TABLE OF CONTENTS

Section 5 Environmental Information 5.5-1

5.5 Noise 5.5-1
5.5.1 Affected Environment 5.5-3
5.5.1.1 Fundamentals of Acoustics 5.5-3
5.5.1.2 Existing Conditions 5.5-5
5.5.1.3 Local Land Use and Noise Sources 5.5-9
5.5.1.4 Noise Level Design Goals 5.5-9
5.5.2 Environmental Consequences 5.5-11
5.5.2.1 Construction Noise 5.5-11
5.5.2.2 Post-Commissioning Maturation Phase Noise 5.5-15
5.5.2.3 Operational Noise 5.5-16
5.5.2.4 Ground-Borne Vibration 5.5-37
5.5.2.5 Worker Exposure to Noise 5.5-37
5.5.2.6 Vehicular Traffic Noise 5.5-37
5.5.3 Cumulative Impacts 5.5-41
5.5.4 Mitigation Measures 5.5-41
5.5.5 Laws, Ordinances, Regulations, and Standards 5.5-42
5.5.5.1 Federal 5.5-43
5.5.5.2 State of California 5.5-43
5.5.5.3 Local 5.5-44
5.5.6 Involved Agencies and Agency Contacts 5.5-44
5.5.6.1 Federal 5.5-44
5.5.6.2 State 5.5-44
5.5.6.3 County 5.5-44
5.5.7 Permits Required and Permit Schedule 5.5-44
5.5.8 References 5.5-45

Tables

Table 5.5-1 Sound Levels of Typical Noise Sources and Noise Environments

Table 5.5-2 25-Hour Sound Level Measurement at LT1 (dBA)

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

Table 5.5-4 Individual Equipment Noise Levels Generated by Project Construction

Table 5.5-5 Aggregate Estimated Noise Levels Generated by Phase for the Project Construction Activities

Table 5.5-6 Estimated Worst-Case Steam Blow Noise Levels

Table 5.5-7 Source Sound Levels for the Base Case

Table 5.5-8 Summary of Base Case Noise Contributions Relative to Kern County Noise Element Standards (Exterior)

Table 5.5-9 Summary of Base Case Noise Contributions Relative to Kern County Noise Element Standards (Interior)

Table 5.5-10 Summary of Project Base Case Noise Contributions Relative to CEC Noise Impact Criteria Guidelines

Table 5.5.11 Source Noise Levels for the Noise Control Case

Table 5.5.12 Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Exterior)

Table 5.5.13 Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Interior)

Table 5.5.14 Summary of Project Contributions with Noise Control Features Relative to CEC Noise Impact Criteria Guidelines

Table 5.5-15 Summary of Project Noise Control Design Features

Table 5.5-16 Construction Traffic Sound Levels at 50 feet from Centerline of Roadways

Table 5.5-17 Operation Traffic Sound Levels at 50 feet from Centerline of Roadways

Table 5.5-18 Summary of LORS – Noise

Figures

Figure 5.5-1 Noise Measurement Locations

Figure 5.5-2 Noise Contours at Project Site

Figure 5.5-3 Noise Contours at Closest Noise Sensitive Receptors

5.5 NOISE

Hydrogen Energy International LLC (HEI or Applicant) is jointly owned by BP Alternative Energy North America Inc., and Rio Tinto Hydrogen Energy LLC. HEI is proposing to build an Integrated Gasification Combined Cycle (IGCC) power generating facility called Hydrogen Energy California (HECA or the "Project") in Kern County, California. The Project will produce electricity while substantially reducing greenhouse gas emissions by capturing carbon dioxide (CO_2) and transporting it for enhanced oil recovery (EOR) and sequestration.

The 315-acre Project Site is located approximately 6.5 miles west of the outermost edge of the city of Bakersfield and 2 miles northwest of the unincorporated community of Tupman in western Kern County, California, as shown in Figure 2-1, Project Vicinity Map. The Project Site is adjacent to an oil producing area known as the Elk Hills Oil Field Unit. The Project Site is currently undeveloped. Existing surface elevations vary from about 445 feet above mean sea level (msl) in the southwest corner to about 310 feet above msl in the northeast corner.

The Project will gasify petroleum coke (or blends of petroleum coke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The gasification component feeds a 390 gross megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The gasification component will also capture approximately 90 percent of the carbon dioxide from the syngas at steady-state operation, which will be transported and used for EOR and sequestration (storage) in the Elk Hills Oil Field Unit. In addition, approximately 100 MW of natural gas generated peaking power will be available from the Project.

The Project Site and linear facilities comprise the affected study area and are entirely located in Kern County, California. These Project components are described below.

Major on-site Project components will include, as shown on Figure 2-4, Plot Plan:

- Solids Handling, Gasification, and Gas Treatment
  - Feedstock delivery, handling and storage
  - Gasification
  - Sour shift/gas cooling
  - Mercury removal
  - Acid gas removal
- Power Generation
  - Combined-cycle power generation
  - Auxiliary combustion turbine generator
  - Electrical switching facilities
- Supporting Process Systems
  - Natural gas fuel systems

- Air separation unit (ASU)
- Sulfur recovery unit
- Zero liquid discharge
- Carbon dioxide compression
- Wastewater injection wells
- Raw water treatment plant
- Other plant systems

The Project also includes the following off-site facilities, as shown on Figure 2-5, Project Location Map:

- **Electrical Transmission Line** – An electrical transmission line will interconnect the Project to Pacific Gas & Electric's (PG&E) Midway Substation. The interconnection voltage is expected to be 230 kilovolts (kV). The Project is considering two alternative transmission routes, both of which extend from the western edge of the Project Site to the north, and west to the north side of the substation. Transmission Alternative 1 is approximately 9 miles long and Transmission Alternative 2 is approximately 9.5 miles long.
- **Natural Gas Supply** – A natural gas interconnection will be made with either PG&E or Southern California Gas Company natural gas pipelines, both of which are located southeast of the Project Site. The natural gas pipeline will be approximately 7 miles in length. The interconnect will consist of one tap off the existing natural gas line, one meter set, one service pipeline service connection, and a pressure limiting station located on the Project Site.
- **Water Supply Pipelines** – The Project will utilize brackish groundwater supplied from the Buena Vista Water Storage District (BVWSD) located to the northwest. The raw water supply pipeline will be approximately 18 miles in length. Potable water for drinking and sanitary use will be supplied by West Kern Water District located near the State Route 119 (SR 119)/Tupman Road intersection (southeast of the Project Site). The potable water supply pipeline will be approximately 5.5 miles in length.
- **Carbon Dioxide Pipeline** – The carbon dioxide pipeline will transfer the carbon dioxide captured during gasification from the Project Site southwest to the custody transfer point. The Project is considering two alternative pipeline routes. Alternative 1 is approximately 2 miles in length, while Alternative 2 is approximately 2.5 miles in length.

The Project components described above are shown on Figure 2-5, Project Location Map, which depicts the region, the vicinity, the Project Site and its immediate surroundings for Project components.

In accordance with California Energy Commission (CEC) regulations, this section describes the existing noise environment on 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. Where appropriate, mitigation measures are proposed to reduce potential project-related noise impacts to acceptable levels.

5.5.1 Affected Environment

5.5.1.1 Fundamentals of Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound typically associated with human activity and that interferes with or disrupts normal activities. The human environment is characterized by a certain consistent noise level which varies with each area. This is called ambient noise. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, perceived importance of the noise and its appropriateness in the setting, time of day, and type of activity during which the noise occurs, as well as 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 intensity. Frequency describes the sound's pitch and is measured in cycles per second, or hertz (Hz), whereas intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet, listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually as pain at still higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. The average person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness; this relation holds true for sounds of any loudness. Sound levels of typical noise sources and environments are provided in Table 5.5-1, Sound Levels of Typical Noise Sources and Noise Environments.

Table 5.5-1
Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at Given Distance)	Noise Environment	A-Weighted Sound Level (Decibels)	Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 Decibels*)
Military Jet Takeoff with afterburner (50 feet)	Carrier Flight Deck	140	128 times as loud
Civil Defense Siren (100 feet)		130	64 times as loud
Commercial Jet Takeoff (200 feet)		120	32 times as loud **Threshold of Pain**
Pile Driver (18 feet)	Rock Music Concert Inside Subway Station (New York)	110	16 times as loud
Ambulance Siren (100 feet) Newspaper Press (5 feet) Gas Lawn Mower (3 feet)		100	8 times as loud **Very Loud**

Table 5.5-1
Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at Given Distance)	Noise Environment	A-Weighted Sound Level (Decibels)	Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 Decibels*)
Food Blender (3 feet) Propeller Plane Flyover (1,000 feet) Diesel Truck (150 feet)	Boiler Room Printing Press Plant	90	4 times as loud
Garbage Disposal (3 feet)	Higher Limit of Urban Ambient Sound	80	2 times as loud
Passenger Car, 65 mph (25 feet) Living Room Stereo (15 feet) Vacuum Cleaner (10 feet)		70	Reference Loudness **Moderately Loud**
Normal Conversation (5 feet) Air Conditioning Unit (100 feet)	Data Processing Center Department Store	60	1/2 as loud
Light Traffic (100 feet)	Large Business Office Quiet Urban Daytime	50	1/4 as loud
Bird Calls (distant)	Quiet Urban Nighttime	40	1/8 as loud **Quiet**
Soft Whisper (5 feet)	Library and Bedroom at Night Quiet Rural Nighttime	30	1/16 as loud
	Broadcast and Recording Studio	20	1/32 as loud **Just Audible**
		10	1/64 as loud
		0	1/128 as loud **Threshold of Hearing**

Source: Kimley-Horn and Associates, Inc., 2008.
Note:
mph = miles per hour

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. A simple rule is useful, however, in dealing with sound levels. 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.

The normal human ear can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. However, all sounds in this wide range of frequencies are not heard equally well by the human ear, which is most sensitive to frequencies in the range of 1,000 Hz to 4,000 Hz. This frequency dependence can be taken into account by applying a correction to each frequency range to approximate the human ear's sensitivity within each range. This is called A-weighting and is commonly used in measurements of community environmental noise. The A-weighted sound pressure level (abbreviated as dBA) is the sound level with the "A-weighting" frequency correction. 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.

The C-weighting network uses much smaller reductions in the low frequency range, which causes the C-weighted sound pressure level to be essentially controlled by the low-frequency content of the noise.

Because community noise fluctuates over time, a single measure called the Equivalent Sound Level (L_{EQ}) is often used to describe the time-varying character of community noise. The L_{EQ} is the energy-averaged A-weighted sound level during a measured time interval, and is equal to the level of a continuous steady sound containing the same total acoustical energy over the averaging time period as the actual time-varying sound. Additionally, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the root-mean-square maximum noise level (L_{MAX}) and root-mean-square minimum noise level (L_{MIN}) indicators obtained during the measurement 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 noise descriptors L_{10}, L_{50}, and L_{90} are commonly used. They are the noise levels equaled or exceeded during 10, 50, and 90 percent of a stated time, respectively. Sound levels associated with L_{10} typically describe transient or short-term events, whereas levels associated with L_{90} describe the steady-state (or most prevalent) noise conditions.

Another sound measure known as the Community Noise Equivalent Level (CNEL) is an adjusted average A-weighted sound level for a 24-hour day. It is calculated by adding a 5 dB adjustment to sound levels during evening hours (7:00 p.m. to 10:00 p.m.) and a 10 dB adjustment to sound levels during nighttime hours (10:00 p.m. to 7:00 a.m.). These adjustments compensate for the increased sensitivity to noise during the typically quieter evening and nighttime hours. Day night average sound level (L_{DN}) is a similar measure which does not add an adjustment to the evening hours.

Some land uses are considered sensitive to noise. Noise sensitive areas (NSAs) are land uses associated with indoor and/or outdoor activities that may be subject to stress and/or significant interference from noise. NSAs often include residential dwellings, mobile homes, hotels, motels, hospitals, nursing homes, educational facilities, and libraries. Industrial, commercial, and agricultural land uses are generally considered not sensitive to noise.

5.5.1.2 Existing Conditions

Project Site Description

The Project Site is located on a (approximately) 315-acre tract in unincorporated Kern County at an approximate latitude of 35°18'28" North and longitude 119°23'08" West, which is just south of Tupman Road. Surrounding land uses include Limited Agricultural, Exclusive Agricultural, and Natural Resources. Noise sensitive receptors are located approximately 2,800 feet to 2.0 miles from the Project Site.

Ambient Noise Level Survey

A long-term and a series of short-term sound level measurements were conducted on 4 and 5 March 2008. The purpose of the measurements was to quantify the existing noise environment in the vicinity of the Project and to characterize NSAs that may be exposed to sound level

increases as a result of the Project. Measurement locations were near the closest residential locations as shown on Figure 5.5-1 and as detailed below:

LT1: This location is approximately 2,800 feet northeast of the Project Site. There is one single-family home located near the measurement location. The measurement was conducted in the front yard of the residence at 1004 Tupman Road. The location was monitored continuously from 3:00 p.m. on 4 March 2008 to 4:00 p.m. on 5 March 2008.

The hourly L_{EQ} at LT1 ranged from 38 to 62 dBA (average = 52 dBA) and the hourly L_{90} ranged from 36 to 45 dBA (average = 43 dBA). The lowest four contiguous hour average L_{90} during the 25-hour period was 36 dBA (1:00 a.m. to 5:00 a.m.). Refer to Table 5.5-2, 25-Hour Sound Level Measurement at LT1 (dBA), for further details.

Table 5.5-2
25-Hour Sound Level Measurement at LT1
(dBA)

Time	L_{EQ}	L_{MIN}	L_{MAX}	L_{10}	L_{50}	L_{90}
15:00 to 16:00	62.2	36.6	80.3	66.8	48.5	38.6
16:00 to 17:00	57.2	36.4	80.5	55.9	42.4	38.0
17:00 to 18:00	56.9	37.0	76.9	61.1	45.7	39.6
18:00 to 19:00	55.1	36.4	72.0	60.0	42.6	37.2
19:00 to 20:00	46.8	36.3	69.1	42.7	37.7	36.4
20:00 to 21:00	52.7	36.4	76.5	50.6	37.9	36.5
21:00 to 22:00	52.0	36.3	81.0	41.0	37.3	36.3
22:00 to 23:00	44.3	36.2	68.7	40.8	37.5	36.3
23:00 to 00:00	39.7	36.5	56.2	40.4	38.4	37.1
00:00 to 01:00	39.5	36.6	54.8	41.1	38.2	37.2
01:00 to 02:00	41.5	36.3	66.6	38.1	36.7	36.3
02:00 to 03:00	38.3	36.3	49.0	39.6	37.6	36.4
03:00 to 04:00	38.6	36.4	54.1	39.9	37.5	36.4
04:00 to 05:00	51.3	36.4	78.5	40.1	37.5	36.4
05:00 to 06:00	57.7	36.6	80.3	57.1	39.0	37.5
06:00 to 07:00	61.2	37.3	79.3	65.1	51.9	39.1
07:00 to 08:00	58.6	40.3	79.5	60.6	50.2	44.7
08:00 to 09:00	53.0	38.5	74.2	55.7	46.2	40.1
09:00 to 10:00	52.9	36.9	74.8	49.7	42.0	38.0
10:00 to 11:00	54.4	38.1	79.7	54.5	45.0	40.0
11:00 to 12:00	56.5	38.5	78.1	58.6	50.3	43.2
12:00 to 13:00	60.6	37.4	87.6	60.0	47.8	41.1
13:00 to 14:00	57.4	37.9	73.5	61.4	49.0	42.1

Table 5.5-2
25-Hour Sound Level Measurement at LT1
(dBA)

Time	L_{EQ}	L_{MIN}	L_{MAX}	L_{10}	L_{50}	L_{90}
14:00 to 15:00	61.1	37.9	91.9	59.8	49.4	41.4
15:00 to 16:00	59.4	37.6	80.8	61.3	47.9	40.7

Source: Kimley-Horn and Associates, Inc., 2008.
Notes:
Measurements conducted on 4 and 5 March 2008.
Measurement Location: N 35°19.107', W 119°22.586'.
Community Noise Equivalent Level = 61 dBA.

º	=	degrees
'	=	minutes
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
W	=	west

ST1: This location is approximately 6,700 feet southeast of the Project Site. The Elk Hills Elementary School buildings are located near the measurement location. The measurement was conducted in an open area on school grounds at 501 Kern Street. The location was monitored for 1 hour in each of the daytime, evening, and nighttime periods during the time frame of 7:00 p.m. on 4 March 2008 to 3:00 p.m. on 5 March 2008.

The hourly L_{EQ} at ST1 ranged from 33 to 42 dBA (average = 36 dBA) and the hourly L_{90} ranged from 25 to 34 dBA (average = 29 dBA). Refer to Table 5.5-3, Short-Term Sound Level Measurements (dBA), for further details.

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

Measurement	Location	Time	L_{EQ}	L_{MIN}	L_{MAX}	L_{10}	L_{50}	L_{90}
ST1	N 35°17.826' W 119°21.333'	19:00 to 20:00	32.5	21.5	52.5	34.8	28.4	24.7
		04:30 to 05:30	34.8	25.7	51.5	36.8	31.4	27.6
		14:00 to 15:00	41.8	29.6	64.5	44.7	38.7	33.9
ST2	N 35°20.028' W 119°22.337'	21:40 to 22:40	39.0	27.5	59.7	38.5	32.0	29.7
		00:50 to 01:50	36.4	31.9	47.2	37.6	35.9	34.1
		16:30 to 17:30	51.6	45.2	58.8	53.8	51.1	48.2

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

Measurement	Location	Time	L_{EQ}	L_{MIN}	L_{MAX}	L_{10}	L_{50}	L_{90}
ST3	N 35°20.277' W 119°23.655'	20:30 to 21:30	40.2	33.4	56.8	41.1	37.0	34.8
		03:10 to 04:10	37.6	32.0	58.8	37.4	35.3	33.5
		15:20 to 16:20	44.8	36.6	53.4	47.0	44.1	41.5

Source: Kimley-Horn and Associates, Inc., 2008.
Notes:
Measurements conducted on 4 and 5 March 2008.

°	=	degrees
'	=	minutes
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
W	=	west

ST2: This location is approximately 9,300 feet northeast of the Project Site. There are two single-family homes on the south side of Station Road at 8229 Station Road and 6122 Tule Park Road located near the measurement location. Station Road was documented as the primary noise source for these residences. Due to dogs barking at one of the residences, a measurement could not be performed on the property of the residences. Since the residence nearest to the Project Site is located at approximately 265 feet south of the Station Road centerline, an acoustically equivalent measurement was taken at 265 feet north of the Station Road centerline directly across the street from the two residences. The location was monitored for 1 hour in each of the daytime, evening, and nighttime periods during the time frame of 9:40 p.m. on 4 March 2008 to 5:30 p.m. on 5 March 2008.

The hourly L_{EQ} at ST2 ranged from 39 to 52 dBA (average = 42 dBA) and the hourly L_{90} ranged from 30 to 48 dBA (average = 37 dBA). Refer to Table 5.5-3, Short-Term Sound Level Measurements (dBA), for further details.

ST3: This location is approximately 9,500 feet north of the Project Site. There are two single-family homes located near the measurement location. The measurement was conducted in an open area at 7345 Adohr Road. The location was monitored for 1 hour in each of the daytime, evening, and nighttime periods during the time frame of 8:30 p.m. on 4 March 2008, to 4:20 p.m. on 5 March 2008.

The hourly L_{EQ} at ST3 ranged from 38 to 45 dBA (average = 41 dBA) and the hourly L_{90} ranged from 34 to 42 dBA (average = 37 dBA). Refer to Table 5.5-3, Short-Term Sound Level Measurements (dBA), for further details.

Average wind conditions were 0 to 8 miles per hour (mph). Daytime temperatures averaged 69 degrees Fahrenheit (°F), with an average relative humidity of 33 percent. Evening temperatures averaged 55°F, with an average relative humidity of 54 percent. Nighttime

temperatures averaged 43°F, with an average relative humidity of 62 percent. No precipitation occurred during the survey.

Instrumentation

To conduct the 25 consecutive one-hour measurements at LT1, a Larson Davis Model 720 American National Standards Institute (ANSI) Type 2 Integrating Sound Level Meter (SLM) was used. To conduct the 1-hour measurements at ST1, ST2, and ST3, a Larson Davis Model 820 ANSI Type 1 Integrating SLM was used. The Model 820 meter was mounted on a tripod approximately 5 feet above the ground to simulate the average height of the human ear. The meters were calibrated before and after the measurement periods.

5.5.1.3 Local Land Use and Noise Sources

Surrounding land uses include Limited Agricultural, Exclusive Agricultural, Residential and Education Facility Space, as described in more detail in Section 5.4, Land Use. The primary noise source for LT1 was traffic on Tupman Road. Agricultural equipment was also documented operating periodically throughout the measurement period. The primary noise source for ST1 was traffic on Tupman Road and Kern Street. Other sources included children at the school playground during the daytime and animal noise during the nighttime hours. The primary noise source for ST2 was traffic on Station Road. An irrigation pump was documented operating during the daytime hours. The primary noise source for ST3 was traffic on Adohr Road. Agricultural equipment was also documented operating periodically. Other sources relevant to each of the measurement locations included activities at residences and aircraft over flight.

5.5.1.4 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 some characteristics that may signify 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 staff, in applying item 3, from Section 5.5.1.4, Noise Level Design Goals, to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA or

more at the nearest sensitive receptor, including those receptors that are considered a minority population. Staff considers it reasonable to assume 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 clearly significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of a case. Factors to be considered in determining the significance of an adverse impact as defined above 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 due to 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

Staff uses the above method and threshold to protect the most sensitive populations including the minority population.

Local

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

> *Implementation Measures…*
>
> *F) 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 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.

The Ordinance Code of Kern County has been reviewed, including Section 8.36, Noise Control, and there are no specific noise limits for stationary or temporary construction noise sources which are applicable to this Project.

Summary of Design Goals

Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable LORS. Therefore, 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 by 5 dBA or more at the nearest sensitive receptor as detailed below.

The ambient background noise level was 36 dBA at LT1, 25 dBA at ST1, 30 dBA at ST2, and 34 dBA at ST3. The Project design noise levels necessary to comply with CEC guidelines will be 40 dBA at LT1, 29 dBA at ST1, 34 dBA at ST2, and 38 dBA at ST3.

5.5.2 Environmental Consequences

Noise will be produced during construction of the Project as well as during operation of the large compressors, cooling towers, combustion turbines, and auxiliary support equipment. Potential noise impacts from both on-site and off-site activities are assessed in this section. To determine the significance of Project-generated increases in noise levels, significance criteria were used. Impacts are considered significant:

- If the Project conflicts with the County of Kern Noise Element to the General Plan.
- If Project operation results in an increase of more than 5 dBA at NSAs, (as per CEC performance standards).
- If Project construction is not temporary.
- If use of all feasible construction noise abatement measures are not implemented.

5.5.2.1 Construction Noise

Main Facility Construction

The construction schedule has been estimated on a single shift, 50-hour weeks, between the hours of 7 a.m. and 5:30 p.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 startup 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 utilized 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

building components. The installation of piles (driven, augered, or vibrated) for some foundations may be needed on the Project, but insufficient information is available at this stage of Project development to ascertain if and what type of piling may be employed.

Noise levels of construction equipment typically utilized for this type of project are presented in Table 5.5-4, 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.

Table 5.5-4
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[a], dBA			
		Receptor LT1 (2,760 feet [0.5 mi] NNE of Project) *Atten[b]=35 dB*	Receptor ST1 (6,720 feet [1.3 mi] SE of Project) *Atten[b]=43 dB*	Receptor ST2 (9,300 feet [1.75 mi] NE of Project) *Atten[b]=45 dB*	Receptor ST3 (9,460 feet [1.8 mi] N of Project) *Atten[b]=46 dB*
Trucks	88	53	45	43	42
Crane	83	48	40	38	37
Roller	74	39	31	29	28
Bulldozers	85	50	42	40	39
Pickup Trucks	60	25	17	15	14
Backhoes	80	45	37	35	34
Jack Hammers	88	53	45	43	42
Pile Drivers	101	66	58	56	55
Rock Drills	98	63	55	53	52
Pneumatic Tools	85	50	42	40	39
Air Compressor	81	46	38	36	35
Compactor	82	47	39	37	36
Grader	85	50	42	40	39
Loader	85	50	42	40	39

Sources: EPA, 1971; FTA, 2006; and Alliance Acoustical Consultants, Inc., 2008

Notes:

[a] Distances shown are from the nearest site boundary line to each receptor 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.

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

Project Site-average sound levels for each phase of construction (from EPA 1971, FTA 2006, and AAC 2008) are presented in Table 5.5-5, 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].

Table 5.5-5
Aggregate Estimated Noise Levels Generated by Phase for the Project Construction Activities

Equipment Type	Equipment Noise Level at 50 feet, dBA	Estimated Equipment Noise Level at Each Receptor Location[a], Leq/L_{DN}[b]dBA			
		Receptor LT1 (4,850' [0.9mi] NNE of Project) *Atten[c]=40 dB*	Receptor ST1 (9,810' [1.9mi] SE of Project) *Atten[c]=46 dB*	Receptor ST2 (11,440' [2.2mi] NE of Project) *Atten[c]=47 dB*	Receptor ST3 (11,000' [2.1mi] N of Project) *Atten[c]=47 dB*
Site Clearing	91	51/57	45/51	44/50	44/50
Excavation	83	43/49	37/43	36/42	36/42
Foundation	89	49/55	43/49	42/48	42/48
Pile Installation[d]	101	61/67	55/61	54/60	54/60
Building Construction	80	40/49	34/40	33/39	33/39
Finishing	60	20/26	14/20	13/19	13/19

Sources: EPA, 1971; FTA, 2006; and Alliance Acoustical Consultants, Inc., 2008

Notes:

[a] Distances shown are from the Project construction activity centroid to each receptor location. This analysis, which differs slightly from the equipment analysis, assumes that the aggregation of construction equipment for each phase will be at the centroid of the Project Site sometime during the overall construction schedule.

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

[c] This is the attenuation due to distance for sound propagating from 50' 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.

[d] Pile installation is a sub-set of the Foundation Phase and would only be expected to last two to four months within the overall Foundation Construction Phase.

The noise levels presented in Tables 5.5-4 and 5.5-5 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). In general, this mechanism results in a 6 dB decrease in the sound level with every doubling of distance from the source. For example, the 84 dBA average sound level associated with site clearing (Table 4) will be attenuated to 78 dBA at 100 feet, 72 dBA at 200 feet, and to 66 dBA at 400 feet. Attenuation for atmospheric absorption or ground effects were 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 2,800 feet to 2.0 miles from the nearest areas of future construction activity.

[1] Excluding consideration for pile installation which is indeterminant at this time.

Because of the nature of construction noise and with common fluctuations in the background noise level, construction activity would be occasionally discernable at the nearest receptors. Given some occasional atmospheric conditions, construction noise could also be discernable 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. However, under the premises discussed in Section 5.2, these results would adhere to the less-than-significant criterion of the CEC.

Nighttime construction activities are not planned for this Project, but may be needed to meet the construction schedule. However, if nighttime construction is needed, the Project will limit noisy construction activities to daytime hours in order to minimize nighttime noise levels to the extent practical. Thus, noise from construction activities at the Project Site would not be expected to exceed the Kern County General Plan requirements of 65/45 dBA L_{DN} (exterior/interior) at any of the nearby receptor locations and construction noise would be also considered to be a less-than-significant impact per the Kern County Noise Element.

Linear Facility Construction

Construction for Project-related linear facilities (i.e., the water and natural gas supply pipelines) will be located farther away from noise-sensitive receptors as compared to the Project Site construction operation. Linear facility construction noise may be audible during the short periods that the linear construction operation is nearest to these receptors. Because of the short-term nature of the linear construction operation, pipeline construction noise will be less than significant and will diminish once the pipeline construction operations move away from the individual receptors.

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 allowed to escape into the atmosphere through the steam piping to clean the piping. A series of short steam blows, lasting 2 or 3 minutes each, will be performed several times daily over a period of 2 or 3 weeks. Steam blows are necessary after erection and assembly of several piping and tubing systems to forcibly blow out accumulated dirt, rust, scale, and construction debris. The construction steam blows prevent this unwanted material and debris from entering the downstream process equipment.

Steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. The resultant sound level at the nearby receptors will range from 86 to 103 dBA. Table 5.5-6, Estimated Worst-case Steam Blow Noise Levels, summarizes the potential, worst-case noise levels at each receptor location. To minimize these short-term, temporary noise impacts, the exhaust piping will be equipped with silencers that will reduce noise levels by 20 dBA to 30 dBA at each receptor location.

Table 5.5-6
Estimated Worst-Case Steam Blow Noise Levels

Receptor	Estimated Distance to Future Project Steam Blow	Potential Steam Blow Noise Level (dBA)	Reduced Steam Blow Noise Level (dBA)
LT1	4,850 feet [0.9mi]	96	66 – 76
ST1	9,810 feet [1.9mi]	90	60 – 70
ST2	11,440 feet [2.2mi]	89	59 - 69
ST3	11,000 feet [2.1mi]	89	59 - 69

Sources: Alliance Acoustical Consultants, Inc, 2008.
Notes:
[a] Distances shown are from the Project centroid to each receptor location.
[b] This is the attenuation due to distance for sound propagating from 100 feet from a given steam blow to the nearest indicated receptor location.

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

5.5.2.2 Post-Commissioning Maturation Phase Noise

As described in Section 2.6.4, Commissioning, the major process units will be commissioned sequentially. For this Project, the power block will be commissioned about 6 months ahead of the gasification block. The commissioning for the project will require four distinct phases: (1) Combined Cycle Unit Commissioning on Natural gas; (2) Commissioning of the auxiliary Simple Cycle CTG on NG; (3) Gasification Block and Balance of Plant (BOP) Commissioning Combined Cycle Block; and (4) Commissioning on Hydrogen-Rich Fuel. The steps involved in the commissioning of these four phases are given in Sections 2.6.4.1 to 2.6.4.4.

As described in Section 2.10 Facility Reliability, the startup and commissioning period of the power Project (CTG, ASU, process block and BOP, IGCC) is expected to be completed within one year from mechanical completion. Commercial operation will start when the commissioning and startup activities are completed and the licensor/contractor guarantees and milestones have been achieved. The ramp-up period to maturity is estimated to be 3 years from the start of commercial operation. The hydrogen-rich fuel availability for mature operation is estimated to be greater than 80 percent. The power availability for mature operation is estimated to be greater than 90 percent.

While considerable data exists on commissioning periods on power generation involving natural gas, and mature operation is reached within a few months for NGCC type systems, the power generation involving hydrogen-rich fuel from solid feedstock such as petroleum coke or coal requires a longer ramping duration due to the shakedown periods involved in the various technologies employed in the process block; in particular, the solid feedstock gasification. For this reason, the process block will have an availability much less than 80 percent during the first 3 years.

After the one-year initial Startup and basic Commissioning Phase, there will be multiple gasifier starts per year. These will occur over the lifespan of the Project, and therefore, can be considered as part of the ‘normal’ operations of the Project, from a noise standpoint. Consequently, these gasifier (and related systems) startup noise sources will need 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, educator systems, atmospheric vents, increased flaring rates, and the like that will be utilized beyond the initial startup 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 noise goals.

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

5.5.2.3 Operational Noise

To evaluate the expected noise emissions from the facility and identify the need for noise control measures, a noise modeling study of the power Project has been performed (Appendix K, Noise Technical Report). A computerized noise prediction program was used to simulate and model the future equipment noise emissions throughout the area. The modeling program uses industry-accepted propagation algorithms based on ANSI and International Organization for Standardization (ISO) standards[2]. 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, minimal ground effects, and barrier/shielding.

Calculations were performed using octave band sound power levels (abbreviated PWL or 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 is ranked by relative noise contribution from each noise source. This model has been validated over the years via noise measurements at several operating plants that had been previously modeled during the engineering design phases.

Figure 2-4, Preliminary Plot Plan for the Project Site was used to establish the position of the noise sources and other relevant physical characteristics of the site. The noise 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

[2] ANSI is the American National Standards Institute, while ISO is the International Standards Organization. Algorithms and methods for this program are included in the ISO 9613, ISO 1913 (Part 1), ANSI 126, or ISO 3891 standards.

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 the Air Separation Unit, the Feed Handling Unit, the Gasification Island, the Gas Treating Unit, the Sulfur Recovery and Tail Gas Treatment Unit, the Power Block, and General Facilities (such as cooling, utilities, and auxiliary/support systems). Within these overall units, the set of modeled sources included:

- Power Block Cooling Towers and Air Separation Unit (ASU) Cooling Towers
- Main Power Block – "F class", combined-cycle, outdoor installation (Gas Turbine + Steam Turbine + Heat Generator Recovery Steam Generator [HRSG])
- Secondary Power Block – "LMS100® class", simple-cycle, outdoor installation (Gas Turbine + Selective Catalytic Converter)
- CTG and Steam Turbine Generator (STG) Main Transformers, plus several facility auxiliary transformers
- Cooling Tower Main Water Pumps and Motors
- Boiler Feed Water Pumps and Motors
- ASU systems[3], primarily an outdoor installation
- ASU vents
- Material Handling Systems, including crushers, conveyors, and transfer towers
- Flares and process vents
- Syngas and Tail Gas Compressors and Blowers
- Acid Gas and Tail Gas Burners
- Various sources in the Gasification Areas
- Slurry Feed systems, as radiated from Slurry Feed building walls
- Grinding Mill systems, as radiated from Mill building walls
- IGCC facility transformers
- 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 be constant, regardless of time-of-day (and, thus, the statistical sound levels will all be the same – that is, $L_{100}=L_{90}=L_{50}=L_{10}=L_0$). Given the early stages of the Project, only limited vendor data are available for use as noise model inputs. Therefore, every effort was made to use

[3] Major equipment inside for the ASU will include ~70,000 hp main air compressor, ~15,000 hp booster air compressor, ~38,000 hp N_2 compressor, and related support pumps, valves, and other systems.

noise emission values that were obtained from equipment vendors on previous design efforts for similar-sized IGCC power plant configurations. As a secondary information source, model inputs derived from generic industry reference information were used. No special noise control options were initially assumed. These "standard-design" levels from the significant noise sources were converted into sound power levels (in decibels re 1 pico Watt) 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. However, for conservatism, low-lying buildings/structures (such as power distribution centers) were neglected for providing shielding benefits. Any temporary feedstock piles were also neglected for shielding benefits.

Future Conditions Modeling - Base Case

The noise model was run for a nominal, Base Case Project configuration; that is, assuming the "typical" noise emissions for the proposed types and sizes of industrial process equipment. The dominant noise sources for the Base Case configuration (at the closest, off-site receptor, LT1) included heat recovery steam generator (HRSG) and selective catalytic reduction (SCR) exhaust stack exits, ASU-related compressor packages, feedstock material handling buildings with major equipment inside (Grinding/Milling buildings, Slurry Feed building, and Transfer Towers) SRU burners, the Power Block and ASU cooling towers, and several large water-handling pumps. Noise source sound levels modeled for the Base Case may be found in Table 5.5-7, Source Noise Levels for the Base Case, and Appendix K, Noise Technical Report.

For the Base Case scenario, all locations were within the Kern County exterior and interior L_{DN} standards (<65 and <45 Ldn, respectively). This is due to the large propagation distances from the Project Site to the remote receptor locations which yielded Project-only exterior contributions to the Ldn environment of between 39 and 50 dBA. When combined with the measured or estimated existing Ldn contributions, the total, future Ldn is predicted to be no higher than 61 dBA (driven by the existing conditions, not the Project).

Table 5.5-7
Source Noise Levels for the Base Case

Area	Item	Notes	Octave Band Sound Power Levels (dB PWL) 63	125	250	500	1k	2k	4k	8k	Overall PWL(A)
AGR	CO_2 Compressor	40,250 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*
	CO_2 Recycle Compressor	900 hp	97	101	101	100	99	96	92	89	*103.6*
	Refrigerant Compressor A	2,500 hp - int	102	93	88	85	84	83	82	81	*90.6*
	Flash Gas Recycle Comp	800 hp - ext	97	101	101	100	99	96	92	89	*103.6*
	Loaded Methanol Pump I	250 hp	94	96	97	97	97	94	91	88	*101.3*
	Lean Methanol Pump	2,000 hp	117	108	103	100	99	98	97	96	*105.6*
	Reflux Pump Methanol/Water Separation	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Syngas Turbo Expander	3,000 hp	117	108	103	100	99	98	97	96	*105.6*
ASU	Main Air Compressor Motor	70,000 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*
	Main Air Compressor (MAC)	70,000 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*
	Booster Air Compressor Motor	14,750 hp - per Project "C"	84	88	87	91	93	93	90	85	*98.3*
	Booster Air Compressor (BAC)	15,000 hp - per Project "C"	84	88	87	91	93	93	90	85	*98.3*
	Med Pressure Nitrogen Compressor	38,000 hp - per Project "C"	102	98	103	105	108	110	106	99	*114.3*
	Expander	2,000 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	Dense Fluid Expander	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Liquid Oxygen Pump	650 hp	94	96	97	97	97	94	91	88	*101.3*
	ASU Cooling Water Pump	750 hp	94	96	97	97	97	94	91	88	*101.3*
	ASU CCW Pump	150 hp	94	95	100	99	98	95	90	87	*102.4*
	Auxiliary Cooling Water Pump	200 hp	94	95	100	99	98	95	90	87	*102.4*
	ASU Cooling Tower, 4 cells	4 cells	118	116	108	102	97	98	101	99	*107.8*

Table 5.5-7
Source Noise Levels for the Base Case

Area	Item	Notes	Octave Band Sound Power Levels (dB PWL) 63	125	250	500	1k	2k	4k	8k	Overall PWL(A)
Common Cooling	Gasification Cooling Water Pump	750 hp	94	96	97	97	97	94	91	88	*101.3*
	Power Block Cooling Water Pump	2,500 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	Power Block Clsd Clg Wtr Pump	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Aux Cooling Water Pump	185 hp	94	95	100	99	98	95	90	87	*102.4*
	Gasification Clsd Clg Wtr Pump	150 hp	94	95	100	99	98	95	90	87	*102.4*
	HRSG FWH Recirculation Pumps	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Condensate Transfer Pump	75 hp	86	87	90	90	88	85	81	79	*92.8*
	Hotwell Pump	600 hp	94	96	97	97	97	94	91	88	*101.3*
	Low Pressure Boiler FeedWater Pump	250 hp	94	96	97	97	97	94	91	88	*101.3*
	Process Intrmd Press BlrFdWtr Pumps	350 hp	94	96	97	97	97	94	91	88	*101.3*
	High Pressure Boiler FeedWater Pump	2,500 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	Process High Press BlrFdWtr Pumps	4,000 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	Power Block Cooling Tower, 4 cells	4 cells	118	116	108	102	97	98	101	99	*107.8*
	Gasification Cooling Tower, 4 cells	4 cells	118	116	108	102	97	98	101	99	*107.8*
Flaring	Thermal Oxidizer	from Project "A"	94	90	82	74	71	74	78	78	*83.8*
	Ground Flare Stack	from Project "A"	94	90	82	74	71	74	78	78	*83.8*
	Elev Acid Gas Flare Stack	not used - not normal ops	--	--	--	--	--	--	--	--	--

Table 5.5-7
Source Noise Levels for the Base Case

Area	Item	Notes	Octave Band Sound Power Levels (dB PWL) 63	125	250	500	1k	2k	4k	8k	Overall PWL(A)
Gasification	Injector Cooling Water Pump	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Filter Feed Pumps	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Mill Discharge Tank Pumps	40 hp	86	87	90	90	88	85	81	79	*92.8*
	Slurry Booster Pump	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Slurry Charge Pumps	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Quench Water Pumps	350 hp	94	96	97	97	97	94	91	88	*101.3*
	Settler Bottom Pump	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Settler Feed Pump	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Grey Water Pumps	1800 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	Grinding Water Tank Pumps	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Deaerator Bottoms Pumps	100 hp	89	91	92	92	91	88	85	82	*95.6*
	Mill Discharge Tank Agitator	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Slurry Tank Agitators	325 hp	94	96	97	97	97	94	91	88	*101.3*
	ME Settler Rake	50 hp	86	87	90	90	88	85	81	79	*92.8*
	Filtration Skid	250 hp	94	96	97	97	97	94	91	88	*101.3*
	Vacuum Pump Package	60 hp	86	87	90	90	88	85	81	79	*92.8*
	Slurry Prep Bldg	from Project "A"	114	104	94	87	80	71	69	73	*92.9*
	Gasifiers	from Project "A"	117	110	105	100	97	96	96	97	*105.0*
Mat'l Handling	Pneumatic Conveyor Blower	from Project "A"	108	101	96	91	88	87	87	88	*96.0*
	Impact Crusher	EPPENG w/adjustment	105	105	103	101	100	98	92	85	*104.8*
	Belt Conveyors	EPPENG w/adjustment	93	93	91	89	88	86	80	73	*92.8*
	Crusher Bldg	from Project "A"	129	119	109	103	95	86	84	88	*108.0*
	Feedstock Silo walls	from Project "A"	119	109	99	93	85	76	74	78	*98.0*
	Feedstock Unloading Shed	EPPENG w/adjustment	105	105	103	101	100	98	92	85	*104.8*
	Feedstock Transfer Towers	EPPENG w/adjustment	113	113	111	109	108	106	100	93	*112.8*
	Crushed Feedstock Transfer Towers	EPPENG w/adjustment	113	113	111	109	108	106	100	93	*112.8*
	Mat'l Handling Dust Collectors	estimate	89	91	92	92	91	88	85	82	*95.6*

Table 5.5-7
Source Noise Levels for the Base Case

Area	Item	Notes	Octave Band Sound Power Levels (dB PWL) 63	125	250	500	1k	2k	4k	8k	Overall PWL(A)
Power Block	GTG Transformer	from Project "A"	99	101	96	96	90	85	80	73	*96.4*
	GTG Air Inlet	from Project "A"	103	102	92	91	88	88	81	76	*94.6*
	GTG Generator	from Project "E"	107	114	105	94	95	92	96	99	*104.5*
	GTG Main Body	from Project "E"	117	114	104	100	94	92	92	90	*103.6*
	GTG Accessory Bay	estimate	114	111	110	107	105	105	101	99	*111.4*
	HRSG Transition	from Project "B"	110	103	99	92	84	82	72	60	*94.9*
	HRSG Main Body	from Project "A"	117	113	106	99	90	87	71	57	*102.3*
	HRSG Stack Exhaust	from Project "A"	117	119	119	112	101	87	72	67	*113.4*
	STG Main Body	from Project "D"	114	112	107	103	99	96	88	82	*105.4*
	STG Generator	from Project "D"	107	114	105	94	95	92	96	99	*104.5*
	STG Transformer	from Project "A"	99	101	96	96	90	85	80	73	*96.4*
	LMS100® Air Inlet	from Project "E"	118	117	106	94	100	86	86	91	*105.1*
	LMS100® Main Body	from Project "E"	116	113	103	99	93	91	91	89	*102.6*
	LMS100® Generator	from Project "E"	106	113	104	93	94	91	95	98	*103.5*
	LMS100® SCR Body	from Project "E"	128	125	118	106	100	93	76	58	*113.3*
	LMS100® Stack Exhaust	from Project "E"	138	132	118	106	101	93	89	81	*118.2*
	LMS100® Transformer	from Project "E"	103	107	100	101	98	87	82	75	*102.0*
	LMS100® Fuel Gas Compressor	estimate	90	92	91	93	96	100	94	88	*103.4*
Shift/ LTGC	Hot Process Condensate Pumps	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Contact Condenser Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*
	Regen Overhead Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*
SRU	SRU furnaces	from Project "A"	103	104	113	111	104	97	95	96	*111.0*
	HP Flare Knock-out Drum Pump	300 hp	94	96	97	97	97	94	91	88	*101.3*
TGTU	TGTU Treated Gas Compressor	1,200 hp	90	92	91	93	96	100	94	88	*103.4*
	Lean Amine Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*

Table 5.5-7
Source Noise Levels for the Base Case

Area	Item	Notes	Octave Band Sound Power Levels (dB PWL) 63	125	250	500	1k	2k	4k	8k	Overall PWL(A)
Water Treat	Demin Water Pump	250 hp	94	96	97	97	97	94	91	88	*101.3*
	Storm Water Sump Pump	75 hp	86	87	90	90	88	85	81	79	*92.8*
	Sump Pump	75 hp	86	87	90	90	88	85	81	79	*92.8*
	Water Treat Pumps	12 x 75 hp = 11 dB	97	98	101	101	99	96	92	90	*103.8*
	R/O Feed Pump-1stg	1,500 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
	R/O Feed Pump-2stg	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Deep Well Injection Pump	2,000 hp - per Project "F"	117	108	103	100	99	98	97	96	*105.6*
ZLD	Vapor Compressor	500 hp	94	96	97	97	97	94	91	88	*101.3*
	Exhaust Fan	50 hp	86	87	90	90	88	85	81	79	*92.8*
	ZLD pumps	16 x 75 hp = 12 dB	98	99	102	102	100	97	93	91	*104.8*
	Drum Dryer	60 hp	86	87	90	90	88	85	81	79	*92.8*
Misc.	Aux Transformers	~15 MVA - per Proj "B"	87	89	84	84	78	73	68	61	*84.4*
	Various Atmospheric Vents	Various services	110	103	98	93	90	89	89	90	*98.0*
										Total Project PWL(A) =	**126.7**

Source: Alliance Acoustical Consultants.

Notes:

AGR = Acid Gas Removal Area
ASU = Air Separation Unit
Power Block = (includes both Main 7-class and LMS100® trains)
Shift/LTGC = Sour Shift + Low-Temp Gas Cooling + Mercury Removal
SRU = Sulfur Recovery Unit
TGTU = Tail Gas Treating Unit
Water Treat = Water Treatment Area
ZLD = Zero Liquid Discharge Area

Base Case Compared to Kern County Standards

For the Kern County interior standards of less than 45 L_{DN}, a similar calculation was performed with a nominal industry value for sound reduction between the exterior environment and the interior setting. Assuming a nominal exterior-to-interior reduction factor of 17 dB, even with windows open (USEPA 1974), the Project -only interior contributions to the L_{DN} environment will be between 22 and 33 dBA. When combined with the estimated existing interior environments, the total, future interior L_{DN} is predicted to be typically around 30 dBA and no higher than 44 dBA (note: this value is controlled by the existing conditions and not from the Project contributions). The results at all four receptor locations are below the 45 L_{DN} Kern County limit.

The predicted Project noise contributions are summarized with respect to the Kern County Noise Element standards in Tables 5.5-8, Summary of Base Case Noise Contributions Relative to Kern County Noise Element Standards (Exterior**),** and 5.5-9, Summary of Base Case Noise Contributions Relative to Kern County Noise Element Standards (Interior).

Table 5.5-8
Summary of Base Case Noise Contributions 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, Base Case 1, SPL dBA** *[column 4]*	**Predicted Project L_{DN} Contributions, Base Case 1** *[column 5][a]*	**Total, Future Calculated L_{DN} (Existing plus Project)** *[column 6][b]*	**Compliance?[c]** *[column 7]*
LT1	65	61[d]	44	50	61[f]	Yes
ST1	65	41[e]	35	41	44	Yes
ST2	65	47[e]	33	39	48	Yes
ST3	65	46[e]	34	40	47	Yes

Source: HECA Project

Notes:

[a] Using 24 hourly L_{eq} values to calculate the equivalent L_{DN} metric, assuming continuous operations at steady-state, design conditions.

[b] Summing sound levels from column 3 plus column 5.

[c] i.e., is column 6 less than column 2?

[d] Calculated L_{DN}

[e] Estimated L_{DN} from short-term data in Table 5.5-3

[f] Result is completely controlled by existing noise environment.

Table 5.5-9
Summary of Base Case Noise Contributions 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} Environ-ment[a] *[column 3]*	Predicted Project Exterior L_{DN} Contributions, Base Case 1 *[column 4]*[b]	Predicted Project Interior L_{DN} Contributions, Base Case 1 *[column 5]*[c]	Total, Future Calculated L_{DN} (Existing plus Project) *[column 6]*[d]	Compliance?[e] *[column 7]*
LT1	45	44	50	33	44[f]	Yes
ST1	45	24	41	24	28	Yes
ST2	45	30	39	22	31	Yes
ST3	45	29	40	23	30	Yes

Source: HECA Project

Notes:

[a] Applying -17 dB to results from Table N-1a above.
[b] Using results of column 5 from Table N-1a above.
[c] Applying -17 dB to column 4.
[d] Summing sound levels from column 3 plus column 5.
[e] i.e., is column 6 less than column 2?
[f] Result is completely controlled by existing noise environment.

Base Case Compared to CEC Standards

For the two closest community receptors (Locations LT1 and ST1), the aggregate noise emissions (without any assumed noise control treatments) from the complete Project were above the indicated CEC late-night L_{90} standards for the Base Case. This was primarily due to the very low ambient noise conditions at these receptor locations. The farthest sensitive receptors (Locations ST2 and ST3) met the CEC standards for the Base Case scenario.

The largest nighttime overage (+6 dB) was shown to be at Location ST1 since it has the lowest late-night L_{90} value, from which the CEC criterion standard is established. Location LT1, the closest receptor to the Project Site, was predicted to be +4 dB relative to the CEC standard. The other two receptor locations were predicted to have Base Case noise contributions that will be under the CEC's L_{90} + 5 dB criterion, since they are both on the order of 11,000 feet (over 2 miles) from the Project centroid. These Base Case results, shown for the analyzed receptors, are summarized in Table 5.5-10, Summary of Project Base Noise Contributions Relative to CEC Noise Impact Criteria Guidelines.

Table 5.5-10
Summary of Project Base Case Noise Contributions Relative to CEC Noise Impact Criteria Guidelines

Location	Distance from Project Site (feet) From Nearest Boundary	Distance from Project Site (feet) From Site Centroid	Design Goal[a], Project Contributions to Meet CEC's Late-Night Standard (dBA)	Predicted Project A-wtd Sound Pressure Level Contributions, Base Case 1 (dBA)	Comparison to Design Goal
Off-Site Receptors					
LT1	2,762	4,849	40	44	4 dB over
ST1	6,718	9,810	29	35	6 dB over
ST2	9,307	11,441	34	33	1 dB under
ST3	9,464	11,001	38	34	4 dB under
On-Site/Boundary Receptors					
NW corner	–	2,810	–	59	Not applicable
N	–	1,557	–	60	Not applicable
NNE corner	–	2,477	–	57	Not applicable
E	–	2,809	–	57	Not applicable
SE corner	–	3,099	–	55	Not applicable
S	–	1,539	–	64	Not applicable
SW corner	–	2,859	–	66	Not applicable
W	–	2,493	–	65	Not applicable

Source: HECA Project
Note:
[a]See the end of Section 5.5.1.4.

Noise Control Case

Since nighttime exceedances are predicted at one or more receptor locations per the CEC guidelines, noise control measures are required to ensure complying with this criterion during ongoing Project operations. Note that the Base Case Project design already met the Kern County Noise Element limits, so noise control measures were evaluated with respect to meeting the CEC standard, which is the more stringent in this case.

To address the Project-controlled noise exceedances, the ranked listing of noise contributors was studied to evaluate which set of equipment should have noise control options applied for an efficient mix of noise mitigation treatments. Then, an iterative process of reducing the highest contributors, via the effective application of noise control treatments was performed. This took the form of making reasonable adjustments to the input noise levels to account for such treatments as installing silencers on inlets/exhausts or using low-noise equipment. This process was continued to achieve an efficient and reasonably-achievable[4] mix of noise course characteristics that will result in predicted compliance at all receptor locations. This mixture of

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

treatments included the specification of known low-noise designs for some equipment items, using available noise control technologies (such as stack silencers), and applying external treatments such as enclosures or noise control panels on selected building walls. This mix of noise reduction measures focused on the following generalized treatments:

- Putting open-top enclosures on selected non-enclosed compressors
- Putting an open-top enclosure on the (non-enclosed) expander
- 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
- Lower-noise cooling tower cells
- Use stack silencer on HRSG exhaust
- Use stack silencer on LMS100® SCR exhaust
- Use inlet silencer on LMS100® air inlet
- Specify low-noise casing on LMS100® SCR body
- Use silencers on selected gas and steam vents to atmosphere

Noise source sound levels modeled for the Noise Control Case may be found in Table 5.5-11, Source Noise Levels for the Noise Control Case and Appendix K, Noise Technical Report.

Table 5.5-11
Source Noise Levels for the Noise Control Case

Area	Item	Notes	Octave Band Sound Power Levels, PWL								Overall PWL(A)	
			63	125	250	500	1k	2k	4k	8k		
AGR	CO_2 Compressor	40,250 hp - per Project "C"	72	68	73	75	78	80	76	69	*84.3*	*
	CO_2 Recycle Compressor	900 hp	82	86	86	85	84	81	77	74	*88.6*	*
	Refrigerant Compressor A	2,500 hp - int	87	78	73	70	69	68	67	66	*75.6*	*
	Flash Gas Recycle Comp	800 hp - ext	82	86	86	85	84	81	77	74	*88.6*	*
	Loaded Methanol Pump I	250 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Lean Methanol Pump	2,000 hp	107	98	93	90	89	88	87	86	*95.6*	*
	Reflux Pump Methanol/Water Separation	50 hp	86	87	90	90	88	85	81	79	*92.8*	
	Syngas Turbo Expander	3,000 hp	102	93	88	85	84	83	82	81	*90.6*	*
ASU	Main Air Compressor Motor	70,000 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*	
	Main Air Compressor (MAC)	70,000 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*	
	Booster Air Compressor Motor	14,750 hp - per Project "C"	84	88	87	91	93	93	90	85	*98.3*	
	Booster Air Compressor (BAC)	15,000 hp - per Project "C"	84	88	87	91	93	93	90	85	*98.3*	
	Med Pressure Nitrogen Compressor	38,000 hp - per Project "C"	87	83	88	90	93	95	91	84	*99.3*	*
	Expander	2,000 hp - per Project "F"	102	93	88	85	84	83	82	81	*90.6*	*
	Dense Fluid Expander	500 hp	79	81	82	82	82	79	76	73	*86.3*	*
	Liquid Oxygen Pump	650 hp	84	86	87	87	87	84	81	78	*91.3*	*
	ASU Cooling Water Pump	750 hp	84	86	87	87	87	84	81	78	*91.3*	*
	ASU CCW Pump	150 hp	84	85	90	89	88	85	80	77	*92.4*	*
	Auxiliary Cooling Water Pump	200 hp	84	85	90	89	88	85	80	77	*92.4*	*
	ASU Cooling Tower, 4 cells	4 cells	114	112	104	98	93	94	97	95	*103.8*	*

Table 5.5-11
Source Noise Levels for the Noise Control Case

Area	Item	Notes	Octave Band Sound Power Levels, PWL								Overall PWL(A)	
			63	125	250	500	1k	2k	4k	8k		
Common Cooling	Gasification Cooling Water Pump	750 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Power Block Cooling Water Pump	2,500 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
	Power Block Clsd Clg Wtr Pump	500 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Aux Cooling Water Pump	185 hp	84	85	90	89	88	85	80	77	*92.4*	*
	Gasification Clsd Clg Wtr Pump	150 hp	84	85	90	89	88	85	80	77	*92.4*	*
	HRSG FWH Recirculation Pumps	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Condensate Transfer Pump	75 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Hotwell Pump	600 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Low Pressure Boiler FeedWater Pump	250 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Process Intrmd Press BlrFdWtr Pumps	350 hp	84	86	87	87	87	84	81	78	*91.3*	*
	High Pressure Boiler FeedWater Pump	2,500 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
	Process High Press BlrFdWtr Pumps	4,000 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
	Power Block Cooling Tower, 4 cells	4 cells	114	112	104	98	93	94	97	95	*103.8*	*
	Gasification Cooling Tower, 4 cells	4 cells	114	112	104	98	93	94	97	95	*103.8*	*
Flaring	Thermal Oxidizer	from Project "A"	94	90	82	74	71	74	78	78	*83.8*	
	Ground Flare Stack	from Project "A"	94	90	82	74	71	74	78	78	*83.8*	
	Elev Acid Gas Flare Stack	not used - not normal ops	--	--	--	--	--	--	--	--	--	--

Table 5.5-11
Source Noise Levels for the Noise Control Case

Area	Item	Notes	Octave Band Sound Power Levels, PWL								Overall PWL(A)	
			63	125	250	500	1k	2k	4k	8k		
Gasification	Injector Cooling Water Pump	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Filter Feed Pumps	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Mill Discharge Tank Pumps	40 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Slurry Booster Pump	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Slurry Charge Pumps	500 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Quench Water Pumps	350 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Settler Bottom Pump	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Settler Feed Pump	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Grey Water Pumps	1800 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
	Grinding Water Tank Pumps	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Deaerator Bottoms Pumps	100 hp	79	81	82	82	81	78	75	72	*85.6*	*
	Mill Discharge Tank Agitator	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Slurry Tank Agitators	325 hp	84	86	87	87	87	84	81	78	*91.3*	*
	ME Settler Rake	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Filtration Skid	250 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Vacuum Pump Package	60 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Slurry Prep Bldg	from Project "A"	114	104	94	87	80	71	69	73	*92.9*	
	Gasifiers	from Project "A"	102	95	90	85	82	81	81	82	*90.0*	*
Mat'l Handling	Pneumatic Conveyor Blower	from Project "A"	98	91	86	81	78	77	77	78	*86.0*	*
	Impact Crusher	EPPENG w/ adjustment	105	105	103	101	100	98	92	85	*104.8*	
	Belt Conveyors	EPPENG w/ adjustment	93	93	91	89	88	86	80	73	*92.8*	
	Crusher Bldg	from Project "A"	119	109	99	93	85	76	74	78	*98.0*	*
	Feedstock Silo walls	from Project "A"	109	99	89	83	75	66	64	68	*88.0*	*
	Feedstock Unloading Shed	EPPENG w/ adjustment	95	95	93	91	90	88	82	75	*94.8*	*
	Feedstock Transfer Towers	EPPENG w/ adjustment	103	103	101	99	98	96	90	83	*102.8*	*
	Crushed Feedstock Transfer Towers	EPPENG w/ adjustment	103	103	101	99	98	96	90	83	*102.8*	*
	Mat'l Handling Dust Collectors	estimate	79	81	82	82	81	78	75	72	*85.6*	*

Table 5.5-11
Source Noise Levels for the Noise Control Case

Area	Item	Notes	Octave Band Sound Power Levels, PWL								Overall PWL(A)	
			63	125	250	500	1k	2k	4k	8k		
Power Block	GTG Transformer	from Project "A"	99	101	96	96	90	85	80	73	*96.4*	
	GTG Air Inlet	from Project "A"	103	102	92	91	88	88	81	76	*94.6*	
	GTG Generator	from Project "E"	107	114	105	94	95	92	96	99	*104.5*	
	GTG Main Body	from Project "E"	117	114	104	100	94	92	92	90	*103.6*	
	GTG Accessory Bay	estimate	114	111	110	107	105	105	101	99	*111.4*	
	HRSG Transition	from Project "B"	110	103	99	92	84	82	72	60	*94.9*	
	HRSG Main Body	from Project "A"	117	113	106	99	90	87	71	57	*102.3*	
	HRSG Stack Exhaust	from Project "A"	107	109	109	102	91	77	62	57	*103.4*	*
	STG Main Body	from Project "D"	114	112	107	103	99	96	88	82	*105.4*	
	STG Generator	from Project "D"	107	114	105	94	95	92	96	99	*104.5*	
	STG Transformer	from Project "A"	99	101	96	96	90	85	80	73	*96.4*	
	LMS100® Air Inlet	from Project "E"	112	111	100	88	94	80	80	85	*99.1*	*
	LMS100® Main Body	from Project "E"	116	113	103	99	93	91	91	89	*102.6*	
	LMS100® Generator	from Project "E"	106	113	104	93	94	91	95	98	*103.5*	
	LMS100® SCR Body	from Project "E"	118	115	108	96	90	83	66	48	*103.3*	*
	LMS100® Stack Exhaust	from Project "E"	128	122	108	96	91	83	79	71	*108.2*	*
	LMS100® Transformer	from Project "E"	103	107	100	101	98	87	82	75	*102.0*	
	LMS100® Fuel Gas Compressor	estimate	80	82	81	83	86	90	84	78	*93.4*	*
Shift/ LTGC	Hot Process Condensate Pumps	500 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Contact Condenser Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*	
	Regen Overhead Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*	
SRU	SRU furnaces	from Project "A"	103	104	113	111	104	97	95	96	*111.0*	
	HP Flare Knock-out Drum Pump	300 hp	84	86	87	87	87	84	81	78	*91.3*	*
TGTU	TGTU Treated Gas Compressor	1,200 hp	75	77	76	78	81	85	79	73	*88.4*	*
	Lean Amine Air Cooler	from Project "E"	98	95	85	78	72	63	56	48	*82.7*	

Table 5.5-11
Source Noise Levels for the Noise Control Case

Area	Item	Notes	Octave Band Sound Power Levels, PWL								Overall PWL(A)	
			63	125	250	500	1k	2k	4k	8k		
Water Treat	Demin Water Pump	250 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Storm Water Sump Pump	75 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Sump Pump	75 hp	76	77	80	80	78	75	71	69	*82.8*	*
	Water Treat Pumps	12 x 75 hp = 11 dB	87	88	91	91	89	86	82	80	*93.8*	*
	R/O Feed Pump-1stg	1,500 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
	R/O Feed Pump-2stg	500 hp	84	86	87	87	87	84	81	78	*91.3*	*
	Deep Well Injection Pump	2,000 hp - per Project "F"	107	98	93	90	89	88	87	86	*95.6*	*
ZLD	Vapor Compressor	500 hp	79	81	82	82	82	79	76	73	*86.3*	*
	Exhaust Fan	50 hp	76	77	80	80	78	75	71	69	*82.8*	*
	ZLD pumps	16 x 75 hp = 12 dB	88	89	92	92	90	87	83	81	*94.8*	*
	Drum Dryer	60 hp	86	87	90	90	88	85	81	79	*92.8*	
Misc	Aux Transformers	~15 MVA-per Project "B"	87	89	84	84	78	73	68	61	*84.4*	
	Various Atmospheric Vents	Various services	95	88	83	78	75	74	74	75	*83*	*
										Total Project PWL(A) =	**120.5**	*

Source: Alliance Acoustical Consultants.

Notes:
* Items shown with an asterisk include noise control treatments
AGR = Acid Gas Removal Area
ASU = Air Separation Unit
Power Block = (includes both Main 7-class and LMS100® trains)
Shift/LTGC = Sour Shift + Low-Temp Gas Cooling + Mercury Removal
SRU = Sulfur Recovery Unit
TGTU = Tail Gas Treating Unit
Water Treat = Water Treatment Area
ZLD = Zero Liquid Discharge Area

Noise Control Case Compared to Kern County Standards

The Project is predicted to comply with the Kern County standards for the Base Case scenario, so noise control measures are not needed for these criteria. The noise control modeling results, however, are presented relative to the Kern County Noise Element for information and completeness, in Tables 5.5-12, Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Exterior), and 5.5-13, Summary of Project Contributions with Noise Control Features Relative to Kern County Noise Element Standards (Interior).

Table 5.5-12
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, Noise Control Case, SPL dBA *[column 4]*	Predicted Project L_{DN} Contributions, Noise Control Case *[column 5][a]*	Total, Future Calculated L_{DN} (existing plus Project) *[column 6][b]*	Compliance?[c] *[column 7]*
LT1	65	61[d]	37	43	61[f]	Yes
ST1	65	41[e]	29	35	42	Yes
ST2	65	47[e]	27	33	47[f]	Yes
ST3	65	46[e]	29	35	46[f]	Yes

Source: HECA Project
Notes:
[a] Using 24 hourly Leq values to calculate the equivalent L_{DN} metric, assuming continuous operations at steady-state, design conditions.
[b] Summing sound levels from column 3 plus column 5
[c] Is column 6 less than column 2?
[d] Calculated L_{DN}
[e] Estimated L_{DN} from short-term data in Table 5.5-3.
[f] Result is completely controlled by existing noise environment.

Table 5.5-13
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} Environ-ment[a] *[column 3]*	Predicted Project Exterior L_{DN} Contributions, Noise Control Case *[column 4][b]*	Predicted Project Interior L_{DN} Contributions, Noise Control Case *[column 5][c]*	Total, Future Calculated L_{DN} (Existing plus Project) *[column 6][d]*	Compliance?[e] *[column 7]*
LT1	45	44	43	26	44[f]	Yes
ST1	45	24	35	18	25	Yes
ST2	45	30	33	16	30[f]	Yes
ST3	45	29	35	18	29[f]	Yes

Source: HECA Project
Notes:
[a] Applying -17 dB to results from Table N-3a above.
[b] Using results of column 5 from Table N-3a above.
[c] Applying -17 dB to column 4.
[d] Summing sound levels from column 3 plus column 5.
[e] Is column 6 less than column 2?
[f] Result is completely controlled by existing noise environment.

Noise Control Case Compared to CEC Standards

With receptor Location ST1 as the critical location for achieving compliance with CEC standards (i.e., having the highest value over its associated design goal), the iterative process of reducing the highest contributors focused on a 6 dB reduction at ST1. Similar reductions were also predicted for the other community receptor locations as shown in Table 5.5.14, Summary of Project Contributions with Noise Control Features Relative to CEC Noise Impact Criteria Guidelines for Noise Control Case.

Table 5.5-14
Summary of Project Contributions with Noise Control Features Relative to CEC Noise Impact Criteria Guidelines

Location	Distance from Project Site (feet)		Design Goal[a], Project contributions to Meet CEC's Late-Night Standard (dBA)	Predicted Project A-wtd Sound Pressure Level Contributions, Mitigated (dBA)	Comparison to Design Goal
	From Nearest Boundary	From Site Centroid			
Off-Site Receptors					
LT1	2,762	4,849	40	37	3 dB under
ST1	6,718	9,810	29	29	at goal
ST2	9,307	11,441	34	27	7 dB under
ST3	9,464	11,001	38	29	9 dB under
On-Site/Boundary Receptors					
NW corner	–	2,810	–	59	Not applicable
N	–	1,557	–	60	Not applicable
NNE corner	–	2,477	–	57	Not applicable
E	–	2,809	–	57	Not applicable
SE corner	–	3,099	–	55	Not applicable
S	–	1,539	–	64	Not applicable
SW corner	–	2,859	–	66	Not applicable
W	–	2,493	–	65	Not applicable

Source: HECA Project
Note:
[a]See the end of Section 5.5.1.4.

With the selected design features for controlling Project noise emissions, all pertinent receptor locations are predicted to be at or below the design goal needed to achieve compliance with the CEC nighttime standard.

After the results for the discrete receptor locations were predicted, the same modeling process was used to calculate plant noise levels at regularly-spaced grid points. From these grid results, a noise level contour map was generated for the Noise Control Case. 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 Figures 5.5-2, Noise Contours at Project Site, and 5.5-3, Noise Contours at Closest Noise Sensitive Receptors.

Noise Control Design Features

The effective noise control treatments that were used in the compliant Project design model are a combination of vendor specification limits, acoustical designs in specific systems, and/or external treatments on selected equipment items or systems. The originally assumed noise emissions values and the subsequent noise mitigation features are summarized in Table 5.5-15, Summary of Project Noise Control Design Features.

Table 5.5-15
Summary of Project Noise Control Design Features

Noise Source (Original Noise Emissions Rating)	Conceptual Noise Control Feature(s)
Power Block Cooling Tower (13 cell) (64 dBA at 400 feet from tower edge)	Reduced 4 dB to 60 dBA at 400 feet from tower edge. 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.
ASU Area Cooling Tower	Reduced on a per-cell basis to be consistent with above reduction.
Main Power Island: F-class Gas Turbine, Steam Turbine, & HRSG	None indicated at this time, but adjustments may be needed during the detailed engineering design phase.
HRSG Stack Exit (alone) (60 dBA at 400 feet')	Reduced 10 dB to 50 dBA at 400 feet from stack base. Power Island vendor should use a stack silencer (either before or after the up-turn bend) to reduce HRSG stack noise.
Main Power Block Transformers (46 dBA at 400 feet or 59 dBA at 100 feet)	None indicated at this time.
Secondary Power Island: LMS100®-class Gas Turbine	Include additional 6 dB of silencing on air inlet (relative to nominal reduction for this class of turbine).
Secondary Power Island: Simple-cycle SCR and exhaust	(a). Include stack silencer for 10 dB reduction. (b). Specify SCR body design to achieve 10 dB reduction.
Secondary Power Block Transformers	Specify low-noise package (i.e. -10 dB relative to nominal noise emissions for this size transformer).
Selected Pump Trains (pump+motor) [for trains <100hp, PWLA should be <83; for trains between 150 and 750 hp, PWLA should be <91; and for trains >750hp, PWLA should be <96]	Reduced nominal noise emissions (shown inside [brackets] and relative to standard offerings) for each size pump train (motor plus pump). 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 such sources > 83 PWLA for noise control]	Reduced 10 dB relative to nominal noise emissions 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, Transfer Towers, Feedstock Silo Building, Slurry Prep Building, Slag Handling Building, and Crushing/Milling Buildings)	Reduced noise emissions (relative to nominal designs) for sheet metal building with several openings such that they are ≤65 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.

Table 5.5-15
Summary of Project Noise Control Design Features

Noise Source (Original Noise Emissions Rating)	Conceptual Noise Control Feature(s)
Conveyors	None indicated at this time (assuming enclosed systems and provided vendors can supply noise-limited equipment such that they are ≤61 dBA at 50 feet).
Open Compressors and Expanders	Some Compressor Trains have 4-sided, open-topped enclosures in the current design. 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 Burners	Specify low-noise burners to equipment vendors or use noise control enclosures/plenums around burner systems.
Gasifiers	Specify low-noise fuel deliver systems (slurry injectors or fuel gas aspirators) or use noise control enclosures/plenums such that noise emissions are reduced to below 90 PWLA.
Ground Flare (mainly used for Gasifier start-up)	None indicated at this time (provided vendors can supply equipment meeting Petrochem industry standards). (Assumes normal operations will be pilot flame only.)
Elevated Acid Gas Flare (mainly used for minimum heat rate disposal of acid gas; no start-up flow)	None indicated at this time (provided vendors can supply equipment meeting Petrochem industry standards). (Assumes normal operations will be pilot flame only.)
Thermal Oxidizer (mainly used for Tail Gas Treating Tank vent discharges)	None indicated at this time (provided vendors can supply equipment meeting Petrochem industry standards). (Assumes normal 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 3feet.
Building HVAC units and fans (various)	Noise limit specification to equipment vendor; no more than 85 dBA at 3 feet.

Source: HECA Project

The noise control features in Table 5.5-15, Summary of Project Noise Control Design Features, are incorporated into the modeling results shown in Figures 5.5-2, Noise Contours at Project Site, and 5.5-3, Noise Contours at Closest Noise Sensitive Receptors.

With the selected design features for controlling Project noise emissions, all pertinent receptor locations are predicted to be at or below the design goal needed to achieve compliance with the CEC criterion.

The noise control features are considered technically feasible at this time. These measures and features will be updated, refined, and confirmed during detailed design efforts to ensure both Project compliance and fit-for-purpose cost control.

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 surround 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 large distances from the actual equipment to the nearest receptor locations, coupled with the inherently low vibration levels from the Project's well-balance machinery, ground-borne vibrations would not be expected to be even detectable above the residual background vibration environment at any of the pertinent receptor locations. As a result, impact related to ground-borne vibrations will be less than significant.

5.5.2.5 Worker Exposure to Noise

The Project is currently planning to use BP Group Engineering Technical Practices as part of the detailed design phase[5]. With these Practices, nearly all components of the Project will be specified not to exceed near-field maximum noise levels of 80 dBA at 1 m (3 feet) as the standard for equipment selection and procurement. Note that this level is 5 dB lower than is commonly used for large-scale industrial design efforts. Since there are no permanent or semi-permanent workstations located near any piece of noisy plant equipment and since 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, the Applicant (HEI) 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, and will be conducted 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 Vehicular Traffic Noise

Project construction and operation would result in an increase in vehicular traffic along site access roadways. Access roadways include Stockdale Highway, Morris Road, Tupman Road, Taft Highway (SR-119) and South Enos Lane.

[5] The pertinent Practices include GP 14-01, "Guidance on Practice for Noise Control", and GP 14-011, "Guidance on Industry Standard for Noise Control".

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 was used to estimate existing traffic noise levels along the access roads. The modeling effort considered the posted vehicle speed, peak hour traffic volume (Section 5.10, Traffic and Transportation) and the estimated vehicle mix. The model assumed a default ground type of "pavement." Calculations using the current traffic volumes were performed at a distance of 50 feet from the centerline of each roadway. Scattered residences and one school are located at various distances from the Stockdale Highway and Tupman Road. Table 1 shows the calculated existing traffic noise levels. Assuming that the peak hour noise level is equivalent to the $L_{DN,}$ noise levels along Stockdale Highway, Taft Highway and South Enos Lane currently exceed the Kern County General Plan exterior requirement of 65 dBA L_{DN}. The actual noise level at any receptor location is dependent upon such factors as the source-to-receptor distance, ground type and the presence of intervening structures, barriers, and topography.

Construction Traffic

Acoustical calculations were performed for vehicular traffic during construction as described above. The Project peak hour construction employee traffic trips were added to the 2013 peak hour traffic volume as cars for the purpose of analysis. It was assumed that construction truck trips would be evenly distributed throughout a 10-hour work day; therefore, 10% of the daily truck trips were added to the 2013 peak hour traffic volume as "heavy trucks." A comparison of existing traffic noise levels and the 2013 traffic noise levels during construction is shown in Table 5.5-16, Construction Traffic Sound Levels at 50 feet from Centerline of Roadway. This table also shows the Project's contribution to the noise environment.

The noise level along Project roadway segments is expected to increase by approximately 0 to 13 dBA during construction. A change of greater than 3 dBA is perceptible by the average human ear. Roadway segments adjacent to scattered noise sensitive receptors that may increase by more than 3 dBA are Tupman Road between Grace Road to Taft Highway (7 dBA increase) and Morris Road (this segment is representative of traffic volumes adjacent to LT1 [13 dBA increase]).

Since the noise level along the Tupman Road segment would be expected to be 64 dBA L_{DN} and therefore below the Kern County General Plan exterior requirement of 65 dBA L_{DN}, the impact would be less than significant.

However, the noise level at LT1 would experience a 13 dBA increase and be 67 dBA $L_{DN,}$ which would exceed the Kern County General Plan Exterior requirement of 65 dBA L_{DN}. Therefore, the Project noise impact at LT1 would be significant without mitigation. However, the Project noise impact at LT1 is considered less than significant with mitigation measure NOISE-1.

Operation Traffic

Acoustical calculations were performed for operations vehicular traffic as described above. The Project peak hour employee operations traffic trips were added to the 2015 peak hour traffic volume as cars. It was assumed that operation truck trips would be evenly distributed throughout a 10-hour work day; therefore, 10% of the daily operations truck trips were added to the 2015 peak hour traffic volume as "heavy trucks." A comparison of existing traffic noise levels and the 2015 traffic noise levels during operations is shown in Table 5.5-17, Operation Traffic Sound

Levels at 50 feet from Centerline of Roadways (dBA Leq). This table also shows the Project's contribution to the noise environment.

The noise level along Project roadway segments is expected to increase by approximately 0 to 9 dBA during Project operations. A 9 dBA noise level increase would occur along Morris Road (this segment is representative of LT1). Since the noise level along this segment is projected to be 63 dBA L_{DN} and therefore, below the Kern County General Plan exterior requirement of 65 dBA L_{DN} the impact would be less than significant. No other roadway segment adjacent to scattered noise sensitive receptors would experience an increase of 3 dBA.

Table 5.5-16
Construction Traffic Sound Levels at 50 feet from Centerline of Roadway

Roadway Segment	Existing		2013			2013 + Construction			
	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[1]	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[2]	Project Contribution
Stockdale Highway									
Dairy Rd to Morris Rd	108	60	135	61	+1	135	61	+1	0
Morris Rd to I-5 SB	152	61	175	62	+1	828	70	+8	+8
I-5 NB to Enos Lane	551	67	625	67	0	1,031	70	+3	+2
East of South Enos Lane	607	67	685	68	+1	1,033	70	+2	+2
Morris Road									
Stockdale Hwy to Station Rd	33	52	50	54	+2	703	67	+15	+13
Tupman Road									
Grace Ave to Taft Hwy (SR 119)	91	56	110	57	+1	583	64	+8	+7
Taft Highway (SR 119)									
West of Tumpan Rd	1,074	74	1,225	75	+1	1,283	75	+1	0
Tupman Rd to South Enos Lane	1,195	74	1,350	75	+1	1,765	75.4	+1	+1
South Enos Lane to I-5 SB	700	72	795	73	+1	1,210	73	+1	+1
East of I-5 NB	681	72	765	72	0	1,113	73	+1	+1

Table 5.5-16
Construction Traffic Sound Levels at 50 feet from Centerline of Roadway

Roadway Segment	Existing		2013			2013 + Construction			
	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[1]	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[2]	Project Contribution
South Enos Lane									
North of Stockdale Hwy	487	68	545	69	+1	603	69	+1	0
South of Stockdale Hwy	534	69	605	69	+0	605	69	+0	0
North of Taft Hwy	591	69	670	70	+1	670	70	+1	0
South of Taft Hwy	150	63	165	64	+1	165	64	+1	0

Notes:
[1]Delta is difference between Existing and Year 2013
[2]Delta is difference between Existing and Year 2013 + Construction Traffic
Sound levels are rounded to the nearest decibel.

Table 5.5-17
Operation Traffic Sound Levels at 50 feet from Centerline of Roadways (dBA Leq)

Roadway Segment	Existing		2015			2015 + Project			
	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[1]	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[2]	Project Contribution
Stockdale Highway									
Dairy Rd to Morris Rd	108	60	135	61	+1	135	61	+1	0
Morris Rd to I-5 SB	152	61	185	62	+1	273	66	+5	+4
I-5 NB to Enos Lane	551	67	645	68	+1	699	68	+1	0
East of South Enos Lane	607	67	715	68.0	+1	764	68	+1	0
Morris Road									
Stockdale Hwy to Station Rd	33	52	50	54	+2	138	63	+11	+9
Tupman Road									
Grace Ave to Taft Hwy (SR-119)	91	56	110	57	+1	143	58	+2	+1

Table 5.5-17
Operation Traffic Sound Levels at 50 feet from Centerline of Roadways (dBA Leq)

Roadway Segment	Existing		2015			2015 + Project			
	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[1]	Peak-Hour Traffic Volume	Calculated Level (L_{DN})	Delta[2]	Project Contribution
Taft Highway (SR-119)									
West of Tumpan Rd	1,074	74	1,265	75	+1	1,270	75	+1	0
Tupman Rd to South Enos Lane	1,195	74	1,395	75	+1	1,424	75	+1	0
South Enos Lane to I-5 SB	700	72	825	73	+1	854	73	+1	0
East of I-5 NB	681	72	795	73	+1	821	73	+	0
South Enos Lane									
North of Stockdale Hwy	487	68	580	69	+1	585	69	+1	0
South of Stockdale Hwy	534	69	630	69	0	630	69	0	0
North of Taft Hwy	591	69	695	70	+1	695	70	0	0
South of Taft Hwy	150	63	175	64	+1	175	64	+1	0

Notes:
[1]Delta is difference between Existing and Year 2015
[2]Delta is difference between Existing and Year 2015 + Project
[3]Sound levels are rounded to the nearest decibel

5.5.3 Cumulative Impacts

The Project has confirmed that no industrial or commercial developments are currently planned that will significantly impact ambient levels at noise sensitive receivers in the vicinity of the Project Site (see Appendix J, List of Proposed Projects). As a result no significant cumulative impacts will occur from project construction or operations.

5.5.4 Mitigation Measures

The implementation of these 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. The Project has incorporated mitigation measure NOISE-1 to minimize the construction impacts to a level of less than significant.

Noise -1

Acoustical calculations using the TNM Model as described in Section 5.5.2.5 were performed to evaluate reduced vehicle speed as a construction noise mitigation measure at LT1. It was determined that limiting the speed of employee vehicles to 35 miles per hour and construction trucks to 30 mile per hour within 250 feet of LT1 would reduce the noise level to below the Kern County General Plan exterior requirement of 65 dBA L_{DN}. Therefore the Project has committed to train construction workers that reduced vehicle speeds within 250 feet of LT1 are required as part of the Project.

5.5.5 Laws, Ordinances, Regulations, and Standards

This section describes LORS for the control of noise, as also summarized in Table 5.5-18, Summary of LORS – Noise.

Table 5.5-18
Summary of LORS – Noise

LORS	Applicability	Section
Federal Jurisdiction		
USEPA 1974 Noise Guidelines	Guidelines for state and local governments.	Section 5.5.5.1
Noise Control Act (1972) as amended by the Quiet Communities Act (1978); (42 USC 4901-4918)	Separate noise-sensitive areas are encouraged.	
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 5.5.5.2
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 5.5.5.2
California Vehicle Code	Regulates vehicle noise limits on California highways.	Section 5.5.5.2
Local Jurisdiction		
Kern County General Plan (Chapter 3 – Noise Element)	This requirement is applicable to stationary and temporary construction noise sources such as the project. It requires proposed commercial and industrial uses or operations be designed so they will not significantly impact noise sensitive areas.	Section 5.5.5.3

Source: Kimley-Horn and Associates, Inc., 2008.
Notes:
Cal/OSHA = California Occupational Safety and Health Administration
CCR = California Code of Regulations
CEC = California Energy Commission
LORS = laws, ordinances, regulations, and standards
OSHA = Occupational Safety and Health Administration
USC = United States Code
USEPA = U.S. Environmental Protection Agency

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 [USC] 4321, *et seq*.) (Public Law [PL]-91-190)
- Noise Control Act of 1972 (42 USC 4910)

The U.S. Environmental Protection Agency (USEPA) has not promulgated standards or regulations for environmental noise generated by power plants. However, USEPA has published a guideline (USEPA Levels Document, Report No. 556/9-74-664) 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.

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 California Occupational Safety and Health Administration (Cal/OSHA) in Title 8, Group 15, Article 105, § 5095 to § 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 time-weighted average (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

The Noise Element of the Kern County General Plan requires 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}.

5.5.6 Involved Agencies and Agency Contacts

5.5.6.1 Federal

Federal Transit Administration - Region 9
201 Mission Road, Room 2210
San Francisco, CA 94105-1835
415-744-1333
Regional Administrator
Leslie Rogers

5.5.6.2 State

Cal/OSHA
7575 Metropolitan Drive, Suite 207
San Diego, CA 92108
619-767-2280
Area Manager
Wende Carlson

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

42 United States Code (U.S.C.). The Noise Control Act of 1972, as amended, 42 U.S.C. § 4901 § 4918 *et seq.*

Baker, Steve. 1999, 2002, 2007 - Personal communication with CEC Noise Staff.

Beranek, Leo. 1988. *Noise and Vibration Control*. Revised Edition. Institute of Noise Control Engineering. Washington, D.C.

California Energy Commission (CEC). 1997. Rules of Practice and Procedure, Power Plant Site Certification Regulations.

California Code of Regulations (CCR). 1983. Title 8, Article 105, § 5095. October 3.

California Vehicle Code. § 27151.

County of Kern. 2005. Zoning Ordinance of Kern County. Chapter 8.36 Noise Control. February.

_____. 2007. Kern County General Plan. Noise Element. March 13.

Electric Power Research Institute. 1987. *Transmission Line Reference Book 345 kV and Above*. Second Edition, EL-2500. Palo Alto, CA.

Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control, Third Edition*. McGraw Hill, Inc.

International Organization Standardization (ISO). 1996a. *Description and Measurement of Environmental Noise, Basic Quantities and Procedures Part 1, ISO 1996/1*.

_____. 1996b. *Description and Measurement of Environmental Noise, Basic Quantities and Procedures, Acquisition of Data Pertinent to Land Use, Part 2, ISO 1996/2*.

_____. 1996c. *Description and Measurement of Environmental Noise, Basic Quantities and Procedures, Application to Noise Limits, Part 3, ISO 1996/3*.

Kimley-Horn and Associates, Inc. 2008. Field work and observations.

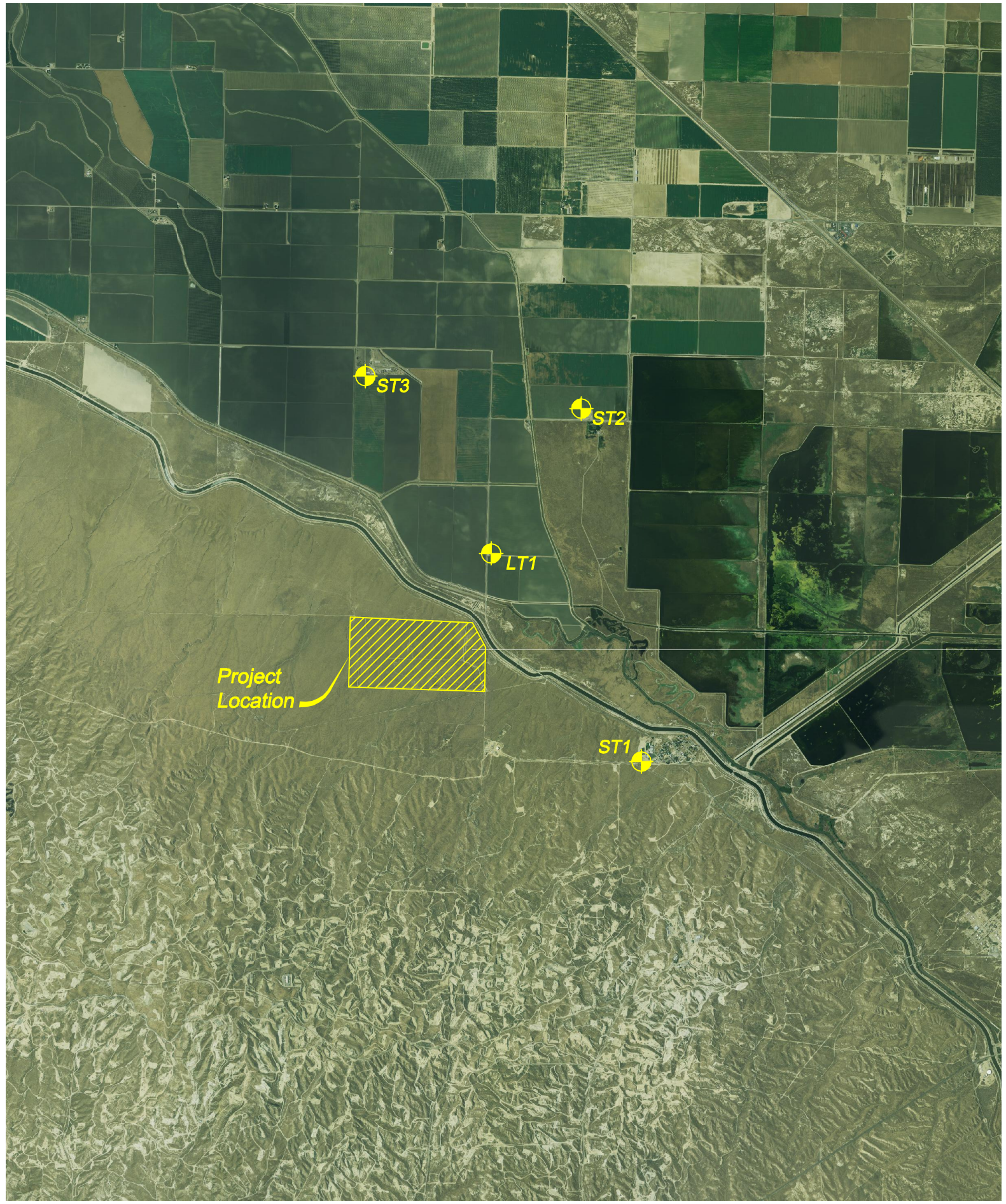
Miller, L.N., E.W. Wood, R.M. Hoover, A.R. Thompson, S.L. Thompson, and S.L. Paterson. 1978. *Electric Power Plant Environmental Noise Guide, Vol. 1*. ("EPPENG") Bolt Beranek & Newman, Inc. Cambridge, MA. Prepared for the Edison Electric Institute, New York.

U.S. Dept. of Transportation, Federal Transit Agency (FTA). 2006. *Transit Noise and Vibration Impact Assessment.* Report VTA-VA-90-1003-06. (Prepared under contract by Harris, Miller, Miller, & Hanson, Inc., Burlington, MA). Washington, DC.

U.S. Environmental Protection Agency (USEPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances.* NTID300.1 (Prepared under contract by Bolt, Beranek & Newman, Boston, MA). Washington, DC.

_____. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,* EPA Report 55019-74-004. Washington, DC.

_____. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control. Report number EPA 550/9-79-100. Washington, D.C. 20460.

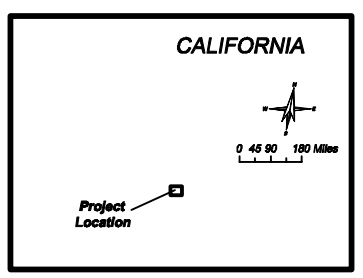


Project Site

Receiver Location

0 1.5 1 2 Miles

Sources:
USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPOI, @2006 National Geographic Maps, All Rights Reserved.
Others XXX (other data sets XXX).



Noise Measurement Locations

Hydrogen Energy California (HECA)
HEI LLC

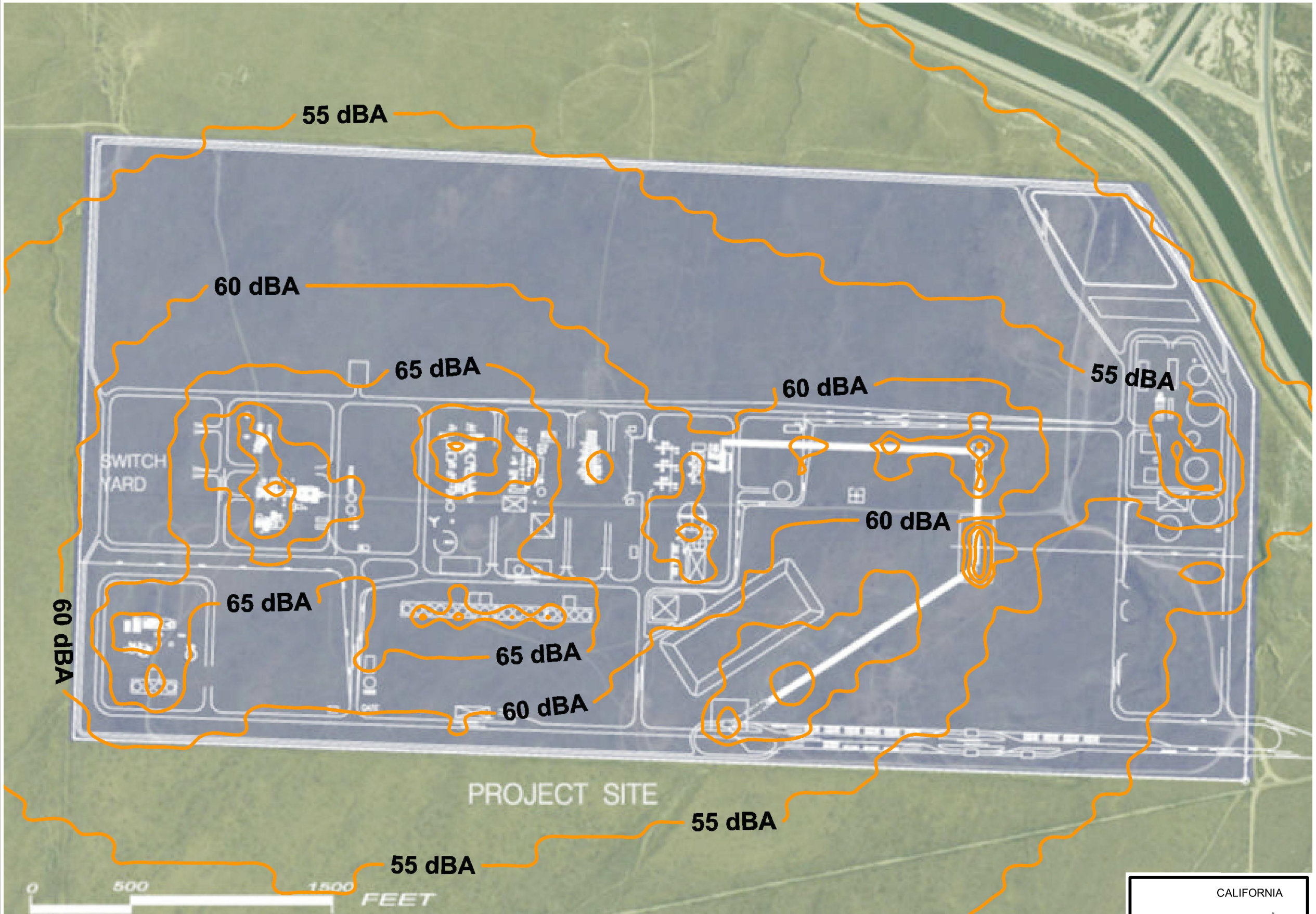
FIGURE 5.5-1

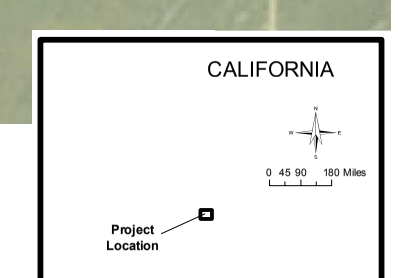
URS

Created 07/03/08

DRAFT

K:\NO\SE\09547\0017\Design\x-Meas_Loc.dwg 7-03-08-3:46 PM





Project Site

N
W E
S

0 250 500 1000 Feet

Sources:
USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, @2006 National Geographic Maps, All Rights Reserved. Others XXX (other data sets XXX).

Noise Contours At Project Site

Hydrogen Energy California (HECA)
HEI LLC

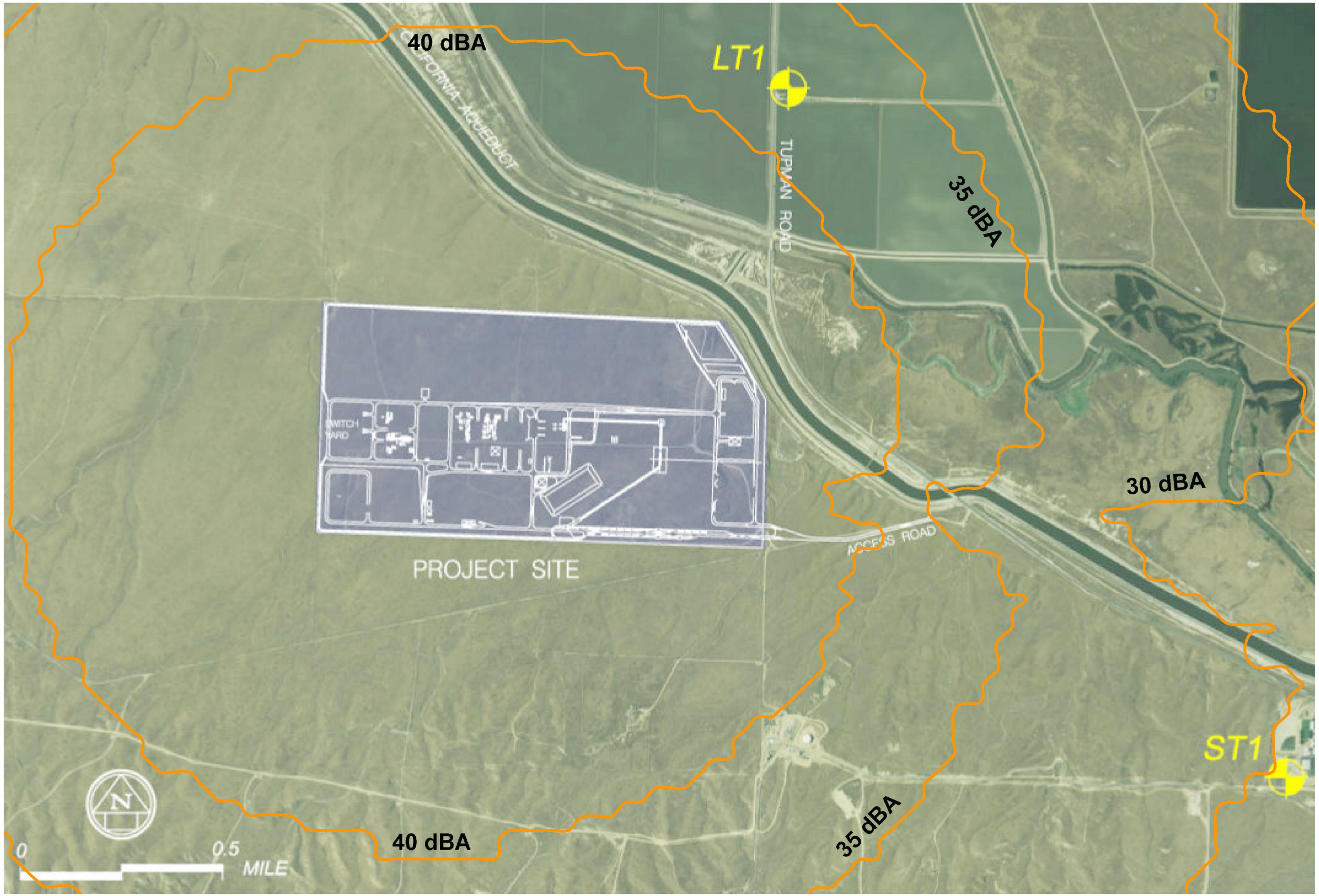
FIGURE 5.5-2

URS

Created 07/03/08

DRAFT

C:\NOISE\09547001\7\Designix-Contours_Site.dwg 7-03-08-12:11 PM

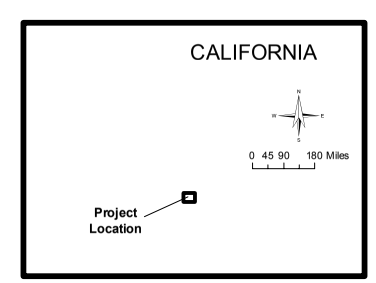


Project Site

Receiver Location

0 0.25 0.5 Mile

Sources:
USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, @2006 National Geographic Maps, All Rights Reserved. Others XXX (other data sets XXX).



Noise Contours At Closest Noise Sensitive Receptor

Hydrogen Energy California (HECA)
HEI LLC

FIGURE 5.5-3

URS Created 07/03/08 **DRAFT**

C:\NOISE\09547001\Design\x-Contours_Receptor.dwg 7-03-08-12:09 PM

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Noise** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Existing conditions: 5.5-4, -5, -6 / 5.5.1.2 Impacts: N/A Measures: N/A Monitoring: N/A		
Appendix B (g) (4) (A)	A land use map which identifies residences, hospitals, libraries, schools, places of worship, or other facilities where quiet is an important attribute of the environment within the area impacted by the proposed project. The area potentially impacted by the proposed project is that area where, during either construction or operation, there is a potential increase of 5 dB(A) or more, over existing background levels.	Figure 5.5-1		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Noise** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (4) (B)	A description of the ambient noise levels at those sites identified under subsection (g)(4)(A) which the applicant believes provide a representative characterization of the ambient noise levels in the project vicinity, and a discussion of the general atmospheric conditions, including temperature, humidity, and the presence of wind and rain at the time of the measurements. The existing noise levels shall be determined by taking noise measurements for a minimum of 25 consecutive hours at a minimum of one site. Other sites may be monitored for a lesser duration at the applicant's discretion, preferably during the same 25-hour period. The results of the noise level measurements shall be reported as hourly averages in Leq (equivalent sound or noise level), L_{DN} (day-night sound or noise level) or CNEL (Community Noise Equivalent Level) in units of dB(A). The L10, L50, and L90 values (noise levels exceeded 10 percent, 50 percent, and 90 percent of the time, respectively) shall also be reported in units of dB(A).	Page 5.5-4, -5, -6 / Section 5.5.1.2		
Appendix B (g) (4) (C)	A description of the major noise sources of the project, including the range of noise levels and the tonal and frequency characteristics of the noise emitted.	Section 5.5.2.2 Table 5.5-7 and 5.5-11		
Appendix B (g) (4) (D)	An estimate of the project noise levels, during both construction and operation, at residences, hospitals, libraries, schools, places of worship or other facilities where quiet is an important attribute of the environment, within the area impacted by the proposed project.	Sections 5.5.2..1 and 5.5.2.2 Table 5.5-12, 5.5-13, 5.5-14, and 5.5-15 Figures 5.5-2 and 5.5-3		
Appendix B (g) (4) (E)	An estimate of the project noise levels within the project site boundary during both construction and operation and the impact to the workers at the site due to the estimated noise levels.	Section 5.5.2.1 Tables 5.5-4, 5.5-5, 5.5-6		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Noise** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (4) (F)	The audible noise from existing switchyards and overhead transmission lines that would be affected by the project and estimates of the future audible noise levels that would result from existing and proposed switchyards and transmission lines. Noise levels shall be calculated at the property boundary for switchyards and at the edge of the rights-of-way for transmission lines.	Section 4.0		
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	5.5-9, -10 / 5.5.5 Table 5.5-4		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	5.5-9, -10 / 5.5.5 Table 5.5-16		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	5.5-11, -12 / 5.5.6		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Noise**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	5.5-12 / 5.5.7		