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5.7 Noise

This section presents an assessment of potential noise effects related to the Alamitos Energy Center (AEC) Project. Section 5.7.1 presents the proposed project and the environmental setting. Section 5.7.2 discusses the fundamentals of acoustics. Section 5.7.3 describes the affected environment, including baseline noise level survey methodology and results. Section 5.7.4 presents an environmental noise analysis of the construction and operation of the power plant and associated facilities. Section 5.7.5 discusses cumulative effects. Section 5.7.6 discusses noise minimization measures. Section 5.7.7 presents applicable laws, ordinances, regulations, and standards (LORS). Section 5.7.8 presents agency contacts, and Section 5.7.9 presents permit requirements and schedules. Section 5.7.10 contains the references used to prepare this section.

5.7.1 Setting and Affected Environment

AES Southland Development, LLC (AES-SLD) proposes to construct, own, and operate the AEC—a natural-gas-fired, air-cooled, combined-cycle, electrical generating facility in Long Beach, Los Angeles County, California. The proposed AEC will have a net generating capacity of 1,936 megawatts (MW) and gross generating capacity of 1,995 MW.[1] The AEC will replace and be constructed on the site of the existing Alamitos Generating Station.

The AEC will consist of four 3-on-1 combined-cycle gas turbine power blocks with twelve natural-gas-fired combustion turbine generators, twelve heat recovery steam generators (HRSG), four steam turbine generators, four air-cooled condensers, and related ancillary equipment. The AEC will use air-cooled condensers for cooling, completely eliminating the existing ocean water once-through-cooling system. The AEC will use potable water provided by the City of Long Beach Water Department (LBWD) for construction, operational process, and sanitary uses but at substantially lower volumes than the existing Alamitos Generating Station has historically used. This water will be supplied through existing onsite potable water lines.

The AEC will interconnect to the existing Southern California Edison 230-kilovolt (kV) switchyard adjacent to the north side of the property. Natural gas will be supplied to the AEC via the existing offsite 30-inch-diameter pipeline owned and operated by Southern California Gas Company that currently serves the Alamitos Generating Station. Existing water treatment facilities, emergency services, and administration and maintenance buildings will be reused for the AEC. The AEC will require relocation of the natural gas metering facilities and construction of a new natural gas compressor building within the existing Alamitos Generating Station site footprint. Stormwater will be discharged to two retention basins and then ultimately to the San Gabriel River via existing stormwater outfalls.

The AEC will include a new 1,000-foot process/sanitary wastewater pipeline to the first point of interconnection with the existing LBWD sewer system and will eliminate the current practice of treatment and discharge of process/sanitary wastewater to the San Gabriel River. The project may also require upgrading approximately 4,000 feet of the existing offsite LBWD sewer line downstream of the first point of interconnection, therefore, this possible offsite improvement to the LBWD system is also analyzed in this AFC. The total length of the new pipeline (1,000 feet) and the upgraded pipeline (4,000 feet) is approximately 5,000 feet.

To provide fast-starting and stopping, flexible generating resources, the AEC will be configured and deployed as a multi-stage generating (MSG) facility. The MSG configuration will allow the AEC to generate power across a wide and flexible operating range. The AEC can serve both peak and intermediate loads with the added capabilities of rapid startup, significant turndown capability (ability to turn down to a low load), and fast ramp rates (30 percent per minute when operating above minimum gas turbine turndown capacity). As California's intermittent renewable energy portfolio continues to grow, operating in either load following or

[1] Referenced to site ambient average temperature conditions of 65.3 degrees Fahrenheit (°F) dry bulb and 62.7°F wet bulb temperature without evaporative cooler operation.

partial shutdown mode will become necessary to maintain electrical grid reliability, thus placing an increased importance upon the rapid startup, high turndown, steep ramp rate, and superior heat rate of the MSG configuration employed at the AEC.

By using proven combined-cycle technology, the AEC can also run as a baseload facility, if needed, providing greater reliability to meet resource adequacy needs for the southern California electrical system. As an in-basin generating asset, the AEC will provide local generating capacity, voltage support, and reactive power that are essential for transmission system reliability. The AEC will be able to provide system stability by providing reactive power, voltage support, frequency stability, and rotating mass in the heart of the critical Western Los Angeles local reliability area. By being in the load center, the AEC also helps to avoid potential transmission line overloads and can provide reliable local energy supplies when electricity from more distant generating resources is unavailable.

The AEC's combustion turbines and associated equipment will include the use of best available control technology to limit emissions of criteria pollutants and hazardous air pollutants. By being able to deliver flexible operating characteristics across a wide range of generating capacity, at a relatively consistent and superior heat rate, the AEC will help lower the overall greenhouse gas emissions resulting from electrical generation in southern California and allow for smoother integration of intermittent renewable resources.

Existing Alamitos Generating Station Units 1–6 are currently in operation. All six operating units and retired Unit 7 will be demolished as part of the proposed project. Construction and demolition activities at the project site are anticipated to last 139 months, from first quarter 2016 until third quarter 2027. The project will commence with the demolition of retired Unit 7 and other ancillary structures to make room for the construction of AEC Blocks 1 and 2. The demolition of Unit 7 will commence in the first quarter of 2016. The construction of Block 1 is scheduled to commence in the third quarter of 2016 and construction of Block 2 is scheduled to commence in the fourth quarter of 2016. The demolition of existing Units 5 and 6 will make space for the construction of AEC Block 3. AEC Block 3 construction is scheduled to commence in the first quarter of 2020 and will be completed in the second quarter of 2022. The demolition of existing Units 3 and 4 will make space for the construction of AEC Block 4. AEC Block 4 construction is scheduled to commence in the second quarter of 2023 and will be completed in the fourth quarter of 2025. The demolition of remaining existing units is scheduled to commence in the third quarter of 2025.

Construction of the AEC will require the use of onsite laydown areas (approximately 8 acres dispersed throughout the existing site) and an approximately 10-acre laydown area located adjacent to the existing site. The adjacent 10-acre laydown area will be shared with another project being developed by the Applicant (Huntington Beach Energy Project [HBEP] 12-AFC-02). Due to the timing for commencement of construction for these two projects, the adjacent laydown area will already be in use for equipment storage before AEC construction begins.

5.7.2 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 section are summarized in Table 5.7-1.

TABLE 5.7-1
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 energy averaged L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically make up the background. The background level is generally defined by the L_{90} percentile noise level.

TABLE 5.7-1
Definitions of Acoustical Terms

Term	Definition
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.
Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Hertz is a measure of the pitch of the sound. Middle C of a piano has a frequency of 262 Hz while the lowest C on an 88 key piano has a frequency of 33 Hz and the highest C has a frequency of 4186 Hz.
Pure Tone	A pure tone as used by the California Energy Commission (CEC) exists if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.
Sound Pressure 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 of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Pressure 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. All sound levels in this report are A-weighted unless stated otherwise.
Equivalent Sound Level (L_{eq})	The average sound level, on an equal energy basis, during the measurement period.
Percentile Level (L_n)	The sound level exceeded during "n" percent of the measurement period, where "n" is a number between 0 and 100 (for example, L_{90})
Day-Night Noise Level (L_{dn} or DNL)	The energy averaged A-weighted sound level during a 24-hour day, obtained after addition of 10 decibels penalty for the hours between 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 similar to the way in which a person perceives or hears sound. There is consensus that A-weighting is appropriate for estimation of the hazard of noise-induced hearing loss. With respect to other effects, such as annoyance, A-weighting is acceptable if there is largely middle and high frequency noise present, but if the noise is unusually high at low frequencies, or contains prominent low-frequency tones, the A-weighting may not give a valid measure. Compared with other noise sources, combined-cycle power facilities are not typically substantial sources of unusual low-frequency noise and are broad band or do not generate strong low-frequency tones. Therefore, A-weighting provides a good measure for evaluating acceptable and unacceptable sound levels for projects such as the AEC.

A-weighted sound levels are typically measured or presented as equivalent noise 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.

Some metrics used in determining the impact of environmental noise consider the differences in response that people have to daytime and nighttime noise levels. During the nighttime, exterior background noises are generally lower than those of 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 intrusive noises. 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 applying 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: 7:00 a.m. to 10:00 p.m. (15 hours) weighting factor of 0 decibels (dB)
- Nighttime: 10:00 p.m. to 7:00 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 decibels (A-weighted scale) (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, and dissatisfaction
- Interference with activities such as speech, sleep, and 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 may experience noise effects in the third 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 results from 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 5.7-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 5.7-2
Typical Sound Levels Measured in the Environment and Industry

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

Source: Beranek, 1998.

5.7.3 Affected Environment

5.7.3.1 Local Land Use and Noise Sources

The AEC site has a General Plan Land Use Designation (LUD) of No. 7 (Mixed Use) and is located within the South East Area Development and Improvement Plan (SEADIP) Specific Plan area of the General Plan and City of Long Beach Local Coastal Program (LCP). The AEC site and the surrounding vicinity has numerous existing industrial operations such as the existing Alamitos Generating Station, other power generation facilities, oil storage tank farms, in addition to several major air and ground transportation corridors.

The 1-mile study area for the AEC encompasses the southeastern portion of Long Beach, the westernmost portion of Seal Beach directly east of the project site, and a small area within Rossmoor (an unincorporated community within the County of Orange) to the northeast. Existing land uses are described in greater detail in Section 5.6.2.1.4, and Figure 5.6-1 shows the four existing land use categories within the study area: Residential, Commercial, Industrial, and Other (Other uses include Institutions/Schools, Open Space/Parks, Harbor/Airport, Right-of-Way, and Not in Long Beach, which is the Los Cerritos Wetlands area).

The residences closest to the AEC site boundary are located approximately 500 feet west of the AEC site across the Los Cerritos Channel within the city of Long Beach. The closest residence to the noise-producing equipment (combustion turbine) is located approximately 1,150 feet to the west of the closest combustion turbine on East Eliot Street. Rosie the Riveter Charter High School is a tenant on the existing Alamitos Generating Station site. Figure 5.6-1 depicts the land uses near the project site.

5.7.3.2 Ambient Noise Survey

To support the analysis of the AEC, continuous ambient noise monitoring was conducted to determine the level of existing noise in the project area. Long-term (25 hours or more) measurements were collected at three representative residential locations near the project where permission for long-term monitoring was obtained (M1 –6333 Eliot Street, Long Beach; M2 –6810 East Septimo Street, Long Beach; and Leisure World, Seal Beach). Table 5.7-3 and Figure 5.7-1 describe the noise monitoring locations. The monitoring was conducted between August 23, 2011, and August 31, 2011. The detailed monitoring results are presented in Appendix 5.7A.

TABLE 5.7-3
Summary of Noise Survey Locations

Location Number	Location Description	Primary Noise Sources
M1	Residence at 6333 Eliot Street, Long Beach	Local and distant transportation sources. Existing power plant.
M2	Residence at 6810 East Septimo Street, Long Beach	Local and distant transportation sources. Existing power plant.
M3	Residence at the intersection of El Dorado Drive and Nassau Drive in the Leisure World Retirement Community, Seal Beach	Local and distant transportation sources. Existing power plant.

A Larson Davis 824 and two Larson Davis 820 American National Standards Institute (ANSI) S1.4 Type 1 (precision) statistical sound level meters were used to conduct the sound level measurements. The sound level meters were field calibrated before and after the survey with a Larson Davis CAL200 calibrator and were factory calibrated within the previous 12 months. Weather conditions during the noise survey were conducive to accurate measurements—generally clear and sunny. The temperature ranged from 64°F to 87°F and the relative humidity varied between 16 and 83 percent.

The hourly measured L_{eq} sound levels were used to calculate the 24-hour L_{dn} levels at each site on a rolling average basis. The ranges and averages of the L_{dn} and L_{50} levels are summarized in Table 5.7-4.

TABLE 5.7-4
Average and Range in Measured Sound Levels

Location	L_{dn}			L_{50}		
	Average (dBA)	Minimum (dBA)	Maximum (dBA)	Average (dBA)	Minimum (dBA)	Maximum (dBA)
M1 – Residence at 6333 Eliot Street, Long Beach	59	56	66	52	46	55
M2 – Residence at 6810 East Septimo Street, Long Beach	61	60	62	55	46	60
M3 - Residence at the intersection of El Dorado Drive and Nassau Drive in the Leisure World Retirement Community, Seal Beach	58	55	62	50	45	56

5.7.4 Environmental Analysis

Noise will be produced during the construction (including demolition activities of existing facilities) and operation of the AEC. Potential noise impacts from AEC construction, demolition, and operation activities are assessed in this section.

5.7.4.1 Significance Criteria

Appendix G of the California Environmental Quality Act (CEQA) is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used in the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to make a determination as to whether a project requires an Environmental Impact Report, a Mitigated Negative Declaration or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects, but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

In terms of potential noise impacts, Appendix G, asks, in part, whether the project would:

- Expose people to noise levels in excess of standards established in the local General Plan or noise ordinance
- Expose people to excessive ground-borne noise levels or vibration
- Cause a substantial permanent increase in ambient noise levels in the project vicinity
- Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity

Generally, the AEC design basis for noise control is the minimum, or the most stringent, noise level required by the applicable LORS. Therefore, noise from the project is evaluated against the City of Long Beach's requirements. The City has established quantitative guidelines for determining appropriate noise levels for various land uses in the Noise Element of its General Plan and in its noise ordinance.

The CEC staff has stated that construction noise is typically insignificant if the construction activity is temporary, use of heavy equipment and noisy activities is limited to daytime hours, and feasible noise abatement measures are implemented for noise-producing equipment. As explained in Section 2.0, construction activity for the AEC will limit use of heavy equipment and noisy activities to daytime hours, and feasible noise abatement measures will be implemented for noise-producing construction equipment.

Legend

- Project Boundary
- Parking/Laydown Construction Area
- Process/Sanitary Wastewater Pipeline
- Noise Monitoring Location

0 500 1,000 Feet

N

FIGURE 5.7-1
Noise Monitoring Locations
Alamitos Energy Center
Long Beach, California

5.7.4.2 Construction and Demolition Impacts

5.7.4.2.1 Project Construction and Demolition Noise

Construction activities at the AEC site are expected to be typical of other power plants in terms equipment used and other types of activities performed. Demolition activities use equipment similar to that used for construction activities; therefore, the range in equipment sound levels during demolition activities is expected to be the same as construction activities. Construction and demolition activities at the project site are anticipated to last 139 months, from January 2016 until July 2027. The project will commence with the demolition of retired Alamitos Generating Station Unit 7 and other ancillary structures to make room for the construction of AEC Blocks 1 and 2 on the Alamitos Generating Station site. The demolition of Alamitos Generating Station Unit 7 will commence in the first quarter of 2016. The construction of Block 1 is scheduled to commence in the third quarter of 2016, and construction of Block 2 is scheduled to commence in the fourth quarter of 2016. The demolition of existing Units 5 and 6 will make space for the construction of AEC Block 3. AEC Block 3 construction is scheduled to commence in the first quarter of 2020 and will be completed in the second quarter of 2022. The demolition of existing Units 3 and 4 will make space for the construction of AEC Block 4. AEC Block 4 construction is scheduled to commence in the second quarter of 2023 and will be completed in the fourth quarter of 2025. The demolition of the remaining existing units is scheduled to commence in the third quarter of 2025.

The noise level will vary during the construction or demolition period, depending on the activities being performed. Construction of power plants can be divided into five phases that use different types of construction equipment. The five phases are demolition, site preparation, and excavation; concrete pouring; steel erection; mechanical; and clean-up (Miller et al., 1978). In addition to onsite construction- and demolition-related activities, additional sources of noise include the transport of materials to and from the site, and construction worker traffic during commute hours. Vehicles traveling on public roads are regulated by a number of state and local agencies, as described in Section 5.12, Traffic and Transportation. Section 5.12 also discusses measures to minimize potential traffic impacts, some of which (such as the transport of heavy/oversize loads during construction) will result in nighttime traffic on public roads. The project will include best management practices (BMP) that will limit offsite noise impacts by ensuring that vehicles are appropriately muffled and that noisy activities at construction parking areas (loud stereos or conversations) are limited.

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control, and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment, from power plant construction and demolition sites, and from other types of facilities (EPA, 1971; Barnes et al., 1976). Given the dynamic nature of construction activities and because specific information on the types, quantities, and operating schedules of construction equipment is not available at this point in the project development, information from these documents for similarly sized industrial projects will be used.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 5.7-5. The composite average or equivalent site noise level, representing noise from all equipment, also is presented for each phase.

TABLE 5.7-5
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
Demolition, 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: EPA, 1971; Barnes et al., 1976.

Average or equivalent construction and demolition noise levels projected at various distances from the project site are presented in Table 5.7-6. These results are considered conservative because the only attenuating mechanism considered was divergence of the sound waves in open air. At times, actual sound levels may exceed the long-term average sound levels and precise estimates of construction noise levels are challenging to make given the dynamic nature of construction activities. The noisiest construction activities will be confined to the daytime hours. Pile driving is currently anticipated, but it would be limited to daytime periods. Table 5.7-7 presents noise levels from common construction equipment at various distances.

Noise from construction of the wastewater pipeline is expected to be similar to the excavation construction phase listed in Table 5.7-5, although it will be of much shorter duration for any particular receptor location.

TABLE 5.7-6
Average Construction Noise Levels at Various Distances

Construction Phase	Noise Level (dBA)		
	At 375 feet	At 1,500 feet	At 3,000 feet
Demolition, 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 5.7-7
Noise Levels from Common Construction and Demolition Equipment at Various Distances

Construction Equipment	Typical Noise Level (dBA) at 50 feet	Typical Noise Level (dBA) at 375 feet	Typical Noise Level (dBA) at 1,500 feet
Pile Driver (20,000 to 32,000 ft-lbs/blow)	104	86	74
Dozer (250 to 700 hp)	88	70	58
Front end Loader (6 to 15 yd^3)	88	70	58
Truck (200 to 400 hp)	86	68	56
Grader (13- to 16-foot blade)	85	67	55
Shovels (2 to 5 yd^3)	84	66	54
Portable Generator (50 to 200 kW)	84	66	54
Derrick Crane (11 to 20 tons)	83	65	53
Mobile Crane (11 to 20 tons)	83	65	53
Concrete Pump (30 to 150 yd^3)	81	63	51
Tractor (3/4 to 2 yd^3)	80	62	50
Unquieted Paving Breaker	80	62	50
Quieted Paving Breaker	73	55	43

yd^3 = cubic yard
ft-lbs/blow = foot pounds per blow
hp = horsepower
kW = kilowatt

Impact pile driving is one of the louder construction activities that emits a short term repetitive sound as the piles are advanced into the ground with successive hammer blows. The average sound levels for pile driving may be less than those shown in Table 5.7-7 because the hammer blows are paused while additional pile is positioned and welded into place and as equipment is repositioned for successive piles. All pile driving activities will be limited to daytime hours.

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 they are usually short lived. Additional construction hours may be necessary to make up schedule deficiencies or to complete critical construction activities (for example, critical continuous concrete pours, pouring concrete at night during hot weather, or working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities may continue 24 hours per day, 7 days per week. These include, but are not limited to, nighttime transportation of heavy construction equipment to the site, the nighttime transport of heavy or oversize loads during construction to minimize traffic impacts, and the subsequent unloading or handling of that equipment onsite. Noise emissions from such activities will be limited to the extent feasible.

Steam blows during the construction phase are an activity designed to clean scale and other debris from the boiler tubes and steam lines before steam is admitted to the steam turbine where such debris would damage the blades. When high-pressure blows are used, several short blows several minutes in duration are generally performed each day (during daytime hours) and the entire process takes several weeks. Alternatively, quieter, lower-pressure continuous or semi-continuous blows may be used. In either case, steam blow activities are silenced to levels similar to common construction equipment (generally less than 90 dBA at 50 feet) to minimize potential for complaints.

Construction noise levels vary depending on the nature of the construction activity and its location. To minimize potential construction noise effects, noise mitigation measures, described in Section 5.7.5, have been developed. For example, haul trucks and other engine-powered equipment will be required to be equipped with adequate mufflers and operated in accordance with posted speed limits, and truck engine exhaust brake use will be limited to emergencies.

5.7.4.2.2 Construction and Demolition Vibration

Construction and demolition vibrations can be divided into three classes, based on the wave form and its source (see Table 5.7-8). Blasting is not currently anticipated and pile driving will be limited to a depth of approximately 50 feet. The contractor will develop an appropriate vibration mitigation plan to ensure potential vibrations are limited to a peak particle velocity of 0.2 in/sec at the nearest sensitive receptor. Such activities will be limited to normal daytime work hours and will be of short duration; therefore, no additional mitigation is required.

TABLE 5.7-8
Construction and Demolition Vibrations

Wave Form	Example Source
Impact	Impact pile driver or blasting
Steady state	Vibratory pile driver
Pseudo steady state	Double acting pile hammer

5.7.4.2.3 Construction and Demolition Worker Exposure to Noise

Worker exposure to noise levels during construction of the AEC and the demolition of the Alamitos Generating Station units will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. The project will develop a Hearing Protection Plan that complies with California Division of Occupational Safety and Health Administration (Cal/OSHA) requirements. This Hearing Protection Plan will be incorporated into the project’s construction and demolition Health and Safety Plan. The plan will require appropriate hearing protection for workers and visitors during the construction and demolition period. Additional information on the overall construction worker health and safety program is included in Section 5.16, Worker Health and Safety.

5.7.4.3 Operational Impacts

5.7.4.3.1 Worker Exposure

Nearly all equipment and project 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). Neither permanent nor semi-permanent workstations are near noisy plant equipment, so a worker’s time-weighted average exposure to noise should not routinely approach allowable levels. 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, and the project will comply with applicable Cal/OSHA requirements. Outdoor noise levels throughout the plant will range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from a major noise source. Therefore, noise impacts to workers during operation will be less than significant. Additional information on the overall operational worker health and safety program is included in Section 5.16, Worker Health and Safety.

5.7.4.3.2 Transmission Line and Switchyard Noise Levels

One of the electrical effects of high-voltage transmission lines is corona. Corona is the ionization of air at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and production of ozone. Corona is a concern with transmission lines of

345 kV and greater and with lines that are at higher elevations. Higher levels of corona noise are also associated with rain, fog, or foul weather conditions.

No offsite electrical linear developments are proposed as part of the project. As discussed in Section 3.0, Transmission System Engineering, the design voltage and current flow are not increasing; therefore, the audible noise associated with the 230-kV lines and switchyards in the area is not expected to change.

5.7.4.3.3 Plant Operational Noise Levels

A noise model of the proposed AEC has been developed using the CADNA/A noise model by DataKustik GmbH of Munich, Germany. The CADNA/A noise model is capable of modeling very complex industrial plants. The sound propagation factors used in the model have been adopted from International Organization for Standardization (ISO) 9613-2, *Acoustics – Sound Attenuation during Propagation Outdoors* (ISO, 1996). The model divides the proposed facility into a list of individual noise sources representing each piece of equipment that produces a significant amount of noise. Using these noise levels as a basis, the model calculates the noise level that would occur at each receptor from each source after losses from distance, air absorption, enclosures and blockages are considered. The sum of all these individual levels is the total plant level at the modeling point. A-weighted sound power (noise) levels used to estimate project noise are summarized in Table 5.7-9.

TABLE 5.7-9
Major Equipment Sound Power Levels

Source	Sound Power Level (dBA)
Combustion Turbine Generator	116
Heat Recovery Steam Generator	103
Stack Exit	103
Fin Fan Cooler	100
Air Cooled Condenser (ACC)	112
Steam Turbine Generator (in building)	90
Generator Step-up Transformers	101
Fuel Gas Compressor	106
Boiler Feed Water Pumps (will be enclosed)	108

The difference between a sound power level and a sound pressure level (or noise level) is as follows: A sound power level is analogous to the wattage of a light bulb; it is a measure of the acoustical energy emitted by the source and is, therefore, independent of distance. A sound pressure level is analogous to the brightness or intensity of light experienced at a specific distance from a source and is measured directly with a sound level meter. Sound pressure levels should always be specified with a location or distance from the noise source.

Sound power level data typically are used in acoustic models to predict sound pressure levels. This is because sound power levels take into account the size of the acoustical source and account for the total acoustical energy emitted by the source. For example, the sound pressure level 15 feet from a small radio and a large orchestra may be the same, but the sound power level of the orchestra will be much larger because it emits sound over a much larger area. Similarly, 2-hp and 2,000-hp pumps can both achieve 85 decibels of A-weighted sound (dBA) at 3 feet (a common specification) but the 2,000-hp pump will have a significantly greater sound power level. Consequently the noise from the 2,000-hp pump will travel farther. A sound power level can be determined from a sound pressure level if the distance from and dimensions of the source are known. Sound power levels will always be greater than sound pressure levels, and sound power levels should never be compared to sound pressure levels such as those presented in Table 5.7-2.

To ensure the AEC complies with the applicable acoustical requirements, design measures have been assumed to be incorporated into the preliminary modeling, as follows:

- Acoustical building for the steam turbine generator
- Low-noise HRSG design
- Larger and lower noise ACC fans
- Lagging or enclosing of the ACC ductwork
- Low-noise and/or noise barriers around transformer
- Acoustical boiler feed pump enclosures
- Lagging of high-noise piping
- Steam vent silencers
- Low noise valves
- Large noise barriers around each power block
- Acoustical gas compressor enclosures

As discussed in Section 5.7.7.3, the applicable sound limit for the AEC site is the City of Long Beach's District 4 criteria of 70 dBA at the boundary of the District. With the acoustical design features for the AEC, the anticipated steady-state sound levels do not exceed the District 4 criteria of 70 dBA at the district boundary. In District 1, the estimated operational noise levels at the residences, M1, M2, and M3, are shown in Table 5.7-10. The maximum anticipated steady-state sound level at the closest existing residence is 56 dBA. This residence is located to the west of the facility in the vicinity of monitoring location M1.

The maximum anticipated steady-state sound level at the Rosie the Riveter Charter High School, located in District 4, is 56 dBA.

TABLE 5.7-10
Anticipated Plant Operational Noise Levels

Location	Estimated Plant Operational Noise, (L_{50}, dBA)
M1 – Residence at 6333 Eliot Street, Long Beach	55
M2 – Residence at 6810 East Septimo Street, Long Beach	51
M3 – Residence at the intersection of El Dorado Drive and Nassau Drive in the Leisure World Retirement Community, Seal Beach	53

At nearby residential locations, no significant tones are anticipated. Nevertheless, audible tones are possible—certain sources within the AEC, such as the combustion turbine inlets, transformers, pump motors, and fan gearboxes, have been known to produce significant tones.

5.7.4.3.4 Ground and Airborne Vibration

Similar combined-cycle facilities have not resulted in ground or airborne vibration impacts. The project is primarily driven by gas turbines exhausting into a HRSG duct and a stack silencer. These very large ducts and silencers effectively reduce low-frequency noise, which is the main source of airborne-induced vibration of structures. It is the Project Owner's intention to anticipate the potential for low-frequency noise in the design and specifications of the project equipment and take the necessary steps to minimize or prevent significant ground or airborne vibration impacts.

The equipment that would be used in the project is well balanced and is designed to produce very low vibration levels throughout the life of the project. An imbalance could contribute to ground 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 equipment would automatically shut down. Given these protective measures, impacts related to ground and airborne vibrations will be less than significant.

5.7.5 Cumulative Effects

Section 15355 of the CEQA Guidelines defines “cumulative impacts” as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” Subsection b of Section 15355 states, in part, that “The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.” Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an EIR is required to discuss cumulative impacts when the project’s incremental effect is “cumulatively considerable.” Section 15065(a)(3) then defines “cumulatively considerable” as meaning “that the incremental effects of an individual project are significant when viewed in connection with the effects of other closely related past projects, the effects of other current projects and the effects of probable future projects.” Therefore, a cumulative impact refers to the AEC’s incremental effect together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effects of the proposed project (Public Resources Code §21083; CCR, Title 14, §§15064(h), 15065(c), 15130, and 15355).

Potential cumulative noise impacts from construction and/or operation of the proposed project are not expected to differ from those of the project alone. The project will have a less-than-significant noise effect in the immediate vicinity of the project site. Other pending projects identified by the City of Long Beach have not been identified as substantial sources of noise in the project vicinity (see Section 5.6.4, Land Use). Furthermore, these projects would also be required to comply with applicable federal, state, and local LORS. The proposed project’s cumulative noise impacts are therefore expected to be less than significant.

5.7.6 Mitigation Measures

Even though the AEC will not cause any significant noise impacts, the following measures are proposed to further minimize any potential noise impacts from project construction and operation.

5.7.6.1 Noise Hot Line

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

5.7.6.2 Noise Complaint Resolution

Throughout the construction, demolition, and operation of the project, the Project Owner will document, investigate, evaluate, and attempt to resolve all legitimate project-related noise complaints. The Project Owner or authorized agent will take the following actions:

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

5.7.6.3 Steam Blows

If a traditional, high-pressure steam blow process is used, the Project Owner will equip the steam blow piping with a temporary silencer that quiets the noise of steam blows to 89 dBA or less, measured at a distance of 50 feet. Use of high-pressure steam blows will be limited to the daytime hours. If the quieter, low-pressure continuous steam blow process is used, the Project Owner will prepare a description of the process, with expected noise levels and planned hours of steam blow operation.

5.7.7 Laws, Ordinances, Regulations, and Standards

Table 5.7-11 presents the LORS that apply to noise.

TABLE 5.7-11
Laws, Ordinances, Regulations, and Standards for Noise

LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
EPA	Guidelines for state and local governments.	EPA	5.7.6.1.1
Occupational Safety and Health Act of 1970	Exposure of workers over 8-hour shift limited to 90 dBA.	Occupational Safety and Health Administration	5.7.6.1.2
State			
Cal/OSHA, CCR Title 8, Article 105 Sections 095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	Cal/OSHA	5.7.6.2.1
California Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	California Department of Transportation (Caltrans), California Highway Patrol, and the County Sheriff's Office	5.7.6.2.2
Local			
California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	California Office of Planning and Research	5.7.6.3
City of Long Beach General Plan	Establishes policies to assist the City in making land use decisions.	City of Long Beach	5.7.6.3.1
City of Long Beach Noise Ordinance	Establishes numeric noise standards for industrial uses of 70 dBA at the industrial district boundary.	City of Long Beach	5.7.6.3.2

The AEC is located solely within the jurisdiction of the City of Long Beach.

5.7.7.1 Federal LORS

5.7.7.1.1 EPA

Guidelines are available from the EPA (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, the EPA guidelines are not applicable.

5.7.7.1.2 Occupational Safety and Health Administration

Onsite noise levels are regulated through the U.S. Occupational Safety and Health Administration (OSHA). To protect workers' hearing, the noise exposure level is regulated at 90 dBA, over an 8-hour work shift (29 Code of Federal Regulations §1910.95). Onsite noise levels will generally be in the 70-to-85-dBA range. Areas with a noise level above 85 dBA will be posted as high-noise level areas, and hearing protection will be required when entering or working in those areas. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

5.7.7.2 State LORS

5.7.7.2.1 Cal/OSHA

The California Department of Industrial Relations, Division of Occupational Safety and Health enforces state noise regulations that are the same as the federal OSHA regulations described previously. The Cal/OSHA regulations are contained in the CCR, Title 8, General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

5.7.7.2.2 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 offices.

5.7.7.3 Local LORS

5.7.7.3.1 City of Long Beach General Plan

The City of Long Beach General Plan (1975) Noise Element establishes goals, objectives and policies that address noise issues within the City's jurisdiction. The noise element recommends the following actions for all industrial related activities in the City:

- Complying with existing sections of the Municipal Code;
- Taking advantage of existing sound barriers in cases where noise cannot be effectively contained, muffled, or directed away from schools, hospitals, and housing;
- Choosing industrial equipment designed to emit less noise whenever possible.

More detailed recommendations are also listed in the noise element in which provides specific construction methodologies and noise abatement strategies for industrial activity such as:

- Require industrial noise control sources not kept indoors to be placed so as to take advantage of existing sound barriers, or directed toward non-sensitive uses.
- Require adequate exhaust and intake mufflers and soundproofed enclosures to restrict the noise level output and the duration of noise exposures generated by heavy noise construction equipment.
- Consider the establishment of buffer zones around industrial areas to minimize the noise impact on other adjacent land uses.

The General Plan also establishes the following recommendations for land use compatibility.

TABLE 5.7-12
City of Long Beach General Plan's (1975) Recommended Criteria for Maximum Acceptable Noise Levels (dBA)

	Outdoor			Indoor
Major Land Use Type	**Maximum Single Hourly Peak**	**L_{10}**	**L_{50}**	**L_{dn}**
Residential (7 a.m. – 10 p.m.)	70	55	45	45
Residential (10 p.m. – 7 a.m.)	60	45	35	35
Commercial (anytime)	75	65	55	
Industrial (anytime)	85	70	60	6

5.7.7.3.2 City of Long Beach Noise Ordinance

The City of Long Beach has adopted a Noise Ordinance (Chapter 8.80), which established noise standards for the various land use districts as presented in Table 5.7-13.

TABLE 5.7-13
Long Beach Noise Ordinance—8.80.160, Table A– Exterior Noise Limits

Receiving Land Use District Category	Time Period	Noise Level** (L_{50}, dBA)
District One (Predominately Residential with other land uses types also present)	Night: 10:00pm – 7:00am	45
	Day: 7:00am – 10:00pm	50
District Two (Predominantly commercial with other land use types also present)	Night: 10:00pm – 7:00am	55
	Day: 7:00am – 10:00pm	60
District Three (Predominantly industrial with other land use types present)	Any time	65**
District Four (Predominantly industrial with other land use types present)	Any time	70**
District Five (Airport, freeways, and waterways regulated by other agencies)	Regulated by other agencies and laws	—

** Districts Three and Four limits are intended primarily for use at their boundaries rather than for noise control within those districts.

The Code includes corrections for time characteristics. The noise level, when measured on any other property, may not exceed:

The noise standard for that land use district as specified in Table 5.17-13 for a cumulative period of more than thirty minutes in any hour; (Long Beach Noise Ordinance, 8.80.150(A)); or

The noise standard plus five (5) dB for a cumulative period of more than fifteen (15) minutes in any hour (L_{25}); (Long Beach Noise Ordinance, 8.80.150(B)); or

The noise standard plus ten (10) dB for a cumulative period of more than five (5) minutes in any hour ($L_{8.3}$); (Long Beach Noise Ordinance, 8.80.150(B)); or

The noise standard plus fifteen (15) dB for a cumulative period of more than one minute in any hour ($L_{1.6}$); (Long Beach Noise Ordinance, 8.80.150(B)); or

The noise standard plus twenty (20) dB for any period of time. (Long Beach Noise Ordinance, 8.80.150(B)).

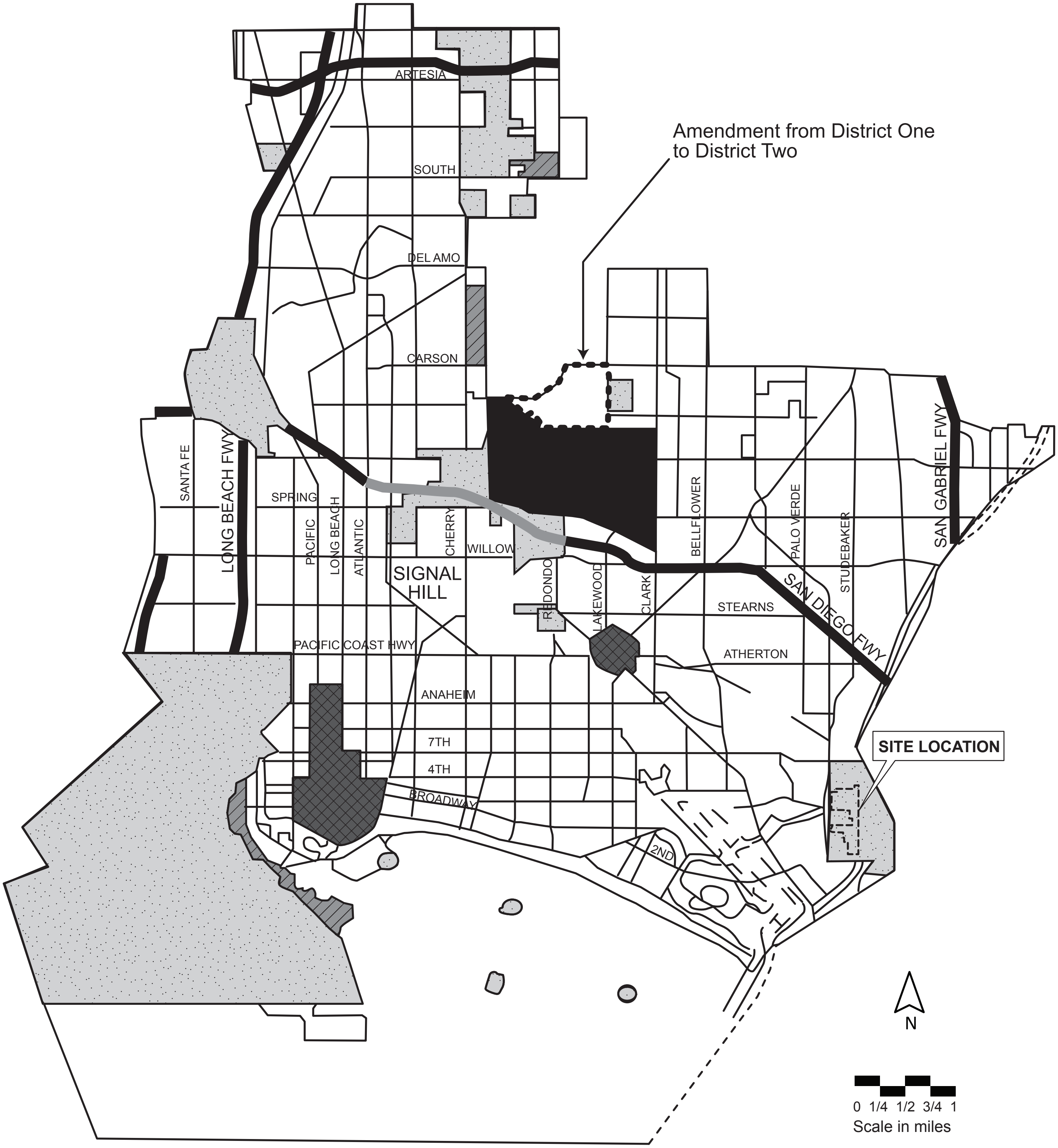
If the measured ambient noise level at a receptor exceeds the levels presented in Table 5.7-13 or the levels with the time characteristic corrections, the allowable standard is increased in 5 dB increments to encompass or reflect such ambient noise. (Long Beach Noise Ordinance, 8.80.150(C)).

If the measurement location is on a boundary between two different districts, the noise level limit applicable shall be the arithmetic mean of the two districts. (Long Beach Noise Ordinance, 8.80.150(D))

In the event the noise contains a steady audible tone such as a whine, screech, or hum, or is a repetitive noise such as hammering or riveting or contains music or speech conveying informational content the standards are reduced by 5 dBA. (Long Beach Noise Ordinance, 8.80.160).

The AEC site is located in District 4 (predominantly industrial with other land use types present). The applicable limit for District 4 is 70 dBA. The project will comply with this limit.

Residences are located outside of the District 4 boundary in District 1 (see Figure 5.7-2).



Source of the images is the (Long Beach Noise Element, 8.80.160)

LEGEND

- District 1 - Remainder of the City
- District 2
- District 3
- District 4
- District 5 - Preempted by other Agencies*

* Noise at Long Beach Airport is regulated by State & Federal Laws. It is the responsibilty of the Noise Control Officer to address complaints filed against aircraft noise. Report all violations to proper enforcing agencies and the Long Beach City Council.

FIGURE 5.7-2
Noise District Map
Alamitos Energy Center
Long Beach, California

CH2MHILL

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Construction activities which annoy or disturb a reasonable person of normal sensitivity are not permitted between the hours of 7 p.m. and 7 a.m. on weekdays and federal holidays, between 7 p.m. Friday to 9 a.m. on Saturdays, or anytime on Sundays. The code provides for a Sunday work permit to be issued as well as procedures to obtain a variance. Interior noise limits are also established by the noise ordinance.

5.7.8 Agencies and Agency Contacts

Given the CEC's exclusive jurisdiction, no further agency contacts are required.

5.7.9 Permits and Permit Schedule

Given the CEC's exclusive jurisdiction, no additional noise permits are required; therefore, there is no permit schedule.

5.7.10 References

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