This EIR section describes the existing noise environment in the project vicinity and identifies potential noise impacts associated with the proposed project. Project impacts are evaluated relative to applicable noise level criteria and to the existing ambient noise environment. Mitigation measures have been identified for significant noise-related impacts. The information in this section was derived from Environmental Noise Assessment [for] Sierra Pacific Industries Cogeneration Plant Expansion (j.c. brennan & associates, Inc., April 16, 2010), which is attached as **Appendix F**.

There were two written comments received during the public review period for the Notice of Preparation regarding this topic:

- A letter to Shasta County from resident Kirk Sanders, dated July 31, 2009 indicated that the project may result in increased noise impacts.
- An undated letter to Shasta County signed by residents Ashley Wayman, Tim Wedan, and Barbara Wedan, received on August 3, 2009 indicated that the EIR should address potential noise increases that may occur from the proposed project.

3.8.1 ACOUSTIC FUNDAMENTALS

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound is mechanical energy transmitted in the form of a wave because of a disturbance or vibration. Sound levels are described in terms of both amplitude and frequency.

Amplitude

Amplitude is defined as the difference between ambient air pressure and the peak pressure of the sound wave. Amplitude is measured in decibels (dB) on a logarithmic scale. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Amplitude is interpreted by the ear as corresponding to different degrees of loudness. Laboratory measurements correlate a 10 dB increase in amplitude with a perceived doubling of loudness and establish a 3 dB change in amplitude as the minimum audible difference perceptible to the average person.

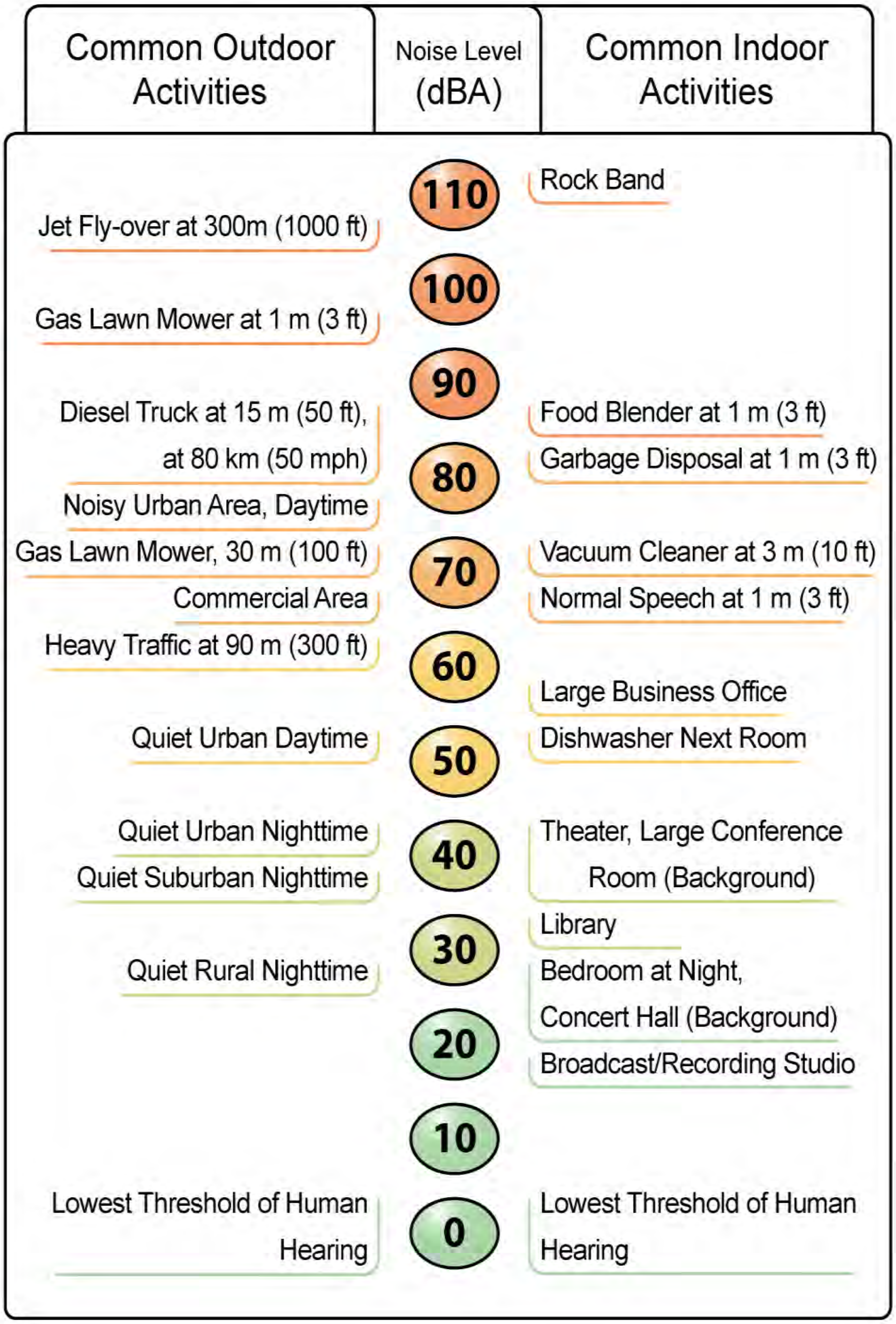
Frequency

The frequency of a sound is defined as the number of fluctuations of the pressure wave per second. The unit of frequency is the Hertz (Hz). One Hz equals one cycle per second. The human ear is not equally sensitive to sound of different frequencies. For instance, the human ear is more sensitive to sound in the higher portion of this range than in the lower and sound waves below 16 Hz or above 20,000 Hz cannot be heard at all. To approximate the sensitivity of the human ear to changes in frequency, environmental sound is usually measured in what is referred to as "A-weighted decibels" (dBA). On this scale, the normal range of human hearing extends from about 10 dBA to about 140 dBA. Common community noise sources and associated noise levels, in dBA, are depicted in Exhibit 3.8-1.

Addition of Decibels

Because decibels are logarithmic units, sound levels cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces a sound level of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB.

Exhibit 3.8- 1 Common Noise Levels



SOURCE: CALTRANS 2009

Sound Propagation & Attenuation

GEOMETRIC SPREADING

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level decreases (attenuates) at a rate of approximately 6 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path, and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of approximately 3 decibels for each doubling of distance from a line source, depending on ground surface characteristics. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between a line source and the receiver, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation for soft surfaces results in an overall attenuation rate of 4.5 decibels per doubling of distance from a line source.

ATMOSPHERIC EFFECTS

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

SHIELDING BY NATURAL OR HUMAN-MADE FEATURES

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in minimum 5 dB of noise reduction. Taller barriers provide increased noise reduction.

Noise Descriptors

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound-pressure level in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies, which is referred to as the "A-weighted" sound level (expressed in units of dBA). The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted noise scale. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with environmental noise.

The intensity of environmental noise fluctuates over time, and several descriptors of time-averaged noise levels are typically used. For the evaluation of environmental noise, the most commonly used descriptors are L_{eq}, L_{dn}, CNEL and SEL. The energy-equivalent noise level, L_{eq}, is a measure of the average energy content (intensity) of noise over any given period. Many communities use 24-hour descriptors of noise levels to regulate noise. The day-night average noise level, L_{dn}, is the 24-hour average of the noise intensity, with a 10-dBA "penalty" added for nighttime noise (10 p.m. to 7 a.m.) to account for the greater sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} but adds an additional 5-dBA penalty for evening noise (7 p.m. to 10 p.m.) Another descriptor that is commonly discussed is the single-event noise exposure level, also referred to as the sound-exposure level, expressed as SEL. The SEL describes a receiver's cumulative noise exposure from a single noise event, which is defined as an acoustical event of short duration (0.5 second), such as a backup beeper, the sound of an airplane traveling overhead, or a train whistle. Common noise level descriptors are summarized in Table 3.8-1.

TABLE 3.8-1: COMMON ACOUSTICAL DESCRIPTORS

DESCRIPTOR	DEFINITION
Energy Equivalent Noise Level (L_{eq})	The energy mean (average) noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value (in dBA) is calculated.
Minimum Noise Level (L_{min})	The minimum instantaneous noise level during a specific period of time.
Maximum Noise Level (L_{max})	The maximum instantaneous noise level during a specific period of time.
Day-Night Average Noise Level (DNL or L_{dn})	The DNL was first recommended by the U.S. EPA in 1974 as a "simple, uniform and appropriate way" of measuring long term environmental noise. DNL takes into account both the frequency of occurrence and duration of all noise events during a 24-hour period with a 10 dBA "penalty" for noise events that occur between the more noise-sensitive hours of 10:00 p.m. and 7:00 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours to account for increases sensitivity to noise during these hours.
Community Noise Equivalent Level (CNEL)	The CNEL is similar to the Ldn described above, but with an additional 5 dBA "penalty" added to noise events that occur between the hours of 7:00 p.m. to 10:00 p.m. The calculated CNEL is typically approximately 0.5 dBA higher than the calculated Ldn.
Single Event Level (SEL)	The level of sound accumulated over a given time interval or event. Technically, the sound exposure level is the level of the time-integrated mean square A-weighted sound for a stated time interval or event, with a reference time of one second.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases. The acceptability of noise and the threat to public well-being are the basis for land use planning policies preventing exposure to excessive community noise levels.

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

- Except in carefully controlled laboratory experiments, a change of 1 dB cannot be perceived by humans;
- Outside of the laboratory, a 3-dB change is considered a just-perceivable difference;
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected. An increase of 5 dB is typically considered substantial;
- A 10-dB change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

3.8.2 EXISTING SETTING

Sensitive Land Uses

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as, uses where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other noise-sensitive land uses include hospitals, convalescent facilities, parks, hotels, places of worship, libraries, and other uses where low interior noise levels are essential.

Noise-sensitive land uses located near the project site consist predominantly of residential land uses. There are existing residences in a mobile home park located across the Sacramento River to the north and northeast of the project site. There are a limited number of existing residences located across SR 273 to the southwest of the project site. Noise sensitive land uses in the vicinity of the project site are shown in Figure 3.8-1.

Ambient Noise Levels

The project site noise environment is subjectively considered fairly loud, due to the amount of on-site equipment which operates from approximately 6:00 a.m. to midnight. In addition, adjacent operations from the Siskiyou Forest Products operations, railroad operations, and nearby I-5 and S.R. 273 contribute to the noise environment in the project vicinity. To quantify typical noise levels at the property lines of the project site and in the immediate project vicinity, continuous 24-hour ambient noise surveys were conducted by j.c. brennan & associates at three locations on October 20-21, 2009. The ambient noise monitoring sites are described as follows:

- Site 1: This site is located along the southwest property line, and adjacent to the Siskiyou Forest Products lumber mill facility. Based upon field observations, the background noise environment is dominated by activity at the SPI mill and the Siskiyou Forest Products mill. Noise Monitoring Site #1 was located approximately 1,200 feet to the west from the existing cogeneration plant, and the noise levels were not audible at this site;

- Site 2: This site is located along the southeast property line, and adjacent to a greenbelt and light industry/manufacturing facilities. Based upon field observations, the background noise environment at this site was dominated by activity at the SPI mill. Noise Monitoring Site #2 was located approximately 1,250 feet to the south from the existing cogeneration plant, and the noise levels were not audible at this site.

- Site 3: This site is located to the northeast, and across the Sacramento River. This site is in direct line of sight to the existing and proposed power plant, within the Sacramento River RV Resort (Space 95). Based upon field observations, the background noise environment at this site was dominated by activity at the RV Resort, I-5 traffic, and some activity at the SPI mill. The cogeneration plant noise levels were not audible at this site.

Noise measurement equipment consisted of Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters. The meters were calibrated before and after use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

A summary of the noise measurement data for the 24-hour continuous noise measurement site is shown in Table 3.8-2. Noise measurement locations are shown on Figure 3.8-2.

TABLE 3.8-2: SUMMARY OF CONTINUOUS MEASURED AMBIENT NOISE LEVELS

Ldn	AVERAGE HOURLY DAYTIME (7:00AM - 10:00PM)			AVERAGE HOURLY NIGHTTIME (10:00PM – 7:00AM)		
	Leq	**L50**	**Lmax**	**Leq**	**L50**	**Lmax**
Site 1 – Southwest Property Line						
62.5 dBA	56.4 dBA	55 dBA	72.2 dBA	56.0 dBA	55 dBA	70.5 dBA
Site 2 – Southeast Property Line						
64.6 dBA	57.8 dBA	56 dBA	74.2 dBA	58.3 dBA	55 dBA	74.5 dBA
Site 3 – Sacramento RV Resort						
61.3 dBA	56.6 dBA	56 dBA	69.4 dBA	54.6 dBA	53 dBA	64.4 dBA
Source: j.c. brennan & associates, Inc. - 2009						

Existing Power Plant Noise Levels

The existing power plant includes a 4 megawatt (MG) turbine generator with a 2-Cell cooling tower and 80,000 pound per hour boiler. As a means of determining the noise levels associated with the existing cogeneration power plant, j.c. brennan & associates, Inc. conducted noise level measurements of the cogeneration plant operations. The noise measurements were conducted for a period of time that a steady-state Leq was observed. The plant operations reflected typical operating conditions. Overall A-weighted noise levels and frequency analyses of the plant operation noise levels were conducted. All noise measurements were conducted in the free-field to assess all noise sources associated with the equipment. The primary noise sources included the cooling tower, boiler and steam turbine. Noise levels associated with the cooling tower were isolated. However, noise levels associated with the turbine and boiler could not be isolated individually. Therefore, the overall noise levels associated with the boiler and turbine operations were measured together. Table 3.8-3 shows the results of the noise measurements.

Noise measurement equipment consisted of Larson Davis Laboratories (LDL) Model 824 precision integrating sound level meter. The meter was equipped with 1/3 and 1/1 octave band filters. The meter was calibrated before and after use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4) and frequency analyzers.

TABLE 3.8-3: EXISTING SPI COGENERATION PLANT NOISE LEVELS

SOURCE	DISTANCE	SOUND LEVEL	
		Leq	**Converted Sound Power Level**
Cooling Tower	30 feet	72.7 dBA	102 dBA
Boiler & Steam Turbine	70 feet	71.6 dBA	112 dBA
Source: j.c. brennan & associates, Inc. - 2009			

The noise level data shown in Table 3.8-3, and the frequency data shown in Table 3.8-4 were used to determine the overall noise levels associated with the existing cogeneration power plant.

As a means of predicting noise levels associated with the existing cogeneration plant operations, j.c. brennan & associates, Inc. used the computer based "Environmental Noise Model" (ENM). The ENM is capable of projecting the locations of noise contours for multiple noise sources, while accounting for natural topography, ground type, atmospheric conditions, noise source directionality, height of the noise sources, and frequency content of the noise sources.

Inputs to the ENM were obtained from base maps for the site. Other inputs to the ENM included temperature and the relative humidity. In addition, existing buildings on the site, including the sawmill, kilns and planer building, as well as the log decks, were digitized into the model to account for shielding. Noise level and sound power data were based upon the noise measurements described above. Octave band sound power levels which were used for direct inputs to the ENM for each individual piece of the cogeneration plant equipment are contained within Table 3.8-4.

TABLE 3.8-4: EXISTING COGENERATION POWER PLANT ENM INPUT SOUND POWER LEVELS

COMPONENT	LINEAR OCTAVE BAND CENTER FREQUENCY, HZ IN DB									DBA
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
Turbine/Boiler	115	118	114	110	106	102	99	96	91	112
Cooling Tower	107	113	109	104	101	93	89	86	85	102
Source: j.c. brennan & associates, Inc. - 2009										

Figure 3.8-3 shows the noise contours associated with the existing cogeneration power plant operations. Based upon the analysis, existing cogeneration power plant, 45 dBA Leq noise contour is confined to the existing SPI mill site. In addition, the cogeneration power plant noise levels are more than 10 dBA less than the existing background noise levels.

Existing Lumber Mill Noise Levels at Osprey Nesting Site

Currently, there is an existing Osprey nesting site located on an electrical transmission tower at the northeast corner of the lumber mill site. Figure 3.8-2 shows the location of the Osprey Nesting Site. j.c. brennan & associates, Inc. conducted noise level measurements of the lumber mill operations at the base of the tower. The primary noise sources were the planer building and the bag house. Measured noise levels were approximately 70 dB Leq at the base of the tower. Assuming that other contributions of noise occur at the elevated nesting site, it is estimated that the lumber mill noise levels could be as high as 73 dB Leq at the nesting site. It should be noted that this nesting site is used on an annual basis, and therefore does not appear to be affected by the noise.

Existing Roadway Traffic Noise Levels

To describe existing traffic noise levels on the area roadways, j.c. brennan & associates, Inc. used the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108). The FHWA model is the analytical method which was developed for highway traffic noise prediction for most state and local agencies, including the California Department of Transportation (Caltrans).

The FHWA model is based upon the Calveno reference noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly Leq values for free-flowing traffic conditions. To predict Ldn values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Average daily traffic (ADT) volumes for existing conditions were obtained from the traffic study prepared for the project by Omni Means. Table 3.8-5 shows the predicted existing traffic noise levels at a reference distance of 100 feet from the roadway centerlines. The FHWA Model inputs are shown in the Environmental Noise Assessment, included as **Appendix F**.

TABLE 3.8-5: EXISTING TRAFFIC NOISE LEVELS AND DISTANCES TO NOISE CONTOURS

ROADWAY	SEGMENT	ADT	LDN @ 100 FEET	DISTANCE TO LDN CONTOUR (FEET)[1]		
				60 dB	65 dB	70 dB
Riverside Ave.	North of Ox Yoke Rd.	2440	58 dBA	74	35	16
Ox Yoke Rd.	East of Riverside Ave.	8460	60 dBA	102	48	22
Ox Yoke Rd.	West of Riverside Ave.	7200	59 dBA	92	43	20

[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

Source: FHWA-RD-77-108 with inputs from Omni Means Transportation Consultants, Caltrans and j.c. brennan & associates, Inc.

3.8.3 REGULATORY SETTING

STATE OF CALIFORNIA

California General Plan Guidelines

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The *State of California General Plan Guidelines* (State of California 1998), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

SHASTA COUNTY

Shasta County General Plan

The goals of the Shasta County General Plan Noise Element are:

N-1 To protect County residents from the harmful and annoying effects of exposure to excessive noise.

N-2 To protect the economic base of the County by preventing incompatible land uses from encroaching upon existing or planned noise-producing uses.

N-3 To encourage the application of state of the art land use planning methodologies in areas of potential noise conflicts.

The following noise policies, some of which are excerpted or summarized, of the Shasta County General Plan are relevant to the proposed project:

N-b Noise likely to be created by a proposed non-transportation land use shall be mitigated so as not to exceed the noise level standards of Table N-IV [of the Shasta County General Plan] as measured immediately within the property line of adjacent lands designated as noise-sensitive. . . .

Note: For the purposes of the Noise Element, transportation noise sources are defined as traffic on public roadways, railroad line operations and aircraft in flight. Control of noise from these sources is preempted by Federal and State regulations. Other noise sources are presumed to be subject to local regulations, such as a noise control ordinance. Non-transportation noise sources may include industrial operations, outdoor recreation facilities, HVAC units, loading docks, etc.

N-c Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table N-IV [of the Shasta County General Plan] upon existing or planned noise-sensitive land uses, an acoustical analysis shall be required as part of the environmental review process so that appropriate noise mitigation may be included in the project design. . . .

N-f Noise created by new transportation sources shall be mitigated to satisfy the levels specified in Table N-VI [of the Shasta County General Plan] at outdoor activity areas and/or interior spaces of existing noise-sensitive land uses. . . .

N-i Where noise mitigation measures are required to achieve the standards of Tables N-IV and N-VI [of the Shasta County General Plan], the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving compliance with the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.

TABLE 3.8-6: (TABLE N-IV OF THE SHASTA COUNTY GENERAL PLAN)
NOISE LEVEL PERFORMANCE STANDARDS FOR NEW PROJECTS
AFFECTED BY OR INCLUDING NON-TRANSPORTATION SOURCES

NOISE LEVEL DESCRIPTOR	DAYTIME (7 A.M. TO 10 P.M.)	NIGHTTIME (10 P.M. TO 7 A.M.)
Hourly L_{eq}, dB	55	50

Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises (e.g., humming sounds, outdoor speaker systems). These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

The County can impose noise level standards which are more restrictive than those specified above based upon determination of existing low ambient noise levels.

In rural areas where large lots exist, the exterior noise level standard shall be applied at a point 100' away from the residence.

Industrial, light industrial, commercial and public service facilities which have the potential for producing objectionable noise levels at nearby noise-sensitive uses are dispersed throughout the County. Fixed noise sources which are typically of concern include, but are not limited to the following:

HAC Systems	Cooling Towers/Evaporative Condensers
Pump Stations	Lift Stations
Emergency Generators	Boilers
Steam Valves	Steam Turbines
Generators	Fans
Air Compressors	Heavy Equipment
Conveyor Systems	Transformers
Pile Drivers	Grinders
Drill Rigs	Gas or Diesel Motors
Welders	Cutting Equipment
Outdoor Speakers	Blowers

The types of uses which may typically produce the noise sources described above include but are not limited to: industrial facilities including lumber mills, trucking operations, tire shops, auto maintenance shops, metal fabricating shops, shopping centers, drive-up windows, car washes, loading docks, public works projects, batch plants, bottling and canning plants, recycling centers, electric generating stations, race tracks, landfills, sand and gravel operations, and athletic fields.

TABLE 3.8-7: (TABLE N-VI OF THE SHASTA COUNTY GENERAL PLAN)
MAXIMUM ALLOWABLE NOISE EXPOSURE FOR TRANSPORTATION NOISE SOURCES

LAND USE	OUTDOOR ACTIVITY AREAS[1] L_{DN}/CNEL, DB	INTERIOR SPACES	
		L_{DN}/CNEL,DB	L_{EQ}, DB[2]
Residential	60[3]	45	--
Transient Lodging	60[4]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

[1] *WHERE THE LOCATION OF OUTDOOR ACTIVITY AREAS IS UNKNOWN, THE EXTERIOR NOISE LEVEL STANDARD SHALL BE APPLIED TO THE PROPERTY LINE OF THE RECEIVING LAND USE.*

WHERE IT IS NOT PRACTICAL TO MITIGATE EXTERIOR NOISE LEVELS AT PATIO OR BALCONIES OF APARTMENT COMPLEXES, A COMMON AREA SUCH AS A POOL OR RECREATION AREA MAY BE DESIGNATED AS THE OUTDOOR ACTIVITY AREA.

[2] *AS DETERMINED FOR A TYPICAL WORST-CASE HOUR DURING PERIODS OF USE.*

[3] *WHERE IT IS NOT POSSIBLE TO REDUCE NOISE IN OUTDOOR ACTIVITY AREAS TO 60 DB L_{DN}/CNEL OR LESS USING A PRACTICAL APPLICATION OF THE BEST-AVAILABLE NOISE REDUCTION MEASURES, AN EXTERIOR NOISE LEVEL OF UP TO 65 DB L_{DN}/CNEL MAY BE ALLOWED PROVIDED THAT AVAILABLE EXTERIOR NOISE LEVEL REDUCTION MEASURES HAVE BEEN IMPLEMENTED AND INTERIOR NOISE LEVELS ARE IN COMPLIANCE WITH THIS TABLE.*

[4] *IN THE CASE OF HOTEL/MOTEL FACILITIES OR OTHER TRANSIENT LODGING, OUTDOOR ACTIVITY AREAS SUCH AS POOL AREAS MAY NOT BE INCLUDED IN THE PROJECT DESIGN. IN THESE CASES, ONLY THE INTERIOR NOISE LEVEL CRITERION WILL APPLY.*

Groundborne Vibration

There are no federal, state, or local regulatory standards for ground-borne vibration. However, various criteria have been established to assist in the evaluation of vibration impacts. For instance, the California Department of Transportation (Caltrans) has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans-recommended criteria for the evaluation of groundborne vibration levels, with regard to structural damage and human annoyance, are summarized in Table 3.8-8 and Table 3.8-9, respectively. The criteria differentiate between transient and continuous/frequent sources. Transient sources of ground-borne vibration include intermittent events, such as blasting; whereas, continuous and frequent events would include the operations of equipment, including construction equipment, and vehicle traffic on roadways (Caltrans 2002, 2004).

The ground-borne vibration criteria recommended by Caltrans for evaluation of potential structural damage is based on building classifications, which take into account the age and condition of the building. For residential structures and newer buildings, Caltrans considers a minimum peak-particle velocity (ppv) threshold of 0.25 inches per second (in/sec) for transient sources and 0.04 in/sec for continuous/frequent sources to be sufficient to protect against building damage. Continuous ground-borne vibration levels below approximately 0.02 in/sec ppv are unlikely to cause damage to any structure. In terms of human annoyance, continuous vibrations in excess of 0.04 in/sec ppv and transient sources in excess of 0.25 in/sec ppv are identified by Caltrans as the minimum perceptible level for ground vibration. Short periods of ground vibration in excess of 2.0 in/sec ppv can be expected to result in severe annoyance to people. Short periods of ground vibration in excess of 0.1 in/sec ppv (0.2 in/sec ppv within buildings) can be expected to result in increased levels of annoyance (Caltrans 2002, 2004).

TABLE 3.8-8: DAMAGE POTENTIAL TO BUILDINGS AT VARIOUS GROUNDBORNE VIBRATION LEVELS

STRUCTURE AND CONDITION	VIBRATION LEVEL (IN/SEC PPV)	
	TRANSIENT SOURCES	CONTINUOUS/FREQUENT INTERMITTENT SOURCES
Extremely Fragile Historic Buildings, Ruins, Ancient Monuments	0.12	0.08
Fragile Buildings	0.2	0.1
Historic and Some Old Buildings	0.5	0.25
Older Residential Structures	0.5	0.3
New Residential Structures	1.0	0.5
Modern Industrial/Commercial Buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans 2002, 2004

TABLE 3.8-9: ANNOYANCE POTENTIAL TO PEOPLE AT VARIOUS GROUNDBORNE VIBRATION LEVELS

HUMAN RESPONSE	VIBRATION LEVEL (IN/SEC PPV)	
	TRANSIENT SOURCES	CONTINUOUS/FREQUENT INTERMITTENT SOURCES
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.10
Severe	2.0	0.4

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans 2002, 2004

3.8.4 IMPACTS AND MITIGATION MEASURES

METHODOLOGY

The analysis of noise impacts for this project focuses on the following areas:

1. Noise impacts due to on-site cogeneration plant operations;
2. Noise impacts due to increased traffic noise levels;
3. Noise impacts due to construction activities;
4. Vibration impacts due to construction activities;

Noise Impact Assessment Methodology for Cogeneration Plant Noise Levels

To determine the future noise levels associated with the proposed cogeneration power plant, the Environmental Noise Model (ENM) was used to determine the locations of the future noise contours. Table 3.8-10 shows the sound power inputs to the ENM. Noise level data used as direct inputs to the ENM were provided by one of the potential turbine manufacturer's (General Electric), and noise level data for the proposed boiler and cooling tower were based upon noise measurement data collected by ENVIRON consultants at the SPI Aberdeen Washington power plant. This analysis assumes that the boiler would be equipped with a silencer on the steam vent. Locations of each piece of equipment were provided by SPI. Figure 3.8-4 shows the locations of the Leq contours associated with the new power plant.

Noise Impact Assessment Methodology for Traffic Noise

To describe future noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The FHWA model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model was developed to predict hourly Leq values for free-flowing traffic conditions. To predict Ldn values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Direct inputs to the FHWA model included traffic volumes contained within the project traffic analysis, as well as truck volumes contained in the analysis. It is estimated that an additional 23 truck trips per day, to and from the facility, will be required for the new facility, and approximately 6 additional employee vehicles, to and from the facility, per day.

Noise Impact Assessment Methodology for Construction Noise

Construction noise was analyzed using data compiled by the Federal Highway Administration Roadway Construction Noise Model User's Guide.

Vibration Impact Assessment Methodology for Construction-related Vibration

The types of construction vibration impacts include human annoyance and building structural damage. The analysis of construction vibration impacts will utilize vibration data for various pieces of construction equipment compiled by the Federal Transit Administration and j.c. brennan & associates, Inc..

THRESHOLDS OF SIGNIFICANCE

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act Guidelines (CEQA Guidelines, Appendix G). According to those guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or of applicable standards of other agencies.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- For a project located within an airport land use plan area or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project expose people residing or working in the project area to excessive noise levels.
- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

The nearest airport/airstrip is the Redding Municipal Airport, which is located approximately 2.2 miles northeast of the project site. Implementation of the proposed project would not affect airport operations, nor would implementation of the proposed project result in the development or relocation of any noise-sensitive land uses within two miles of any airport or airstrip. As a result, implementation of the proposed project would not result in increased exposure of individuals to excessive aircraft noise levels associated with the existing airport. There are no existing private airstrips within two miles of the project area. For these reasons, noise impacts associated with existing airports and airstrips were identified as having no impact and will not be further discussed in this section.

Temporary noise impacts associated with the proposed project would be associated with short-term construction-related activities. Long-term permanent increases in noise levels would occur associated with onsite operational activities. Potential increases in groundborne vibration levels would be primarily associated with short-term construction-related activities. For purposes of this analysis and where applicable, the Shasta County General Plan Noise Element noise standards were used for evaluation of project-related noise impacts.

IMPACTS AND MITIGATION MEASURES

Impact 3.8-1: Noise associated with operation of the proposed Cogeneration Facility would not exceed applicable noise standards at nearby sensitive land uses (Less than Significant)

To determine the future noise levels associated with the proposed cogeneration power plant, the ENM was once again used to determine the locations of the future noise contours. Table 3.8-10 shows the sound power inputs to the ENM. Noise level data used as direct inputs to the ENM were provided by one of the potential turbine manufacturer's (General Electric), and noise level data for the proposed boiler and cooling tower were based upon noise measurement data collected by ENVIRON consultants at the SPI Aberdeen Washington power plant. This analysis assumes that the boiler would be equipped with a silencer on the steam vent. Locations of each piece of equipment were provided by SPI. Figure 3.8-4 shows the locations of the Leq contours associated with the new power plant.

TABLE 3.8-10: PROPOSED COGENERATION POWER PLANT ENM INPUT SOUND POWER LEVELS

COMPONENT	LINEAR OCTAVE BAND CENTER FREQUENCY, HZ IN DB									DBA
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
Turbine *Gear Reducer Generator	122	117	110	106	97	80	76	74	63	100.8
Cooling Tower	116	115	108	108	102	99	98	93	85	105.8
Boiler	101	100	94	94	96	86	82	78	73	94.8

Source: j.c. brennan & associates, Inc. – 2009
**Gear Reducer has a sound absorbing cover.*

Based upon the ENM contours shown in Figure 3.8-4 for the proposed cogeneration power plant, the noise levels associated with the proposed plant will be approximately 3 dBA lower than the existing plant. This is due to the fact that the equipment is new and more efficient, the boiler and the turbine will be located within metal buildings, and the boiler will be fitted with a silencer on the steam vent. In addition, the noise levels associated with the proposed power plant are less than the measured daytime and nighttime ambient noise levels shown in Table 3.8-2. The 50 dBA and 55 dBA Leq noise contours are confined to the project site. The 45 dBA Leq noise contour is confined to the project site and the industrial uses to the east, and does not encroach upon any noise-sensitive land uses. No increases in overall ambient noise levels associated with operation of the proposed cogeneration facility are expected to occur. This is a **less than significant** impact.

Impact 3.8-2: Implementation of the proposed project would not result in a significant increase in traffic noise levels (Less than Significant)

To describe future noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The FHWA model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model was developed to predict hourly Leq values for free-flowing traffic conditions. To predict Ldn values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Direct inputs to the FHWA model included traffic volumes contained within the project traffic analysis, as well as truck volumes contained in the analysis. It is estimated that an additional 23 truck trips per day, to and from the facility, will be required for the new facility, and approximately 6 additional employee vehicles, to and from the facility, per day.

Table 3.8-11 shows the results of the changes in traffic noise levels for the Existing Plus Project scenario, and Table 3.8-12 shows the results of the changes in traffic noise levels for the Cumulative Plus Project scenario.

TABLE 3.8-11: PROJECT CHANGES IN TRAFFIC NOISE LEVELS- EXISTING PLUS PROJECT

Segment	Ldn @ 100 feet		Change	Distance to Existing + Project Ldn Contours (feet)[1]	
	Existing	Existing + Project		60 dB	65 dB
Riverside Avenue					
North of Ox Yoke Rd	58 dBA	58 dBA	0 dBA	74	35
Ox Yoke Road					
East of Riverside Ave	60 dBA	61 dBA	+1 dBA	102	48
West of Riverside Ave	59 dBA	60 dBA	+ 1 dBA	92	43

[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

Source: FHWA-RD-77-108 with inputs from Omni Means Transportation Consultants, Caltrans and j.c. brennan & associates, Inc.

TABLE 3.8-12: PROJECT CHANGES IN TRAFFIC NOISE LEVELS- CUMULATIVE PLUS PROJECT

Segment	Ldn @ 100 feet		Change	Distance to Cumulative + Project Ldn Contours (feet)[1]	
	Cumulative	Cumulative + Project		60 dB	65 dB
Riverside Avenue					
North of Ox Yoke Rd	60 dBA	60 dBA	0 dBA	102	48
Ox Yoke Road					
East of Riverside Ave	61 dBA	62 dBA	+1 dBA	133	62
West of Riverside Ave	61 dBA	61 dBA	0 dBA	122	57

[1] Distances to traffic noise contours are measured in feet from the centerlines of the roadways.

Source: FHWA-RD-77-108 with inputs from Omni Means Transportation Consultants, Caltrans and j.c. brennan & associates, Inc.

Based upon the traffic noise analysis contained in Table 3.8-11 and Table 3.8-12, the project will not result in exceedances of the Shasta County General Plan Noise Element traffic noise criteria. In addition, the project will not result in a significant increase in traffic noise levels. The increases in traffic noise levels due to the project have been calculated to be less than 1 dB Ldn. Therefore, the proposed project would be expected to have a **less than significant** impact related to increased traffic noise in the area.

Impact 3.8-3: Short-term construction-generated noise levels associated with the proposed project could result in a substantial temporary increase in ambient noise levels at nearby noise-sensitive land uses. Short-term increases in ambient noise levels may result in increased levels of annoyance and activity interference at nearby noise-sensitive land uses (Less than Significant with Mitigation)

Construction noise was analyzed using data compiled by the Federal Highway Administration Roadway Construction Noise Model User's Guide.

TABLE 3.8-13: CONSTRUCTION EQUIPMENT NOISE

TYPE OF EQUIPMENT	MAXIMUM LEVEL, dBA AT 50 FEET
Backhoe	78
Compactor	83
Compressor (air)	78
Concrete Saw	90
Dozer	82
Dump Truck	76
Excavator	81
Generator	81
Jackhammer	89
Pneumatic Tools	85
Pile Driving	95 - 100

SOURCE: ROADWAY CONSTRUCTION NOISE MODEL USER'S GUIDE. FEDERAL HIGHWAY ADMINISTRATION. FHWA-HEP-05-054. JANUARY 2006.

Activities associated with construction will result in temporary elevated noise levels within the immediate area. Activities involved in construction would generate maximum noise levels, as indicated in Table 3.8-13, ranging from 76 to 90 dB at a distance of 50 feet, and up to 100 dBA if pile driving is required. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours.

Because construction activities could result in periods of elevated noise levels at existing residences, this impact is considered **potentially significant**.

MITIGATION MEASURES

Mitigation Measure 3.8-1*: The following mitigation measures shall be included in the project's Conditional Use Permit:*

a) *Construction activities (excluding activities that would result in a safety concern to the public or construction workers) shall be limited to between the hours of 7:00 a.m. and 7:00 p.m. Construction activities shall be prohibited on Sundays and federal holidays.*

b) *Construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.*

c) *Construction equipment staging areas shall be located at the furthest distance possible from nearby noise-sensitive land uses.*

SIGNIFICANCE AFTER MITIGATION

Implementation of the above mitigation measures would limit construction activities to the less noise-sensitive periods of the day. Use of mufflers would reduce individual equipment noise levels by approximately 10 dBA. With implementation of the above mitigation measures, noise-generating construction activities would comply with the Shasta County General Plan Noise Element requirements and would be considered **less than significant**.

Impact 3.8-4: Exposure to ground-borne vibration levels would not exceed applicable groundborne vibration criterion at nearby existing or proposed land uses (Less than Significant)

The types of construction vibration impacts include human annoyance and building structural damage. The analysis of construction vibration impacts will utilize vibration data for various pieces of construction equipment compiled by the Federal Transit Administration and j.c. brennan & associates, Inc. Table 3.8-14 provides a list of vibration levels expected from various types of construction equipment.

TABLE 3.8-14: VIBRATION LEVELS FOR VARYING CONSTRUCTION EQUIPMENT

TYPE OF EQUIPMENT	PEAK PARTICLE VELOCITY @ 25 FEET (INCHES/SECOND)	APPROXIMATE VELOCITY LEVEL @ 25 FEET (VDB)
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Small Bulldozer	0.003	58
Auger/drill Rigs	0.089	87
Jackhammer	0.035	79
Vibratory Hammer	0.070	85
Vibratory Compactor/roller	0.210	94
*Pile Driver	0.055 - 0.078 @ 100 feet	--

SOURCE: FEDERAL TRANSIT ADMINISTRATION, TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT GUIDELINES, MAY 2006

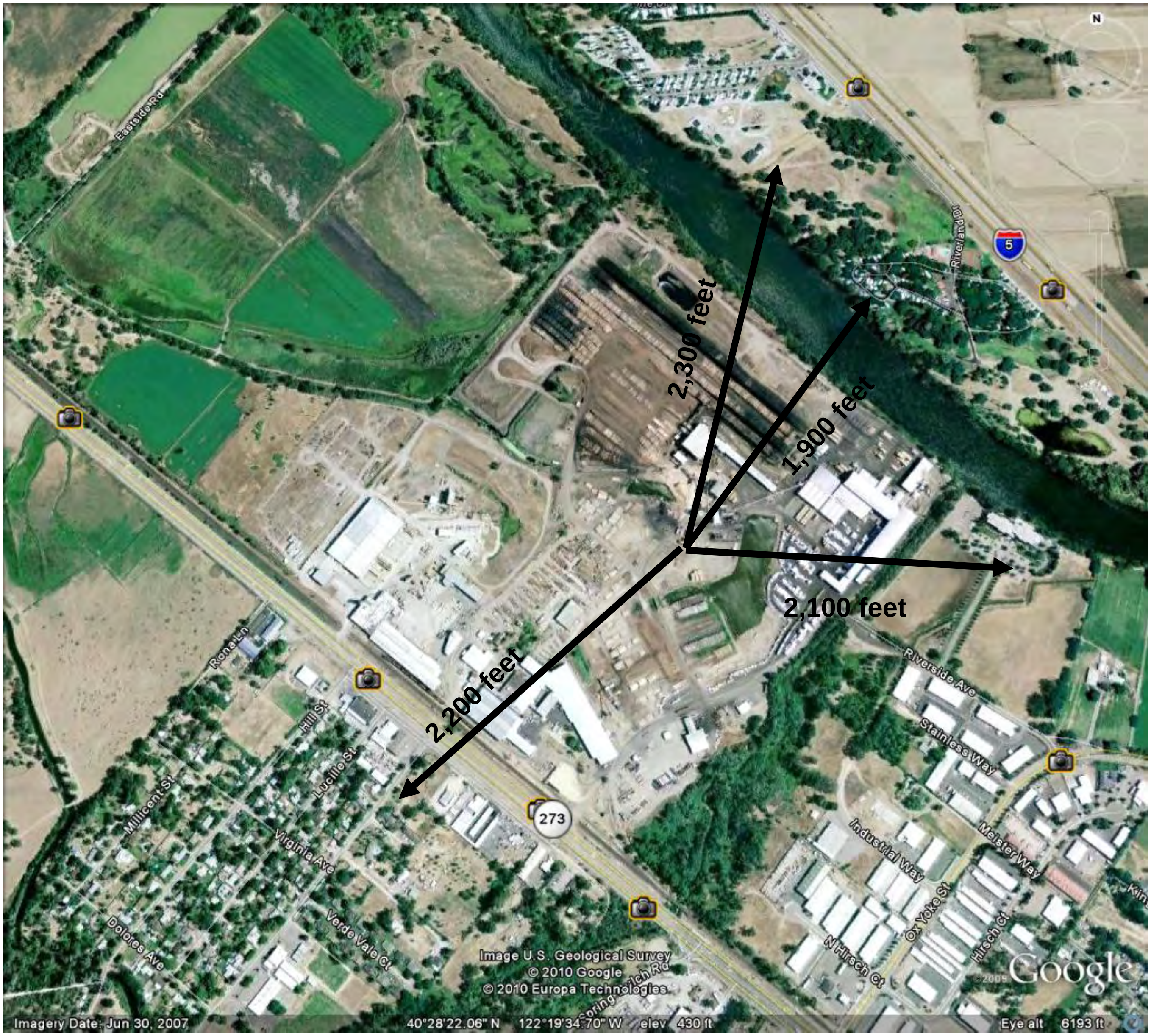
** SOURCE: J.C. BRENNAN & ASSOCIATES, INC. - 2008*

The primary construction activities associated with the project would occur when the equipment is installed and buildings are constructed. Comparing Table 3.8-9, which contains the criteria for acceptable vibration levels, to Table 3.8-14, which shows potential vibration impacts, it is not expected that vibration impacts would occur which would cause any structural damage. Additionally, the existing SPI cogeneration facility operates an electrostatic precipitator (ESP) for the control of particulate matter. ESP's must have a mechanism for removing the collected particulate matter from the collection plates. As a result, ESP's are equipped with a series of mechanical devices called rappers. The current SPI Anderson facility operates magnetic plate rappers which are located on the roof of the ESP. These rappers are relatively quiet in comparison to other types of rappers such as pneumatic rappers. Pneumatic rappers are much louder than the magnetic style and sound similar to a jackhammer operating continuously. The proposed cogeneration facility would also implement the use of a magnetic plate rapper, similar to the one currently in use on the site. As a result, noise increases and increases in groundborne vibrations for the use of a rapper in the ESP would not increase above the existing baseline conditions. Therefore, groundborne vibration impacts are considered **less than significant**.

This page left intentionally blank

Figure 3.8-1

Project Site and Distances to the Nearest Noise-Sensitive Receptors



j.c. brennan & associates
consultants in acoustics

This page left intentionally blank.

Figure 3.8-2

SPI Lumber Mill Site, Noise Measurement Sites & Project Area

: Noise Measurement Sites

Osprey Nest Site

SPI Site Boundaries

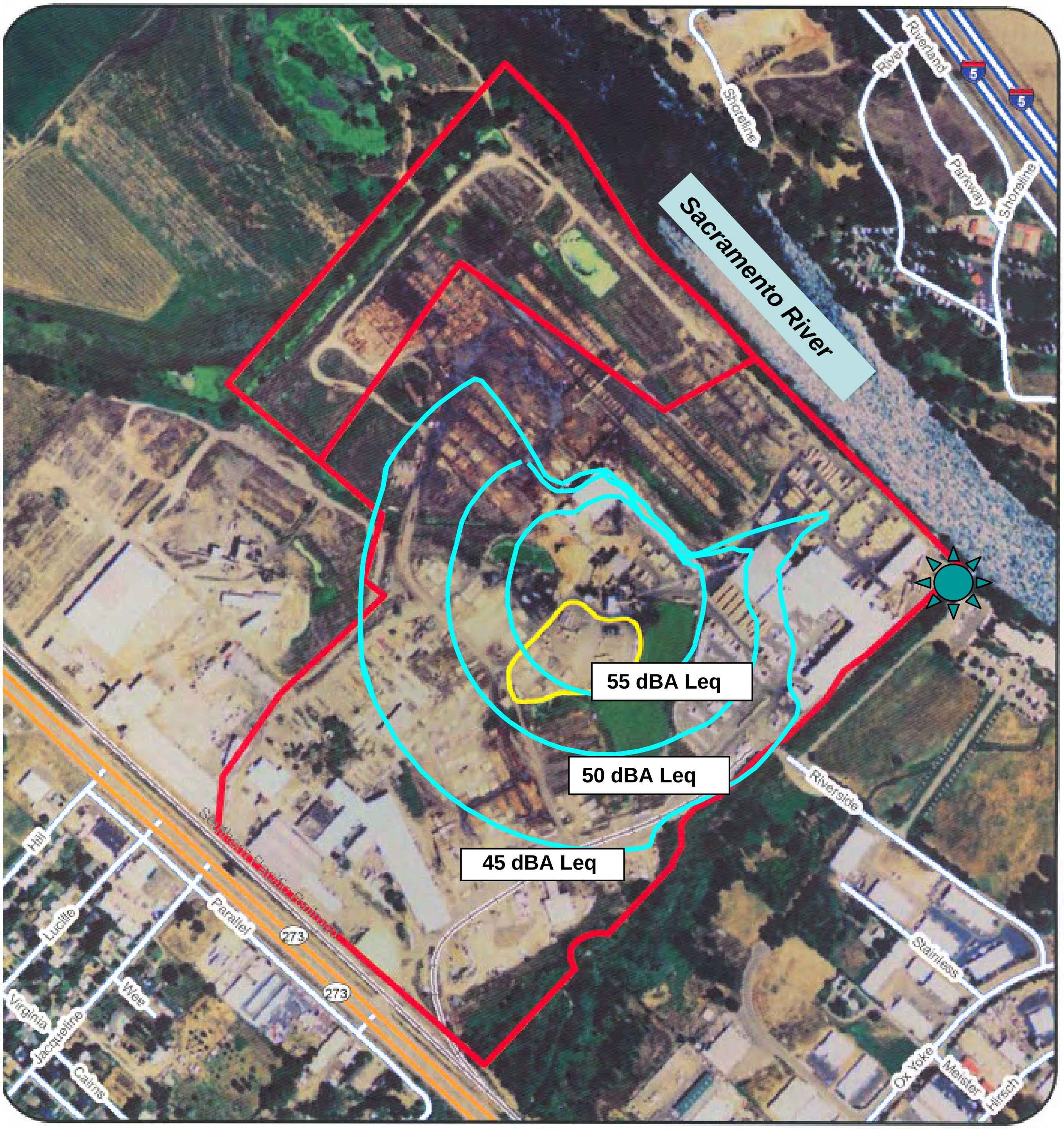
Cogeneration Plant Area

j.c. brennan & associates
consultants in acoustics

This page left intentionally blank.

Figure 3.8-3

Existing SPI Lumber Mill Cogeneration Plant Noise Levels



Noise Level Contours

SPI Site Boundaries

Cogeneration Plant Area

Osprey Nest Site

j.c. brennan & associates
consultants in acoustics

This page left intentionally blank.

Figure 3.8-4

Future SPI Lumber Mill Cogeneration Plant Noise Levels

Noise Level Contours

SPI Site Boundaries

Cogeneration Plant Area

Osprey Nest Site

j.c. brennan & associates
consultants in acoustics

This page left intentionally blank.