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| Project Title: | Gem Energy Storage Center |
| TN #: | 240751-13 |
| Document Title: | Section 5_7_Noise_Gem Energy Storage Center |
| Description: | This section presents the noise impact assessment related to the Gem Energy Storage Center (Gem/GESC). Section 5.7.1 discusses the fundamentals of acoustics. Section 5.7.2 describes the affected environment, including baseline noise level survey methodology and results. Section 5.7.3 presents an environmental analysis of the construction and operation of the energy storage center and associated facilities. Section 5.7.4 discusses cumulative effects. Section 5.7.5 discusses mitigation measures. Section 5.7.6 presents applicable laws, ordinances, regulations, and standards (LORS). Section 5.7.7 presents agency contacts, and Section 5.7.8 presents permit requirements and schedules. Section 5.7.9 contains the references used to prepare this section. |
| Filer: | Kari Miller |
| Organization: | Golder Associates USA Inc. |
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# 5.7 Noise

This section presents the noise impact assessment related to the Gem Energy Storage Center (Gem/GESC). Section 5.7.1 discusses the fundamentals of acoustics. Section 5.7.2 describes the affected environment, including baseline noise level survey methodology and results. Section 5.7.3 presents an environmental analysis of the construction and operation of the energy storage center and associated facilities. Section 5.7.4 discusses cumulative effects. Section 5.7.5 discusses mitigation measures. Section 5.7.6 presents applicable laws, ordinances, regulations, and standards (LORS). Section 5.7.7 presents agency contacts, and Section 5.7.8 presents permit requirements and schedules. Section 5.7.9 contains the references used to prepare this section.

## 5.7.1 Fundamentals of Acoustics

Acoustic values can be described in terms of noise or sound. **Sound** is generated by pressure fluctuations in the air. **Noise** is genially defined as any “unwanted” sound and is therefore based on human perception, but the terms noise and sound are often used interchangeably. Sound propagation involves three principal components: a noise source, a person or a group of people, and the transmission path. While two of these components, the noise source, and the transmission path are easily quantified (i.e., by direct measurements or through predictive calculations), the effect of noise on humans is the most difficult to determine due to the varying responses to the same or similar noise patterns and therefore it is difficult to predict a response from one individual to another.

Noise and noise levels are used to describe ambient levels perceived by off-site receptors, while sound and sound emissions describe acoustic energy emitted by activities/equipment associated with the project. The level of noise is related to its magnitude, which is referred to as **sound pressure level (SPL)** and is measured in units called **decibels (dB)**. The higher the decibel value, the louder the sound. Decibels are calculated as a logarithmic function of the measured SPL in the air to a reference effective pressure, which is considered the hearing threshold, or:

$$SPL = 20 \log_{10} (P_e/P_o)$$

where: $P_e$ = measured effective pressure of sound wave in micropascals (µPa), and

$P_o$ = reference effective pressure of 20 µPa.

Noise data and analysis are primarily given in terms of **frequency** distribution. The levels are grouped into **octave bands**. Typically, the center frequencies for each octave band are 31.5, 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hertz (Hz). The human ear responds to the pressure variations in the atmosphere that reach the eardrum. These pressure variations are composed of different frequencies that give each sound we hear its unique character.

Due to the complexity of human ear functions, the measurement of different noise sources does not always correspond to relative loudness or annoyance. It is common practice to sum sound levels over the entire audible spectrum (i.e., 20 Hz to 20,000 Hz) to give an overall sound level, but human hearing varies in sensitivity depending on the frequency of the sound. Specifically, the human ear is most responsive to sound with the 1,000 Hz to 6,000 Hz frequency range. To account for the response of humans, it is common to use the “***A-weighted***” sound level (noted in units of **dBA**) in evaluating noise sources and their effects on a human since it models how the human ear responds to noise levels in the sensitive frequencies outlined above. Typical sound pressure levels of common noise sources are presented in Table 5.7-1.

Since the decibel scale is logarithmic, a sound that is twice the sound pressure level as another will be 3 decibels (3 dB) higher. A change of 3 dBA is generally barely perceptible by humans, while a 5 dBA change is perceptible, and a 10 dBA increase is perceived as a doubling of the sound pressure level. (Cowan 1994)

Measured SPL data collected during a typical noise study consists of the following noise parameters:

- $L_{eq}$ – The SPL averaged over the measurement period; this parameter is the continuous steady SPL that would have the same total acoustic energy as the real fluctuating noise over the same time.
- $L_{max}$ – The maximum SPL for the sampling period.
- $L_{min}$ – The minimum SPL for the sampling period.
- $L_n$ – The SPLs that were exceeded *n* percent of the time during the sampling period. For example, $L_{90}$ is the level exceeded 90 percent of the time.

The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10 \text{ Log} \frac{\sum_{i=1}^{N} 10^{(SPL_i/10)}}{N}$$

where: N = number of observations
SPL = individual SPL in data set

Some noise sources and industrial activities are inherently likely to give rise to tonal noise, otherwise known as a "***pure tone***". Pure tones are more noticeable than broadband noise and therefore be more intrusive. The Identification of pure tones can be quantified by using the method developed in Annex D of ISO 1996:2007(E). This method identifies a pure tone using the time-average sounds pressure level in the one-third-octave band equal to or exceeding the time-averaged sound pressure levels of both adjacent one-third-octave bands in accordance with the following:

- 15 dB in low-frequency bands (25 Hz to 125 Hz)
- 8 dB in middle-frequency bands (160 Hz to 400 Hz)
- 5 dB in high-frequency bands (500 Hz to 10,000 Hz)

Environmental noise levels vary over time and are described using an overall sound level known as the $\mathbf{L_{eq}}$, or equivalent sound pressure level. The $L_{eq}$ is the energy averaged continuous sound pressure level which has the same total energy as the time-varying noise level over a stated time. The day-night average sound level ($\mathbf{L_{dn}}$) is a common metric in evaluating sound impacts to noise sensitive receptors. The $L_{dn}$ is the 24-hour average SPL calculated with a 10 dBA "penalty" added to nighttime hours (10 p.m. to 7 a.m.). This is done to evaluate potential human response in residential land uses where humans are more sensitive to nighttime noise impacts. The equation for $L_{dn}$ is:

$$L_{dn} = 10 \log \frac{15 \times 10^{\frac{L_d}{10}} + 9 \times 10^{\frac{L_n + 10}{10}}}{24}$$

where: Ld = daytime $L_{eq}$ for the period 0700 to 2200 hours
Ln = nighttime $L_{eq}$ for the period 2200 to 0700 hours

The $L_{dn}$ can be calculated based on the overall average sound average ($L_{eqdn}$) and as a percentile such as the $L_{90}$ ($L_{90dn}$). The sound pressure levels of typical noise environments are presented in Table 5.7-2.

The EPA has recommended an outdoor $L_{dn}$ of 55 dBA for residential and farming areas. For industrial areas, an $L_{eq}$ of 70 dBA is suggested. The Department of Housing and Urban Development (HUD)-recommended goal for exterior noise levels is not to exceed an $L_{dn}$ of55 dBA. In contrast to EPA's recommendation, the HUD recommendation for exterior noise is 65 dBA measured as $L_{dn}$.

**Table 5.7-1: Sound Pressure Levels of Typical Sounds Sources**

| Activity / Sound | Sound Pressure Level (dBA) |
|---|---|
| Air Raid Siren at 50 feet (ft) | 120 |
| Jackhammer at 15 meters (m) | 95 |
| Loud Shout | 90 |
| Heavy Truck at 15 m | 85 |
| Vacuum Cleaner at 3 m | 70 |
| Automobile (100 kilometers per hour (km/hr) at 30 m | 65 |
| Normal Conversation at 1 m | 60 |
| Quiet Living Room | 40 |
| Soft Whisper at 2 m | 35 |
| Unoccupied Broadcast Studio | 28 |
| Threshold of Hearing | 0 |

Source: Harris 1998

**Table 5.7-2: Sound Pressure Levels of Typical Environments**

| Activity / Sound | Sound Pressure Level (dBA) |
|---|---|
| Rock Concert | 110 |
| Subway Platform with Passing Train | 100 |
| Sidewalk with Passing Heavy Truck or Bus | 90 |
| Sidewalk by Typical Highway | 80 |
| Sidewalk of Typical Road with Passing Traffic | 70 |
| Typical Urban Area | 60 – 70 |
| Typical Suburban Area | 50 – 60 |
| Quiet Suburban Area at Night | 40 – 50 |
| Typical Rural Area at Night | 30 – 40 |
| Quiet Living Room | 40 |
| Isolated Broadcast Studio | 20 - 30 |

Source: Harris 1998.

Generally, the noise assessment carried out is completed on locations where it is expected noise effects from the Project activities can affect humans. Specific study areas have been identified as being representative of all sensitive receptors, which could be affected by noise emissions associated with project activities.

## 5.7.2 Affected Environment

### *5.7.2.1 Local Land Use and Noise Sources*

The terrain immediately surrounding the Project site is mostly flat at an elevation of approximately 2,600 feet (ft) with a slight uphill change moving toward the north except for Willow Springs Butte to the south and southeast of the property boundary with a peak of over 3,200 ft. The Project area is sparsely populated with some residential land use accessed from roadways. The Project site land use is primarily undeveloped and unoccupied on private land. Because noise attenuates with distance, the impact area for this noise study included receptors located within 1 mile of the Project.

Existing sources of noise in the Project area include Tehachapi Willow Springs Road traffic noise, local roadway noise, Willow Springs International Raceway, and sounds of nature typical to the area.

The receptors most sensitive to noise typically include residences, hospitals, schools, parks, and churches. These receptors are identified as noise sensitive areas (NSAs). The closest NSAs are residences, no other NSA’s are located within 1 mile of the Project.

### 5.7.2.2 Ambient Noise Survey

The existing noise environment (baseline) was quantified during a field noise survey where ambient noise was measured and recorded. Procedures and results are assessed in this subsection.

#### Noise Measurement Procedures

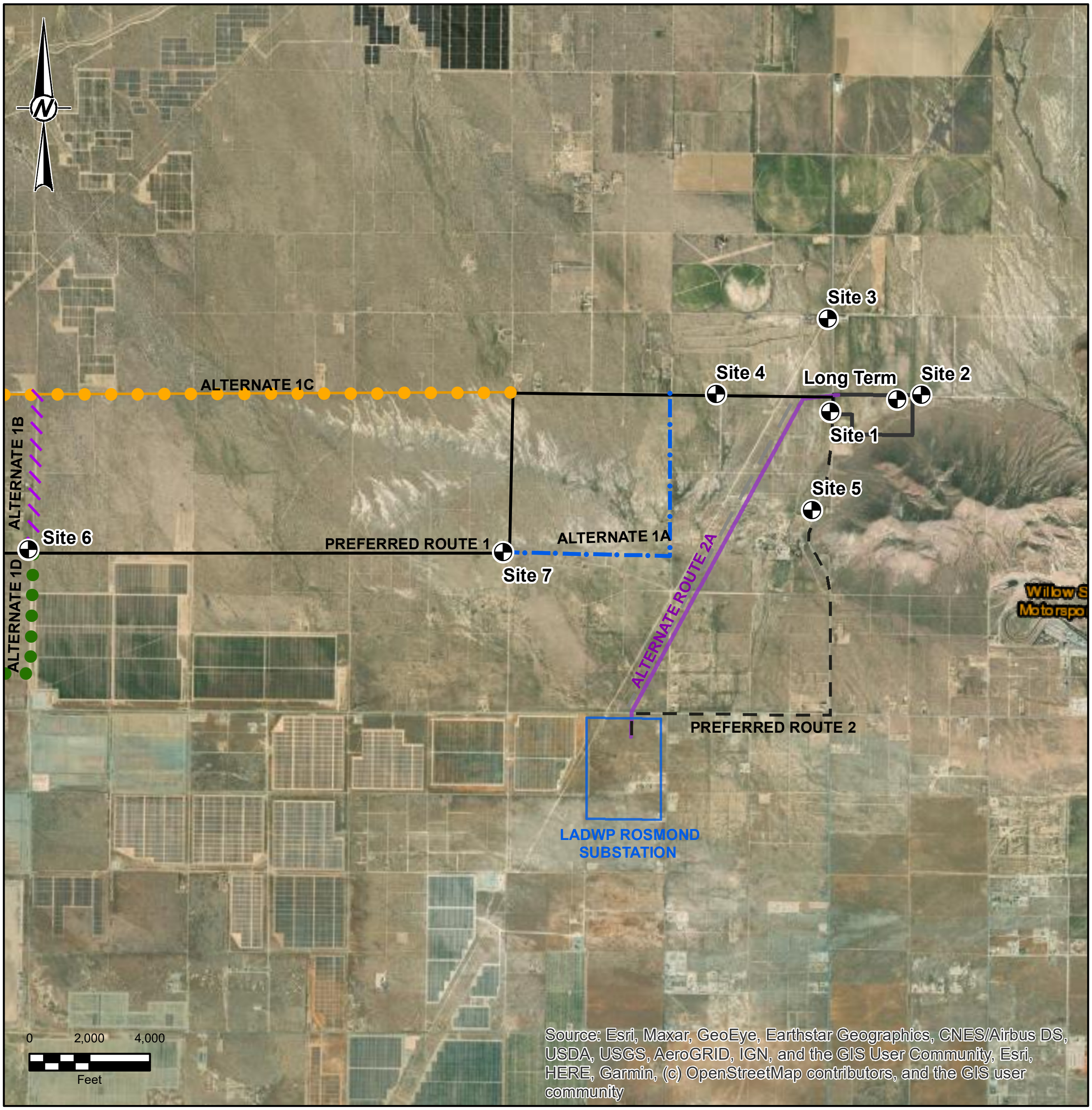
Noise levels were measured at eight locations at or near the Project boundaries from July 8 through July 9, 2021. The primary baseline monitoring location collected area-wide sound data for 25 hours that was representative of the Project area. Additional individual baseline measurements were collected at or near existing sensitive receptors most likely to be affected by the Project during the daytime and at night. Data at the seven off-site monitoring locations included daytime measurements and additional nighttime (between 10 p.m. and 7 a.m.) measurements at three of those sites. The daytime and nighttime measurements were collected for a minimum of 15 minutes to collect a measurement representative of the existing environment as determined by the on-site noise specialist. The monitoring locations, dates, and sample type are presented in Table 5.7-3. These locations along with the current plot plan and noise sensitive receptors are presented in Figure 5.7-1.

**Table 5.7-3: Monitoring Locations Included in the Baseline Noise Study**

| Site | Geographic Coordinates | | Monitoring Dates | Sample Type |
|---|---|---|---|---|
| | Latitude | Longitude | | |
| GEM-1 | 34.891764 | -118.291424 | July 9, 2021 | 15-minute minimum daytime |
| GEM-2 | 34.892571 | -118.281290 | July 9, 2021 | 15-minute minimum daytime |
| GEM-3 | 34.899491 | -118.291655 | July 9, 2021 | 15-minute minimum daytime/nighttime |
| GEM-4 | 34.892585 | -118.303577 | July 9, 2021 | 15-minute minimum daytime/nighttime |
| GEM-5 | 34.881908 | -118.293273 | July 9, 2021 | 15-minute minimum daytime/nighttime |
| GEM-6 | 34.877319 | -118.379480 | July 9, 2021 | 15-minute minimum daytime |
| GEM-7 | 34.877922 | -118.326916 | July 9, 2021 | 15-minute minimum daytime |
| GEM-8 | 34.891717 | -118.283750 | July 8 to 9, 2021 | 25-hour continuous monitoring |

The monitoring duration is dependent on the complexity of the noise environment being monitored. The more complex the environment, the longer the preferred duration of the measurement, and the less complex the environment, the less the monitoring duration. Daytime noise environments are typically more complex than nighttime environments due to human activities that generate noise. The project area was of minimal complexity, with local traffic noise being the primary noise source, therefore all measurements were a minimum of 15 minutes in duration. The noise measurements obtained in this study followed the minimum background measurement period outlined in ANSI/ASA S12.9-2013 is 10 minutes (ANSI/ASA 2013). In addition, measurements at multiple locations provide a better description of area-wide noise baseline levels than longer measurements at fewer locations over a similar timeline.

Measurement techniques set forth by the ANSI S12.9-2013/Part 3, 2013, were used and included using a Type - 1 sound level meter set to the slow response mode to obtain consistent, integrated, A-weighted SPLs. Concurrent one-third octave band frequencies were also measured at all sites. The octave band data from each monitoring site were measured and stored during each monitoring period. The SPL data were analyzed in both dB and dBA. The higher the decibel value, the louder the sound.




LEGEND

- Noise Monitoring Locations
- GEM SITE

Route

- Alternate 1A
- Alternate 1B
- Alternate 1C
- Alternate 1D
- Preferred Route 1
- Preferred Route 2
- Alternate Route 2A
- LAWDP Transmission Corridor
- LADWP Rosmond Substation

REFERENCE(S)
COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N

CLIENT
HYDROSTOR, INC.

PROJECT
GEM ENERGY STORAGE CENTER

TITLE
**NOISE MONITORING LOCATIONS**

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 9/15/2021 |
| DESIGNED | MR |
| PREPARED | MR |
| REVIEWED | GM |
| APPROVED | DS |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20449449 | - | A | 5.7-1 |

PATH: G:\GIS\Sites\MorroBay_Rosmond\Maps\Noise\Gem_Mxage\5.7-1 Noise Monitoring Locations.mxd

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The noise monitoring equipment used during the study included:

- Larson Davis Model 824 and 831 Precision Integrating Sound Level Meters with Real-Time Frequency Analyzers
- Larson Davis Model PRM902 Microphone Preamplifier
- Larson Davis Model 2560 Pre-polarized ½-inch Condenser Microphone
- Windscreen, tripod, and various cables
- Larson Davis Model CAL200 Sound Level Calibrator (CAL200), 94/114 dB at 1,000 Hz

Monitoring was conducted using the sound level meter mounted on a tripod at a minimum height of 1.5 meters (5 feet) above grade. A windscreen was used since measurements were taken outdoors. The windscreen protects the microphone from interference from wind up to a constant wind speed of 12 miles per hour (mph). Measurements were not collected if wind gusts continually exceeding 12 mph were observed. The microphone was positioned so that a random incidence response was achieved. The sound level meter and octave band analyzer were calibrated immediately before and just after each sampling period using the CAL200 to provide a quality control check of the sound level meter's operation during monitoring.

The operator recorded detailed field notes during monitoring that included major noise sources in the area. The Larson Davis sound level meters comply with Type I – Precision requirements set forth for sound level meters and for one-third octave filters. Calibration reports for the Larson Davis Sound Level Meters can be found in Appendix 5-9A. Weather data from the closest airport was downloaded for the time when monitoring was completed. The data shows that there were no weather events (rain, excessive wind, or high humidity) that would have interfered with noise monitoring during the field campaign. Weather data from the monitoring period from the nearest reporting airport can be found in Appendix 5.9B.

## EXISTING BASELINE ENVIRONMENT

Noise levels in the area of the Project are variable; the major noise sources included traffic on Tehachapi Willow Springs Road, which included truck traffic, wind noise, and typical sounds of nature. Monitoring locations were selected based on two goals. Measurements were collected as either short-term (approximately 15 minutes in duration) or long-term (25 hours in duration). In general, the 25-hour measurement represents the entire spectrum of area-wide noise levels, and the individual location short-term measurements represent noise levels at NSAs. A summary of all measurements can be found in Table 5.7-4.

**5.7-4: Noise Summary Table Baseline Ambient Sound Pressure Levels Observed at the Gem Site July 2021**

| Monitoring Location | Date | Time | Start Time (HH:MM) | Sound Pressure Levels (dBA) | | | | | | | | Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $L_{Min}$ | $L_{max}$ | $L_{10}$ | $L_{50}$ | $L_{90}$ | $L_{eq}$ | $L_{90dn}$[a] | $L_{eqdn}$[b] | |
| Site 1: Tehachapi Willow Springs Road - West | 9-Jul-21 | Daytime | 15:02 | 31.4 | 76.3 | 64.8 | 52.0 | 35.3 | 60.2 | | | Cars on nearby highway - continuous. Birds, insects. |
| | | Nighttime[c] | | | | | | 33.3 | 49.8 | 40.1 | 60.1 | |
| Site 2: Hamilton Road - East | 9-Jul-21 | Daytime | 13:52 | 33.9 | 66.4 | 40.7 | 37.2 | 34.7 | 38.7 | | | Cars on highway. Wind. AC unit of nearby residence. Distant cars from racetrack. |
| | 9-Jul-21 | Nighttime | 0:45 | 30.2 | 58.7 | 34.5 | 31.5 | 30.9 | 32.7 | 38.1 | 40.7 | Sporadic distant cars. Insects. |
| Site 3: Tehachapi Willow Springs Road -North | 9-Jul-21 | Daytime | 14:14 | 33.3 | 34.3 | 59.7 | 52.7 | 39.5 | 55.9 | | | Intermittent cars on highway. Birds. Transmission line cracking. Large trucks. |
| | 9-Jul-21 | Nighttime | 1:37 | 31.4 | 71.5 | 48.6 | 33.9 | 33.3 | 49.8 | 41.3 | 57.8 | Transmission line cracking, birds. Intermittant cars on highway. |
| Site 4: Hamilton Road - West | 9-Jul-21 | Daytime | 14:40 | 30.7 | 81.0 | 38.5 | 34.2 | 32.0 | 52.1 | | | Distant generator hum. Distant cars. Wind. |
| | 9-Jul-21 | Nighttime | 2:17 | 30.4 | 57.3 | 35.9 | 32.7 | 31.1 | 33.7 | 37.7 | 50.4 | Distant cars. Insects. Distant plane. |
| Site 5: Tehachapi Willow Springs Road - South | 9-Jul-21 | Daytime | 15:30 | 31.5 | 70.0 | 61.2 | 47.8 | 36.1 | 55.0 | | | Intermittant cars on highway. Birds. Insects. |
| | | Nighttime[c] | | | | | | 33.3 | 49.8 | 40.2 | 57.4 | |
| Site 6: 140th St W and Irone Ave | 9-Jul-21 | Daytime | 16:05 | 32.0 | 57.5 | 45.3 | 38.1 | 35.1 | 41.3 | | | Plane overhead. Insects and birds. Wind. |
| | | Nighttime[c] | | | | | | 31.1 | 33.7 | 38.4 | 42.4 | |
| Site 7: 110th St W and Irone Ave | 9-Jul-21 | Daytime | 16:35 | 30.9 | 59.0 | 46.7 | 40.1 | 34.8 | 42.7 | | | Wind in trees. |
| | | Nighttime[c] | | | | | | 31.1 | 33.7 | 38.3 | 43.1 | |
| Long Term Monitoring | 8-Jul-21 to 9-Jul-21 | Continuous | 15:00 | 19.5 | 78.2 | 45.6 | 41.7 | 38.4 | 42.8 | 43.1 | 47.4 | Wind, cars on highway, insects, birds. |
| Kern County General Plan, Chapter 3 Noise Element - exterior noise at residential receptor | | | | | | | | | | | 65.0 | |

Source: Golder 2021

[a] Calculated using the daytime $L_{90}$ and the nighttime $L_{90}$

[b] Calculated using the daytime $L_{eq}$ and the nighttime $L_{eq}$

[c] Site 3 nighttime $L_{90}$ and $L_{eq}$ used to predict calculated $L_{dn}$ at Sites 1 and 5, and Site 4 nighttime $L_{90}$ and $L_{eq}$ used to predict calculated $L_{dn}$ at Sites 6 and 7.

## Long-Term Monitoring

The long-term monitoring site was located on the Project site along the northern property boundary. Sounds of nature (birds and insects, etc.), traffic along Tehachapi Willow Springs Road, and wind noise were the observed sounds during the study.

The $L_{eq}$ and $L_{90}$ measured at the Long-term Site were 47.4 and 38.4 dBA, respectively, and the $L_{dn}$ was as an $L_{eq}$ and an $L_{90}$ was 47.4 dBA and 43.1 dBA respectively. Figure 5.7-2 shows that there were elevated constant noise levels during the afternoon when wind speeds exceeded 12 miles per hour. Observed nighttime sound levels were largely a result of insect noise. The difference between the $L_{eq}$ and $L_{90}$ was caused by transient noises such as wind gusts and traffic along Tehachapi Willow Springs Road. Table 5.7-5 shows the measured hourly noise levels from the 25-hour location along with summary metrics and averages.

**Table 5.7-5: Summary of Long-term Sound Pressure Levels (dBA)**

| Date | Time | $L_{10}$ | $L_{50}$ | $L_{90}$ | $L_{eq}$ |
|---|---|---|---|---|---|
| Thursday, July 8, 2021 | 15:00 | 51.3 | 47.0 | 43.0 | 48.2 |
| | 16:00 | 52.0 | 47.7 | 43.5 | 48.8 |
| | 17:00 | 52.1 | 48.2 | 43.9 | 49.1 |
| | 18:00 | 49.1 | 45.0 | 41.2 | 46.1 |
| | 19:00 | 45.9 | 42.1 | 38.3 | 43.0 |
| | 20:00 | 42.7 | 41.0 | 39.2 | 41.2 |
| | 21:00 | 44.5 | 43.0 | 41.2 | 43.1 |
| | 22:00 | 43.1 | 39.1 | 37.8 | 43.4 |
| | 23:00 | 38.5 | 33.2 | 29.5 | 35.0 |
| Friday, July 9, 2021 | 0:00 | 35.3 | 31.7 | 29.6 | 32.8 |
| | 1:00 | 37.8 | 35.0 | 32.6 | 35.5 |
| | 2:00 | 40.5 | 38.2 | 36.6 | 38.6 |
| | 3:00 | 42.9 | 40.0 | 38.4 | 40.7 |
| | 4:00 | 42.3 | 38.8 | 37.2 | 39.8 |
| | 5:00 | 46.0 | 41.3 | 37.5 | 42.7 |
| | 6:00 | 45.9 | 41.0 | 36.7 | 42.5 |
| | 7:00 | 40.5 | 34.1 | 29.9 | 36.4 |
| | 8:00 | 39.2 | 32.0 | 28.0 | 35.1 |
| | 9:00 | 38.6 | 31.6 | 26.8 | 34.6 |
| | 10:00 | 42.7 | 40.7 | 40.2 | 41.7 |
| | 11:00 | 43.2 | 37.8 | 33.7 | 39.6 |
| | 12:00 | 42.6 | 38.8 | 35.1 | 39.7 |
| | 13:00 | 43.7 | 39.7 | 36.4 | 40.8 |
| | 14:00 | 39.4 | 36.3 | 33.3 | 36.9 |
| | 15:00 | 41.5 | 37.3 | 34.1 | 38.4 |
| Average[a] | | 45.6 | 41.7 | 38.4 | 42.8 |
| Daytime (7:00 am–10:00 pm)[b] | | 46.7 | 42.8 | 39.3 | 43.8 |
| Nighttime (10:00 pm–7:00 am) | | 42.6 | 38.6 | 36.1 | 40.3 |
| $L_{dn}$[a] | | | | 43.1 | 47.4 |

Source: Golder 2021

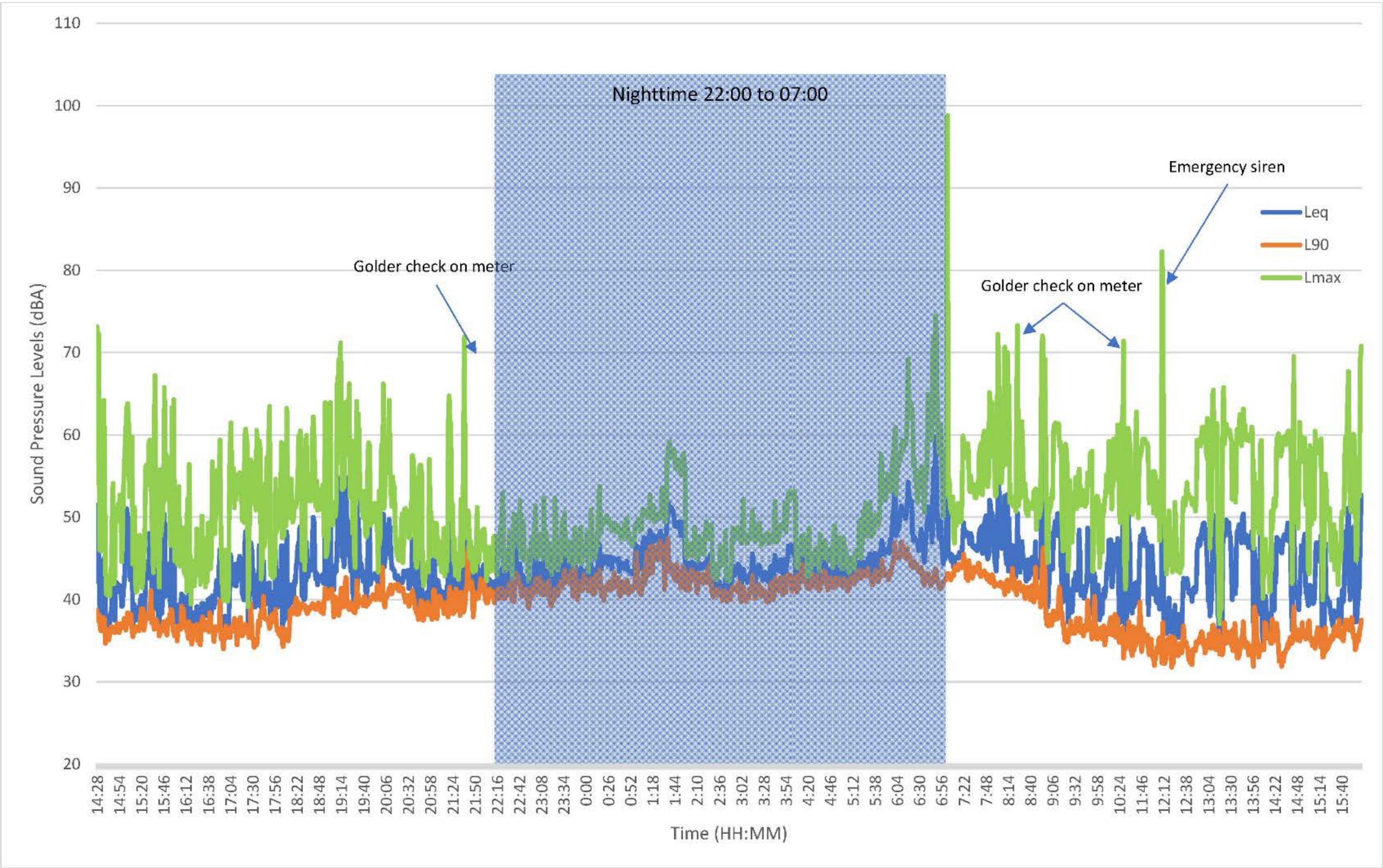





**Figure 5.7-2 Long-Term Baseline Sound Pressure Levels, One Minute Intervals**

**Gem Energy Storage Center**

## Short-Term Monitoring

Vehicle traffic along Tehachapi Willow Springs Road is the major noise source in the area and was generally greater during the daytime than during the nighttime as anticipated. The daytime $L_{eq}$ ranged from a low of 38.7 dBA at Site 2 to a maximum of 60.2 dBA at Site 1. The nighttime $L_{eq}$ ranged from a low of 32.7 dBA at Site 2 to a high of 49.8 dBA at Site 3.

The sound level that is exceeded 90 percent of the time ($L_{90}$) is commonly used when comparing noise monitoring results between locations. This excludes most transient and intermittent noise sources, such as traffic noise, airplane noise, birds chirping, etc. The $L_{90}$ is better used to compare measurements between sites where transient noises may vary greatly. The daytime $L_{90}$ ranged from a low of 32.0 dBA at Site 4 to a maximum of 39.5 dBA at Site 3. The nighttime $L_{90}$ ranged from a low of 30.9 dBA at Site 2 to a high of 33.3 dBA at Site 3.

The day-night average ($L_{dn}$) sound pressure levels that are used to account for the potential sensitivity to nighttime noise at residential receptors ranged from 37.7 dBA at Site 4 to 41.3 dBA at Site 3. Insect noise was common at all locations during the nighttime. Transmission line corona noise was a continuous noise source observed at Site 3 and was more pronounced during the nighttime when there was less traffic and wind noise.

### Site-1 – Short Term Monitoring Location

This site is located along Tehachapi Willow Springs Road close to the residences immediately to the west of the Project. It is approximately 325 feet north of the closest sensitive residential receptor. Traffic along Tehachapi Willow Springs Road and sounds of nature (i.e., birds, insects) were the common noise sources observed during the study.

Overall, the noise levels at this site were variable during the daytime and at night. The daytime $L_{eq}$ was 60.2 dBA and the $L_{eqdn}$ was 60.1 dBA. The $L_{90}$ used to compare inter-site readings was 35.3 dBA during the daytime and the $L_{90dn}$ was 40.1. Daytime noise levels were influenced by transient noise sources (mostly vehicle traffic) which accounted for the difference between $L_{eq}$ and $L_{90}$ values. There was no nighttime measurement at this site, so the $L_{dn}$ was calculated using the nighttime measurement from Site 3 which would have a similar noise profile being located at a similar distance off Tehachapi Willow Springs Road.

### Site-2 – Short Term Monitoring Location

This site is located near the northeast boundary of the Project along Sweetser Road near the closest residential receptor to the east. Sounds of nature (birds and insects, etc.), cars on Tehachapi Willow Springs Road, wind, and distant racecars from the Willow Springs International Raceway were the noise sources observed during the study.

Overall, the noise levels at this site were less variable than at Site 1 during the daytime and at night. The daytime $L_{eq}$ was 38.7 dBA compared to a nighttime $L_{eq}$ of 32.7 dBA with an $L_{eqdn}$ of 40.7 dBA. The $L_{90}$ used to compare inter-site readings was 34.7 dBA during the day and 30.9 dBA at night with an $L_{90dn}$ of 38.1 dBA.

### Site-3 – Short Term Monitoring Location

This site is north of the Project along Tehachapi Willow Spring Road located about 250 feet from the closest residential receptor. Vehicular traffic from the road, transmission line crackling, and sounds of nature (insects and birds) were sources observed during the study.

Overall, the noise levels at this site were variable during the daytime and at night. The daytime $L_{eq}$ was 55.9 dBA compared to a nighttime $L_{eq}$ of 49.8 dBA with an $L_{eqdn}$ of 57.8 dBA. The $L_{90}$ used to compare inter-site readings was 39.5 dBA and 33.3 dBA at night with an $L_{90dn}$ of 41.3 dBA.

There was slightly more transient noise from Tehachapi Willow Springs Road during the daytime when compared to the nighttime.

### Site-4 – Short Term Monitoring Location

This site is along Hamilton Road west of the Project, about 450 feet from the closest residential receptor. Sounds of nature (birds and insects, etc.), distant highway noise, and local cars were noise sources observed during the measurements.

Overall, the noise levels at this site were variable during the daytime and more constant at night. The $L_{eq}$ for the daytime was 52.1 dBA and 33.7 dBA at night with an $L_{eqdn}$ of 50.4 dBA. The $L_{90}$ used to compare inter-site readings was 32.0 dBA during the daytime and 31.1 dBA at night with an $L_{90dn}$ of 37.7 dBA.

Daytime noise levels were greatly influenced by transient noise sources (mostly vehicle traffic) which accounted for the large difference between $L_{eq}$ and $L_{90}$ values.

### Site-5 – Short Term Monitoring Location

This site is located southwest of the Project along Tehachapi Willow Springs Road. Local car and truck traffic and sounds of nature (birds and insects, etc.) were sources observed during the study.

Overall, the noise levels at this site were variable during the daytime. The $L_{eq}$ and $L_{90}$ observed during the daytime measurement were 55.0 dBA and 36.1 dBA, respectively. The $L_{eqdn}$ was 57.4 dBA and the $L_{90dn}$ of 40.2 dBA. There was no nighttime measurement at this site, so the $L_{dn}$ was calculated using the nighttime measurement from Site 3.

Daytime noise levels were greatly influenced by transient noise sources (mostly vehicle traffic) which accounted for the large difference between $L_{eq}$ and $L_{90}$ values.

### Site-6 – Short Term Monitoring Location

This site is located about 5.5 miles southwest of the Project surrounded by a few residences along 140$^{th}$ Street West. This area is expected to be near a potential transmission line. Sounds of nature (birds and insects, etc.), and wind generated noises were the observed sounds during the study.

The $L_{eq}$ and $L_{90}$ observed during the daytime measurement were 41.3 dBA and 35.1 dBA, respectively. The $L_{eqdn}$ was 42.4 dBA and the $L_{90dn}$ of 38.4 dBA. There was no nighttime measurement at this site, so the $L_{dn}$ was calculated using the nighttime measurement from Site 4 which would have a similar noise profile being located near less-traveled roadways.

### Site-7 – Short Term Monitoring Location

This site is located southwest of the Project along 110$^{th}$ Street W near a potential transmission line alley. Sounds of nature (birds and insects, etc.), and wind noise were observed during the study.

The $L_{eq}$ and $L_{90}$ observed during the daytime measurement were 42.7 dBA and 34.8 dBA, respectively. The $L_{eqdn}$ was 47.4 dBA and the $L_{90dn}$ of 43.1 dBA. There was no nighttime measurement at this site, so the $L_{dn}$ was calculated using the nighttime measurement from Site 4 which would have a similar noise profile being located near less-traveled roadways.

## 5.7.3 Environmental Analysis

Noise will be produced during the construction and operation of the project. Potential noise impacts from construction and operation activities are assessed in this subsection.

### *5.7.3.1 Significance Criteria*

Following the California Environmental Quality Act guidelines (Title 14, California Code of Regulations [CCR], Appendix G, Section XI), the project would cause a significant impact if it would result in the following:

- Exposure of people to noise levels above standards established in the local General Plan or noise ordinance
- Exposure of people to excessive ground-borne noise levels or vibration
- Substantial permanent increase in ambient noise levels in the project vicinity
- Substantial temporary or periodic increase in ambient noise levels in the project vicinity

The design basis for noise control is the most stringent (lowest), noise level required by any of the applicable LORS. Therefore, noise from the project is evaluated against Kern County standards outlined in the Noise Element. The county has prohibited noise within sensitive land uses in Project impact areas as not to exceed 65 dBA as an $L_{dn}$ in areas of outdoor activity and not to exceed 45 dBA as an $L_{dn}$ within interior living spaces.

The California Energy Commission (CEC staff has previously stated that an increase in background noise levels up to 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA is generally considered significant; and an increase between 5 and 10 dBA may be either significant or insignificant, depending on the particular circumstances of the project. The CEC staff also has concluded that construction noise is typically insignificant if the construction activity is temporary, if noisy construction activities are limited to daytime hours, and if all feasible noise abatement measures are implemented for noise-producing equipment.

### *5.7.3.2 Construction Impacts*

#### 5.7.3.2.1 Center Construction Noise

Construction of the GESC is expected to be typical of other conventional power plants in serval aspects including the schedule, equipment used, and other types of activities. In addition to these aspects, there will be a-typical construction phases similar to a small mine or quarry including the removal and hauling of overburden and the digging/drilling of shafts similar to that of a mine. The noise level will vary during the construction period depending on the construction phase. For this study, the period of construction where the most equipment has been planned to be operating at the same time was analyzed as the worst case (loudest) period of construction. This timeline was construction months 15 to 18 and included both surface and cavern work.

Because specific information on types of construction equipment is not available at this point in project development, information from similarly sized industrial projects was used. The source of data used in determining impacts included vendor-supplied noise source data, field data collected by Golder, and U.S. Environmental Protection Agency (EPA) noise studies. In the 1970s, the U.S. EPA Office of Noise Abatement and Control had previously developed sound levels from individual pieces of construction equipment (EPA 1971). While some data represents sound levels for equipment more than 40 years old, they would be considered conservative. Sound levels of more modern construction equipment have evolved toward quieter designs to protect operators from exposure to high noise levels.

The number of pieces of equipment and schedule (usage rates) has been estimated and incorporated into this study.

## Construction Noise Impact Methodology

The impact evaluation of the Project was performed using CadnaA, an environmental noise propagation computer program that was developed to assist with noise propagation calculations for major noise sources and projects. For this analysis, the major noise sources modeled are associated with Project construction activities between months 15 and 18 when the most construction equipment will be operating at the same time and is estimated to have the highest noise impacts from the construction phase. This includes both surface and cavern work and includes 108pieces of construction equipment operating.

Noise sources are entered as octave band SPLs. Coordinates for sources and receptors, either rectangular or polar, can be specified by the user. All noise sources are assumed to be area sources can be simulated by several point sources located in a defined area. As construction equipment is often mobile and no permanent equipment will be utilized, this is the best means of representing construction noise sources. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and barrier attenuation. Atmospheric attenuation is calculated using the data specified in the International Standards Organization Attenuation of Sound During Propagation Outdoors, Part 1: Calculations of the Absorption of Sound by the Atmosphere [International Standard Organization (ISO) 1993]. Path-specific attenuation can be specified to account for the effects of ground, vegetation, foliage, and wind shadow. Directional source characteristics and reflection can be simulated using path-specific attenuation. Attenuation due to barriers can be specified by giving the coordinates of the barrier. Barrier attenuation is calculated by assuming a defined barrier perpendicular to the source-receptor path. Total and A-weighted SPLs are calculated.

The model predicted the maximum noise levels produced by the Project using expected noise sources from surface and cavern noise sources. The noise sources include heavy equipment operations, loading and unloading of material, and on-site large and medium-sized vehicle traffic noise. The sources were modeled using an expected operational usage factor and do not include any periodic startup or shutdown noises.

Table 5.7-6 lists the configuration of the calculation parameters used to complete noise modeling for the Project.

**Table 5.7-6: Noise Model Configuration Parameters**

| Parameter | Model Setting | Description/Notes |
|---|---|---|
| Standards | ISO 9613 only | All sources and attenuators are treated as required by the cited standard. |
| Source directivity | Horizontal area sources | No directivity was applied to modeled sources. |
| Ground absorption | 0.5 | Soft ground appropriate for the current and future area which is comprised of boreal forest and soil covered terrain |
| Temperature/humidity | 20°C / 70% relative humidity | Assumed weather conditions |
| Wind conditions | Default ISO 9613 – moderate inversion condition | The propagation conditions in the ISO standard are valid for wind speeds between 4 and 18 km/hr; all points are considered downwind. |
| Terrain | Existing terrain considered | Existing ridgeline and changes in elevation in the impact area will affect sound propagation |

| Parameter | Model Setting | Description/Notes |
|---|---|---|
| Reflections | 1 | One reflection is taken into account as mirror image sources from reflecting structures. |
| Construction Operations | Daytime Only | Minimal construction activities are anticipated during nighttime hours and on weekends. Anticipated work during nighttime hours and weekends is limited to rock handling on the surface from the continual operations of the underground workings. |
| Noise Mitigation | None | The model does not include the planned natural buffers or existing foliage that will remain during project operations. |

Sound pressure levels, noise source data, and usage rates input into the model are presented in Table 5.7-7. General compliance with OSHA regulations requires that heavy equipment outlined in the table is typically required to use backup alarms as a worker health and safety measure. Such alarms were not included in this study.

**Table 5.7-7: Construction Noise Source Data**

| Equipment ID | Location | Number Used | Usage Rate (Hr/day) | Source Height (m) | Levels at Octave Band Centre Frequencies | | | | | | | | | dBA | dB | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| **Surface Work - Months 15 to 18** | | | | | | | | | | | | | | | | |
| Diesel Generators (60 KW/100 HP)) | General | 10 | 8 | 1 | | 103 | 111 | 106 | 99 | 99 | 94 | 89 | 85 | 103.6 | 112.5 | Noise from Construction, EPA 1971 (Const_8) |
| Pick-up Trucks (150 HP) | General | 22 | 4 | 2 | 67 | 72 | 86 | 92 | 98 | 99 | 98 | 94 | 88 | 103.9 | 104.1 | Field Measurement 12/20/11 @ Wolf Creek_gbm |
| Crawler Dozer (120 HP) | Civil | 2 | 4 | 2 | | 103 | 115 | 106 | 107 | 103 | 101 | 97 | 87 | 109.1 | 116.5 | Vendor Supplied - Cat_D10/D11/D7 LGPa |
| Backhoe (120 HP) | Civil | 15 | 4 | 2 | 68 | 81 | 93 | 97 | 99 | 100 | 100 | 94 | 88 | 105.0 | 105.7 | Excavator - Komatsu PC 300, Field Measurement |
| Grader (160 HP) | Civil | 5 | 4 | 2 | | 103 | 115 | 106 | 107 | 103 | 101 | 97 | 87 | 109.1 | 116.5 | Cat 14M Grader |
| Wheel Loader (120 HP) | Civil | 1 | 4 | 2 | | 102 | 110 | 101 | 102 | 99 | 93 | 89 | 82 | 103.7 | 111.7 | Cat 988 Wheel Loader |
| Crawler Loader (120 HP) | Civil | 11 | 4 | 2 | | 102 | 110 | 101 | 102 | 99 | 93 | 89 | 82 | 103.7 | 111.7 | Cat 988 Wheel Loader |
| Scraper (270 HP) | Civil | 8 | 4 | 2 | | 107 | 104 | 102 | 103 | 100 | 97 | 95 | 97 | 105.3 | 110.4 | Noise from Construction, EPA 1971 (Const_4) |
| Roller (100 HP) | Civil | 9 | 4 | 2 | 70 | 87 | 99 | 106 | 111 | 113 | 108 | 101 | 93 | 115.6 | 116.5 | Cat CS76 Compactor |
| Pile Driver Hammer (250 HP) | Civil | 2 | 4 | 2 | 131 | 132 | 127 | 116 | 119 | 122 | 124 | 117 | 110 | 127.5 | 135.5 | Edison Electric Institute, 1984 |
| Crane (200 HP) | Turbine Hall | 2 | 4 | 2 | | 112 | 119 | 117 | 115 | 110 | 105 | 99 | 93 | 115.6 | 122.4 | Noise from Construction, EPA 1971 |
| Welder (50 HP) | Turbine Hall | 4 | 6 | 1 | | 103 | 111 | 106 | 99 | 99 | 94 | 89 | 85 | 103.6 | 112.7 | Noise from Construction, EPA 1971 |
| Crane (200 HP) | Spheres | 2 | 8 | 2 | | 112 | 119 | 117 | 115 | 110 | 105 | 99 | 93 | 115.6 | 122.4 | Noise from Construction, EPA 1971 |
| Welder (50 HP) | Spheres | 4 | 6 | 1 | 131 | 103 | 111 | 106 | 99 | 99 | 94 | 89 | 85 | 103.6 | 112.7 | Noise from Construction, EPA 1971 |
| **Cavern Work - Months 15 to 18** | | | | | | | | | | | | | | | | |
| Drill Rig (675 HP) | Cavern | 3 | 11 | 2 | 118 | 115 | 112 | 114 | 112 | 109 | 108 | 106 | 98 | 115.2 | 121.2 | Bluewater Drill Rig Ops |
| 30 Ton Crane (173 HP) | Cavern | 3 | 4 | 2 | | 112 | 119 | 117 | 115 | 110 | 105 | 99 | 93 | 115.6 | 122.3 | Noise from Construction, EPA 1971 |
| Water Pumps, 6" 58 HP | Cavern | 3 | 11 | 1 | 95 | 96 | 97 | 98 | 97 | 99 | 96 | 92 | 86 | 102.8 | 105.3 | Devon Project - Circ Pump, 55 kW |
| Track Hoe (187 HP) | Cavern | 1 | 4 | 2 | | 112 | 119 | 117 | 115 | 110 | 105 | 99 | 93 | 115.6 | 122.3 | Noise from Construction, EPA 1971 |
| Dump Truck (370 HP) | Cavern | 1 | 4 | 2 | | | 119 | 116 | 113 | 110 | 106 | 102 | | 115.2 | 121.6 | Noise from Construction, EPA 1971 |

## Modeling Results

Modeling results are summarized in Table 5.7-8 and illustrated in Figure 5.7-3. The modeling results show that noise propagation is affected by changes in terrain to the south and southeast causing varying noise levels at increasing distances from noise sources and not affected very much by the terrain in the remaining directions

The daytime construction noise impacts at the 17 identified NSAs ranged from a high of 66 dBA at NSA 01 to a low of 37 dBA at NSA 09. The highest contributor to the modeled noise level at NSA 01 was pile driver operations during surface work. The maximum calculated $L_{dn}$ was recalculated by adding the modeled construction noise levels to the daytime baseline $L_{90}$ and is 64 dBA an NSA 01, which is below Kern County standard of an Ldn of 65 dBA.

#### 5.7.3.2.2 Construction Vibration

Vibrations could occur during large equipment operations, pile driving, drilling, and blasting. Vibrations will be limited to normal construction hours (during the daytime) and will be of short duration; therefore, no mitigation is required.

#### 5.7.3.2.3 Worker Exposure to Noise

Worker exposure levels during the construction of the GESC will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. The project will develop a Hearing Protection Plan, which complies with California Division of Occupational Safety and Health (Cal/OSHA) requirements. This Hearing Protection Plan will be incorporated into the project construction Health and Safety Plan. The plan will require appropriate hearing protection for workers and visitors throughout the construction period.

### *5.7.3.3 Operational Impacts*

#### 5.7.3.3.1 Worker Exposure

Based on the noise levels of the indoor components of the GESC, it is highly likely that hearing protection will be required in the Turbine Hall building. At this stage of the project, vendor equipment has not been specified and vendor noise specifics/guarantees are unknown. Given an indoor environment and the expected size of the equipment, near-field maximum noise levels of 90 dBA at 3 feet could be exceeded.

Based on the noise levels of outdoor components, worker exposure to elevated noise levels in the outdoor environment will be limited to periods of time while working directly on, or next to noise generating equipment, if at all. Additionally, because there are no permanent or semi-permanent workstations located near any piece of noisy outdoor equipment, no visiting worker’s time-weighted average exposure to noise should routinely approach the level allowable under Occupational Safety and Health (OSHA) standards (29 Code of Federal Regulations 1910.95).

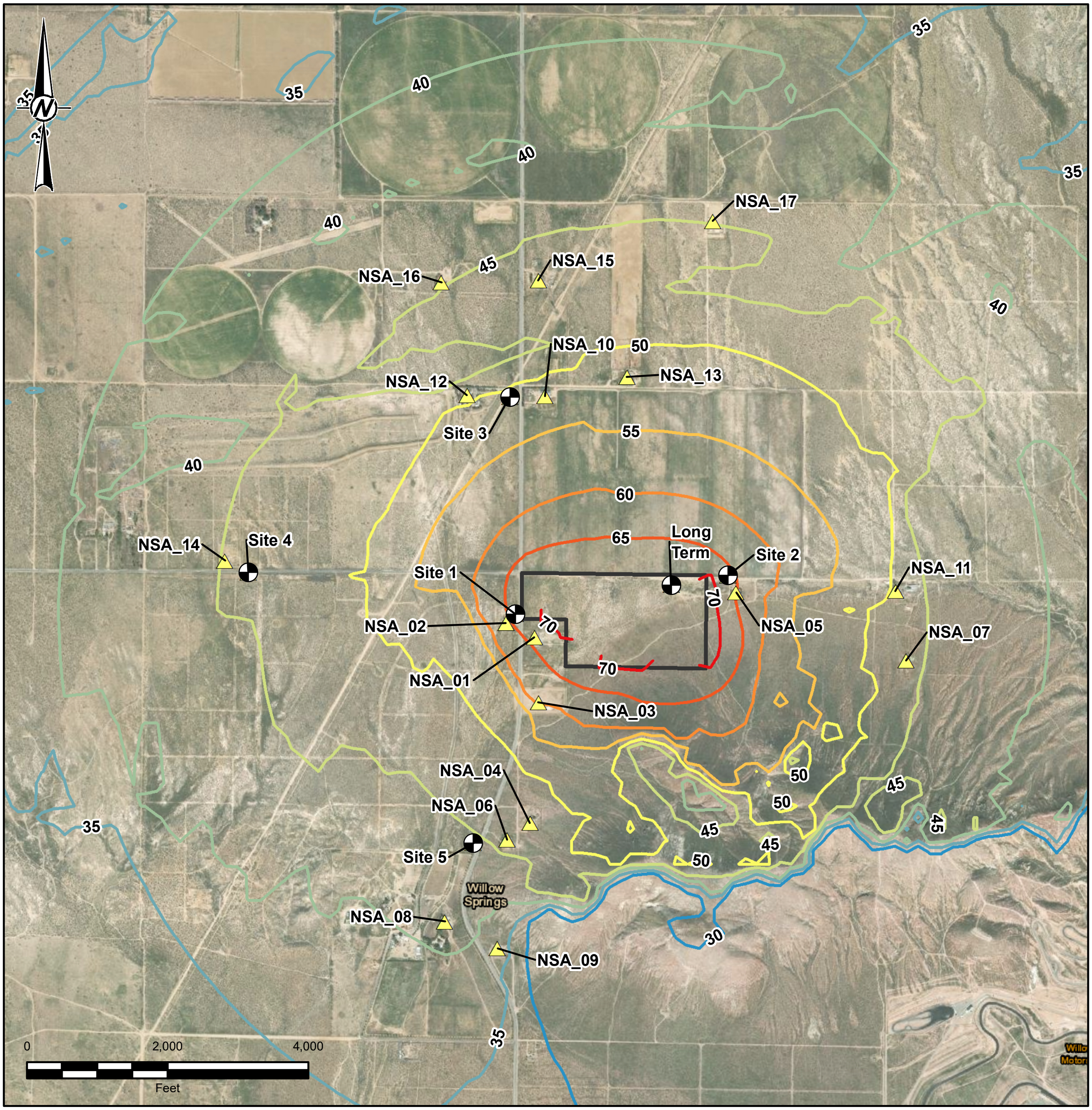
Signs requiring the use of hearing protection devices will be posted in all areas where noise levels commonly exceed 85 dBA, such as inside acoustical enclosures, and the project will comply with applicable Cal/OSHA requirements. Outdoor levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source. Therefore, noise impacts to visiting workers during operation will be less than significant.

**Table 5.7-8: Modeled and Predicted Construction Noise Levels at Residential Receptors**

| Site [c] | Representative Land Use | A- Weighted Sound Levels (dBA) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Baseline | | Modeled [a] | Predicted [b] | | |
| | | $L_{90}$, Day | $L_{90}$, Night | | Day | Night | $L_{dn}$ |
| Site 1 | Residential | 35 | 33 | 67 | 67 | 33 | 65 |
| Site 2 | Residential | 35 | 31 | 66 | 66 | 31 | 64 |
| Site 3 | Residential | 40 | 33 | 52 | 52 | 33 | 51 |
| Site 4 | Residential | 32 | 31 | 46 | 46 | 31 | 45 |
| Site 5 | Residential | 36 | 33 | 45 | 45 | 33 | 44 |
| NSA 01 | Residential | 35 | 33 | 66 | 66 | 33 | 64 |
| NSA 02 | Residential | 35 | 33 | 64 | 64 | 33 | 62 |
| NSA 03 | Residential | 35 | 33 | 61 | 61 | 33 | 59 |
| NSA 04 | Residential | 36 | 33 | 48 | 48 | 33 | 47 |
| NSA 05 | Residential | 35 | 31 | 65 | 65 | 31 | 63 |
| NSA 06 | Residential | 36 | 33 | 46 | 47 | 33 | 46 |
| NSA 07 | Residential | 35 | 31 | 46 | 46 | 31 | 45 |
| NSA 08 | Residential | 36 | 33 | 41 | 42 | 33 | 43 |
| NSA 09 | Residential | 36 | 33 | 37 | 40 | 33 | 41 |
| NSA 10 | Residential | 40 | 33 | 53 | 53 | 33 | 51 |
| NSA 11 | Residential | 35 | 31 | 49 | 49 | 31 | 47 |
| NSA 12 | Residential | 40 | 33 | 48 | 49 | 33 | 47 |
| NSA 13 | Residential | 40 | 33 | 52 | 52 | 33 | 50 |
| NSA 14 | Residential | 36 | 33 | 45 | 46 | 33 | 45 |
| NSA 15 | Residential | 40 | 33 | 46 | 47 | 33 | 46 |
| NSA 16 | Residential | 40 | 33 | 45 | 46 | 33 | 45 |
| NSA 17 | Residential | 40 | 33 | 45 | 46 | 33 | 45 |

Source: Golder Associates Inc, 2021.

[a] Modeled noise generated by proposed center operations configuration calculated by the noise model Cadna A.
[b] Predicted impacts were calculated by logarithmically adding the modeled impacts to the baseline measurements.
[c] Baseline from the most comparable monitoring locations used for NSA baseline.




**LEGEND**

- Noise Monitoring Locations
- Noise Sensitive Area

**Noise Contours**

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA
- 70 dBA
- GEM SITE

**REFERENCE(S)**

COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N

SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
ESRI, HERE, GARMIN, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
HYDROSTOR, INC.

PROJECT
GEM ENERGY STORAGE CENTER

TITLE
**CONSTRUCTION NOISE MODELING IMPACTS**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 9/16/2021 |
| DESIGNED | MR |
| PREPARED | MR |
| REVIEWED | GM |
| APPROVED | DS |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20449449 | - | A | 5.7-3 |

#### 5.7.3.3.2 Transmission Line and Switchyard Noise Levels

One of the electrical effects of high-voltage transmission lines is corona. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware attributable to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and the production of ozone. Corona is generally a principal concern with transmission lines of 345 kilovolts (kV) and greater and with lines that are at higher elevations. Corona noise is also generally associated with foul weather conditions. Existing audible noise associated with the transmission lines in the area will be of the same magnitude upstream and downstream of the GESC. Because the GESC design voltage is 230 kV, it is expected that no corona-related design issues will be encountered, and any related impacts will be less than significant and temporary during foul weather events.

#### 5.7.3.3.3 Plant Operational Noise Modeling

The operation of the GESC is expected to be typical of other power plants with major noise generating equipment located indoors including schedule, equipment used, and other types of activities. A noise model of the proposed Gem was developed by Golder.

### Operational Noise Impact Methodology

The general methodology used in evaluating the operational noise is outlined in section 5.7.3.2.1. For this analysis, all major noise sources will be modeled as operating during a normal fully operational scenario. No shutdown, start-up, or emergency operations were considered. All noise sources are assumed to be point sources; area sources can be simulated by several point sources located in a defined area. Indoor noise sources are modeled at the outer face of the structure as vertical or horizontal area sources.

The model predicted the maximum noise levels produced by the Project using expected noise sources from indoor and outdoor sources. The sources were modeled using an expected operational usage factor of 100 percent. This is a conservative assumption as there are different operational cycles where some equipment will be operating while other equipment will be shut down.

Table 5.7-9 lists the configuration of the calculation parameters used to complete noise modeling for the Project.

**Table 5.7-9: Noise Model Configuration Parameters**

| Parameter | Model Setting | Description/Notes |
|---|---|---|
| Standards | ISO 9613 only | All sources and attenuators are treated as required by the cited standard. |
| Source directivity | Chimney | Directivity is only applied to stack exhaust in the vertical direction. |
| Ground absorption | 0.5 | Soft ground appropriate for the current and future area which is comprised of boreal forest and soil covered terrain |
| Temperature/humidity | 20°C / 70% relative humidity | Assumed weather conditions |
| Wind conditions | Default ISO 9613 – moderate inversion condition | The propagation conditions in the ISO standard are valid for wind speeds between 4 and 18 km/hr; all points are considered downwind. |
| Terrain | Existing terrain considered | Existing ridgeline and changes in elevation in the impact area will affect sound propagation |
| Reflections | 1 | One reflection is taken into account as mirror image sources from reflecting structures. |
| Noise Mitigation | Building insertion loss for interior noise sources.<br>Pump set barriers near eastern boundary | Assumed metal sandwich-style building material with insulation, 7.5 inches thick.<br>Assumed metal roll-up 24' x 24' garage doors.<br>Barriers along northern and eastern sides of specified pump sets. |

Sound pressure levels, noise source data, and usage rates input into the model are presented in Table 5.7-10.

**Table 5.7-10: Operations Noise Source and Reduction Indicies Data**

| Equipment ID | Location | Type | Number Used | Source Height (m) | Levels at Octave Band Centre Frequencies | | | | | | | | | dBA | dB | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| LP Compressor - 45,740 kW | Interior | Mechanical | 5 | 2 | | 91 | 101 | 113 | 124 | 129 | 130 | 131 | 129 | 136.7 | 135.6 | Turbo Compressor train 9,966 kW |
| IP Compressor - 22,840 kW | Interior | Mechanical | 5 | 2 | 107 | 103 | 108 | 107 | 105 | 108 | 113 | 110 | 103 | 116.9 | 117.2 | BOG Compressor from Floridian LNG |
| HP Compressor - 22,630 kW | Interior | Mechanical | 5 | 2 | | 91 | 94 | 101 | 101 | 102 | 104 | 100 | 91 | 108.5 | 108.9 | Siemens Compressor STC-SV 11,404 kW |
| Compressor Aux 560 kW | Interior | Mechanical | 5 | 2 | 104 | 100 | 105 | 104 | 102 | 105 | 110 | 107 | 100 | 113.9 | 114.2 | Recip. 200 kW air comp,Devon Pike 2 Project |
| Inlet Air w/ Silencer | Exterior | Mechanical | 5 | 2 | 112 | 115 | 115 | 99 | 93 | 94 | 97 | 90 | 78 | 103.2 | 118.2 | GE Power_200 MW_7FA05_0315 |
| Exhaust Duct | Exterior | Mechanical | 5 | 2 | 110 | 109 | 103 | 97 | 92 | 85 | 83 | 79 | 74 | 94.5 | 111.5 | GE Data 27 Jul 01 Letter |
| Exhaust Stack | Exterior | Mechanical | 5 | 2 | 132 | 128 | 122 | 121 | 118 | 115 | 104 | 88 | 69 | 119.5 | 132.3 | GE Power_200 MW_7FA05_0315 |
| LP Turbine | Interior | Mechanical | 5 | 2 | 124 | 124 | 120 | 119 | 117 | 112 | 106 | 103 | 102 | 118.0 | 127.6 | LP Turbine Black & Veatch |
| IP Turbine | Interior | Mechanical | 5 | 2 | 124 | 124 | 120 | 119 | 117 | 112 | 106 | 103 | 102 | 118.0 | 127.6 | LP Turbine Black & Veatch |
| HP Turbine | Interior | Mechanical | 5 | 2 | 124 | 124 | 120 | 119 | 117 | 112 | 106 | 103 | 102 | 118.0 | 127.6 | LP Turbine Black & Veatch |
| Thermal Fluid Pump 1361 kW, 836 m3/hr | Exterior | Mechanical | 4 | 2 | 93 | 94 | 95 | 97 | 97 | 100 | 97 | 93 | 87 | 103.6 | 105.2 | Guyer, 2013 An Introduction to Sound Level Data |
| Cooling Circ Pump-charge 1010 kW, 5,460 m3/hr | Exterior | Mechanical | 2 | 2 | 99 | 100 | 101 | 102 | 101 | 103 | 100 | 96 | 90 | 106.8 | 109.3 | Devon Project - HP BFW Pump, 1,100 kW |
| Cooling Circ Pump - discharge 53 kW, 291 m3/hr | Exterior | Mechanical | 4 | 2 | 95 | 96 | 97 | 98 | 97 | 99 | 96 | 92 | 86 | 102.8 | 105.3 | Devon Project - Circ Pump, 55 kW |
| Comp. Air Dryer Package 253 kW | Exterior | Mechanical | 1 | 1 | 104 | 107 | 107 | 104 | 101 | 97 | 94 | 91 | 83 | 103.2 | 111.7 | Compressed air dryer, coal project |
| Hot Tank Transfer Pump 1361 kW, 836 m3/hr | Exterior | Mechanical | 2 | 2 | 99 | 100 | 101 | 102 | 101 | 103 | 100 | 96 | 90 | 106.8 | 109.3 | Devon Project - HP BFW Pump, 1,100 kW |
| Transformer 350/420 MVA | Exterior | Electrical | 2 | 2 | 101 | 107 | 109 | 104 | 104 | 98 | 93 | 86 | 79 | 104.3 | 112.6 | FPL Data (Tom Joseph) |
| Transformer 15/20 MVA | Exterior | Electrical | 4 | 2 | 93 | 99 | 101 | 96 | 96 | 90 | 85 | 80 | 74 | 96.4 | 104.7 | Devon Project - Transformer 10 MW |
| Transformer 125 MVA | Exterior | Electrical | 10 | 2 | 99 | 105 | 107 | 102 | 102 | 96 | 91 | 82 | 77 | 102.3 | 110.6 | FPL Data |
| Cooling Medium Air Cooler | Exterior | Mechanical | 23 | 10 | 93 | 96 | 96 | 93 | 90 | 86 | 83 | 80 | 72 | 92.6 | 101.7 | Calculated based on Guyer, 2013 Table 7 |
| Thermal Medium Cooler | Exterior | Mechanical | 70 | 10 | 92 | 95 | 95 | 92 | 89 | 85 | 82 | 79 | 71 | 90.8 | 100.0 | Calculated based on Guyer, 2013 Table 8 |
| Motor - 50 MW Sychronous 1800 rpm, 13.8 kV | Interior | Electrical | 10 | 2 | 97 | 99 | 101 | 101 | 101 | 101 | 101 | 98 | 91 | 106.6 | 108.9 | Calculated based on Bies and Hansen, 2003 Table 11.25 |
| Generator 100 MW Synchronous 3600 rpm, 13.8 kV | Interior | Electrical | 5 | 2 | 97 | 99 | 101 | 101 | 101 | 101 | 101 | 98 | 91 | 106.6 | 108.9 | Calculated based on Bies and Hansen, 2003 Table 11.26 |
| **Noise Reduction Indicies** | | | | | | | | | | | | | | | | |
| Turbine Hall Roof | | | | | | | 15 | 20 | 28 | 37 | 43 | 40 | | | 32.0 | VDI 2571 |
| Turbine Hall Walls | | | | | | | 20 | 29 | 43 | 48 | 56 | 57 | | | 41.0 | VDI 2571 |
| Turbine Hall Garage Door | | | | | | | 14 | 16 | 20 | 25 | 29 | 23 | | | 25.0 | VDI 2571 |

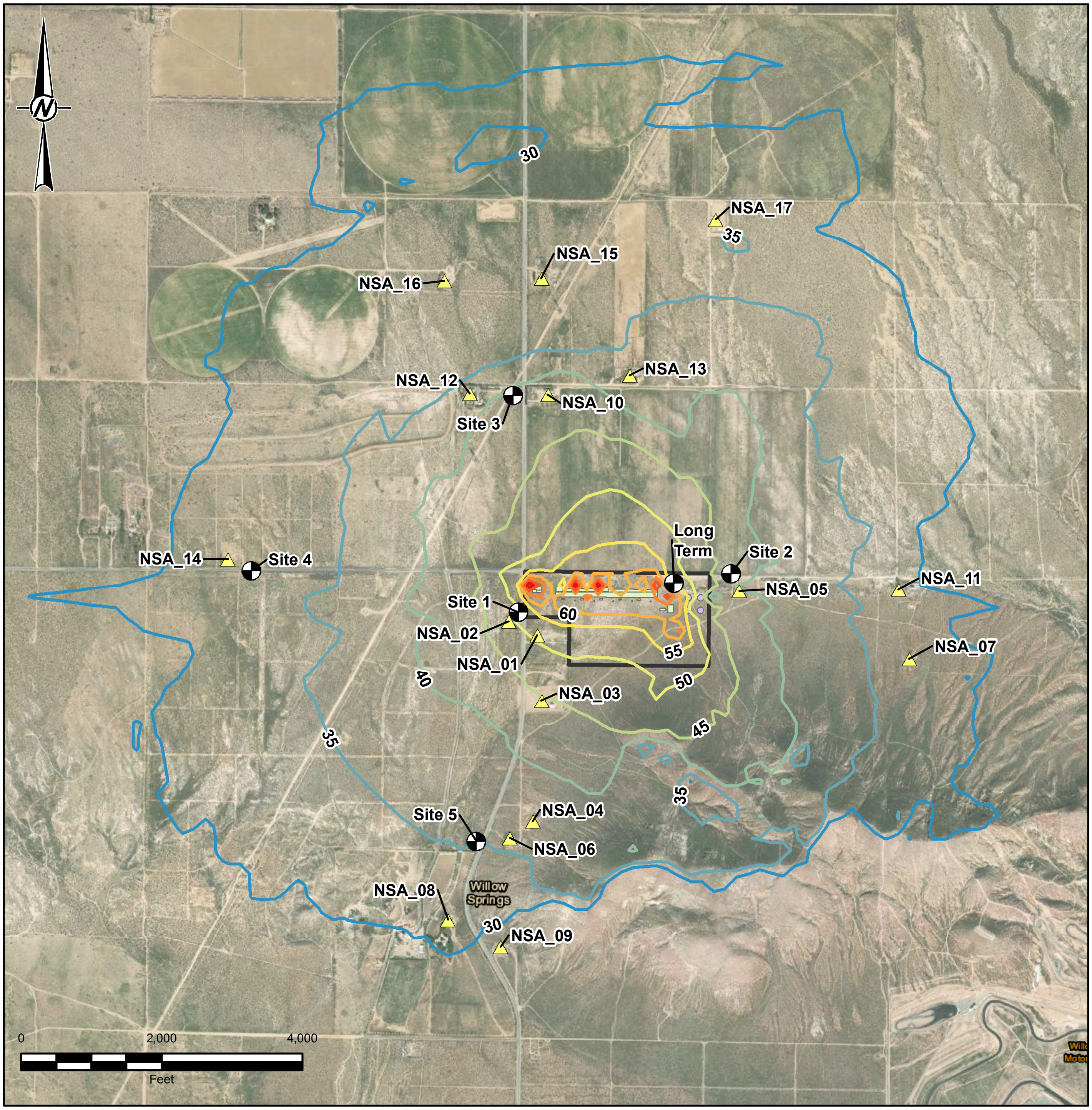
## Modeling Results

Modeling results are summarized in Table 5.7-11 and illustrated in Figure 5.7-4. The modeling results show that noise propagation is affected by changes in terrain to the south and southeast causing varying noise levels at increasing distances from noise sources and is not affected by the terrain in the remaining directions. It is also affected by on-site barriers, buildings, and tanks some of which are sources themselves but also act as barriers to noise propagation

The daytime noise impacts at the 17 identified NSAs range from a high of 52 dBA at NSA 01 to a low of 28 dBA at NSA 09. The highest contributor to the modeled noise level at NSA 01 is the closest air inlet to that location.

**Table 5.7-11: Modeled Operational Noise Levels at Residential Receptors**

| Site | Land Use | Modeled Results (dBA)[a] |
|---|---|---|
| Site 1 | Residential | 51 |
| Site 2 | Residential | 42 |
| Site 3 | Residential | 42 |
| Site 4 | Residential | 31 |
| Site 5 | Residential | 34 |
| NSA 01 | Residential | 52 |
| NSA 02 | Residential | 50 |
| NSA 03 | Residential | 46 |
| NSA 04 | Residential | 37 |
| NSA 05 | Residential | 38 |
| NSA 06 | Residential | 36 |
| NSA 07 | Residential | 31 |
| NSA 08 | Residential | 30 |
| NSA 09 | Residential | 28 |
| NSA 10 | Residential | 42 |
| NSA 11 | Residential | 30 |
| NSA 12 | Residential | 37 |
| NSA 13 | Residential | 36 |
| NSA 14 | Residential | 30 |
| NSA 15 | Residential | 32 |
| NSA 16 | Residential | 32 |
| NSA 17 | Residential | 35 |




**LEGEND**

- Noise Monitoring Locations
- Noise Sensitive Area

**Noise Contours**

- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA
- 70 dBA
- 75 dBA
- GEM SITE

**REFERENCE(S)**

COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N

SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
ESRI, HERE, GARMIN, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
HYDROSTOR, INC.

PROJECT
GEM ENERGY STORAGE CENTER

TITLE
**OPERATIONAL NOISE MODELING IMPACTS**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 10/25/2021 |
| DESIGNED | MR |
| PREPARED | MR |
| REVIEWED | GM |
| APPROVED | DS |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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**Tonal Noise**

It is understood that tonal noise can be more of a nuisance to off-site receptors than broadband noise sources. At the nearby residential locations, no significant tones were identified in the baseline noise measurements, and none are anticipated from Project operations. However, audible tones are not impossible because certain sources within the plant (such as the combustion turbine inlets, transformers, and pump motors) have been known to sometimes produce significant tones mostly during start-up. Gem will anticipate the potential for audible tones in the final design specifications of the plant's equipment and will take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors. Tonal noise issues are rare with similar type projects and, when evident, can be mitigated to reduce these sources of noise.

#### 5.7.3.3.4 Ground and Airborne Vibration

The project consists of five, 100-MW (nominal) power blocks. Each power block will contain a motor-driven air compressor drivetrain, heat exchangers, and an air turbine generator, and their ancillary equipment. Each power block will share a common set of thermal storage tanks (hot and cold) as well as the air storage cavern. Such equipment is not known to cause off-site ground vibration nor airborne low-frequency noise (LFN) during normal operations. LFN is possible during startup conditions when turbines and motors can spin at a certain frequency causing LFN, but these instances are rare and occur for a very short duration (several minutes). Unlike a typical power plant, there is no combustion, lessening the possibility of LFN issues.

The Project anticipates the potential for low-frequency noise in the design and specification of the project equipment and will take necessary steps to prevent ground or airborne vibration impacts. The equipment that would be used in the project is well balanced and is designed to produce very low vibration levels throughout the life of the project. An imbalance could contribute to ground and airborne vibration levels in the vicinity of the equipment. Typically, vibration-monitoring systems are installed and are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected, and the equipment would automatically shut down. Given these protective measures, impacts related to ground- and airborne vibrations will be less than significant.

### 5.7.4 Cumulative Effects

As shown in Table 5.7-11, the predicted impacts were calculated by logarithmically adding operational modeled results to baseline daytime and nighttime sound levels at monitoring locations and at the seventeen additional NSAs identified in the Project impact area.

The predicted $L_{dn}$ impact levels at the off-site sensitive receptor locations range from a high of 58 dBA at NSA 01 to a low of 40 dBA at several NSA 11. The maximum predicted difference in $L_{dn}$ (Predicted $L_{dn}$ value – Baseline $L_{dn}$) at a sensitive receptor is 5 dBA at NSA 05. There is no predicted increase to baseline predicted at any other NSA. This predicted increase to baseline is driven mainly by the lower baseline noise levels to the east of the Project. Impacts to the west of the Project had similar noise impacts from the operations, but those NSA's were subject to a higher baseline noise levels due to their proximity to a traffic corridor.

CEC considers an increase to baseline $L_{dn}$ of 5 dBA or less as insignificant and an increase of 10 dBA or more to be significant. Based on these criteria, Gem will have no significant impacts on the closest 17 NSA's. This suggests the overall impact from the Project will be limited.

**Table 5.7-12: Modeled and Predicted Noise Levels at Boundary and Residential Receptors**

| Site [c] | Representative Land Use | A- Weighted Sound Levels (dBA) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Baseline | | | Modeled [a] | Predicted [b] | | | |
| | | $L_{90}$, Day | $L_{90}$, Night | $L_{dn}$ ($L_{eq}$) | | Day | Night | $L_{dn}$ | $L_{dn}$ Difference[c] |
| Site 1 | Residential | 35 | 33 | 60 | 51 | 51 | 51 | 57 | 0 |
| Site 2 | Residential | 35 | 31 | 41 | 43 | 44 | 44 | 50 | 9 |
| Site 3 | Residential | 40 | 33 | 58 | 41 | 44 | 42 | 49 | 0 |
| Site 4 | Residential | 32 | 31 | 50 | 32 | 35 | 35 | 41 | 0 |
| Site 5 | Residential | 36 | 33 | 57 | 35 | 39 | 37 | 44 | 0 |
| NSA 01 | Residential | 35 | 33 | 60 | 51 | 51 | 51 | 57 | 0 |
| NSA 02 | Residential | 35 | 33 | 60 | 49 | 49 | 49 | 56 | 0 |
| NSA 03 | Residential | 35 | 33 | 60 | 45 | 45 | 45 | 51 | 0 |
| NSA 04 | Residential | 36 | 33 | 57 | 37 | 40 | 39 | 45 | 0 |
| NSA 05 | Residential | 35 | 31 | 41 | 39 | 41 | 40 | 46 | 6 |
| NSA 06 | Residential | 36 | 33 | 57 | 36 | 39 | 38 | 45 | 0 |
| NSA 07 | Residential | 35 | 31 | 41 | 33 | 37 | 35 | 42 | 1 |
| NSA 08 | Residential | 36 | 33 | 57 | 31 | 37 | 35 | 42 | 0 |
| NSA 09 | Residential | 36 | 33 | 57 | 29 | 37 | 35 | 42 | 0 |
| NSA 10 | Residential | 40 | 33 | 58 | 42 | 44 | 43 | 49 | 0 |
| NSA 11 | Residential | 35 | 31 | 41 | 32 | 37 | 34 | 41 | 1 |
| NSA 12 | Residential | 40 | 33 | 58 | 37 | 41 | 38 | 45 | 0 |
| NSA 13 | Residential | 40 | 33 | 58 | 36 | 41 | 38 | 45 | 0 |
| NSA 14 | Residential | 36 | 33 | 57 | 31 | 37 | 35 | 42 | 0 |
| NSA 15 | Residential | 40 | 33 | 58 | 32 | 40 | 36 | 43 | 0 |
| NSA 16 | Residential | 40 | 33 | 58 | 32 | 40 | 36 | 43 | 0 |
| NSA 17 | Residential | 40 | 33 | 58 | 35 | 41 | 37 | 44 | 0 |

Source: Golder Associates Inc 2021

[a] Modeled noise generated by proposed center operations configuration calculated by the noise model Cadna A.

[b] Predicted impacts were calculated by logarithmically adding the modeled impacts to the baseline measurements.

[c] Baseline from the most comparable monitoring locations used for NSA baseline.

[d] Predicted $_{Ldn}$ - Baseline $_{Ldn}$, if result less than zero, corrected to zero.

Outdoor conversations may experience mild annoyance when ambient noise levels are above 55 dBA; levels above 65 dBA are considered significant interference to conversations held outdoors (EPA 1974). The Kern County noise standard is 65 dBA as an Ldn. The predictive noise model suggests that noise generated by Project operations will be below these levels at the nearest residential receptors during daytime hours when outdoor activities are more likely. Therefore, no adverse impacts to outdoor activities from Project operations are expected.

Homes have an average effective sound attenuation of 15 dBA between the outdoors and indoors (EPA 1974). The highest predicted outdoor sound level at an NSA is 52 dBA at NSA 01 with an $L_{dn}$ of 58 dBA. This predicted indoor sound level from the Project would be 37 dBA and the indoor $L_{dn}$ would be 43 dBA. This is below the EPA's guideline and Kern County standard of 45 dBA as an $L_{dn}$ for interior spaces of sensitive receptors.

## 5.7.5 Mitigation Measures

In addition to the operational attenuation measures incorporated into the design and discussed above, Gem proposes to implement the following measures to minimize any potential noise impacts.

### *5.7.5.1 Noise Hot Line*

The Applicant will establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours per day, the project owner will include an automatic answering feature with date and time stamp recording to answer calls when the phone is unattended. This telephone number will be posted at the project site during construction in a manner visible to passersby. This telephone number will be maintained until the project has been operational for at least 1 year

#### *5.7.5.2 Noise Complaint Resolution*

Throughout project construction and operation, the project owner will document, investigate, evaluate, and attempt to resolve all legitimate project-related noise complaints. The Applicant or authorized agent will do the following:

- Use the Noise Complaint Resolution Form typically suggested by CEC or a functionally equivalent procedure to document and respond to each noise complaint.
- Attempt to contact the person(s) making the noise complaint within 24 hours.
- Conduct an investigation to attempt to determine the source of noise related to the complaint.
- If the noise complaint is legitimate, take all feasible measures to reduce the noise at its source.

#### *5.7.5.3 Construction Hours*

Following the Kern County Municipal Code, Chapter 8.36 Noise Control and Chapter 19.80, noisy construction work will not take place between the hours of 9 p.m. and 7 a.m. on weekdays and between the hours of 9 p.m. and 8 a.m. on weekends. Heavy equipment operations and other engine-powered equipment will be equipped with adequate mufflers and will be maintained to run properly and with all enclosures intact and closed. Heavy equipment will be operated following posted speed limits. Truck engine exhaust brake use will be limited to emergencies.

#### *5.7.5.4 Noise Barriers for Pump Sets*

Due to the proximity of NSA 05 to the eastern Project property line, the following pump set included a 12 ft barrier along the northern and eastern sides of the pump set area in the operational noise model. The pump sets include the following equipment tag numbers and descriptions:

- 20P-201 A – D Cold Thermal Fluid Pumps
- 20P-205 A – B Make-up Pumps
- 20P-301 A – B and 20P-302 A – D Cooling Medium Circulation Charge and Discharge Pumps (combined behind one barrier)

The barrier attenuation assumes that the barriers reduce sound levels through the barrier to the point of being insignificant and that the sound levels at the off-site receptors consist of noise that has diffracted around the barriers.

### 5.7.6 Laws, Ordinances, Regulations, and Standards

The Laws, Ordinances, Regulations, and Standards (LORS) discussed in this section were used to evaluate the Project’s noise impacts during construction and operation and are discussed briefly in previous subsections. A summary of the LORS is presented in Table 5.7-12.

**Table 5.7-13: Summary of LORS for Noise**

| LORS | Jurisdiction | Requirements | Agency | Section |
|---|---|---|---|---|
| EPA Noise Control Act, 1972 | Federal | Guidelines for state and local Governments | EPA | 5.7.6.1.1 |
| Occupational Health and Safety Act of 1970 | Federal | Exposure of workers over 8-hour shift limited to 90 dBA | OSHA | 5.7.6.1.2 |
| Cal/OSHA, Title 8 CCR Article 105 Sections 095 et seq. | State | Exposure of workers over 8-hour shift limited to 90 dBA | Cal/OSHA | 5.7.6.2.1 |
| California Vehicle Code Sections 23130 and 23130.5 | State | Regulates vehicle noise limits on California highways. | Caltrans, California Highway Patrol, and the County Sheriff's Office | 5.7.6.2.2 |
| Kern County General Plan, Chapter 3 Noise Element | Local | Residential outdoor noise limit of 65 dBA as an $L_{dn}$ and 45 dBA as an interior noise standard | Kern County | 5.7.6.3 |
| Kern County Municipal Code, Chapter 8.36 Noise Control | Local | Limit's construction noise hours to 6:00 a.m. to 9:00 p.m. on weekdays and 8:00 a.m. to 9:00 p.m. on weekends. | Kern County | 5.7.6.3 |
| Kern County Municipal Code, Chapter 19.80 Special Development Standards | Local | Residential outdoor noise standards of 65 dBA $L_{dn}$ between the hours of seven (7:00) a.m. and ten (10:00) p.m. and shall not generate noise that exceeds 65 dBA, or which would result in an increase of 5 dBA or more from ambient sound levels, whichever is greater, between the hours of ten (10:00) p.m. and seven (7:00) a.m. | Kern County | 5.7.6.3 |

### 5.7.6.1 Federal LORS

#### 5.7.6.1.1 EPA

Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) administrator established the Office of Noise Abatement and Control (ONAC) to carry out investigations and studies on noise and its effect on public health and welfare. Through ONAC, the EPA coordinated all Federal noise control activities; but in 1981 the federal government concluded that noise issues were best regulated at the state and local level. While there are no federal, state, or local standards that apply to the Project, EPA has developed noise level guidelines requisite to protect public health and welfare against hearing loss, annoyance, and activity interference. These noise levels are contained in the EPA document “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.” One of the purposes of this document was to provide a basis for state and local governments’ judgments in setting standards. The document identifies a 24-hour exposure level of 70 dB as the level of environmental noise that will prevent any measurable hearing loss over a lifetime. Likewise, levels of 55 dB outdoors and 45 dB indoors are identified as preventing activity interference and annoyance. These levels of noise are considered those that will permit spoken conversation and other activities such as sleeping, working, and recreation, which are part of the daily human condition (EPA 1974).

The U.S. Department of Housing and Urban Development (HUD) has promulgated noise criteria and standards “to protect citizens against excessive noise in their communities and places of residence.” These criteria relate to short-term and day-night average SPLs.

The equivalent SPL ($L_{eq}$) is the equivalent constant SPL that would be equal in sound energy to the varying SPL over the same time period. The day-night average sound level ($L_{dn}$) is the 24-hour average SPL calculated with a 10 dBA “penalty” added to nighttime hours (10 p.m. to 7 a.m.). This is done because residential land uses are more sensitive to nighttime noise impacts. The equation for $L_{dn}$ is:

$$L_{dn} = 10 \log \frac{15 \times 10^{\frac{L_d}{10}} + 9 \times 10^{\frac{L_n+10}{10}}}{24}$$

Where: $L_d$ = daytime $L_{eq}$ for the period 0700 to 2200 hours
$L_n$ = nighttime $L_{eq}$ for the period 2200 to 0700 hours

The EPA recommends an outdoor $L_{dn}$ of 55 dBA for residential and farming areas. For industrial areas, an $L_{eq}$ of 70 dBA is suggested. The HUD-recommended goal for exterior noise levels is not to exceed an $L_{dn}$ of 55 dBA. However, the HUD standard for exterior noise is 65 dBA measured as $L_{dn}$. Without numerical noise limits, an $L_{dn}$ of 55 dBA as recommended by EPA and HUD provides a recommended and conservative outdoor noise level for comparison of noise levels of the Project.

#### 5.7.6.1.2 Occupational Safety and Health Administration

The Occupational Safety and Health Administration (OSHA) regulates onsite noise levels. The permissible exposure level to noise for workers is 90 dBA over an 8-hour time-weighted average (TWA) work shift, to protect hearing (29 Code of Federal Regulations 1910.95). If an employee is exposed to greater than 85 dBA as an 8-hour TWA, then a hearing conservation program will be implemented and will ensure exposure levels remain below 90 dBA 8-hour TWA through engineering controls or personal protective equipment (PPE).

### *5.7.6.2 State LORS*

#### 5.7.6.2.1 Cal/OSHA

Cal/OSHA has the same regulations as the federal OSHA regulations outlined previously. The regulations are contained in Title 8, California Code of Regulations, General Industrial Safety Orders, Article 105, Control of Noise Exposure.

#### 5.7.6.2.2 California Vehicle Code

Noise limits are enforceable on highways by the California Highway Patrol (CHP) and county sheriffs' offices. They are regulated under California Vehicle Code, Sections 23130 and 23130.5.

### *5.7.6.3 Local LORS*

Guidelines for the Preparation and Content of Noise Elements of the General Plan published by the California Office of Noise Control in 1976 is a mandatory element of California Government Code Section 65302 (f)). Kern County has several ordinances applicable to the project from a noise standpoint.

#### Kern County General Plan, Chapter 3 *Noise Element*

The Kern County General Plan, Chapter 3 Noise Element establishes noise performance standards for proposed industrial sites in Kern County. The chapter states that such projects must not "subject residential or other noise sensitive land uses to exterior noise levels above 65 dB(A) $L_{dn}$ and interior noise levels above 45 dB(A) $L_{dn}$." This policy can be found in Section 3.2 *Noise Sensitive Areas*.

#### Kern County, CA Code of Ordinances, Chapter 8.36 *Noise Control*

This chapter sets limits to construction noise hours to 6:00 a.m. to 9:00 p.m. on weekdays and 8:00 a.m. to 9:00 p.m. on weekends. The limits are to "which is audible to a person with average hearing faculties or capacity at a distance of one hundred fifty (150) feet from the construction site if the construction site is within one thousand (1,000) feet of an occupied residential dwelling".

#### Kern County, CA Code of Ordinances, Chapter 19.80 *Special Development Standards*

Residential outdoor noise standards of 65 dBA $L_{dn}$ between the hours of seven (7:00) a.m. and ten (10:00) p.m. and shall not generate noise that exceeds 65 dBA, or which would result in an increase of 5 dBA or more from ambient sound levels, whichever is greater, between the hours of ten (10:00) p.m. and seven (7:00) a.m.

## 5.7.7 Agencies and Agency Contacts

No agencies were contacted directly to specifically discuss project noise.

## 5.7.8 References

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