SUBSECTION 8.5

Noise

8.5 Noise

8.5.1 Introduction

The project site is located in the City of Turlock (City), in the County of Stanislaus (County). Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable laws, ordinances, regulations, or standards (LORS). Because the site is located within the City limits, noise regulations for the City would govern. However, given that the project is located adjacent to land under the jurisdiction of the County, noise impacts with respect to the County's noise element have also been examined.

Subsection 8.5.2 presents the fundamentals of acoustics while a description of the LORS is presented in Subsection 8.5.3. The affected environment is described in Subsection 8.5.4 and the Environmental Consequences (i.e., the potential project effects from both construction and operation) are analyzed in Subsection 8.5.5. Mitigation measures proposed to reduce potential impacts below the level of significance are presented in Subsection 8.5.6. The involved agencies and agency contacts are listed in Subsection 8.5.7. The permits and permitting schedule are discussed in Subsection 8.5.8. Subsection 8.5.9 provides the noise references.

8.5.2 Fundamentals of Acoustics

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this subsection are summarized in Table 8.5-1.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive sounds. Distant sources, such as traffic, typically makeup the background. The background level is generally defined by the L_{90} percentile noise level.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver. The intrusive level is generally defined by the L_{10} percentile noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure sound pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L_{90})
Day-Night Noise Level (L_{dn} or DNL)	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels from 10:00 p.m. to 7:00 a.m.

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (L_{eq}), which is defined as the average noise level, on an equal energy basis for a stated period of time, and is commonly used to measure steady state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by L_{xx} where xx represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, the Day-Night Sound Level (L_{dn} or DNL) was developed. L_{dn} is a noise index that accounts for the greater annoyance of noise during the nighttime hours.

L_{dn} values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period, and apply a weighting factor to nighttime L_{eq} values. The weighting factor, which reflects the increased sensitivity to noise during nighttime hours, is added to each hourly L_{eq} sound level before the 24-hour L_{dn} is calculated. For the purposes of assessing noise, the 24-hour day is divided into two time periods, with the following weightings:

- Daytime: 7 a.m. to 10 p.m. (15 hours) Weighting factor of 0 dB
- Nighttime: 10 p.m. to 7 a.m. (9 hours) Weighting factor of 10 dB

The two time periods are then averaged to compute the overall L_{dn} value. For a continuous noise source, the L_{dn} value is easily computed by adding 6.4 dB to the overall 24-hour noise level (L_{eq}). For example, if the expected continuous noise level from the power plant was 60.0 dBA, the resulting L_{dn} from the plant would be 66.4 dBA.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants typically experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

Table 8.5-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
Shotgun (at shooter's ear)	140	Carrier flight deck	Painfully loud
Civil defense siren (100 ft)	130		
Jet takeoff (200 ft)	120		Threshold of pain
Loud rock music	110	Rock music concert	
Pile driver (50 ft)	100		Very loud
Ambulance siren (100 ft)	90	Boiler room	
Pneumatic drill (50 ft)	80	Noisy restaurant	
Busy traffic; hair dryer	70		Moderately loud
Normal conversation (5 ft)	60	Data processing center	
Light traffic (100 ft); rainfall	50	Private business office	
Bird calls (distant)	40	Average living room library	Quiet
Soft whisper (5 ft); rustling leaves	30	Quiet bedroom	
	20	Recording studio	
Normal breathing	10		Threshold of hearing

Source: Beranek 1998

8.5.3 Laws, Ordinances, Regulations, and Standards

The following are the LORS that apply to noise generated by the WEC. They are summarized in Table 8.5-3.

TABLE 8.5-3
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Applicability (AFC Section Explaining Conformance)
Federal Offsite: USEPA	Guidelines for state and local governments.	Subsection 8.5.3.1.1.
Federal Onsite: OSHA	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.1.2, 8.5.5.2.1 and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety, of AFC.
State Onsite: Cal/OSHA 8 CCR Article 105 Sections 095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.2.1, 8.5.5.2.1 and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety, of AFC.
State Offsite: Calif. Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Delivery trucks and other vehicles will meet Code requirements.
Local California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	City of Turlock and County of Stanislaus conform, Subsection 8.5.3.3.
City of Turlock - Noise Ordinance	Establishes a 75-dBA standard for industrial uses. According to the City, zoning rather than use dictates the applicable standard.	Subsections 8.5.3.3 and 8.5.5.3.3.
City of Turlock - General Plan	Establishes “Land Use Compatibility Guidelines for Development” depicted in Table 8.5-5. No guideline for industrial uses. Upper range of “Conditionally Acceptable” for residential uses is 70 dBA L_{dn}. According to the City, zoning rather than use dictates the applicable standard.	Subsections 8.5.3.3 and 8.5.5.3.3.
County of Stanislaus – General Plan	Establishes the “Land Use Compatibility Guidelines for Community Noise Environments” depicted in Table 8.5-7. Upper limit of “Normally Acceptable” for industrial uses is 75 dBA L_{dn}. Upper limit of “Conditionally Acceptable” for residential uses is 70 dBA L_{dn}.	Subsections 8.5.3.3 and 8.5.5.3.3.

8.5.3.1 Federal

8.5.3.1.1 USEPA

Guidelines are available from the USEPA (1974) to assist state and local government entities in development of state and local LORS for noise. Because there are local LORS that apply to this project, these guidelines are not applicable.

8.5.3.1.2 OSHA

Onsite noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 (OSHA). The noise exposure level of workers is regulated at 90 dBA, over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95). Onsite noise levels will generally be in the 70- to 85-dBA range. Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

8.5.3.2 State of California

8.5.3.2.1 Cal-OSHA

The California Department of Industrial Relations, Division of Occupational Safety and Health enforces California Occupational Safety and Health Administration (Cal-OSHA) regulations, which are the same as the federal OSHA regulations described previously. The regulations are contained in Title 8 California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

8.5.3.2.2 California Vehicle Code

Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff's Office.

8.5.3.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties, and entities (such as multi-city port authorities) prepare and adopt a General Plan to guide community change. Both the City and County General Plans contain noise provisions.

Table 8.5-4 summarizes the applicable City noise regulations, since the project site is located in the City of Turlock. The site is zoned Industrial under the City's General Plan and Zoning Ordinance (refer to Figure 8.5-1, all figures are at the end of the subsection). The most restrictive standard applicable to WEC is the 75 dBA L_{50} Heavy Industrial standard set forth in the City's noise ordinance. Although there are a few residences within the City's industrial zoned area, the City has stated in a letter from Mike Cooke, Planning Manager for the City, to the Turlock Irrigation District that (the letter is included as Appendix 8.5A):

> "Pursuant to TMC §9-2-307(a), it is the industrial zoning, not the use that determines the applicable noise standard. Therefore, even though there are residences within the vicinity of the subject site, these residences are not considered sensitive land uses because they are located within the City of Turlock's "Industrial" zoning district. Therefore, given the industrial zoning of the project site and the industrial zoning surrounding the site, the city does

not believe the project would be located near any noise sensitive uses such as those contemplated in the Land Use Compatibility Guidelines found in the General Plan and in the Noise Ordinance." (Cooke 2002, Appendix 8.5A)

TABLE 8.5-4
Summary of Applicable Local Noise Regulations for the City of Turlock

Applicable Regulation	General Standard
Noise Ordinance—Chapter 9-2-307	Exterior noise level of 75 dBA L_{50} for Heavy Industrial uses at all times.
	Exterior noise level of 50 dBA L_{50} for Urban, 45 dBA L_{50} for Suburban and 40 dBA L_{50} for Rural/Suburban – One- and Two-Family Residential uses between the nighttime hours of 10 p.m. to 7 a.m.
	Exterior noise level of 60 dBA L_{50} for Urban, 55 dBA L_{50} for Suburban and 50 dBA L_{50} for Rural/Suburban – One- and Two-Family Residential uses between the daytime hours of 7 a.m. to 10 p.m.
	The City has stated that the industrial zoning rather than the use prevails in determining the applicable noise standard.
General Plan—Section 8	Sets forth the "Land Use Compatibility Guidelines for Development" depicted in Table 8.5-5. No guidelines established for industrial uses.
	The City has stated that the industrial zoning rather than the use prevails in determining the applicable noise standard.

Source: City of Turlock. 2002a, 2002c.

TABLE 8.5-5
City of Turlock's Land Use Compatibility Guidelines for Development

Land Use Category	Community Noise Exp. Ldn or CNEL dB 55	60	65	70	75	80	Interpretation
Residential, Theaters, Auditoriums, Music Halls, Meeting Halls, Churches							**Acceptable** Specific land use is satisfactory. No noise mitigation measures are required.
Transient Lodging—Motels, Hotels; Schools, Libraries, Churches, Hospitals, Nursing Homes							**Conditionally Acceptable** Use should be permitted only after careful study and inclusion of protective measures as needed to satisfy the policies of the Noise Element.
Playgrounds, Neighborhood Parks, Office Buildings							**Unacceptable** Development is usually not feasible in accordance with the goals of the Noise Element.

Source: City of Turlock 2002a.

Although the project is located within the City's jurisdiction, it is adjacent to land within the jurisdiction of the County; therefore, the applicable County noise standards are summarized for completeness in Table 8.5-6. The County does not have a noise ordinance, therefore, the applicable County noise criteria are contained in the Noise Element of the General Plan. The

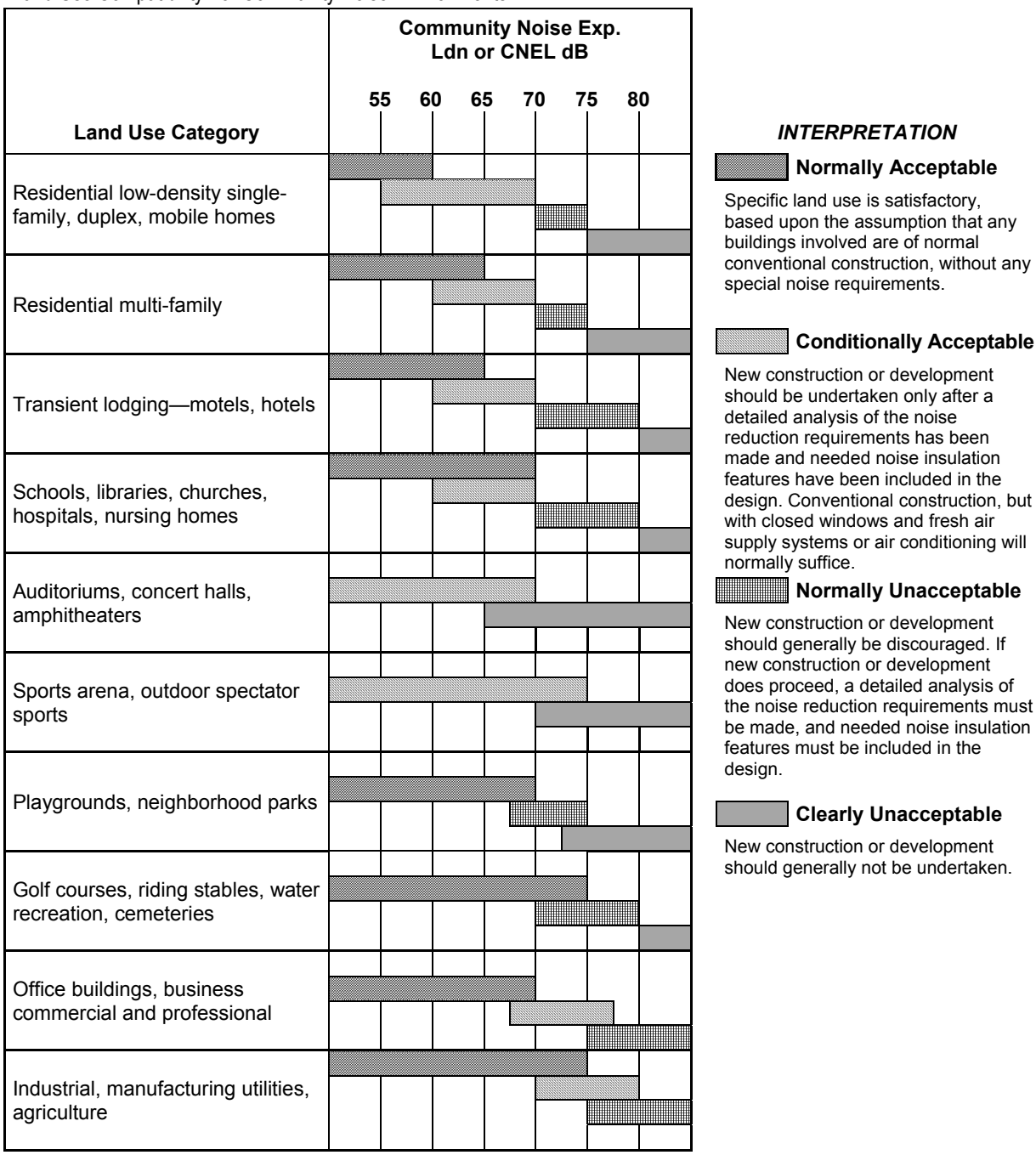
most restrictive criteria applicable to the WEC are the "Normally Acceptable" levels established by their land use compatibility guidelines for Industrial, Manufacturing, Utilities, and Agricultural uses (refer to Table 8.5-7). A level of 75 dBA L_{dn} is the upper limit of "Normally Acceptable." A 75 dBA L_{dn} is approximately equivalent to a continuous level 69 dBA L_{50} or L_{eq}.

TABLE 8.5-6
Summary of Applicable Local Noise Regulations for the County of Stanislaus

Applicable Regulation	General Standard		
General Plan – Chapter 4	Sets forth the "Land Use Compatibility Guidelines for Community Noise Environments" depicted in Table 8.5-7		
	New development of industrial, commercial or other noise generating land uses will not be permitted if resulting noise levels will exceed 60 dB L_{dn} (or CNEL) in noise-sensitive areas.		
	Noise sensitive areas considered in the Noise Element would include areas containing the following land uses: schools, hospitals, rest homes, long-term medical or mental care facilities. Other uses deemed noise sensitive by the local jurisdiction. Residences are not identified as "noise sensitive."		
	Establishes the following performance standards in areas containing residential or other noise-sensitive land uses. Standards are not to be applied on the property of the noise-generating land use. The County does not consider the isolated homes in the area surrounding the project as being "residential" or "noise-sensitive."		
		Daytime (7 a.m. to 10 p.m.)	**Nighttime (10 p.m. to 7 a.m.)**
	L_{50}	50	45
	L_{25}	55	50
	L_{8}	60	55
	L_{1}	65	60
	Max	70	65
	Hourly L_{eq}	50	45

Source: Stanislaus County 2002a

TABLE 8.5-7
Land Use Compatibility For Community Noise Environments



Source: Guidelines for the preparation and content of Noise Elements of General Plans. Prepared by the California State Office of Noise Control. (Stanislaus County, 2002)

8.5.4 Affected Environment

The site (Figure 8.5-1) consists of 18 acres located within a 69-acre parcel in the southwestern portion of the City near the intersection of West Main Street and South Washington Road.

The site is bounded to the north by a railroad corridor. Existing uses on the site include agricultural production, typically corn and oat crops used for livestock feeding in the area.

The City of Turlock and Stanislaus County boundary is depicted in Figure 8.5-1. Residences on the south side of Ruble Road and the west side of South Washington Road are located in agriculturally-zoned county lands. Residences north of West Main Street are located in the County but within the sphere of influence of the City.

The project site is designated in the City's General Plan for industrial land uses. Uses allowable for this designation are summarized in Table 8.5-4, and include industrial uses that are considered incompatible with residential uses.

The residences closest to the site are primarily isolated residential buildings located in farmlands surrounding the site. The closest residence is located approximately 375 feet south of the site at the end of Ruble Road (refer to Figure 8.5-2 for residential locations in the project vicinity).

Sources of environmental noise near the site primarily include industrial agricultural activities (feed processing, storage, and distribution), significant heavy truck traffic on West Main Street, and rail traffic associated with the Foster Farms' Foster Commodities—West Main feed mill north of the site. TID's existing Walnut Power Plant did not operate during the measurement period.

8.5.4.1 Ambient Noise Survey Methodology

Measurements were made at four locations and are listed in Table 8.5-8. The locations are shown in Figure 8.5-2.

TABLE 8.5-8
Noise Monitoring Locations

Map ID	Description
M1	Residence at end of Ruble Road. South of Site (approx. 375 ft.)
M2	Residence on W. Main Street. North of Site (approx. 1,450 ft.)
M3	Across from residence on West Main and Washington Street. Northwest of Site (approx. 3,500 ft.)
M4	Residence on Washington Street. West of Site (approx. 2,600 ft.)

Source: CH2M HILL 2002.

Larson Davis 824 and Bruel and Kjaer 2236, ANSI Type 1, statistical sound level meters were used to continuously record sound levels for a 25-hour period at the four monitoring locations. The measurements started at approximately 7 p.m. on July 29, 2002. The weather conditions were conducive to noise measurements. Daytime conditions were sunny and warm, with highs from 90°F to 100°F. Nighttime skies were clear, temperature was moderate (70°F) with little to no wind.

8.5.4.2 Noise Survey Results

Table 8.5-9 summarizes the existing L_{dn} and average nighttime L_{90} readings between 10 p.m. to 7 a.m. for each location as is typically requested by the California Energy Commission

(CEC) staff. As can be seen by the relatively high nighttime L_{90} levels, the project area is industrial and subject to substantial noise throughout the night.

The monitoring data set including charts and tables of the measured data is included in Appendix 8.5B.

TABLE 8.5-9
Summary of Measured Noise Levels (dBA), July 29, 2002

Location	L_{dn}	Average Nighttime L_{90} (10 p.m. to 7 a.m.)
M1	71	55
M2	63	51
M3	68	59
M4	62	47

8.5.5 Environmental Consequences

The proposed power plant will produce noticeable noise but the noise levels will be in compliance with the City's Noise Ordinance and County requirements for industrial properties. Noise will also be produced at the site during the construction phase of the project. Potential noise impacts from these activities are assessed in this subsection.

8.5.5.1 Significance Criteria

The City has established quantitative standards for determining appropriate noise levels for various land use types within the City. The City has stated that the zoning determines the applicable noise criteria (refer to Appendix 8.5A). There are no residentially-zoned parcels in the area surrounding the site. Therefore, noise impacts may be considered significant if project operational activities would conflict with the City of Turlock Noise Ordinance for Heavy Industrial zones by exceeding 75 dBA L_{50}.

Although the County of Stanislaus does not have jurisdiction, the applicable County criteria are summarized for completeness. The applicable County noise criteria for the WEC would be the 75 dBA L_{dn} guideline established by the Land Use Compatibility Guidelines for Community Noise Environments—Industrial, Manufacturing, Utilities, and Agricultural Uses. According to the guidelines, a level of 75 dBA L_{dn} is considered the upper limit of "Normally Acceptable." A 75 dBA L_{dn} is approximately equivalent to a continuous level 69 dBA.

8.5.5.2 Construction Impacts

This subsection addresses the various components of construction noise and vibration.

8.5.5.2.1 Worker Exposure to Noise

Worker exposure levels during construction of the WEC will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. Hearing protection will be available for workers and visitors to use as needed throughout the

duration of the construction period. A hearing protection plan, which complies with Cal-OSHA requirements, will be incorporated into the Health and Safety Plan.

8.5.5.2.2 Plant Construction Noise

Construction of the WEC is expected to be typical of other power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase. Construction of power plants can generally be divided into five phases that use different types of construction equipment. The five phases are: (1) site preparation and excavation; (2) concrete pouring; (3) steel erection; (4) mechanical; and (5) clean-up (Miller et al. 1978). The typical high-pressure steam blow activity is generally assessed separately because of the high noise levels and potential for short-term significant noise impacts.

Both the USEPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (USEPA 1971; Barnes et al. 1976). Since specific information on types, quantities, and operating schedules of construction equipment is not available at this point in project development, information from these documents for similarly sized industrial projects will be used. Use of this data, which is between 21 and 26 years old, is conservative since the evolution of construction equipment has been toward quieter designs to protect operators from exposure to high noise levels.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 8.5-10. The composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table for each phase.

TABLE 8.5-10
Construction Equipment and Composite Site Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level (dBA) at 50 feet	Composite Site Noise Level (dBA) at 50 feet
Site Clearing and Excavation	Dump Truck Backhoe	91 85	89
Concrete Pouring	Truck Concrete Mixer	91 85	78
Steel Erection	Derrick Crane Jack Hammer	88 88	87
Mechanical	Derrick Crane Pneumatic Tools	88 86	87
Cleanup	Rock Drill Truck	98 91	89

Source: USEPA 1971; Barnes et al. 1976.

Average or equivalent construction noise levels projected to the nearest residence from the site are presented in Table 8.5-11. These results are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air. The construction

noise may be audible at the nearest residences but will not exceed current exposure levels and the noisiest construction activities will be confined to the daytime hours.

TABLE 8.5-11
Average Construction Noise Levels at Various Distances

	Sound Pressure Level (dBA)		
Construction Phase	**375 feet**	**1,500 feet**	**3,000 feet**
Site Clearing and Excavation	71	59	53
Concrete Pouring	60	48	42
Steel Erection	69	57	51
Mechanical	69	57	51
Clean-Up	71	59	53

Table 8.5-12 shows that unsilenced high-pressure, intermittent steam blows would exceed any reasonable impact criteria; consequently, a temporary blowout silencer, such as a Fluid Kinetics Model TBS 16-AC, or similar, will be used for high-pressure steam blows. Such a silencer has an overall noise reduction of 40 to 45 dBA and would reduce the estimated unsilenced level to 89 dBA (at 50 feet) putting it in the same category as heavy construction equipment. Since it is common practice to only carry out high-pressure, intermittent steam blows during the day, silenced blows should produce no significant disturbance.

TABLE 8.5-12
Noise Levels from Common Construction Equipment at Various Distances

Construction Equipment	**Typical Sound Pressure Level at 50 feet (dBA)**	**Typical Sound Pressure Level at 375 feet (dBA)**	**Typical Sound Pressure Level at 1,500 feet (dBA)**
Unsilenced High-Pressure, Intermittent Steam Blow (4- to 8-inch Line)	129	111	99
Silenced High-Pressure, Intermittent Steam Blow (4- to 8-inch Line)	89	71	59
Unsilenced Air Blow (4- to 8-inch Line)	125	107	95
Pile Drivers (20,000-32,000 ft-lbs./blow)	104	86	74
Dozer (250-700 hp)	88	70	58
Front End Loader (6-15 cu. yds.)	88	70	58
Trucks (200-400 hp)	86	68	56
Grader (13 to 16 ft. blade)	85	67	55
Shovels (2-5 cu. yds.)	84	66	54
Portable Generators (50-200 kW)	84	66	54
Derrick Crane (11-20 tons)	83	65	53
Mobile Crane (11-20 tons)	83	65	53

TABLE 8.5-12
Noise Levels from Common Construction Equipment at Various Distances

Construction Equipment	Typical Sound Pressure Level at 50 feet (dBA)	Typical Sound Pressure Level at 375 feet (dBA)	Typical Sound Pressure Level at 1,500 feet (dBA)
Concrete Pumps (30-150 cu. yds.)	81	63	51
Tractor (3/4 to 2 cu. yds.)	80	62	50
Unquieted Paving Breaker	80	62	50
Quieted Paving Breaker	73	55	43

Noise generated during the testing and commissioning phase of the project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole they are usually short-lived. The steam releases associated with these starts and stops should not be problematic since they will be vented through permanent vent silencers.

8.5.5.2.3 Construction Vibration

Construction vibrations can be divided into three classes, based on the wave form and its source:

Wave form: Impact	Example source: impact pile driver or blasting
Wave form: Steady state	Example source: vibratory pile driver
Wave form: Pseudo steady state	Example source: double acting pile hammer

Pile driving is not currently anticipated. If pile driving turns out to be required, mitigation measures (if needed) shall be developed in consultation with the Compliance Project Manager.

8.5.5.3 Operational Impacts

This subsection describes the expected noise impacts from operation of the plant.

8.5.5.3.1 Worker Exposure to Operational Noise

Nearly all components will be specified not to exceed near-field maximum noise levels of 90 dBA at 3 feet (or 85 dBA at 3 feet where available as a vendor standard). Since there are no permanent or semi-permanent workstations located near any piece of noisy plant equipment, no worker's time-weighted average exposure to noise should approach the level allowable under OSHA guidelines. 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 levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source.

8.5.5.3.2 Transmission Line and Switchyard Noise Levels

The electrical output of the plant will be connected to the existing 115-kV and 69-kV transmission lines to the west and south of the site. Corona is associated with transmission lines of 230 kV or greater. Consequently, no impact is expected from the operation of the electrical transmission lines.

8.5.5.3.3 Plant Operation Noise Levels

A noise model of the proposed WEC facility has been developed using source input levels derived from manufacturers' data and field surveys of similar equipment. The instantaneous and L_{dn} noise emission contours from the plant have been calculated and mapped over the site and the surrounding areas as shown in Figures 8.5-3 and 8.5-4, respectively. The noise levels presented represent the anticipated steady-state level from the plant with essentially all equipment operating. To convert from L_{dn} to instantaneous noise levels that one would hear or measure, subtract 6 dB.

The model divides the proposed facility into a list of individual point and area noise sources representing each piece of equipment that produces a significant amount of noise. The sound power levels representing the standard performance of each of these components are assigned based either on first-hand field measurements of similar equipment made at other existing plants, data supplied by manufacturers, or information found in the technical literature. Using these standard power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption, blockages, etc. are considered. The sum of all these individual levels is the total plant level at the modeling point. The sound propagation factors used in the model have been adopted from ISO 9613-2 *Acoustics - Sound Attenuation During Propagation Outdoors*.

The sound power levels, by octave band, used in the model are summarized in Table 8.5-13.

TABLE 8.5-13
Octave Band Sound Power Levels Used to Model WEC Operations, dB (Flat)

	Octave Band Center Frequency, Hz									
Plant Component	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Stack	120.0	122.0	124.0	124.0	119.0	109.0	92.0	79.0	73.0	119.4
Combustion Turbine Generator (CTG) Air Inlet	103.1	102.1	99.6	94.5	92.8	88.5	88.0	85.8	88.1	96.1
Cooling Tower Air Inlet	108.0	114.1	110.2	108.4	103.0	104.6	104.7	106.2	104.9	112.2
Cooling Tower Air Outlet	116.5	116.5	116.6	112.6	109.7	106.7	99.1	95.0	91.0	111.6
Fuel Gas Compressors[a]	98.6	104.5	126.0	118.2	125.5	118.3	110.2	107.3	101.5	124.4
Steam Turbine Generator (STG)[b]	113.2	119.2	117.2	112.2	108.2	104.2	101.2	93.2	87.2	110.7
Surface Condenser	115.0	116.0	115.0	113.0	114.0	108.0	103.0	98.0	94.0	114.1
CTG Transformers	90.1	96.1	98.1	93.1	93.1	87.1	82.1	77.1	70.1	93.5
STG Transformer	89.8	95.8	97.8	92.8	92.8	86.8	81.8	76.8	69.8	93.2
Gas Cooler	106.8	111.3	107.4	97.7	98.7	93.4	99.4	102.8	101.0	107.3

TABLE 8.5-13
Octave Band Sound Power Levels Used to Model WEC Operations, dB (Flat)

	Octave Band Center Frequency, Hz									
Plant Component	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
HRSG Walls	117.0	112.0	106.0	105.0	95.0	79.0	80.0	70.0	52.0	98.8
CTGs (compartments and accessories)	117.9	115.6	112.7	104.2	102.3	98.3	97.3	91.6	86.6	105.2
CTG Exhaust Plenums	107.0	106.0	102.0	93.0	90.0	85.0	80.0	76.0	71.0	92.4
CTG Turbine Compartment Vent Fans	106.0	106.0	110.0	104.0	101.0	92.0	96.0	84.0	75.0	102.8
Brine Concentrators[c]	0.0	0.0	0.0	0.0	107.0	0.0	0.0	0.0	0.0	103.8
Crystallizers[c]	0.0	0.0	0.0	0.0	107.0	0.0	0.0	0.0	0.0	103.8

Notes:
[a] A noise wall will be placed on the north side of the fuel gas compressor to reduce offsite noise levels.
[b] The steam turbine will be located inside a noise enclosure.
[c] Octave band data were not available for the Zero-Liquid-Discharge (ZLD) equipment. Only overall A-weighted PWL data were available. All ZLD noise was assumed to be in the 500-Hz octave band for the noise modeling

Figure 8.5-4 shows the L_{dn} noise contours of the expected sound levels generated by the WEC in the immediate vicinity of the project. Table 8.5-14 summarizes the results at the noise monitoring locations. The analysis shows that the predicted plant sound levels at the monitoring locations are all below 70 dBA L_{dn}.

TABLE 8.5-14
Predicted WEC-generated Noise Levels at the Noise Monitoring Locations

Map Identifier	Predicted L_{dn} Sound Pressure Level (dBA)	Predicted Instantaneous Sound Pressure Level (dBA)
M1	69	63
M2	69	63
M3	61	55
M4	66	60

Refer to Figures 8.5-3 and 8.5-4 and Table 8.5-8 for location descriptions.

8.5.5.3.4 Tonal Noise

Combined cycle plants have several components that can produce tones. As a general rule, combined cycle plants, even those without significant noise controls, do not produce discrete tones that are prominent or noticeable at typical receptor distances. At the monitoring locations modeled here no significant tones are anticipated.

That is not to say that audible tones are impossible—certain sources within the plant such as the combustion turbine inlets, transformers, pump motors, cooling tower fan gearboxes, etc. have been known to sometimes produce significant tones. It is TID's intention to anticipate the potential for audible tones in the design and specification of the plant's equipment and

take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors.

8.5.5.3.5 Ground and Airborne Vibration

Ground and airborne induced vibration from operation of the proposed project will not affect the local area. The proposed project is primarily driven by gas turbines exhausting into a heat recovery steam generator (HRSG), which is contiguous with a selective catalytic reduction (SCR) duct. These very large ducts greatly reduce low frequency noise, which is mainly the source of airborne induced vibration of structures.

The equipment that would be used in the proposed project is well balanced and is designed to produce very low vibration levels throughout the life of the proposed 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 would be detected and the machines would automatically shut down.

8.5.6 Mitigation Measures

The following mitigation measures are anticipated to be included in the project:

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

Noise Mitigation Measure #2: Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all legitimate project related noise complaints.

The project owner or authorized agent shall:

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

Noise Mitigation Measure #3: The project design and implementation includes:

- Combustion turbine air inlet silencer
- Combustion turbine acoustical enclosure
- Steam turbine acoustical enclosure
- 20-foot-high noise barrier on the north side of the gas compressors
- Silencers on high-energy steam relief and vent stacks

Noise Mitigation Measure #4: Noisy construction or demolition work shall be restricted to the times of day delineated below:

- Weekdays 7 a.m. to 7 p.m.
- Weekends and Holidays 9 a.m. to 8 p.m.

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

8.5.7 Involved Agencies and Agency Contacts

Agency contacts relative to noise issues are presented in Table 8.5-15.

TABLE 8.5-15
Agency Contacts

Agency	Contact	Issue	Telephone
City of Turlock	Dana McGarry, Senior Planner Community Development Department 156 South Broadway, Suite 120 Turlock, CA 95380	Noise Standards	209-668-5640
County of Stanislaus	Bob Kachel, Senior Planner Department of Planning and Community Development 1010 10th Street, Suite 3400 Modesto, CA 95354	Noise Standards	209-525-6330

8.5.8 Permits Required and Permit Schedule

No permits are required; therefore, there is no permit schedule.

8.5.9 References

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