term measurement site.

CEC also considers construction noise as typically insignificant if all of the following are true:

- The construction activity is temporary.
- Use of heavy equipment and noisy activities is limited to daytime hours.
- All feasible noise abatement measures are implemented for noise-producing equipment.

California Occupational Safety and Health Administration

Occupational exposure to noise is regulated by Cal/OSHA in Title 8, Group 15, Article 105, §§ 5095–5100. This standard stipulates that protection against the effects of noise exposure will be provided when sound levels exceed 90 dBA over an 8-hour exposure period. Protection will consist of feasible administrative or engineering controls. If such controls fail to reduce sound levels to within acceptable levels, personal protective equipment will be provided and used to reduce exposure to the employee. Additionally, a Hearing Conservation Program must be instituted by the employers whenever employee noise exposure equals or exceeds the Action Level of an 8-hour TWA sound level of 85 dBA. The Hearing Conservation Program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping.

California Vehicle Code

Noise limits for highway vehicles are regulated under the California Vehicle Code, § 27151. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff's Office.

5.5.5.3 Local

Noise Element to the Kern County General Plan and Cities of Wasco and Shafter

The Noise Element of the Kern County General Plan, as well as the Noise Elements for the Cities of Wasco and Shafter, require proposed commercial and industrial uses or operations to be designed or arranged so that they will not subject residential or other noise-sensitive land uses to exterior noise levels in excess of 65 dBA L_{dn}, and interior noise levels in excess of 45 dBA L_{dn} (Schafter, 2006 and 2009; City of Wasco, 2010).

5.5.6 Involved Agencies and Agency Contacts

5.5.6.1 Federal

No agencies were contacted.

5.5.6.2 State

No agencies were contacted.

5.5.6.3 County

No agencies were contacted.

5.5.7 Permits Required and Permit Schedule

No permits are required for noise.

5.5.8 References

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Table 5.5-1
Sound Levels of Typical Noise Sources and Noise Environments
(A-Weighted Sound Levels)

Noise Source (at Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels)
Military jet take-off with after-burner (50 feet)	140	Carrier flight deck	—
Civil Defense siren (100 feet)	130	—	—
Commercial jet take-off (200 feet)	120	—	**Threshold of pain** 32 times as loud
Pile driver (50 feet)	110	Rock music concert	16 times as loud
Ambulance siren (100 feet) Newspaper press (5 feet) Power lawn mower (3 feet)	100	—	**Very loud** 8 times as loud
Propeller plane flyover (1,000 feet) Diesel truck, 40 mph (50 feet) Motorcycle (25 feet)	90	Boiler room Printing press plant	4 times as loud
Garbage disposal (3 feet)	80	High urban ambient sound	2 times as loud
Passenger car, 65 mph (25 feet) Living room stereo (15 feet) Vacuum cleaner (3 feet)	70	—	**Moderately loud** 70 dBs (reference loudness)
Air conditioning unit (100 feet) Normal conversation (5 feet)	60	Data processing center Department Store	1/2 as loud
Light traffic (100 feet)	50	Private business office	1/4 as loud
Bird calls (distant)	40	Lower limit of urban ambient sound	**Quiet** 1/8 as loud
Soft whisper (5 feet)	30	Quiet bedroom	Very quiet
	20	Recording studio	Extremely quiet
	10	—	Extremely quiet
	0	—	Threshold of hearing

Source: Compiled by URS from various published sources and widely used references such as Harris, 1991; Berger, 2004; and Beranek, 1988.

Notes:

— = no specific noise environment identified
mph = miles per hour
dB = decibel

Table 5.5-2
25-Hour Sound Level Measurement at LT-1
(dBA)

Date	Time (Hour-Starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/3/2009	2:00:00	34.6	53.4	33.4	30.5	28.8	27.3
3/3/2009	3:00:00	37.2	51.9	38.7	31.4	29.3	27.1
3/3/2009	4:00:00	40.0	54.3	44.2	33.5	30.2	28.1
3/3/2009	5:00:00	43.2	59.7	47.2	38.1	35.2	32.4
3/3/2009	6:00:00	56.2	76.7	58.8	51.7	43.5	36.1
3/3/2009	7:00:00	56.7	77.3	58.8	54.3	49.8	45.8
3/3/2009	8:00:00	53.3	66.5	55.5	51.5	48.7	45.6
3/3/2009	9:00:00	57.1	76.6	57.9	54.3	51.3	47.6
3/3/2009	10:00:00	54.1	76.3	55.5	50.2	45.3	38.9
3/3/2009	11:00:00	54.0	72.7	57.1	50.9	45.7	40.1
3/3/2009	12:00:00	46.8	60.9	49.6	44.9	40.8	34.3
3/3/2009	13:00:00	53.6	66.0	56.6	52.4	47.1	38.1
3/3/2009	14:00:00	54.6	66.9	57.3	53.2	48.0	39.8
3/3/2009	15:00:00	56.5	64.8	60.1	54.8	48.5	35.5
3/3/2009	16:00:00	58.3	66.3	62.0	57.0	50.2	42.1
3/3/2009	17:00:00	56.7	81.8	60.2	53.8	42.9	36.2
3/3/2009	18:00:00	45.3	61.2	49.7	35.5	27.8	25.7
3/3/2009	19:00:00	37.0	55.5	41.7	29.6	26.4	24.3
3/3/2009	20:00:00	50.1	59.4	53.5	48.6	39.8	35.2
3/3/2009	21:00:00	49.9	61.3	53.4	47.9	42.6	36.9
3/3/2009	22:00:00	54.8	73.8	58.8	50.5	45.0	40.1
3/3/2009	23:00:00	54.1	65.3	57.2	52.8	46.2	42.4
3/4/2009	0:00:00	44.8	53.5	47.6	43.6	40.5	38.0
3/4/2009	1:00:00	38.3	53.5	41.2	35.2	29.8	28.0
3/4/2009	2:00:00	40.6	55.9	44.1	37.3	30.6	28.4

Source: URS, 2009.
Notes:
Measurements conducted on March 3 and 4, 2009.
Measurement Location: N 35°20'18.8", W 119°23'32.4"
Community Noise Equivalent Level = 58 dBA.
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise levels
LT = Long Term (greater than 25-hours continuous data) N = north
W = west

Table 5.5-3
Short-Term Sound Level Measurements at ST-1
(dBA)

Date	Date and Measurement Ending Time (10-minute Measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/2/2009	23:11:00	29.8	48.8	31.3	28.5	27.1	25.4
3/2/2009	23:22:00	34.5	52.2	36.3	32.1	29.2	26.4
3/3/2009	12:14:00	43.8	57.3	46.2	41.3	38.2	34.3
3/3/2009	12:25:00	42.4	52.7	45.4	41.3	36.6	31.0
3/3/2009	21:20:00	45.8	61.4	49.0	44.2	40.5	37.2
3/3/2009	21:31:00	46.5	57.4	49.2	44.9	42.0	38.4

Source: URS, 2009.
Notes:
Measurements conducted on March 2 and 3, 2009.
Measurement Location: N 35°20'18.8", W 119°23'32.4"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise levels
N = north
ST = Short Term
W = west

Table 5.5-4
25-Hour Sound Level Measurements at LT-2
(dBA)

Date	Time (Hour-Starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/2/2009	18:00:00	50.8	74.9	42.0	32.6	28.8	26.8
3/2/2009	19:00:00	49.7	73.2	41.9	31.7	27.9	26.1
3/2/2009	20:00:00	48.6	71.8	34.6	27.9	25.5	23.6
3/2/2009	21:00:00	47.7	72.0	39.0	29.3	25.8	23.8
3/2/2009	22:00:00	46.4	71.8	48.6	37.5	26.2	24.5
3/2/2009	23:00:00	45.8	72.4	47.1	35.0	30.3	28.3
3/3/2009	0:00:00	45.5	72.8	38.4	35.6	33.7	32.5
3/3/2009	1:00:00	41.9	69.2	35.4	33.3	32.0	30.3
3/3/2009	2:00:00	46.7	72.8	35.3	30.5	27.8	25.5
3/3/2009	3:00:00	51.3	79.0	35.0	31.6	30.0	28.3
3/3/2009	4:00:00	51.5	75.2	49.9	43.3	31.6	28.6
3/3/2009	5:00:00	58.2	80.4	56.8	43.3	34.4	30.6
3/3/2009	6:00:00	60.6	78.4	62.0	45.8	35.6	31.4
3/3/2009	7:00:00	53.8	76.0	51.7	43.1	37.2	32.5
3/3/2009	8:00:00	55.4	84.0	45.4	38.5	33.6	29.4
3/3/2009	9:00:00	53.8	76.9	45.7	34.9	30.3	27.4
3/3/2009	10:00:00	51.7	74.5	48.5	32.4	28.0	26.0
3/3/2009	11:00:00	54.0	79.0	43.8	31.7	28.5	26.9
3/3/2009	12:00:00	54.3	76.9	48.9	31.5	27.8	26.2
3/3/2009	13:00:00	52.5	72.7	46.7	32.1	28.2	26.1
3/3/2009	14:00:00	56.2	86.2	41.0	32.8	29.0	27.7
3/3/2009	15:00:00	59.6	77.9	57.8	33.8	27.5	24.7
3/3/2009	16:00:00	57.8	78.3	55.6	33.3	25.8	24.1
3/3/2009	17:00:00	57.8	80.3	57.0	36.0	25.3	23.3
3/3/2009	18:00:00	57.2	85.7	46.0	32.1	25.2	23.0

Source: URS, 2009.
Notes:
Measurements conducted on March 2 and 3, 2009.
Measurement Location: N 35°19'58.7", W 119°22'21.0"
Community Noise Equivalent Level = 61 dBA
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise levels
LT = Long Term (greater than 25-hours continuous data)
N = north
W = west

Table 5.5-5
Short-Term Sound Level Measurements at ST-2
(dBA)

Date	Date and Measurement Ending Time (10-minute measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/2/2009	0:10:00	42.4	61.5	37.1	35.3	34.0	32.2
3/2/2009	0:21:00	52.5	79.4	39.4	35.7	33.9	31.9
3/3/2009	13:24:00	51.4	72.4	44.0	29.2	26.6	24.8
3/3/2009	13:41:00	48.0	75.2	36.6	28.7	25.9	24.2
3/3/2009	20:22:00	53.4	75.1	55.8	48.3	43.0	38.5
3/3/2009	20:33:00	52.5	73.5	52.8	44.4	38.9	33.7

Source: URS, 2009.
Notes:
Measurements conducted on March 3, 2009.
Measurement Location: N 35°19'58.7", W 119°22'21.0"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise levels
N = north
ST = Short Term
W = west

Table 5.5-6
25-Hour Sound Level Measurements at LT-3
(dBA)

Date	Time (hour-starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/2/2009	19:00:00	59.4	86.0	52.9	38.8	32.4	28.9
3/2/2009	20:00:00	55.4	81.9	38.7	34.9	31.4	27.1
3/2/2009	21:00:00	58.8	85.0	45.6	32.7	27.5	24.0
3/2/2009	22:00:00	60.5	85.9	51.2	37.4	29.9	27.0
3/2/2009	23:00:00	56.7	86.1	45.9	41.6	35.1	31.4
3/3/2009	0:00:00	50.2	77.6	48.1	44.0	40.0	37.5
3/3/2009	1:00:00	53.6	79.9	47.4	44.2	41.8	38.7
3/3/2009	2:00:00	51.7	79.8	43.6	39.1	34.7	31.2
3/3/2009	3:00:00	55.9	85.4	41.3	38.9	37.0	31.6
3/3/2009	4:00:00	60.6	83.0	54.4	42.4	38.7	36.6
3/3/2009	5:00:00	68.7	85.1	72.9	53.3	45.7	38.4
3/3/2009	6:00:00	68.7	84.3	73.5	50.7	39.4	35.0
3/3/2009	7:00:00	65.5	85.5	63.0	45.1	39.3	36.3
3/3/2009	8:00:00	64.4	86.3	61.0	42.4	34.5	31.9
3/3/2009	9:00:00	66.6	88.1	63.0	41.0	35.0	31.4
3/3/2009	10:00:00	65.2	88.9	60.3	38.2	33.9	32.2
3/3/2009	11:00:00	66.5	87.2	62.8	38.5	34.4	32.4
3/3/2009	12:00:00	64.8	86.6	59.1	37.0	32.7	31.4
3/3/2009	13:00:00	65.6	86.9	60.9	38.6	35.2	32.9
3/3/2009	14:00:00	64.8	86.8	62.0	38.3	35.3	30.7
3/3/2009	15:00:00	68.6	85.3	71.4	42.9	33.5	30.9
3/3/2009	16:00:00	69.1	86.9	72.7	46.3	33.9	30.6
3/3/2009	17:00:00	68.0	87.4	70.2	46.1	33.2	26.7
3/3/2009	18:00:00	65.0	87.6	58.9	36.9	29.2	26.0
3/3/2009	19:00:00	60.5	82.9	50.9	37.5	28.3	25.0

Source: URS, 2009.
Notes:
Measurements conducted on March 2 and 3, 2009.
Measurement Location: N 35°21'17.2", W 119°22'24.5"
Community Noise Equivalent Level = 70 dBA.
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
N = north
W = west

Table 5.5-7
Short-Term Sound Level Measurements at ST-3
(dBA)

Date	Date and Measurement Ending Time (10-minute Measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/2/2009	22:33:00	55.5	80.7	47.8	31.4	29.8	27.6
3/2/2009	22:49:00	63.3	88.7	54.2	34.8	30.4	27.5
3/3/2009	14:45:00	65.9	85.9	65.1	40.0	34.7	32.8
3/3/2009	14:58:00	64.4	82.8	61.6	38.6	34.7	32.3
3/3/2009	19:12:00	52.5	76.2	45.5	28.6	25.3	24.0
3/3/2009	19:25:00	58.5	79.8	54.9	29.2	24.9	23.2

Source: URS, 2009.
Notes:
Measurements conducted on March 2 and 3, 2009.
Measurement Location: N 35°21'17.2", W 119°22'24.5"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
LT = Long Term (greater than 25-hours continuous data)
N = north
W = west

Table 5.5-8
Short-Term Sound Level Measurements at ST-4
(dBA)

Date	Date and Measurement Ending Time (10-minute measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/3/2009	13:59:00	51.4	73.8	38.7	31.4	29.2	27.3
3/3/2009	14:11:00	51.3	75.9	34.1	29.8	28.4	26.5
3/3/2009	19:49:00	33.4	55.4	35.7	31.3	27.4	23.4
3/3/2009	20:03:00	48.0	71.2	44.1	36.0	32.7	29.6
4/28/2009	2:00:00*	41.1	56.2	43.4	39.9	36.9	33.6

Source: URS, 2009.
Notes:
Measurements conducted on March 2 and 3, 2009 and April 28, 2009.
Measurements conducted on March 2 and 3, 2009 are 10 minutes in length
*Measurement conducted on April 28, 2009 is 1 hour and 15 minutes in length
Measurement Location: N 35°20'00.3", W 119°21'55.0"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
N = north
ST = Short Term
W = west

Table 5.5-9
Short-Term Sound Level Measurements at ST-5
(dBA)

Date	Date and Measurement Ending Time (10-minute measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/3/2009	15:24:00	57.3	82.4	47.9	27.7	23.5	21.2
3/3/2009	15:35:00	62.8	83.1	59.0	38.9	24.5	21.0
3/3/2009	20:49:00	55.0	79.8	49.0	38.9	34.2	29.5
3/3/2009	21:00:00	38.5	52.0	41.9	36.2	31.9	27.2
4/28/2009	2:00:00*	61.7	93.1	43.3	36.6	33.0	29.5

Source: URS, 2009.
Notes:
Measurements conducted on March 3, 2009 and April 28, 2009.
Measurements conducted on March 3, 2009 are 10 minutes in length
*Measurement conducted on April 28, 2009 is 1 hour and 15 minutes in length
Measurement Location: N 35°19'09.8", W 119°22'36.6"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
N = north
ST = Short Term
W = west

Table 5.5-10
Short-Term Sound Level Measurements at ST-6
(dBA)

Date	Date and Measurement Ending Time (10-minute measurements)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
3/3/2009	16:00:00	35.2	51.2	39.1	30.9	28.0	24.7
4/28/2009	16:12:00	30.1	46.7	33.3	28.3	24.9	22.5

Source: URS, 2009.
Notes:
Measurements conducted on March 3, 2009, are 10 minutes in length
Measurement Location: N 35°20'36.3", W 119°25'44.8"
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
N = north
ST = Short Term
W = west

Table 5.5-11
25-Hour Sound Level Measurement at LT-7
(dBA)

Date	Time (hour-starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
2/28/2012	17:00:00	57.3	68.2	58.9	56.9	54.8	51.7
2/28/2012	18:00:00	55.7	68.3	57.6	55.4	53.2	49.9
2/28/2012	19:00:00	57.8	67.0	60.8	56.5	53.2	48.2
2/28/2012	20:00:00	59.2	70.2	61.6	58.4	54.6	48.6
2/28/2012	21:00:00	58.4	67.6	61.1	57.5	53.7	49.4
2/28/2012	22:00:00	58.9	67.6	61.7	58.1	53.8	47.3
2/28/2012	23:00:00	58.4	66.0	61.1	57.7	53.1	47.6
2/29/2012	0:00:00	57.2	65.1	59.8	56.5	52.7	45.0
2/29/2012	1:00:00	54.9	65.0	57.1	54.3	50.8	46.7
2/29/2012	2:00:00	56.5	64.1	59.2	55.8	52.1	47.2
2/29/2012	3:00:00	57.9	66.2	60.6	57.0	52.3	47.3
2/29/2012	4:00:00	57.8	69.5	60.3	57.2	53.2	47.6
2/29/2012	5:00:00	59.2	64.5	61.1	58.9	56.2	51.6
2/29/2012	6:00:00	59.2	68.6	61.2	58.9	56.2	52.1
2/29/2012	7:00:00	57.6	66.4	60.2	57.0	53.2	47.1
2/29/2012	8:00:00	55.7	61.8	57.9	55.3	52.0	47.8
2/29/2012	9:00:00	53.9	61.6	56.7	53.0	48.8	42.0
2/29/2012	10:00:00	54.0	71.7	56.2	52.3	48.6	43.6
2/29/2012	11:00:00	63.0	89.8	57.8	53.6	50.1	46.2
2/29/2012	12:00:00	58.7	77.4	61.9	55.5	51.8	46.9
2/29/2012	13:00:00	54.3	60.0	56.6	53.8	50.8	45.4
2/29/2012	14:00:00	55.5	65.1	57.7	54.9	51.6	46.6
2/29/2012	15:00:00	56.9	66.4	59.6	56.1	52.6	47.0
2/29/2012	16:00:00	58.3	67.8	60.0	57.9	55.9	53.0
2/29/2012	17:00:00	58.9	79.7	60.2	58.3	55.9	51.6

Source: URS, 2012.
Notes:
Measurements conducted on February 28 and 29, 2012.
Community Noise Equivalent Level = 65 dBA.
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
LT = Long Term (greater than 25-hours continuous data)
N = north
W = west

Table 5.5-12
25-Hour Sound Level Measurements at LT-8
(dBA)

Date	Time (hour-starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
2/28/2012	17:00:00	43.7	72.6	37.6	31.3	27.6	25.0
2/28/2012	18:00:00	43.5	71.4	35.2	31.1	29.1	26.7
2/28/2012	19:00:00	36.6	54.6	38.4	35.6	33.9	32.8
2/28/2012	20:00:00	38.1	54.9	39.0	37.1	34.9	33.1
2/28/2012	21:00:00	37.8	60.3	38.8	36.2	33.8	32.0
2/28/2012	22:00:00	40.8	65.3	38.5	36.4	34.9	33.7
2/28/2012	23:00:00	51.1	76.2	39.5	37.0	34.0	31.6
2/29/2012	0:00:00	40.4	68.4	34.8	32.2	29.9	27.8
2/29/2012	1:00:00	33.6	52.3	34.1	30.4	27.6	26.2
2/29/2012	2:00:00	42.9	68.0	39.7	32.7	27.8	25.1
2/29/2012	3:00:00	40.4	64.8	39.8	36.1	32.5	30.2
2/29/2012	4:00:00	45.9	72.1	44.6	41.3	38.9	36.5
2/29/2012	5:00:00	49.6	68.7	52.7	46.8	41.4	39.3
2/29/2012	6:00:00	57.2	72.7	59.3	54.4	49.5	43.8
2/29/2012	7:00:00	53.9	72.9	55.8	49.8	45.5	39.8
2/29/2012	8:00:00	49.0	65.2	51.0	47.0	43.1	39.6
2/29/2012	9:00:00	49.3	66.2	51.5	44.5	38.2	30.8
2/29/2012	10:00:00	44.9	66.4	46.4	39.2	33.2	28.8
2/29/2012	11:00:00	44.2	66.7	46.1	39.0	31.4	27.5
2/29/2012	12:00:00	43.2	62.7	45.0	37.0	31.5	26.8
2/29/2012	13:00:00	44.4	63.8	47.3	38.0	29.5	25.8
2/29/2012	14:00:00	48.0	69.5	48.5	41.2	34.0	29.0
2/29/2012	15:00:00	49.6	74.6	49.5	43.6	39.1	33.0
2/29/2012	16:00:00	48.2	69.4	50.4	42.5	34.5	31.0
2/29/2012	17:00:00	55.6	76.8	43.0	37.5	32.3	29.0

Source: URS, 2012.
Notes:
Measurements conducted on February 28 and 29, 2012.
Community Noise Equivalent Level = 53 dBA.
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
LT = Long Term (greater than 25-hours continuous data)
N = north
W = west

Table 5.5-13
25-Hour Sound Level Measurements at LT-9
(dBA)

Date	Time (hour-starting)	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{min}
2/28/2012	18:00:00	59.6	79.0	64.0	42.3	34.0	30.7
2/28/2012	19:00:00	57.3	78.3	59.3	38.7	35.5	32.8
2/28/2012	20:00:00	45.4	66.8	43.6	40.8	38.4	36.2
2/28/2012	21:00:00	50.6	72.6	45.5	41.6	39.5	37.9
2/28/2012	22:00:00	51.6	73.8	47.5	40.7	36.5	34.6
2/28/2012	23:00:00	44.1	65.8	42.9	40.6	39.2	37.9
2/29/2012	0:00:00	46.9	70.6	45.6	41.6	38.5	35.3
2/29/2012	1:00:00	50.5	73.6	42.4	35.5	32.6	30.7
2/29/2012	2:00:00	45.9	72.9	34.9	32.9	31.3	29.0
2/29/2012	3:00:00	52.0	77.1	37.8	34.2	31.6	29.1
2/29/2012	4:00:00	61.5	76.9	66.8	42.8	33.8	31.8
2/29/2012	5:00:00	66.2	78.3	70.9	60.9	48.5	41.4
2/29/2012	6:00:00	66.1	79.9	70.1	62.6	55.7	47.0
2/29/2012	7:00:00	63.6	83.1	66.2	58.5	53.1	46.6
2/29/2012	8:00:00	61.8	74.9	65.4	57.4	52.8	47.4
2/29/2012	9:00:00	63.5	75.9	68.0	58.5	50.8	46.6
2/29/2012	10:00:00	59.0	75.9	62.9	50.7	44.1	37.9
2/29/2012	11:00:00	57.7	74.7	61.3	47.9	41.3	36.5
2/29/2012	12:00:00	59.4	78.6	60.6	53.8	44.0	36.7
2/29/2012	13:00:00	60.6	84.2	61.1	46.1	39.8	36.5
2/29/2012	14:00:00	56.7	77.1	60.0	46.6	39.6	34.4
2/29/2012	15:00:00	60.1	73.3	64.3	56.0	45.4	38.9
2/29/2012	16:00:00	63.7	77.0	67.1	60.2	54.8	47.4
2/29/2012	17:00:00	62.2	74.2	66.4	58.6	50.3	38.9
2/29/2012	18:00:00	56.7	72.7	60.7	49.5	41.0	34.9

Source: URS, 2012.
Notes:
Measurements conducted on February 28 and 29, 2012.
Community Noise Equivalent Level = 67 dBA.
º = degrees
' = minutes
" = seconds
dBA = A-weighted sound pressure level
L_{10} = noise levels equaled or exceeded 10 percent of a stated time
L_{50} = noise levels equaled or exceeded 50 percent of a stated time
L_{90} = noise levels equaled or exceeded 90 percent of a stated time
L_{eq} = Equivalent Sound Level
L_{max} = root-mean-square maximum noise level
L_{min} = root-mean-square minimum noise level
LT = Long Term (greater than 25-hours continuous data)
N = north
W = west

Table 5.5-14
Criteria of Impact for Human Annoyance and Interference due to Ground-Borne Vibration

Ground-Borne Vibration (GBV) and Ground-Borne Noise (GBN) Impact Criteria for General Assessment						
	GBV Impact Levels (VdB re: 1 micro-inch/sec)			GBN Impact Levels (dB re: 20 micro-Pascals)		
Land Use Category	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibrations could interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people usually sleep	72 VdB	75 VdB	80 VdB	35 VdB	38 VdB	43 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB	40 VdB	43 VdB	48 VdB

Source: FTA 2006, Table 8.1.

Notes:

[1] "Frequent Events" is defined as more than 70 events of the same source per day. Most rapid transit projects fall into this category.

[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

[5] Vibration-sensitive equipment is generally not sensitive to ground-borne noise.

dB = decibel

N/A = not applicable

VdB = vibration decibels

Table 5.5-15
Receptor Ambient Sound Levels and CEC-Related Design Goals

Noise Sensitive Receptor	Label	Measured, Late-night L_{90} ambient conditions (dBA)	CEC's Late-Night L_{90} +5 dB Standard (dBA)
LT-2/ST-2	Adams	30	35
LT-3/ST-3	Along Stockdale Highway	30	35
ST-4	Tule Elk Reserve	37	42
ST-5	Along Tupman Road	33	38
ST-6[1]	Freeborn Road	N/A	N/A
LT-7	-	50	55
LT-8	-	30	35
LT-9	-	32	37

Source: URS, 2009 and 2012.
Notes:
[1] This location is representative of the linear facility construction activities; thus, no nighttime ambient data were obtained here. Given this location's distance from the Project Site (over 2 miles), if noise compliance is achieved at the other, closer locations, then compliance would be expected at ST-6 also, and the late-night criterion is deemed not applicable here.
CEC = California Energy Commission
dBA = A-weighted sound pressure level
LT = Long Term (greater than 25-hours continuous data)
N/A = not applicable
ST = Short Term

Table 5.5-16
Operational Railroad Spur Noise Analysis Results

Noise Sensitive Receptor	Measured, Existing Noise Level (dBA Ldn)	Moderate Noise Impact (dBA L_{dn})	Severe Noise Impact (dBA L_{dn})
MR-1	65	67	69
MR-2	53	54	61
LT-8	53	57	61
LT-9	67	69	71

Notes:
dBA = A-weighted sound pressure level
L_{dn} = day-night sound level
LT = Long Term (greater than 25-hours continuous data)

Table 5.5-17
Lowest Measured L_{eq} Levels and Construction Noise Level Limit Design Goals

Site ID	Lowest Measured L_{eq}[1] (dBA)	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})
LT-2/ST-2	42	45
LT-3/ST-3	50	50
ST-4	41	45
ST-5	39[2]	45
ST-6	30	45
LT-7	55	55
LT-8	34	45
LT-9	44	45

Notes:
[1] Lowest Hourly L_{eq} for LT measurement sites and 10-minute L_{eq} at ST measurement sites
[2] Lowest measured L_{eq} occurred during evening hours, but still within construction noise exempt times
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-18
Individual Equipment Noise Levels Generated by Project Construction

Equipment Type	Equipment Noise Level at 50 feet, dBA	Estimated Equipment Noise Level at Each Receptor Location,[1] dBA							
		LT-2/ST-2 (1,400 feet [0.27 mi] E of Project)	LT-3/ST-3 (6,700 feet [1.3 mi] NNE of Project)	ST-4 (3,900 feet [0.75 mi] E of Project)	ST-5 (3,300 feet [0.55 mi] SE of Project)	ST-6 (10,750 feet [2.0 mi] WNW of Project)	LT-7 (22,300 feet [4.2 mi] NNW of Project)	LT-8 (13,400 feet [2.5 mi] NW of Project)	LT-9 (7,200 feet [1.4 mi] NW of Project)
		Atten[2] = 29 dB	*Atten[2] = 42 dB*	*Atten[2] = 38 dB*	*Atten[2] = 36 dB*	*Atten[2] = 46 dB*	*Atten[2] = 53 dB*	*Atten[2] = 48 dB*	*Atten[2] = 43 dB*
Trucks	88	59	46	50	52	42	35	40	45
Crane	83	54	41	45	47	37	30	35	40
Roller	74	45	32	36	38	28	21	26	31
Bulldozers	85	56	43	47	49	39	32	37	42
Pickup trucks	60	31	18	22	24	14	7	12	17
Backhoes	80	51	38	42	44	34	27	32	37
Jack hammers	88	59	46	50	52	42	35	40	45
Pile drivers	101	72	59	63	65	55	48	53	58
Rock drills	98	69	56	60	62	52	45	50	55
Pneumatic tools	85	56	43	47	49	39	32	37	42
Air compressor	81	52	39	43	45	35	28	33	38
Compactor	82	53	40	44	46	36	29	34	39
Grader	85	56	43	47	49	39	32	37	42
Loader	85	56	43	47	49	39	32	37	42

Sources: USEPA, 1971; FTA, 2006; and URS, 2012.

Notes:

[1] Distances shown are from the nearest site boundary line to each receptor structure (not necessarily the same as the representative monitoring location). This analysis assumes that an example piece of any given type of construction equipment could be, as a worst case, at or near any site boundary line during the various Project construction phases.

[2] This is the attenuation due to distance for sound propagating from 50 feet from each equipment type to the nearest indicated receptor location.

Table 5.5-19
Aggregate Estimated Noise Levels Generated by Phase for the Project Construction Activities

Construction Phase	Aggregate Activity Level at 50 feet, dBA	Estimated Construction Activity Noise Level at Each Receptor Location,[1] L_{eq}/L_{dn}[2] dBA							
		LT-2/ST-2 (4,130 feet [0.78 mi] E of Project)	LT-3/ST-3 (10,150 feet [approx. 2 mi] NNE of Project)	ST-4 (6,650 feet [1.3 mi] E of Project)	ST-5 (5,400 feet [1.0 mi] SE of Project)	ST-6 (13,750 feet [2.6 mi] WNW of Project)	LT-7 (24,680 feet [4.7 mi] NNW of Project)	LT-8 (16,700 feet [3.2 mi] NW of Project)	LT-9 (10,460 feet [2.0 mi] NW of Project)
		Atten[3] = 38 dB	*Atten[3] = 46 dB*	*Atten[3] = 42 dB*	*Atten[3] = 41 dB*	*Atten[3]= 49 dB*	*Atten[3] = 54 dB*	*Atten[3] = 50 dB*	*Atten[3] = 46 dB*
Site Clearing	91	52/58	45/51	49/55	51/57	42/48	37/43	41/47	45/51
Excavation	83	44/50	37/43	41/47	43/49	34/40	29/35	33/39	37/43
Foundation	89	50/56	43/49	47/53	49/55	40/46	35/41	39/45	43/49
Pile Installation[4]	101	62/68	55/61	59/65	61/67	52/58	47/53	51/57	55/61
Building Construction	80	41/47	34/40	38/44	40/46	31/37	26/32	30/36	34/40
Finishing	60	21/27	14/20	18/24	20/26	11/17	6/12	10/16	14/20

Sources: USEPA, 1971; FTA, 2006; and URS, 2012.

Notes:

[1] Distances shown are from the Project construction activity centroid to each receptor location. This analysis, which differs from the equipment analysis, assumes that the aggregation of construction equipment for each phase will predominantly be at the centroid of the Project Site during the overall construction schedule. Note that the size of the Project Site provides additional distance attenuation benefits to each receptor location.

[2] An L_{dn} calculation was made by adding 6 dB to the receptor L_{eq} value under the very unlikely worst-case premise of 24-hour construction at a constant level of activity. See also Section 2.10 for further information on Project Construction.

[3] This is the attenuation due to distance for sound propagating from 50 feet from each phase's equipment aggregation to the nearest indicated receptor location. Note that this analysis only considers spherical spreading loss, and no other attenuation effects.

[4] Pile installation is a subset of the Foundation Phase and would only be expected to last 4 to 6 months within the overall Foundation Construction Phase. For conservative analysis, the worst-case, impact-type pile driving was assumed.

Table 5.5-20
Electrical Transmission Line Construction without Pile Driving

Site ID	Distance to Electrical Transmission Line Construction (feet)	Noise Level due to Electrical Transmission Line Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	1,400	60	45	Yes
LT-3/ST-3	7,850	45	50	No
ST-4	2,550	55	45	Yes
ST-5	2,700	54	45	Yes
ST-6	12,870	41	45	No
LT-7	22,400	36	55	No
LT-8	15,950	39	45	No
LT-9	10,000	43	45	No

Notes:
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-21
Electrical Transmission Line Construction with Pile Driving

Site ID	Distance to Electrical Transmission Line Construction (feet)	Noise Level due to Electrical Transmission Line Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	1,400	72	45	Yes
LT-3/ST-3	7,850	57	50	Yes
ST-4	2,550	67	45	Yes
ST-5	2,700	66	45	Yes
ST-6	12,870	53	45	Yes
LT-7	22,400	48	55	No
LT-8	15,950	51	45	Yes
LT-9	10,000	55	45	Yes

Notes:
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-22
Potable Water Supply Pipeline Construction

Site ID	Distance to Potable Water Supply Pipeline Construction (feet)	Noise Level due to Potable Water Supply Pipeline Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	1,400	60	45	Yes
LT-3/ST-3	7,850	45	50	No
ST-4	2,550	55	45	Yes
ST-5	7,400	46	45	Yes
ST-6	12,870	41	45	No
LT-7	22,400	36	55	No
LT-8	15,950	39	45	No
LT-9	10,000	43	45	No

Notes:
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-23
Natural Gas Supply Pipeline Construction

Site ID	Noise Level due to Natural Gas Supply Pipeline Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	60	45	Yes
LT-3/ST-3	46	50	No
ST-4	51	45	Yes
ST-5	54	45	Yes
ST-6	43	45	No
LT-7	81	55	Yes
LT-8	50	45	Yes
LT-9	53	45	Yes
MR-1	82	55	Yes
MR-2	78	45	Yes

Notes:
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-24
CO_2 Pipeline Construction

Site ID	Distance to CO_2 Pipeline Construction (feet)	Noise Level due to CO_2 Pipeline Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	6,100	47	45	Yes
LT-3/ST-3	12,583	41	50	No
ST-4	8,350	44	45	No
ST-5	2,600	55	45	Yes
ST-6	13,300	41	45	No
LT-7	11,850	42	55	No
LT-8	18,100	38	45	No
LT-9	26,750	34	45	No

Notes:
CO_2 = carbon dioxide
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-25
Railroad Spur Construction

Site ID	Noise Level due to Railroad Spur Construction (dBA L_{eq})	Construction Noise Level Limit During Non-Exempt Hours (dBA L_{eq})	Construction Noise Level Limit Exceeded During Non-Exempt Hours? (Yes/No)
LT-2/ST-2	60	45	Yes
LT-3/ST-3	46	50	No
ST-4	51	45	Yes
ST-5	54	45	Yes
ST-6	43	45	No
LT-7	48	55	No
LT-8	50	45	Yes
LT-9	53	45	Yes
MR-1	82	55	Yes
MR-2	78	45	Yes

Notes:
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-26
Estimated, Silenced Steam Blow Noise Levels

Receptor	Estimated Distance to Future Project Steam Blow[1]	Expected, Silenced Steam Blow Noise Level (dBA)[2]
LT-2/ST-2	4,100 feet (0.78 mi)	62–72
LT-3/ST-3	9,750 feet (1.85 mi)	54–64
ST-4	6,580 feet (1.25 mi)	58–68
ST-5	5,680 feet (1.08 mi)	59–69
ST-6	13,350 feet (2.57 mi)	5 –61
LT-7	—	46–56
LT-8	—	50–60
LT-9	—	54–64

Sources: URS, 2012.
Notes:
[1] Distances shown are from the Project centroid to each receptor location.
[2] This is the attenuation due to distance for sound propagating from 100 feet from a given steam blow to the nearest indicated receptor location. For conservatism, no other attenuation factors are considered.
dBA = A-weighted sound pressure level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
ST = Short Term

Table 5.5-27
Summary of Project Noise Control Design Features

Noise Source	Conceptual Noise Control Feature(s)
Power Block Cooling Tower (12-cell) Process Cooling Tower (13-cell) (64 dBA at 400 feet from tower edge)	This is a low-noise design, and tower vendors can use a combination of slower-speed fans with special blade design, low-noise drive systems, splash control features, and/or tower baffling materials to achieve the specification.
ASU Area Cooling Tower	Same as above on a per-cell basis.
Gas Turbine Train	Vendor specification to meet an overall train limit of 59 dBA at 400 feet (this is a low-noise design relative to nominally standard offerings).
Steam Turbine Train	Vendor specification to meet an overall train limit of 58 dBA at 400 feet (this is a low-noise design relative to nominally standard offerings).
HRSG System	Vendor specification to meet an overall train limit of 58 dBA at 400 feet (this is a low-noise design relative to nominally standard offerings).
HRSG Stack Exit (alone)	Inclusion of a stack silencer to meet a stack exit-only limit of 50 dBA at 400 feet from stack base.
Main Power Block Transformers	Vendor specification to meet limits of 46 dBA at 400 feet or 59 dBA at 100 feet.
Selected Pump Trains (pump+motor) [for trains <100 hp, PWLA should be <83; for 150 to 750 hp trains, PWLA should be <91; and for trains >750 hp, PWLA should be <96]	Specify reduced noise emissions, relative to nominal offerings, for each size train (motor plus driven equipment item). Can be accomplished via noise limit specification to equipment vendor (for a quiet design). Alternatives include the installation of an acoustical enclosure around the pump and drive mechanics or blanketing around the main rotating equipment.
Miscellaneous Rotating Equipment Trains (e.g., blowers, dust collectors, agitators, etc.) [investigate all such sources for noise control, having PWLA > 83]	Specify reduced noise emissions, relative to nominal offerings, for each size train (motor plus driven equipment item). Can be accomplished via noise limit specification to equipment vendor (for a quiet design). Alternatives include the installation of an acoustical enclosure around the item and drive mechanics or blanketing around the main rotating equipment.
Material Handling Structures (including Truck Dumping Area, Train Dumping Area, Transfer Towers, and Feedstock Barn,)	Specify reduced noise emissions, relative to nominal offerings, for sheet metal building with several openings such that they are ≤60 dBA at 50 feet from any building façade (to be verified during detailed design phase). Assumes acoustical panel specifications for building walls in the detailed design such that interior space noise levels are adequately absorbed and encased within the building shell to meet the assumed emissions levels.
Conveyors (to be enclosed for noise and dust control)	Specify reduced noise emissions, relative to nominal offerings, such that they are ≤61 dBA at 50 feet).
Open Compressors and Expanders	Employ 4-sided, open-topped or closed-top enclosures on selected large trains. Remaining Compressor and Expander Trains above 500 hp or above 86 PWLA should be investigated for noise control such that they achieve noise reduction features for a nominal 15 dB reduction (relative to nominal designs).
Sulfur Recovery Unit Furnaces	Specify low-noise burners to equipment vendors or use noise control enclosures/plenums around burner systems.

Table 5.5-27
Summary of Project Noise Control Design Features

Noise Source	Conceptual Noise Control Feature(s)
Gasifiers	Specify low-noise fuel delivery systems or use noise control enclosures/plenums such that noise emissions are reduced to below 90 PWLA.
Elevated Flare Systems	None indicated at this time (provided vendors can supply equipment meeting Petrochem industry standards). (Assumes operations will be pilot flame only with design flows during occasional start-ups.)
Thermal Oxidizer (mainly used for miscellaneous tank vent discharges in Tail Gas Area)	None indicated at this time (provided vendors can supply equipment meeting Petrochem industry standards). (Assumes operations will be "low" flow; negligibly different than pilot flame only.)
Various Atmospheric Vents	Used of exhaust silencers, as applicable, such that noise emissions are below 83 PWLA.
Other Pump Sets (various)	Noise limit specification to equipment vendor; no more than 85 dBA at 3 feet.
Other Mechanical Equipment not specified above (various)	Noise limit specification to equipment vendor; no more than 85 dBA at 3 feet.
Other Electrical Equipment not specified above (various)	Noise limit specification to equipment vendor; no more than 85 dBA at 3 feet.
Building HVAC units and fans (various)	Noise limit specification to equipment vendor; no more than 85 dBA at 3 feet.

Source: HECA, 2012.

Notes:
ASU = Air Separation Unit
dBA = A-weighted sound pressure level
HRSG = Heat Generator Recovery Steam Generator
HVAC = Heating, Ventilation, and Air Conditioning
PWLA = Sound Power Level – A-weighted

Table 5.5-28
Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Exterior)

Location [column 1]	Kern County Noise Element Exterior Standards, L_{dn} [column 2]	Existing Exterior L_{dn} Environment [column 3]	Predicted Project L_{eq} Contributions, dBA [column 4]	Predicted Project L_{dn} Contributions, [column 5][a]	Total, Future Calculated L_{dn} (existing plus Project)[f] [column 6][b]	Project Contribution/ Project Compliance[c,f] [column 7]
LT-2/ST-2	65	61	37	43	61	0/Yes
LT-3/ST-3	65	70	27	33	70	0/Yes
ST-4	65	51 [e]	31	37	51	0/Yes
ST-5	65	68 [e]	36	42	68	0/Yes
ST-6	65	N/A[g]	26	32	N/A[g]	0/Yes
LT-7	65	65	16	22	65	0/Yes
LT-8	65	53	21	27	53	0/Yes
LT-9	65	67	27	33	67	0/Yes

Source: URS and The Planning Center DC&E.
Notes:
[a] Using 24 hourly L_{eq} values to calculate the equivalent L_{dn} metric, assuming continuous operations at steady-state, design conditions. Thus, $L_{dn} = L_{eq} + 6$ dB.
[b] Summing sound levels from column 3 plus column 5.
[c] Is column 6 less than or equal to columns 3 and 2?
[d] Footnote not used.
[e] Estimated L_{dn} from short-term data in Tables 5.5-8 and 5.5-9.
[f] Result is completely controlled by the existing noise environment.
[g] No nighttime noise measurements were conducted at this location.
L_{dn} = day-night sound level
L_{eq} = Equivalent Sound Level
LT = Long Term (greater than 25-hours continuous data)
N/A = not applicable
ST = Short Term

Table 5.5-29
Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Interior)

Location [column 1]	Kern County Noise Element Interior Standards, L_{dn} [column 2]	Existing Interior L_{dn} Environment[1] [column 3]	Predicted Project Exterior L_{dn} Contributions, [column 4][2]	Predicted Project Interior L_{dn} Contributions, [column 5][3]	Total, Future Calculated L_{dn} (Existing plus Project)[7] [column 6][4]	Project Contribution/ Project Compliance[5, 6] [column 7]
LT-2/ST-2	45	44	43	26	44	0/Yes
LT-3/ST-3	45	53	33	16	53	0/Yes
ST-4	45	34	37	20	34	0/Yes
ST-5	45	51	42	25	51	0/Yes
ST-6	45	N/A[g]	32	N/A[g]	N/A[g]	0/Yes
LT-7	45	48	22	5	48	0/Yes
LT-8	45	36	27	10	36	0/Yes
LT-9	45	50	33	16	50	0/Yes

Source: URS and The Planning Center|DC&E.
Notes:
1 Applying -17 dB to results from Table 5.5-28.
2 Using results of column 5 from Table 5.5-28.
3 Applying -17 dB to column 4.
4 Summing sound levels from column 3 plus column 5.
5 Is column 6 less than or equal to columns 3 and 2?
6 Result is completely controlled by the existing noise environment.
7 No nighttime noise measurements were conducted at this location
L_{dn} = day-night sound level
LT = Long Term (greater than 25-hours continuous data)
N/A = not applicable
ST = Short Term

Table 5.5-30
Summary of Project Contributions with Noise Control Features
Relative to CEC Noise Impact Criteria

Location	Distance from Project Site (feet)		Measured, Late-Night L_{90} ambient conditions, (dBA)	CEC's +5 dB Late-Night L_{90} Standard[1] (dBA)	Predicted, Project Contributions (dBA)	Predicted Project Contributions plus Existing Ambient (dBA)	Comparison to Design Goal
	From Approx. Nearest Boundary	From Process Area Centroid					
Off-Site Receptors							
LT-2/ST-2	1,400	4,130	30	35	37	37	2 dB over
LT-3/ST-3	6,700	10,150	30	35	27	32	3 dB under
ST-4	3,900	6,650	37	42	31	38	4 dB under
ST-5	3,300	5,400	33	38	36	38	At standard
ST-6	10,750	13,750	N/A	N/A	26	N/A	N/A
LT-7	—	—	50	55	16	50	5 dB under
LT-8	—	—	30	35	21	31	4 dB under
LT-9	—	—	32	37	27	33	4 dB under
Project Site Boundary							
North	—	3,686		—	40	41[2]	N/A
East	—	3,235	—	—	42	42[2]	N/A
South	—	1,293	—	—	51	51[2]	N/A
West	—	2,339	—	—	53	53[2]	N/A

Source: URS and The Planning Center|DC&E.
Notes:
dB = decibels
dBA = A-weighted sound pressure level
N/A = not applicable
— = not available
[1] Also see Table 5.5-11.
[2] Assumes that the Power Plant contributions dominate the rural noise environment along the Project Site Boundary.

Table 5.5-31
Operational Noise Impacts due to Railroad Spur

Site ID	Measured, Existing Noise Level (dBA L_{dn})	Moderate Noise Impact Threshold (dBA L_{dn})	Severe Noise Impact Threshold (dBA L_{dn})	Modeled Project Noise Contribution due to Horn Noise (dBA L_{dn})	Modeled Project Noise Contribution due to Train Engines and Cars (dBA L_{dn})	Total Noise Exposure Level (dBA L_{dn})	Type of Noise Impact?
MR-1	65	67	69	N/A	61	67	Moderate
MR-2	53	54	61	N/A	58	59	Moderate
LT-8	53	57	61	N/A	37	53	None
LT-9	67	69	71	41	40	67	None

Notes:

dBA = A-weighted sound pressure level
L_{dn} = day-night sound level
LT = Long Term (greater than 25-hours continuous data)
N/A = not applicable

Table 5.5-32
Operational Vibration Analysis Results

Vibration Sensitive Receptor	Modeled Vibration Level (VdB)	Land Use Category	Impact Vibration Level Threshold (VdB)	FTA Vibration Impact[1]
MR-1	67	2	80	No impact

Notes:

[1] Criteria for human annoyance due to ground-borne vibration is 80 VdB.
LT = Long Term (greater than 25-hours continuous data)
VdB = vibration decibels

Table 5.5-33
2016 Construction Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2016 Construction ADT Volumes		2016 Construction L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
I-5 NB Ramp/ Stockdale Highway	North	55	770	985	58	60	2	No impact
	South	55	374	399	55	57	2	No impact
	East	55	6,809	8,353	68	69	1	No impact
	West	55	5,797	7,581	67	69	1	No impact
I-5 SB Ramp/ Stockdale Highway	North	55	2,904	3,119	64	65	1	No impact
	South	55	330	355	55	57	2	No impact
	East	55	5,764	7,548	67	68	1	No impact
	West	55	2,772	4,796	64	67	3	Impact
I-5 NB Ramp/ SR 119	North	55	121	124	50	51	1	No impact
	South	55	231	423	53	55	2	No impact
	East	55	11,110	12,270	71	72	0	No impact
	West	55	11,088	12,437	71	72	0	No impact
I-5 SB Ramp/ SR 119	North	55	638	641	57	58	0	No impact
	South	55	473	665	56	57	1	No impact
	East	55	11,055	12,404	72	72	0	No impact
	West	55	11,154	12,692	72	72	0	No impact

Table 5.5-33
2016 Construction Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2016 Construction ADT Volumes		2016 Construction L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
SR 119/SR 43	North	55	8,470	8,470	70	70	0	No impact
	South	55	3,091	3,091	66	66	0	No impact
	East	55	10,670	12,208	73	73	0	No impact
	West	55	17,171	18,709	75	75	0	No impact
SR 43/Stockdale Highway	North	55	6,589	6,781	71	71	0	No impact
	South	55	7,029	7,029	71	71	0	No impact
	East	55	8,470	9,822	69	70	0	No impact
	West	55	5,896	7,440	67	68	1	No impact
Stockdale Highway/Morris Road	North	25	22	22	35	35	0	No impact
	South	25	231	623	46	48	2	No impact
	East	55	2,783	4,805	64	67	3	Impact
	West	55	2,552	4,182	64	66	2	No impact
SR 119/Tupman Road	North	25	583	2,313	50	53	4	No impact
	South	25	429	429	48	48	0	No impact
	East	55	18,018	19,556	72	73	0	No impact
	West	55	17,468	17,660	72	72	0	No impact
Tupman Road/ Grace Avenue	North	25	484	2,408	50	54	4	No impact
	South	25	539	2,463	50	54	4	No impact
	East	25	154	154	44	44	0	No impact
	West	25	231	231	46	46	0	No impact

Table 5.5-33
2016 Construction Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2016 Construction ADT Volumes		2016 Construction L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
Tupman Road/ Station Road	North	25	121	2,437	43	52	10	No impact
	South	25	418	2,342	48	53	5	No impact
	East	25	319	711	47	49	2	No impact
	West	25	0	0	N/A	N/A	N/A	No impact
Dairy Road/ Stockdale Highway	North	25	22	22	35	35	0	No impact
	South	25	176	2,126	44	63	18	No impact
	East	55	2,541	4,171	64	66	2	No impact
	West	55	2,629	2,949	64	67	3	Impact
Dairy Road/ Adohr Road	North	25	55	2,005	47	63	16	No impact
	South	25	176	2,468	44	62	18	No impact
	East	25	165	1,875	44	55	11	No impact
	West	25	0	0	N/A	N/A	N/A	No impact

Notes:

ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted sound pressure level
I-5 = Interstate 5
L_{dn} = day-night sound level
N/A = not applicable
NB = Northbound
SB = Southbound
SR = State Route

Table 5.5-34
2017 Operational Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 1 ADT Volumes		2017 Alternative 1 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
I-5 NB Ramp/ Stockdale Highway	North	55	784	853	58	61	2	No impact
	South	55	381	449	55	60	4	No impact
	East	55	6,933	7,117	68	68	0	No impact
	West	55	5,902	6,223	67	68	1	No impact
I-5 SB Ramp/ Stockdale Highway	North	55	2,957	3,026	64	65	1	No impact
	South	55	336	404	55	59	5	No impact
	East	55	5,869	6,189	67	68	1	No impact
	West	55	2,822	3,279	64	67	3	No impact
I-5 NB Ramp/ SR 119	North	55	123	130	50	52	2	No impact
	South	55	235	243	53	53	0	No impact
	East	55	11,312	11,404	72	72	0	No impact
	West	55	11,290	11,383	72	72	0	No impact
I-5 SB Ramp/ SR 119	North	55	650	657	58	58	0	No impact
	South	55	482	490	56	56	0	No impact
	East	55	11,256	11,348	72	72	0	No impact
	West	55	11,357	11,450	72	72	0	No impact
SR 119/SR 43	North	55	8,624	8,624	70	70	0	No impact
	South	55	3,147	3,147	66	66	0	No impact
	East	55	10,864	10,956	73	73	0	No impact
	West	55	17,483	17,575	75	75	0	No impact

Table 5.5-34
2017 Operational Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 1 ADT Volumes		2017 Alternative 1 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
SR 43/Stockdale Highway	North	55	6,709	6,725	71	71	0	No impact
	South	55	7,157	7,157	71	71	0	No impact
	East	55	8,624	8,792	69	69	0	No impact
	West	55	6,003	6,187	68	68	0	No impact
Stockdale Highway/ Morris Road	North	25	22	22	35	35	0	No impact
	South	25	235	539	46	60	14	No impact
	East	55	2,834	3,290	64	67	3	No impact
	West	55	2,598	2,750	64	65	1	No impact
SR 119/Tupman Road	North	25	594	702	50	50	0	No impact
	South	25	437	437	48	48	0	No impact
	East	55	18,346	18,438	72	72	0	No impact
	West	55	17,786	17,802	72	72	0	No impact
Tupman Road/Grace Avenue	North	25	493	617	50	50	0	No impact
	South	25	549	673	50	51	0	No impact
	East	25	157	157	44	44	0	No impact
	West	25	235	235	46	46	0	No impact
Tupman Road/ Station Road	North	25	123	339	43	45	2	No impact
	South	25	426	550	48	49	1	No impact
	East	25	325	629	47	60	13	No impact
	West	25	0	212	N/A	45	N/A	No impact

Table 5.5-34
2017 Operational Traffic Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 1 ADT Volumes		2017 Alternative 1 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
Dairy Road/ Stockdale Highway	North	25	22	22	35	35	0	No impact
	South	25	179	331	44	54	10	No impact
	East	55	2,587	2,739	64	65	1	No impact
	West	55	2,677	2,677	64	64	0	No impact
Dairy Road/Adohr Road	North	25	56	208	39	54	15	No impact
	South	25	179	547	44	55	10	No impact
	East	25	168	384	44	46	2	No impact
	West	25	0	0	NA	N/A	N/A	No impact

Notes:

ADT = average daily traffic
CNEL = Community Noise Level Equivalent
dBA = A-weighted sound pressure level
I-5 = Interstate 5
L_{dn} = day-night sound level
N/A = not applicable
NB = Northbound
SB = Southbound
SR = State Route

Table 5.5-35
2017 Industrial Operation Traffic No Rail Scenario Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 2 ADT Volumes		2017 Alternative 2 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
I-5 NB Ramp/ Stockdale Highway	North	55	784	853	58	61	2	No impact
	South	55	381	449	55	60	4	No impact
	East	55	6,933	7,607	68	70	2	No impact
	West	55	5,902	6,713	67	70	3	Impact
I-5 SB Ramp/ Stockdale Highway	North	55	2,957	3,026	64	65	1	No impact
	South	55	336	404	55	59	5	No impact
	East	55	5,869	6,679	67	70	3	Impact
	West	55	2,822	3,769	64	70	5	Impact
I-5 NB Ramp/ SR 119	North	55	123	130	50	52	2	No impact
	South	55	235	243	53	53	0	No impact
	East	55	11,312	11,404	72	72	0	No impact
	West	55	11,290	11,383	72	72	0	No impact
I-5 SB Ramp/ SR 119	North	55	650	657	58	58	0	No impact
	South	55	482	490	56	56	0	No impact
	East	55	11,256	11,348	72	72	0	No impact
	West	55	11,357	11,450	72	72	0	No impact
SR 119/SR 43	North	55	8,624	8,624	70	70	0	No impact
	South	55	3,147	3,147	66	66	0	No impact
	East	55	10,864	10,956	73	73	0	No impact
	West	55	17,483	17,575	75	75	0	No impact
SR 43/Stockdale Highway	North	55	6,709	7,215	71	72	1	No impact
	South	55	7,157	7,157	71	71	0	No impact
	East	55	8,624	8,792	69	69	0	No impact
	West	55	6,003	6,677	68	70	2	No impact

Table 5.5-35
2017 Industrial Operation Traffic No Rail Scenario Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 2 ADT Volumes		2017 Alternative 2 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
Stockdale Highway/ Morris Road	North	25	22	22	35	35	0	No impact
	South	25	235	1,029	46	65	19	Impact
	East	55	2,834	3,780	64	70	5	Impact
	West	55	2,598	2,750	64	65	1	No impact
SR 119/Tupman Road	North	25	594	702	50	50	0	No impact
	South	25	437	437	48	48	0	No impact
	East	55	18,346	18,438	72	72	0	No impact
	West	55	17,786	17,802	72	72	0	No impact
Tupman Road/Grace Avenue	North	25	493	617	50	50	0	No impact
	South	25	549	673	50	51	0	No impact
	East	25	157	157	44	44	0	No impact
	West	25	235	235	46	46	0	No impact
Tupman Road/ Station Road	North	25	123	339	43	45	2	No impact
	South	25	426	550	48	49	1	No impact
	East	25	325	1,119	47	65	18	Impact
	West	25	0	702	N/A	65	N/A	No impact
Dairy Road/ Stockdale Highway	North	25	22	22	35	35	0	No impact
	South	25	179	331	44	54	10	No impact
	East	55	2,587	2,739	64	65	1	No impact
	West	55	2,677	2,677	64	64	0	No impact
Dairy Road/Adohr Road	North	25	56	208	39	54	15	No impact
	South	25	179	547	44	55	10	No impact
	East	25	168	384	44	46	2	No impact
	West	25	0	0	N/A	N/A	N/A	No impact

Table 5.5-35
2017 Industrial Operation Traffic No Rail Scenario Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 2 ADT Volumes		2017 Alternative 2 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
SR 43/Poso Avenue	North	55	10,819	10,835	72	72	0	No impact
	South	55	11,088	11,349	72	73	1	No impact
	East	25	0	245	N/A	60	N/A	No impact
	West	25	358	358	48	48	0	No impact
SR 43/Kimberlina Road	North	55	9,666	9,927	71	72	1	No impact
	South	55	10,875	11,381	72	73	1	No impact
	East	25	3,909	4,154	59	62	4	No impact
	West	25	4,021	4,021	59	59	0	No impact
SR 43/Shafter Avenue	North	55	13,933	14,439	73	74	1	No impact
	South	55	10,696	11,202	72	73	1	No impact
	East	40	4,547	4,547	63	63	0	No impact
	West	40	5,230	5,230	64	64	0	No impact
SR 43/Central Avenue	North	55	11,648	12,154	72	73	1	No impact
	South	55	11,670	12,176	72	73	1	No impact
	East	40	3,763	3,763	63	63	0	No impact
	West	40	3,181	3,181	62	62	0	No impact
SR 43/Lerdo Highway	North	55	10,472	10,978	72	73	1	No impact
	South	55	9,442	9,948	71	73	1	No impact
	East	50	11,312	11,312	69	69	0	No impact
	West	50	8,266	8,266	68	68	0	No impact
SR 43/7th Standard Road	North	55	4,861	5,367	68	71	2	No impact
	South	55	5,734	6,240	69	71	2	No impact
	East	50	7,706	7,706	67	67	0	No impact
	West	50	6,003	6,003	66	66	0	No impact

Table 5.5-35
2017 Industrial Operation Traffic No Rail Scenario Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 2 ADT Volumes		2017 Alternative 2 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
SR 43/SR 58 (Rosedale Highway – West)	North	55	7,459	7,965	71	72	1	No impact
	South	55	10,640	11,146	73	74	1	No impact
	East	55	0	0	N/A	N/A	N/A	No impact
	West	55	8,154	8,154	69	69	0	No impact
SR 43/SR 58 (Rosedale Highway – East)	North	55	10,382	10,888	73	74	1	No impact
	South	55	7,146	7,652	71	72	1	No impact
	East	55	7,762	7,762	69	69	0	No impact
	West	55	963	963	60	60	0	No impact
H Street/9th Street	North	25	1,232	1,232	53	53	0	No impact
	South	25	1,165	1,410	52	61	8	No impact
	East	25	358	603	47	60	13	No impact
	West	25	0	0	N/A	N/A	N/A	No impact
H Street/Wasco Avenue	North	25	907	1,397	51	63	12	No impact
	South	25	0	0	N/A	N/A	N/A	No impact
	East	25	1,882	1,882	54	54	0	No impact
	West	25	2,744	3,234	56	64	8	No impact
Wasco Avenue/Poso Avenue	North	25	2,912	3,402	56	64	8	No impact
	South	25	1,254	1,499	53	61	8	No impact
	East	25	112	112	43	43	0	No impact
	West	25	2,531	2,776	57	62	5	No impact
Wasco Avenue/ Kimberlina Road	North	25	1,288	1,533	53	61	8	No impact
	South	25	0	0	N/A	N/A	N/A	No impact
	East	25	3,909	3,909	59	59	0	No impact
	West	25	3,920	4,165	59	62	4	No impact

Table 5.5-35
2017 Industrial Operation Traffic No Rail Scenario Noise Results

Intersection	Leg	Speed Limit (mph)	2017 Alternative 2 ADT Volumes		2017 Alternative 2 L_{dn}/CNEL (dBA)		Difference in L_{dn}/CNEL (dBA)	Impact
			Without Project	With Project	Without Project	With Project		
J Street/9th Street	North	25	1,837	1,837	54	54	0	No impact
	South	25	1,758	2,003	54	61	7	No impact
	East	25	0	0	N/A	N/A	N/A	No impact
	West	25	101	346	42	60	18	No impact

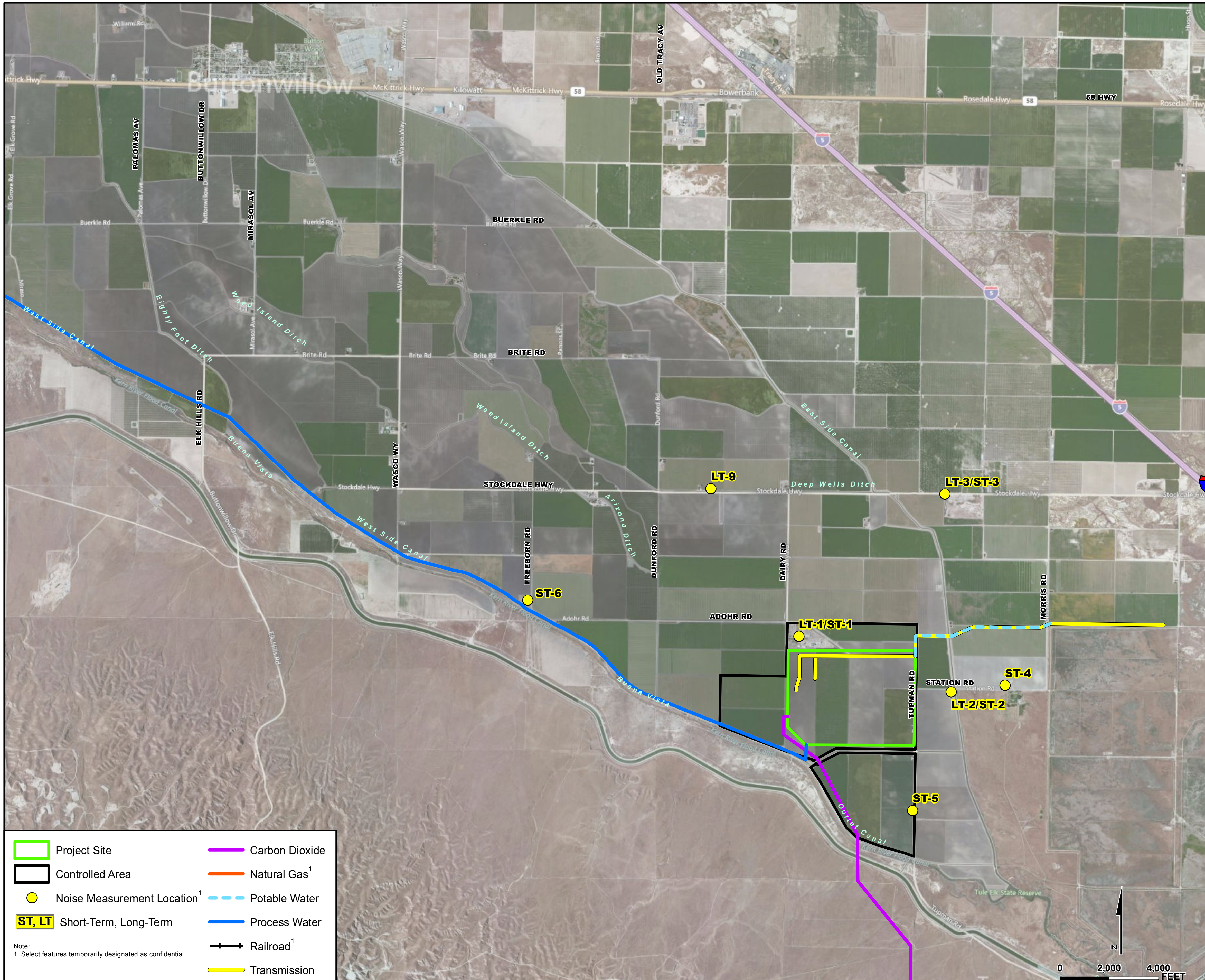
Notes:

ADT = average daily traffic
CNEL = Community Noise Level Equivalent
dBA = A-weighted sound pressure level
I-5 = Interstate 5
L_{dn} = day-night sound level
N/A = not applicable
NB = Northbound
SB = Southbound
SR = State Route

Table 5.5-36
Summary of LORS—Noise

LORS	Applicability	Section
Federal Jurisdiction		
Noise Guidelines, USEPA, 1974	Guidelines for state and local governments.	Section 5.5.1.5
Noise Control Act (1972) as amended by the Quiet Communities Act (1978); 42 U.S.C. §§ 4901–4918	Separate noise-sensitive areas are encouraged.	Section 5.5.1.5
FTA	Guidelines and standards for noise-sensitive receptors that are subjected to potential noise and vibration impacts due to a rail project.	Section 5.5.1.5
State Jurisdiction		
CEC	This agency has established guidelines for noise generated during operation and construction of the project. It identifies criteria for the determination of significant impact on residential areas.	Section 5.5.1.5
Cal/OSHA Occupational Noise Exposure Regulations (8 CCR, General Industrial Safety Orders, Article 105, Control of Noise Exposure, §§ 5095 *et seq*.)	Sets employee noise exposure limits. Equivalent to Federal OSHA standards.	Section 5.5.1.5
California Vehicle Code	Regulates vehicle noise limits on California highways.	Section 5.5.1.5
Local Jurisdiction		
Kern County General Plan (Chapter 3 – Noise Element)	This requirement is applicable to stationary, transportation, and temporary construction noise sources relating to the project. It requires that proposed commercial and industrial uses or operations be designed so they will not significantly impact noise-sensitive areas.	Section 5.5.1.5
City of Wasco General Plan (Chapter 8 – Noise Element)	This requirement is applicable to stationary, transportation, and temporary construction noise sources relating to the project. It requires proposed commercial and industrial uses or operations be designed so they will not significantly impact noise sensitive areas.	Section 5.5.1.5
City of Shafter General Plan (Chapter 7 – Noise Element)	This requirement is applicable to stationary, transportation, and temporary construction noise sources relating to the project. It requires proposed commercial and industrial uses or operations be designed so they will not significantly impact noise sensitive areas.	Section 5.5.1.5

Source: URS, 2012.
Notes:
Cal/OSHA = California Occupational Safety and Health Administration
CCR = California Code of Regulations
CEC = California Energy Commission
FTA = Federal Transit Administration
LORS = laws, ordinances, regulations, and standards
OSHA = Occupational Safety and Health Administration
USC = United States Code
USEPA = U.S. Environmental Protection Agency



AMBIENT NOISE LEVEL MEASUREMENT LOCATIONS

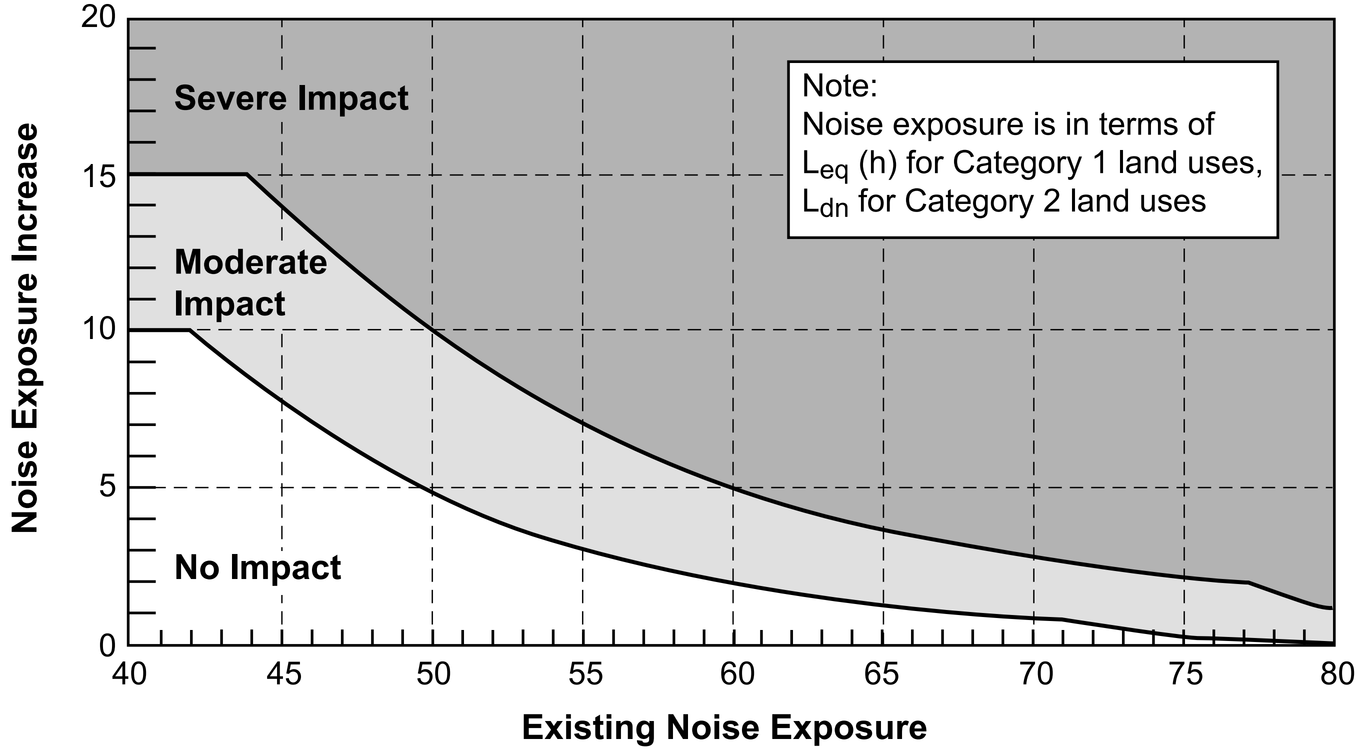
April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.5-1

Source: Aerial Photo, Bing Maps 2009; Roads, Kern County, 2008, Waterways, US Census Bureau Tiger Data, 2000; Places, ESRI Streetmap Data, 2000-2005.



Source:
FTA Manual; Figure 3.2 "Increase in Cumulative Noise Levels Allowed by Criteria (Land Use Cat. 1 & 2)."

FTA NOISE IMPACT CRITERIA

April 2012
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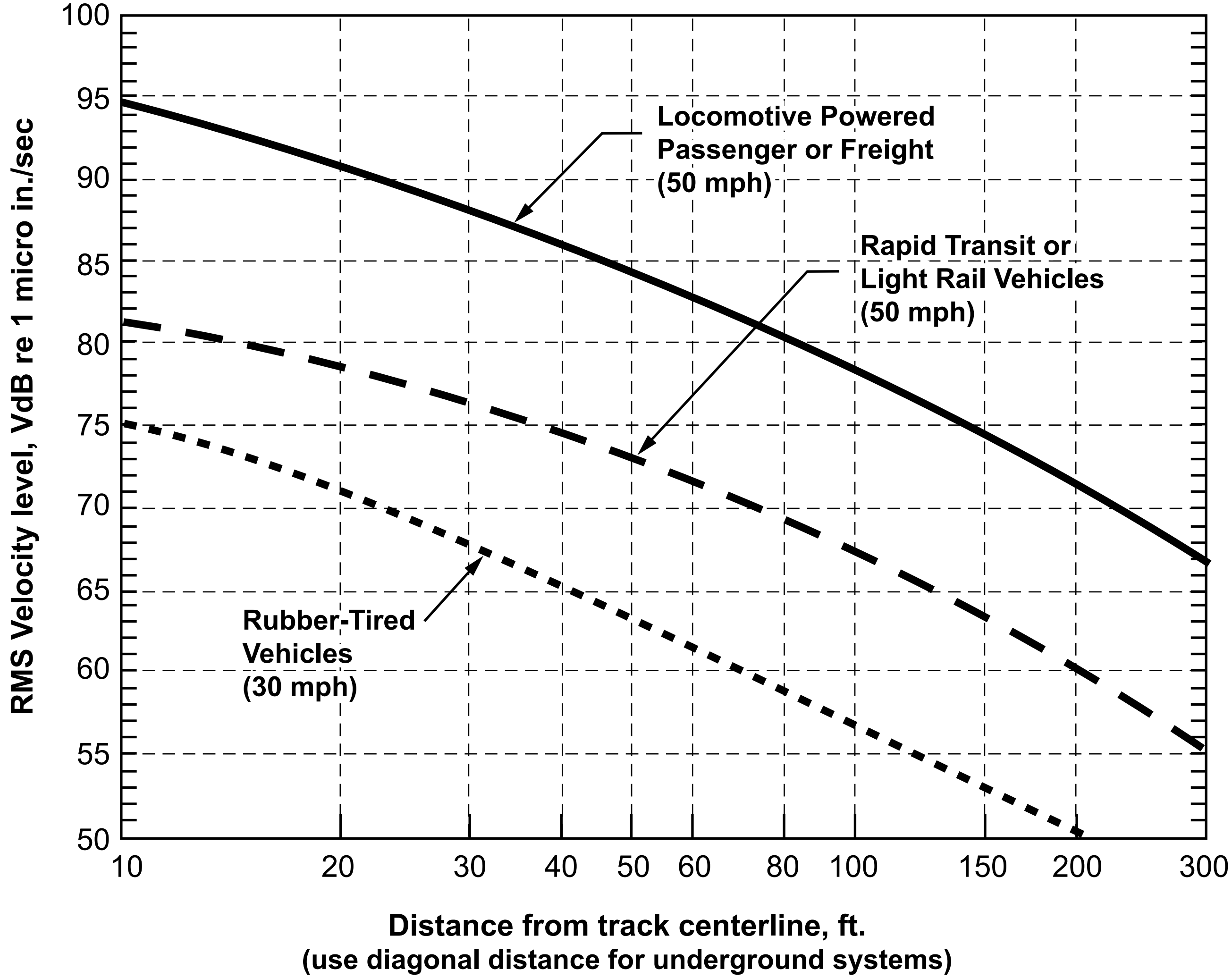
Kern County, California

URS

FIGURE 5.5-2



Source:
FTA 2006, Figure 10.1

CRITERIA OF IMPACT FOR HUMAN ANNOYANCE AND INTERFERENCE DUE TO GROUND-BORNE VIBRATION

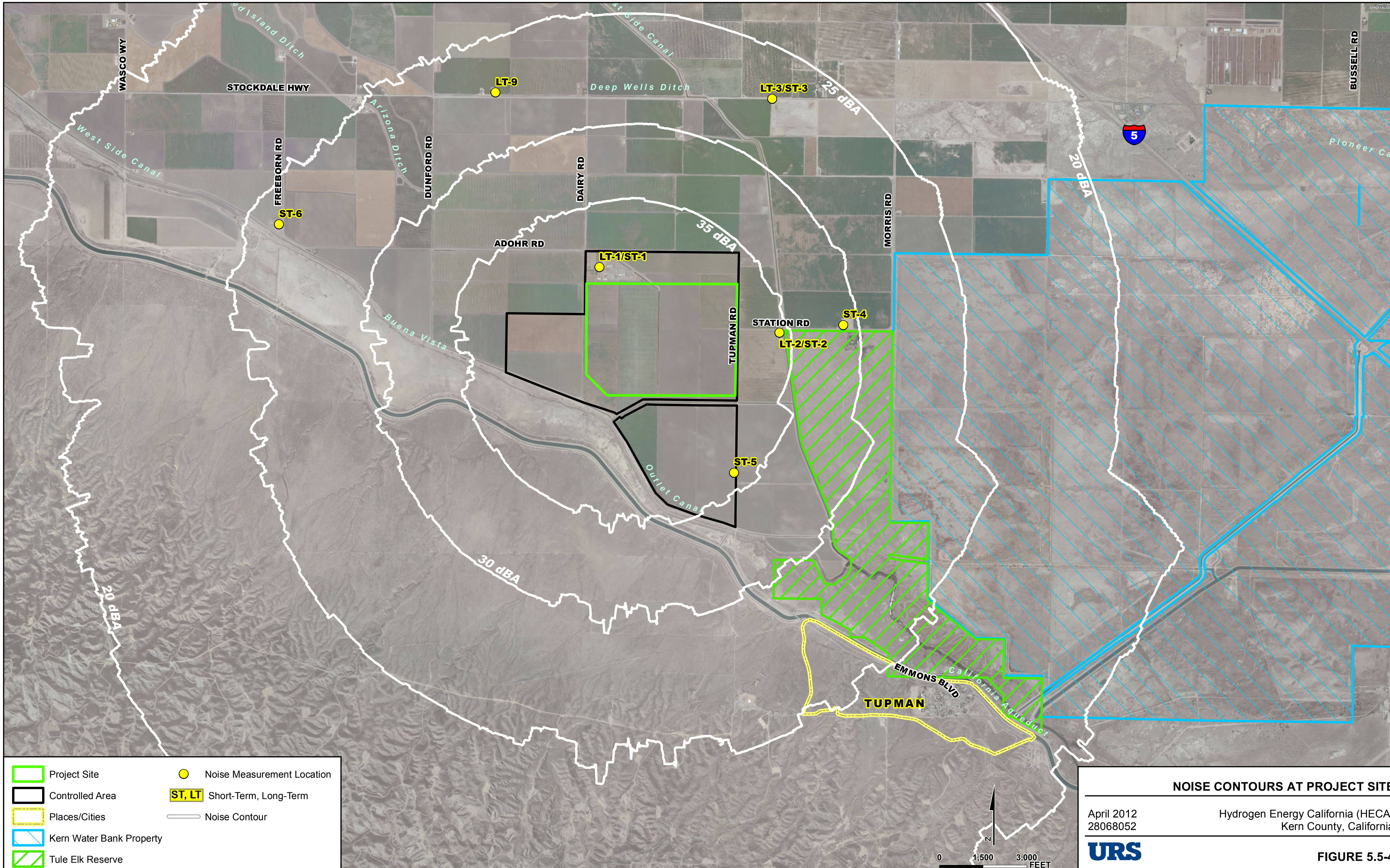
April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.5-3

4/30/12 vsa..T:\HECA-SCS 2012\GRAPHICS 2012\5.2_Noise\Fig5_5_3_criteria.ai



NOISE CONTOURS AT PROJECT SITE

April 2012
28068052

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 5.5-4

Source: Aerial Photo, Digital Globe, June 1, 2008; Kern Water Bank Property, Kern County Parcels, 2008; Tule Elk Reserve, California State Parks, 2008; Roads, Kern County, 2008, Waterways, US Census Bureau Tiger Data, 2000; Places, ESRI Streetmap Data, 2000-2005.