7.5 NOISE

In accordance with California Energy Commission (CEC) regulations, this section describes the existing noise environment on site and in the vicinity of the proposed Marsh Landing Generating Station (MLGS), evaluates the future noise environment in view of changes to the existing noise environment, and assesses potential noise impacts associated with the project. Noise-sensitive receptors are identified, as well as the laws, ordinances, regulations, and standards (LORS) that regulate noise levels from plant operations at those receptors. The following discussion describes the fundamentals of acoustics, the results of a detailed site reconnaissance, sound level measurements, previous noise studies that are applicable to the project, acoustical calculations, assessment of potential noise impacts from construction and plant operations, and applicable LORS. Where appropriate, mitigation measures are proposed to reduce potential project-related noise impacts to acceptable levels.

7.5.1 Affected Environment

7.5.1.1 Fundamentals of Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to typical environmental noise exposure levels is annoyance. The response of individuals to similar noise events is diverse and influenced by many factors including the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound's pitch and is measured in cycles per second (Hertz), while amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is so large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound pressure measurement is the decibel (dB).

Hertz (Hz) is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the healthy human ear.

As mentioned above, sound level is expressed by reference to a specified national/international standard. This report refers to two acoustical quantities: (1) Sound Power Level (PWL) is used to express the sound energy radiated from a source, and (2) Sound Pressure Level (SPL) is used to describe sound at a specified distance or specific receptor location. In expressing sound power as a dB level, the standard reference sound power is 1 picowatt. In expressing sound pressure level on a logarithmic scale, sound pressure is compared to a reference value of 20 micropascals (µPa). These terms are different and should not be confused. PWL is a measure of the inherent acoustic power radiated by a source, while SPL depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source (absorption, reflection, etc.).

Outdoor sound levels decrease as the distance from the source increases. This is due to wave divergence, atmospheric absorption, and ground attenuation. Sound radiating from a source in a homogeneous and undisturbed manner travels in spherical waves. As the sound waves travel away from the source, the sound energy is dispersed over a greater area, decreasing the sound pressure of the wave. Spherical spreading of the sound wave reduces the noise level at a rate of 6 dB per doubling of distance.

Atmospheric absorption also influences the sound levels received by an observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries farther) at high humidity and high temperatures and higher frequencies are more readily absorbed than lower frequencies. Over large distances, the lower frequencies become dominant as the higher frequencies are attenuated. Turbulence, gradients of wind and other atmospheric phenomena also play a significant role in determining the degree of attenuation. For example, certain conditions such as temperature inversions can channel or focus the sound waves, resulting in higher noise levels than would result from simple spherical spreading.

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds one hears in the environment do not consist of a single frequency but rather a broad band of many frequencies differing in sound level. Because of the broad range of audible frequencies, methods have been developed to quantify these values into a single number. The most common method used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that is reflective of human hearing. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process is termed "A" weighting, and the resulting dB level is termed the "A weighted" decibel (dBA). "A" weighting is widely used in local noise ordinances and state and federal guidelines. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve. Unless specifically noted, the use of "A" weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the "A."

A sound level of 0 dBA is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. This threshold is the reference level against which the amplitude of other sounds is compared. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dB. A 3- to 5-dB change is readily perceived. An increase or decrease in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness.

Because of the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB. Remember however, that it requires about a 10 decibel increase to double the perceived intensity of a sound.

Although dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from nearby and distant sources that creates an ebb and flow of sound, including some identifiable sources plus a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given constant source to equal the acoustic energy contained in the fluctuating sound level measured during the interval. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators that represent the root-mean-square (RMS) maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, half of the sounds during the measurement interval are softer than L_{50} and half are louder, while levels associated with the L_{90} are typically used to describe the background noise conditions.

The Day-Night Average Sound Level (L_{dn} or DNL) represents the average sound level for a 24-hour day and is calculated by adding a 10-dB penalty only to sound levels during the night period (10:00 p.m. to 7:00 a.m.). The L_{dn} is the descriptor of choice used by nearly all federal, state, and local agencies throughout the United States to define acceptable land use compatibility with respect to noise. Because of the time-of-day penalties associated with the L_{dn} descriptor, the L_{dn} dBA value for a continuously operating sound source during a 24-hour period will be numerically greater than the dBA value of the 24-hour L_{eq}. Thus, for a continuously operating noise source producing a constant noise level operating for periods of 24 hours or more, the L_{dn} will be 6 dB higher than the L_{eq} value. To provide a frame of reference, common sound levels are presented in Table 7.5-1, Sound Levels of Typical Noise Sources and Noise Environments.

7.5.1.2 Use of Near Field Versus Far Field Noise Emission Specifications

Measured and predicted noise levels may be objectively described using appropriate units, several different types of sound descriptors, and secondary parameters where necessary to convey specific information. Selection of the scientifically correct description set is typically dictated by the purpose for measuring and/or predicting (modeling) the noise levels. The two most common reasons for quantifying levels are related to occupational noise exposure and to community noise exposure. While a single noise source (such as a fan motor or an entire power plant) may be of interest in both cases, the purpose for obtaining the noise level is different for each concern. Thus, the description set used to describe the noise must include purpose-specific characteristics of the noise (i.e., its absolute and relative level, duration, temporal pattern, spectrum uniformity, shape of radiation pattern, etc.), and, in some cases, the local or more distant characteristics of the propagation path and the physical environment.

In the case of occupational noise, the most important parameters are the absolute level of sound at the employee's ears during typical work tasks, the cumulative amount of sound energy to which a worker is exposed during a work shift, and the type of noise (relatively constant or "impulsive"). Because of the potential complexity of describing noise that might affect a worker, a short-cut criterion was developed to generally reduce the risk of adverse occupational noise exposure. This short-cut method is to describe and/or limit potential noise levels near a machine (sometimes called the "operator's position") or in a defined acoustic environment (e.g., shop floor, vehicle cab, control room). "Near" is assumed to be 3 feet distant from the noise source in the vicinity of the worker's head (usually about 5 feet above local floor or ground). A location this close to a large noisy object is also in the object's acoustic near field and its sound pressure is subject to large fluctuations over small distances. The specification of a machine's sound level as less than, no more than, or equal to "85 dBA at 3 feet" is useful (when combined with quite a bit of other information) for the limited purpose of addressing occupational noise exposure. However, it is nearly useless for describing or modeling the community noise exposure caused by the machine.

With respect to community noise, much more acoustic information is required to accurately describe (measure and model) the noise exposure that may result from the identical noise source causing a worker exposure (plus the sum of all additional different sources). For example, assume the noise source is very large (typical of noisy machinery at power generating plants) and produces noise at a level of 85 dBA when measured at a nearby worker. What about the noise energy that is radiated by the other parts of the device that travels into an adjacent community? If the machine radiates noise uniformly per unit area (which is not likely) it is the overall surface area of the machine that determines the total amount of noise that will ultimately reach the community. Two machines with the same 85 dBA at 3 feet specification may be grossly different in size. If the machine does not radiate noise uniformly from its entire surface (as is almost always the case) then "85 dBA at 3 feet" is a meaningless piece of acoustical information at other than one or a few points around the machine.

Thus, for example the far-field sound pressure level specification (e.g., "x" dBA at 400 feet) from one, a few, or a large group of machines may be used to more accurately predict the sound pressure level of overall machine noise in the community for a range of distances from the machines. This is because measurements and prediction of noise level (in any given direction) in the noise source's acoustic far field (typically several hundred feet away for a very large source such as a power plant) are much more stable than near field measurements or specifications.

The best acoustic data to use for accurate community sound level modeling are the intrinsic sound power levels of each major noise source in specific octave bands. This information describes the overall sound energy emission of the source irrespective of its size, shape, or directivity, and takes into account the magnitude (level) and frequency (spectrum) of the noise emitted. The temporal component (often, but not always continuous for power plants) and the distance attenuation component may then be calculated separately to determine the far field noise level from each major source (and energy summed to provide the overall power plant noise level) at various points of interest (e.g., plant boundary, rest home, residences, school) within the surrounding area.

7.5.1.3 MLGS Project Site and Vicinity

The MLGS site is located within the existing Contra Costa Power Plant (CCPP) along the south shore of the San Joaquin River in unincorporated Contra Costa County. The site is located about 1/10 of a mile from the City of Antioch limits. Proceedings are underway to annex the MLGS site and adjacent land into the City of Antioch. The MLGS will be situated on a parcel of approximately 27 acres that will be created by a subdivision of the existing single parcel that constitutes the site of the CCPP.

Nearby land uses consist of industrial uses to the south, east, and west, and the San Joaquin River to the north. More distant land uses include a commercial marina and industrial and non-conforming residential land uses to the east, open space to the south, and distant residential land uses to the southwest. State Route (SR) 4, SR 160, and the Antioch Bridge are just east of the site. Wilbur Avenue is located south of the MLGS.

The most significant nearby land use is the Gateway Generating Station (GGS). This facility is east of MLGS and is currently under construction. This project, approved by the CEC in May 2001, is a gas-fired, combined-cycle combustion turbine plant. The facility will be operational prior to the MLGS. Based on the Application for Certification for this project, operational sound levels from the GGS facility will be no higher than 51 dBA at any residentially zoned land use and the nearest residences, which are non-conforming land uses in an area zoned for heavy industry and already experience existing sound levels that are well above county guidelines (CEC, 2001).

The noise-sensitive receptors nearest to the MLGS are non-conforming residential land uses east of the project site in industrial areas. These residences are considered caretaker residences associated with the commercial marinas.

Ambient Noise Surveys

Environmental noise was measured at the MLGS site and at selected offsite locations on November 13 through 15, 2007. Noise level measurements were made within an approximately 1-mile radius of the project site. The noise survey was conducted to evaluate current environmental noise conditions and to assess potential for project noise impacts on the surrounding community. The offsite locations represent residential receptors nearest to the MLGS site. The ambient noise surveys included both long-term (LT, 25-hour) automated and short-term (ST, up to 1-hour) manual measurements of existing ambient noise.

Figure 7.5-1 shows the locations where the ST and LT measurements were conducted. During the survey, two LT, and three ST measurements were conducted at five locations to acoustically describe the project site and its environs, and to determine the existing sound levels at potential noise-sensitive receptors.

The Community Noise Analyzer (CNA) at LT-1 was located northeast of the project site, within the confines of the Sportsman Yacht Club. This location represents the most potentially impacted noise receptor due to its close proximity to the plant. Noise sources during the measurement included construction noise from the Gateway Generating Station project, faint traffic noise, and wildlife. The CNA measured noise levels for contiguous 15-minute intervals during a 25-hour period (0830 hours November 14, 2007 to 0930 hours November 15, 2007).

The CNA at LT-2 was located southwest of the project site, at 1957 Santa Fe Avenue, in unincorporated Contra Costa County. This location is a residential land use and is also the location nearest to MLGS that is zoned for residential uses. Noise sources during the measurement survey included railway noise, faint traffic noise, distant aircraft, and wildlife. The CNA measured noise levels for contiguous 15-minute intervals during a 25-hour period (2100 hours November 13, 2007 to 2200 hours November 14, 2007).

While the Gateway Generating Station will be operational prior to the MLGS and should be considered as an existing condition for the analysis of the MLGS, it was not operational at the time ambient noise surveys were conducted in November 2007. Therefore, those ambient noise surveys are conservatively lower than the ambient noise levels expected at the time the MLGS begins operation.

7.5.1.4 Methods

As indicated above, the automated CNAs measured average noise levels in contiguous 15-minute intervals during a 25-hour period. Shorter duration operator-attended noise measurements were conducted during nighttime hours at two locations (ST) to corroborate the results of the long-term monitor and to allow for physical observations of the predominant local noise sources. ST measurements were made with a Brüel & Kjær 2231 (Serial Number 1850301), Type 1 “Precision” grade sound level meter (SLM). The LT measurements were made with Larson Davis Model 820 (LT-1 Serial Number 0515, LT-2 Serial Number 1528). These instruments are Type 1 “Precision” Grade Integrating SLMs and were operating in CNA mode.

The sound measurement instruments meet the requirements of the ANSI Standard S1.4-1983 and the International Electrotechnical Commission Publications 804 and 651. The sound measuring instruments used for the survey were set on Slow time response using the dBA scale. A-weighting is used so that the instrument’s response is similar to human hearing, which is less sensitive to low and very high-pitched sounds. In all cases, the microphone height was 5 feet above the ground and the microphone was equipped with a windscreen. The SLM used for the short-term measurements was mounted on a tripod. Each sound measuring instrument was programmed to record equivalent sound levels (L_{eq}), maximum and minimum sound levels (L_{max}, L_{min}), and statistical distributions of sound level (L_{10}, L_{50}, and L_{90}) for each measurement period.

Atmospheric conditions during the survey period were suitable for conducting noise measurements. Temperatures and humidity conditions ranged from 57 degrees Fahrenheit (°F) and 75 percent relative humidity during nighttime hours to 88°F and 28 percent relative humidity during the daytime hours. Winds were calm and sky conditions were clear throughout the survey period.

To ensure accuracy and to verify laboratory calibration, the instruments were also checked in the field before and after each measurement period. The LT SLMs were verified with a Larson Davis Model CAL200 acoustic calibrator (Serial Number 2794). The SLM used for the ST measurements was verified with a Brüel & Kjær 4231 acoustic calibrator (Serial Number 1413404). The accuracy of each of the acoustical calibrators is maintained through a program established through the manufacturer and traceable to the National Institute of Standards and Technology. All field procedures were consistent with professional practice and ANSI Standards for measuring environmental noise.

The stored hourly L_{eq} data from the CNAs was downloaded to a personal computer for subsequent analysis. The overall noise environment in Day-Night Average Sound Level (L_{dn}) was calculated for the long-term locations from the hourly L_{eq} dBA values. The 10-decibel (dB) nighttime penalty integral to the L_{dn} noise descriptor was added to the hourly data for the hours between 2200 hrs and 0700 hrs.

7.5.1.5 Results

Listings of the hourly noise data at the two long-term measurement locations are provided in Tables 7.5-2 and 7.5-3. The noise data from the three short-term measurement locations are summarized in Table 7.5-4.

7.5.1.6 Discussion

LT-1 is located east of the project site at the commercial marina. The residence closest to the project site is just north of LT-1 in the marina. This is considered a non-conforming residential land use located in an area zoned for heavy industrial use. The quietest four consecutive hours, in terms of the L_{90} metric, is commonly used by CEC for determining potential noise impacts. Based on the data obtained from the noise measurement survey, the quietest four consecutive hours occur during the period from 21:00 hours to 01:00 hours. The average L_{90} for this period is 46.6 dBA.

LT-2 is located southwest of the project site at the northeastern corner of an existing residential area. LT-2 is representative of the nearest residential zoning to the project. Based on the data obtained from the noise measurement survey, the quietest four consecutive hours occur during the period from 11:00 hours to 15:00 hours. The average L_{90} for this period is 41.8 dBA.

ST-1/NT-1 is located along the roadway leading to the Sportsman Yacht Club and is near LT-1. A concrete batch plant is located immediately southeast of the site. The area is zoned heavy industrial. Daytime noise sources included traffic along Wilbur Avenue, construction activity, industrial noise associated with a concrete batch facility, and other noise such as distant traffic noise and wildlife. Nighttime noise included traffic along Wilbur Avenue, noise associated with concrete batch facility cooling processes, and other noise such as distant traffic noise and wildlife.

ST-2/NT-2 is southeast of the project along Wilbur Avenue. Noise at this location is dominated by traffic noise. ST-3/NT-3 is located along a single-lane asphalt road east of the site. The area is zoned heavy industrial. Several non-conforming residential land uses are in the vicinity of the site.

7.5.2 Environmental Consequences

This section summarizes the noise impact analysis conducted for the proposed MLGS. Noise levels from the project expected at noise-sensitive receptors in the study area including the future facility boundaries were predicted using a model. The predicted noise levels were compared with existing ambient noise conditions and typical residential noise criteria to determine the potential for environmental noise impact as a consequence of construction and operation of the project.

7.5.2.1 Modeled Construction Noise

Construction is expected to take place for several months, with varying degrees of activity occurring during different phases of construction. Construction phases are expected to include:

- Excavation;
- Concrete pouring;
- Steel erection;
- Mechanical/electrical installation; and
- Cleanup.

Construction noise for MLGS should be typical of noise associated with industrial facility construction activities. Noise sources that are associated with most large industrial construction sites (including power plants) include air compressors, track hoes, backhoes, graders, bulldozers, scrapers, front-end loaders, cranes, hoists, generators, boom trucks, portable welders, and various heavy trucks and smaller vehicles. The exact noise levels are a complex function of the actual noise levels emitted from each major noise-emitting equipment, their location and orientation within the construction area, their operation and load, etc.

To realistically estimate the plant construction noise impacts, the composite noise levels listed in Table 3.1 of the *Power Plant Construction Noise Guide* (the *Guide*) were used (Barnes, Miller, and Wood, 1977). The composite noise levels are based on intensive noise monitoring during the construction of 15 actual power plants. The noise monitoring for the composite levels was done at locations selected to avoid undue excess attenuation from atmospheric conditions and terrain. The construction equipment was characterized as typical; it was neither unusually noisy nor quiet. The noise measurement data from the 15 power plants were normalized to consistent propagation conditions as follows: 59° Fahrenheit, 70 percent relative humidity, no wind or temperature gradients, flat terrain, and no soft ground (vegetation) losses. One important consideration in using these data is that the measurements are over 20 years old. Thus, they probably overestimate actual construction noise (there has been a trend towards quieter equipment in the intervening years). This same observation would be made if the U.S. Environmental Protection Agency (U.S. EPA) construction equipment or phases of construction noise level data were used because the U.S. EPA data were compiled in 1971. In spite of this consideration, these data are comprehensive and have the advantage of integrating significant variability to arrive at average impacts from construction. The estimated variability of the composite levels is ±3 dB for transient noise events, and is conservative overall.

For each phase of construction, the composite noise levels (defined in the *Guide*) provide long-term average L_{eq} at multiple distances from a hypothetical power plant construction site. These levels were then used to predict noise levels at the nearest residential use (LT-1) located northeast of the proposed plant site, using simple spherical divergence of the sound wave energy from the site to LT-1 1,500 feet distant. No additional excess attenuation due to vegetation, wind, atmospheric absorption, or temperature gradients was assumed. The results of the modeling are presented in Table 7.5-5. These results indicate that worst-case construction noise would be at or below existing noise levels at this location. Noise from MLGS construction will be lower at more distant noise-sensitive locations.

Periodically, some noises will be higher or lower than the levels presented here, but the overall sound levels should be lower because of excess attenuation and the trend toward quieter construction equipment in the intervening decade since the data were developed. These noise levels are based on data from normal workday construction only. Where nighttime or weekend construction must occur, shifts are usually smaller and noise levels correspondingly lower. In the *Guide*, only one of 15 sites had evening construction activity. In that instance, the crew was about one-third the size of the daytime force and noise levels were about 4 dB lower.

A reference distance of 100 feet was used to evaluate onsite construction noise levels and their potential impact on workers. These noise levels are also presented in Table 7.5-6. These noise levels will vary significantly depending on whether a worker is close to or conducting a noisy activity, but the L_{eq} are projected to average between 70 and 80 dBA during construction. Some workers will be occasionally exposed to noise levels above 85 dBA during construction.

7.5.2.2 Modeled Construction Traffic Noise

Construction traffic will be from Wilbur Avenue to the project site. The maximum number of construction vehicle daily round trips is predicted to be 508 in the summer of 2010.

Wilbur Avenue

The existing traffic volume on Wilbur Avenue is approximately 15,000 vehicles per day in the area adjacent to MLGS. The predicted 508 daily round trips due to construction vehicles would not measurably or perceptually increase noise on Wilbur Avenue.

7.5.2.3 Modeled Operational Noise

The power plant will have two Siemens Flex Plant 10 gas combustion turbines operating in combined cycle, two SGT6-5000F Simple Cycle gas combustion turbines, two heat recovery steam generators (HRSGs), a steam generator turbine, air-cooled heat exchangers, and associated auxiliary systems and equipment. Major noise-generating components would include combustion turbine generators, steam turbine generators, compressors, air-cooled heat exchangers, HRSGs, and transformers. The overall noise level generated by these components at offsite locations depends upon the physical layout of the facility and the noise control measures incorporated into the facility design. Onsite sound levels may be as high as 100 dBA in proximity to an individual noise source.

As part of the facility's design, specific noise control equipment will be incorporated that includes:

- Inlet air silencer (8 feet for up and over with lined elbow);
- Gas turbine – sound-attenuated enclosure;
- Exhaust diffuser and duct-acoustical barrier;
- Gas compressors – sound – attenuated enclosure; and
- ACHE – acoustic design for the fans.

The incorporation of these noise control devices has been included in the formulation of equipment noise generation values and modeling of overall noise emission.

Cadna/A® was used to model the generation and propagation of noise from the proposed plant. Cadna/A is a three-dimensional software program for predicting and assessing levels in the vicinity of industrial facilities and other noise sources. Cadna/A uses internationally recognized algorithms (ISO 9613-2) for the propagation of sound outdoors to calculate noise levels, and presents the resultant noise levels in an easy to understand, graphically oriented format. The program allows for input of all pertinent features (such as terrain or structures) that affect noise, resulting in a highly accurate estimate of existing and future noise levels.

Cadna/A was used to create a virtual model of the planned facility and other existing nearby structures. Digital Terrain Modeling was used to account for elevation and terrain features, and aerial photographs were used to model the existing structures. Noise emission levels were input using octave band levels, to accurately estimate noise propagation and attenuation effects. To ensure the validity of the results, the model was tested using previously measured and modeled noise data, and found to be consistent with both practice and theory.

All pieces of equipment that were deemed to be significant noise sources at the MLGS facility were included in the baseline noise model. The facility (i.e., all four units) was assumed to operate 24 hours per day as a worst-case scenario. The set of modeled sources included turbines, generators, pumps, motors, main transformers, air-cooled heat exchangers, and HRSGs. Small equipment items, such as pumps with less than 25 horsepower, were excluded because they were considered insignificant sources. Nominal noise emissions levels from various sources were used for the modeling inputs. The source level data included data provided by the client, limited vendor data, databases of previously modeled similar projects, and industry-standard estimated sound power values. Major buildings, tanks, and large equipment trains were included as barriers where appropriate. The Cadna/A model output predicted noise levels at several discrete locations and areas of equal noisiness around the plant site.

Attenuation due to spherical wave divergence, topographic features, barriers, and standard atmospheric absorption (70 percent relative humidity, 60°F) was included in the calculation of predicted noise levels. To provide a conservative estimate of project sound levels, attenuation due to wind, or temperature gradients was not subtracted from the predicted levels.

Based on the above assumptions, the estimated sound levels (at the noise-sensitive receptors closest to the proposed equipment) are summarized in Table 7.5-7. The nearest noise-sensitive receptor is north of LT-1, which is approximately 1,500 feet east of the proposed MLGS. The plant's operational sound levels will not measurably or perceptually increase LT-1's existing daytime L_{dn}, thus the resulting L_{dn} would remain 63 dBA. All residences are located far enough away from the project site, that MLGS will have no appreciable effect on existing ambient noise levels. Figure 7.5-2 shows the predicted noise contours of the surrounding area with the MLGS in operation. There are no residential land uses in this area.

7.5.2.4 Tonal Noise

The combustion turbine generators, transformers, and combustion turbine inlet compressors produce tonal sounds. Because of care in specifying the plant's engineering design features, no prominent tonal noise emissions will affect the noise-sensitive receptors. For example, the generator enclosure and combustion turbine enclosure and inlet silencers will be designed to reduce the tonal emissions from these sources to levels below the general plant noise. In addition, the transformer tonal noise emission level will be below the broadband plant noise level. Therefore, any equipment tonal emissions would not be distinctly audible at any offsite locations. During normal operations, the nature of noise from the proposed facility would be essentially continuous and broadband (no tones).

7.5.2.5 Occupational Noise Exposure

A review of major equipment noise emission data very close to the source and general knowledge of machinery associated with power generation indicate that noise levels within the MLGS project site could reach 85 to 100 dBA within 3 feet of the equipment envelope. Because of these predicted site noise levels, the requirement for a hearing conservation program will be evaluated and employees working at the MLGS facility with exposure to noise sources will be identified. All areas within the MLGS facility where noise levels could be 85 dBA or greater will be delineated and posted "Noise Hazard Area – Hearing Protection Required."

7.5.2.6 Power Transmission

Noise sources associated with power transmission include occasional breaker operation in the switchyard, corona noise, and very low magnetostriction hum from the conductors. Breaker noise is considered impulsive in nature, with a very short duration and may occur only a very few times per year. Corona noise is characterized as a buzz or hum, and is usually worse when the conductors are wet, such as in rain or fog.

The Electric Power Research Institute (EPRI) has conducted noise tests and studies and has published reference material on transmission line noise. Consistent with all acoustic textbooks' discussion of propagation of noise from a line source, EPRI states that noise produced by a conductor decreases at a rate of 3 decibels per doubling of distance from the source. The EPRI Transmission Line Reference Book indicates that the audible noise from a typical 230-kilovolt line with two conductors per phase would likely be less than 40 dBA at a distance of 40 feet from the outside conductor at ground level. If only one conductor per phase is used, the noise level will be less. This level of noise is very likely to be inaudible with respect to existing levels of community noise.

7.5.2.7 Conclusion

Based on the above analysis, project noise levels during operation of the facility are not predicted to exceed recommended noise compatibility guidelines at any sensitive receptors.

7.5.3 Cumulative Impacts and Indirect Effects

As discussed in Section 7.4, Land Use, seven other recently approved or proposed development projects are in the project vicinity. None of these projects is an industrial or manufacturing project and they would not be expected to impact noise levels in the area. Therefore, no cumulative impacts from increased noise in the area are expected.

7.5.4 Noise Control Measures

This section discusses mitigation measures proposed by the Applicant that will be implemented to reduce project-related noise impacts.

7.5.4.1 Offsite Operational Noise

The project as designed will not cause significant adverse noise impacts; thus, no additional mitigation of operational noise is required. However, to ensure that acoustical design goals are met by the facility while in operation, the following mitigation measures are recommended.

NOISE-1 Noise Attenuation

The design and implementation of the project shall include appropriate noise attenuation measures adequate to ensure that the noise level produced by operation of the project will not exceed an hourly average exterior noise level of more than 52 dBA L_{eq} at any residence. No new pure tone components may be introduced. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints, as determined by the compliance project manager (CPM).

Verification: Within 30 days of the project first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct a 25-hour noise survey. The noise survey shall also include short-term measurement of one-third octave-band SPL to ensure that no noise tones have been introduced. If the results from the operational noise survey indicate that pure tones are present, then additional noise control measures shall be implemented to eliminate the pure tones. Irrespective of the specific method used for determining the project's noise level, the character of the project's noise shall be evaluated at the nearest residence to determine the presence of tones or other dominant sources of project noise.

The measurement of project noise for the purposes of demonstrating compliance with this Condition of Certification may be made at a location, acceptable to the CPM, closer to the project than the nearest residence (e.g., 400 feet from the project's acoustic center in the direction of residences) and this measured level then mathematically extrapolated to determine the project's noise contribution at the nearest residence. If the results from the operational noise survey indicate that the project-only noise level exceeds 52 dBA, L_{eq} for any given hour at any residence, additional noise control measures shall be implemented to reduce noise to a level of compliance with this limit.

Within 30 days after completing the post-construction operational noise survey, the project owner shall submit a summary report of the survey to the CPM. Included in the survey report will be a description of any additional noise control measures necessary to achieve compliance with the above-listed noise limits, and a schedule, subject to CPM approval, for implementing these measures.

Within 30 days of completion of installation of these measures, the project owner shall submit to the CPM a summary report of a new noise survey, performed as described above and showing compliance with this condition.

7.5.4.2 Construction Noise

Construction of MLGS will temporarily elevate the noise levels in the surrounding community. Most often the sound levels will be moderate, with a few processes causing short-term, substantially elevated noise levels to occur. Because construction is of a limited duration, will be conducted during daylight hours, and best practices for construction noise control will be implemented, no adverse construction noise effects are expected to occur in the surrounding community.

NOISE-2 Construction Noise Restrictions

- Construction noise emission shall comply with all local LORS regarding hours of construction activity and permitted noise levels affecting adjacent uses.
- All construction equipment should be operated and maintained to minimize noise generation. Equipment and vehicles using internal combustion engines shall be equipped with mufflers, air-inlet silencers where appropriate, and other shrouds or noise reducing features, in good operating condition that meet or exceed original factory specifications. Mobile or fixed "package equipment" shall be equipped with shrouds and noise control features that are readily available for that type of equipment.
- The use of noise-producing signals, including horns, whistles, electronic alarms, and sirens and bells, will be for safety warning purposes only.
- No construction-related public address, loudspeaker, or music system shall be audible at any adjacent noise-sensitive land use.

NOISE-3 Noise Hotline

The construction contractor shall implement a noise complaint process and hotline number for the surrounding community. The Applicant will have the responsibility and authority to receive and resolve noise complaints.

7.5.4.3 Onsite Occupational Noise Exposure

Noise levels within the MLGS site were modeled to be above 85 dBA within 50 feet of major noise producing equipment. Employees working near the noise sources will participate in a facility-specific hearing conservation program if a program is necessary for compliance with the Occupational Safety and Health Administration (OSHA) regulations. In addition, specific plant areas will have noise surveys conducted after commissioning to determine where noise hazard warnings and personal hearing protection is necessary. With these project features in-place, no special mitigation measures will be required.

NOISE-4 Occupational Noise Survey

Within 30 days of the project first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to verify modeled noise levels and to identify any additional noise hazard areas in the facility. The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations (CCR), Sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations (CFR), Section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure. Areas above 85 dBA that may be accessed by any personnel shall be posted as high noise level areas. Hearing protectors shall be furnished and their use required in the posted areas.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and California Occupational Safety and Health Administration (Cal/OSHA) upon request.

7.5.5 Applicable Laws, Ordinances, Regulations, and Standards

The following discussion addresses relevant LORS regarding noise emissions and exposure. Some of these LORS are not legally applicable to the MLGS because of the preemptive jurisdiction of the CEC in the certification process of power plants. The purpose of this section is to provide the reader with a greater understanding of the regulatory environment relating to environmental noise. These LORS and their applicability to the project are summarized in Table 7.5-8.

7.5.5.1 Federal

A number of laws and guidelines at the federal level direct the consideration of a broad range of noise and vibration issues. Because the project does not fall within the purview of the Federal Energy Regulatory Commission or require action by federal agencies, the project is not directly subject to federal noise regulations other than OSHA. For perspective, several of the more significant noise-related federal regulations and guidelines are provided below:

- National Environmental Policy Act (42 United States Code [U.S.C.] 4321, et seq.) (PL-91-190) (40 CFR § 1506.5)

The National Environmental Policy Act (NEPA) is the basic national charter for protection of the environment including the noise environment. It establishes policy, sets goals, and provides means for carrying out the policy. It also contains "action-forcing" provisions to ensure that federal agencies act according to the letter and spirit of the Act. The regulations that follow provide guidance to federal agencies regarding what they must do to comply with the procedures and achieve the goals of the Act.

- Noise Control Act of 1972 (42 U.S.C. 4910)

  The Noise Control Act establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To accomplish this, the Act establishes a means for the coordination of federal research and activities in noise control, authorizes the establishment of federal noise emissions standards for products distributed in commerce, and provides information to the public respecting the noise emission and noise reduction characteristics of such products.

- U.S. Environmental Protection Agency recommendations in "Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety," NTIS 550\9-74-004, U.S. EPA, Washington, D.C., March 1974.

  In response to a federal mandate, the U.S. EPA provided guidance in this document, commonly referenced as the "Levels Document," which establishes an L_{dn} of 55 dBA as the requisite level, with an adequate margin of safety, for areas of outdoor uses including residences and recreation areas. This document does not constitute U.S. EPA regulations or standards, but identifies safe levels of environmental noise exposure without consideration for achieving these levels or other potentially relevant considerations. It is intended to "provide State and Local governments as well as the Federal Government and the private sector with an informational point of departure for the purpose of decision making." The agency is careful to stress that the recommendations contain a factor of safety and do not consider technical or economic feasibility issues, and therefore should not be construed as standards or regulations.

- Federal Energy Regulatory Commission (FERC) Guidelines on Noise Emissions from Compressor Stations, Substations, and Transmission Lines (18 CFR 157.206(d)5)

  These guidelines require that:

  > "the noise attributable to any new compressor stations, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed a day-night level (L_{dn}) of 55 dBA at any pre-existing noise sensitive area (such as schools, hospitals, or residences)."

  This policy was adopted based on the U.S. EPA-identified level of significance of 55 L_{dn} dBA.

- Federal Highway Administration (FHWA) Noise Abatement Procedures (23 CFR Part 772)

  The purpose of 23 CFR Part 772 is to provide procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways. It establishes five categories of noise sensitive receptors and prescribes the use of the hourly L_{eq} as the criterion metric for evaluating traffic noise impacts.

- Department of Housing and Urban Development (HUD) Environmental Standards (24 CFR Part 51)

  HUD Regulations set forth the following exterior noise standards for new home construction assisted or supported by the Department:

  65 L_{dn} or less – Acceptable

  > 65 L_{dn} and < 75 L_{dn} – Normally unacceptable, appropriate sound attenuation measures must be provided

  > 75 L_{dn} – Unacceptable

  HUD's regulations do not contain standards for interior noise levels. Rather, a goal of 45 decibels is set forth and attenuation requirements are geared to achieve that goal.

- Occupational Safety and Health Administration Occupational Noise Exposure; Hearing Conservation Amendment (Federal Register 48 (46), 9738 – 9785 (1983).

  The standard stipulates that protection against the effects of noise exposure shall be provided for employees when sound levels exceed 90 dBA over an 8-hour exposure period. Protection shall consist of feasible administrative or engineering controls. If such controls fail to reduce sound levels to within acceptable levels, personal protective equipment shall be provided and used to reduce exposure of the employee. Additionally, a Hearing Conservation Program must be instituted by the employers whenever employee noise exposure equals or exceeds the Action Level of an 8-hour time-weighted average sound level of 85 dBA. The Hearing Conservation Program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping.

The most relevant federal guidelines applicable to community noise exposure are those provided by the U.S. EPA in "Information of Levels on Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (EPA 550/9-74-004). It should be noted that this document does not constitute U.S. EPA regulations or standards, but rather identifies safe levels of environmental noise exposure without consideration for achieving these levels or other potentially relevant considerations. It is intended to "provide State and Local governments as well as the Federal Government and the private sector with an informational point of departure for the purpose of decision making." These guidelines are not adopted or recommended by the State of California or any local jurisdiction. The agency is careful to stress that the recommendations contain a factor of safety and do not consider technical or economic feasibility issues needed to implement these guidelines.

7.5.5.2 State

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified, and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (Title 14, CCR, Appendix G) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

a. exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies;
b. exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
c. a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
d. a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project….”

The State of California provides regulation by adopted laws and guidance regarding noise emissions through the jurisdiction of state commissions. Regulation of noise emissions and noise exposure from power plants is provided via the CEC. The CEC provides siting guidelines (CEC-140-2007-003) to assist power plant operators with the evaluation of potential power plant locations. The siting guidelines specify the that potential noise impacts from power plant construction and operation be evaluated through the comparison of existing ambient noise levels with the noise levels projected to result from the project. This approach requires the determination of noise emissions from the project and evaluation of noise exposure at specific receptor locations. In essence, this methodology ensures that power plants in California are sited with regard to the local noise environment. In general, the CEC considers that a project-related increase in environmental noise of 5 to 10 dBA or more at noise-sensitive receptors may be significant. An increase of 10 dBA or more is generally considered a significant impact.

Occupational exposure to noise is regulated by Cal/OSHA in Title 8, Group 15, Article 105, Sections 5095-5100. The standard specifies that protection against the effects of noise exposure shall be provided when sound levels exceed 90 dBA over an 8-hour exposure period. Protection shall consist of feasible administrative or engineering controls. If such controls fail to reduce sound levels to within acceptable levels, personal protective equipment shall be provided and used to reduce exposure of the employee. Additionally, a Hearing Conservation Program must be instituted by the employers whenever employee noise exposure equals or exceeds the Action Level of an 8-hour time-weighted average sound level of 85 dBA. The Hearing Conservation Program requirements consist of periodic area and personal noise monitoring, performance and evaluation of audiograms, provision of hearing protection, annual employee training, and record keeping. The CEC incorporates this regulation into its Conditions of Certification.

7.5.5.3 Local

The project is located within the existing CCPP site in unincorporated Contra Costa County. This site is within 1.5 miles of the City of Antioch. Noise emissions from the project could potentially impact sensitive uses located within each of these jurisdictions.

Contra Costa County

The Noise Element of the Contra Costa County General Plan is designed to limit the exposure of the community to excessive noise levels. A major objective of the Noise Element is to provide guidelines to achieve noise land use compatibility. The Land Use and Noise Elements of the General Plan are closely related. By identifying noise-sensitive land uses and establishing guidelines for land use and noise, the Noise Element influences the general distribution, location, and intensity of future land uses and helps to alleviate noise conflicts. Figure 7.5-3 provides a listing of acceptable noise levels by land use category. The noise levels considered generally acceptable and conditionally acceptable for single-family residences are 60 dBA CNEL and 70 dBA CNEL, respectively. Several policies in the Contra Costa County General Plan Noise Element are applicable to construction and operation of the project (Contra Costa County, 2005). These policies are as follows:

- Policy 11-1 – Requires new projects to meet acceptable exterior noise level standards.
- Policy 11-8 – Requires construction activities to be concentrated during normal daytime work hours.

Contra Costa County Noise Ordinance: The County of Contra Costa has a noise ordinance restricting the noise from Temporary Events. The Contra Costa County Municipal Code Chapter 82-44 states that temporary events shall not generate or emit any noise or sound that exceeds any of the levels specified in Table 7.5-9, Allowable Exterior Noise Levels, measured at the exterior of any dwelling unit located a residential property. The noise generated or emitted shall not exceed the levels specified in the table for the duration of the time specified in the table.

Title 7 Building Regulations, Chapter 716-8.1008 of the Contra Costa County Code contains regulations applicable to construction.

> Chapter 716-8.1008 Nuisances.
>
> Operations shall be controlled to prevent nuisances to public and private ownerships because of dust, drainage, removal of natural support of land and structures, encroachment, *noise*, and/or vibration. (Ords. 99-46 § 15: 69-59 § 1, 1969)

City of Antioch

The City of Antioch Municipal Code provides noise standards pertaining to noise abatement, and residential districts. Noise abatement standards are provided in Chapter 5: Zoning, Article 19: Noise Attenuation Requirements, Section 9-5.1901 of the municipal code. These standards specify that noise levels from stationary sources adjacent to outdoor living areas and parks shall not cause an increase in background ambient noise that will exceed the 60 dBA Community Noise Equivalent Level. The city may require noise attenuation measures to be incorporated into a project to obtain compliance.

Two noise ordinances in the City of Antioch Code of Ordinances are applicable to construction and operation of the project (Antioch, 2008). Ordinances § 5-17.04 and § 5-17.05 regulate heavy construction equipment noise and construction activity noise. These regulations limit heavy construction equipment operation and construction activity to the following hours:

1. On weekdays between 7:00 a.m. and 6:00 p.m.
2. On weekdays within 300 feet of occupied residences between 8:00 a.m. and 5:00 p.m.
3. On weekends and holidays between 9:00 a.m. and 5:00 p.m.

7.5.6 Involved Agencies and Agency Contacts

No agencies are involved with noise-related aspects of the project.

7.5.7 Permits Required and Permit Schedule

No noise-specific permits are required for construction of the MLGS project.

7.5.8 References

Antioch (City of), 2008. Antioch Zoning Code. Accessed January 21, 2008 at http://www.ci.antioch.ca.us/CityGov/CommDev/PlanningDivision/

Barnes, J. D., L. M. Miller, and E. W. Wood, 1997. Power Plant Construction Noise Guide. Report No. 3321.

Beranek, Leo L., ed., 1971. Noise and Vibration Control. McGraw-Hill, Inc. New York, NY.

Beranek, L. L. and I. L. Ver, eds. 1992. Noise and Vibration Control Engineering. John Wiley & Sons, Inc. New York, NY.

CEC (California Energy Commission), 2006. *Rules of Practice and Procedure & Power Plant Site Certification Regulations.* CEC-140-2007-003. Sacramento, CA. July.

CEC (California Energy Commission), 2001. Contra Costa Unit 8 Power Project, Application for Certification , Commission Decision 00-AFC-1) P800-01-18, May.

Contra Costa County, 2005. Contra Costa County General Plan 2005 – 2020. Adopted January 18, 2005.

Diehl, George M., ed, 1973. Machinery Acoustics. John Wiley & Sons, Inc. New York, NY.

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

General Electric Energy, 2000, December 15. LM6000 Combustion Turbine Generator. *Sound Power Levels of the LM6000 Turbine Generator Package, PC Engine, dB (Ref. 1 picowatt).*

Harris, Cyril M., ed, 1991. *Handbook of Acoustical Measurements and Noise Control*. Third Edition. McGraw-Hill, Inc. New York, NY.

Hassall, J. R. and K. Zaveri. 1988. *Acoustic Noise Measurements*. Fifth Edition. Brüel & Kjær Instruments, Inc. Copenhagen, Denmark.

U.S. EPA (U.S. Environmental Protection Agency). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. NTID 300-1. (Prepared under contract by Bolt, et al.) Washington, DC.

U.S. EPA (U.S. Environmental Protection Agency), 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. 550/9-74-004. U.S. Environmental Protection Agency, Office of Noise Abatement and Control. Washington, DC.

Table 7.5-1
Sound Levels of Typical Noise Sources and Noise Environments
(A-Weighted Sound Levels)

Noise Source (at Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)
Military Jet Take-off with After-burner (50 feet)	140	Carrier Flight Deck	–
Civil Defense Siren (100 feet)	130	–	–
Commercial Jet Take-off (200 feet)	120	–	**Threshold of Pain** *32 times as loud
Pile Driver (50 feet)	110	Rock Music Concert	*16 times as loud
Ambulance Siren (100 feet) Newspaper Press (5 feet) Power Lawn Mower (3 feet)	100		**Very Loud** *8 times as loud
Motorcycle (25 feet) Propeller Plane Flyover (1,000 feet) Diesel Truck, 40 mph (50 feet)	90	Boiler Room Printing Press Plant	*4 times as loud
Garbage Disposal (3 feet)	80	High Urban Ambient Sound	*2 times as loud
Passenger Car, 65 mph (25 feet) Living Room Stereo (15 feet) Vacuum Cleaner (3 feet) Electronic Typewriter (10 feet)	70	–	**Moderately Loud** *70 decibels (Reference Loudness)
Normal Conversation (5 feet) Air Conditioning Unit (100 feet)	60	Data Processing Center Department Store	*1/2 as loud
Light Traffic (100 feet)	50	Private Business Office	*1/4 as loud
Bird Calls (distant)	40	Lower Limit of Urban Ambient Sound	**Quiet** *1/8 as loud
Soft Whisper (5 feet)	30	Quiet Bedroom	**Very Quiet**
	20	Recording Studio	
	10	–	**Extremely Quiet**
	0	–	**Threshold of Hearing**

Source: Compiled by URS Corporation from various published sources and widely used references such as *The Handbook of Acoustical Measurements and Noise Control*, Third Edition, edited by C. M. Harris, 1991; *Federal Agency Review of Selected Airport Noise Analysis Issues*, 1992, Modified by The Louis Berger Group, Inc, 2004, and *Noise and Vibration Control*, Second Edition, edited by L. L. Beranek, 1988 Institute of Noise Control Engineering.

Table 7.5-2
Hourly Long-Term Results, Location LT-1
(dBA)

Start Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}
7:00	61.4	54.1	75.0	63.6	61.8	58.0
8:00	59.5	46.8	76.8	60.7	59.9	57.8
9:00	63.1	53.2	81.8	64.1	62.0	59.0
10:00	62.2	50.6	80.5	64.9	61.1	56.5
11:00	58.7	45.8	69.9	59.6	61.0	58.4
12:00	62.8	54.6	81.8	65.2	63.1	59.4
13:00	60.5	52.7	70.9	63.0	60.5	57.4
14:00	58.7	51.3	71.8	60.6	57.4	55.3
15:00	58.0	50.3	68.3	60.9	58.1	53.7
16:00	55.7	47.0	70.9	58.3	53.5	50.2
17:00	53.4	46.7	71.7	54.9	51.6	49.4
18:00	53.1	46.3	68.4	55.0	52.0	50.3
19:00	52.9	46.3	70.7	54.9	51.4	49.2
20:00	54.6	46.8	70.2	55.7	53.0	50.7
21:00	48.5	42.4	67.5	49.0	49.6	48.3
22:00	46.6	43.4	52.5	47.8	47.0	45.9
23:00	46.6	43.0	56.7	47.9	47.1	45.7
0:00	53.2	44.5	70.5	53.6	49.1	46.6
1:00	50.3	43.6	64.6	51.0	50.8	48.8
2:00	49.1	44.9	61.0	51.3	48.3	47.1
3:00	51.6	45.7	61.3	53.6	52.5	50.8
4:00	56.4	49.0	70.7	58.4	57.0	55.3
5:00	58.4	51.7	69.8	60.5	58.7	55.6
6:00	60.8	53.6	72.7	63.6	60.6	58.2
7:00	63.3	54.6	77.3	65.7	61.7	58.6
25-hour	58.5	42.4	81.8	57.7	55.6	53.0
Quietest 4-hours (L_{90}) (21:00-00:59)	58.8	42.4	70.5	49.6	48.2	46.6
L_{dn}	64.8					

Notes:
Measurement survey conducted on November 14 and 15, 2007.
Measurements do not include GGS operations noise.

Table 7.5-3
Hourly Long-Term Results, Location LT-2
(dBA)

Start Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}
17:00	46.0	40.7	57.4	48.0	45.4	43.3
18:00	58.7	41.2	80.0	51.7	47.4	45.5
19:00	46.3	39.9	62.6	48.3	45.0	43.2
20:00	45.4	41.5	58.4	47.1	45.1	43.3
21:00	69.2	39.5	98.7	53.3	46.0	43.7
22:00	61.1	38.0	89.0	47.1	42.7	40.5
23:00	43.7	37.7	56.2	46.1	42.9	41.0
0:00	42.1	37.0	57.6	43.0	41.2	40.0
1:00	65.4	37.7	95.4	49.8	42.7	40.4
2:00	64.4	38.9	94.9	47.7	45.1	41.2
3:00	48.2	38.9	65.1	51.1	47.1	43.5
4:00	53.3	45.8	62.8	55.7	54.0	50.8
5:00	54.1	49.6	63.7	55.9	53.9	52.3
6:00	57.4	49.6	80.6	56.0	53.5	51.4
7:00	67.7	45.8	98.9	54.0	49.9	48.5
8:00	58.3	40.1	90.5	51.2	47.5	45.9
9:00	55.3	41.0	76.7	52.1	46.8	44.6
10:00	51.2	38.5	73.0	52.1	48.7	44.5
11:00	47.6	37.7	64.1	50.3	47.5	43.8
12:00	44.6	36.3	61.8	46.9	44.4	41.2
13:00	53.5	36.8	78.2	49.5	43.8	40.8
14:00	56.4	35.9	88.2	48.1	44.0	41.5
15:00	53.3	42.4	78.4	54.0	50.3	46.4
16:00	55.5	44.4	76.1	53.8	51.7	49.0
17:00	65.8	46.2	96.3	53.0	51.4	49.4
25-hour	60.8	35.9	98.9	50.6	47.1	44.6
Quietest 4-hours (L_{90}) (11:00-14:59)	52.7	35.9	88.2	48.7	44.9	41.8
L_{dn}	68.1					

Notes:
Measurement survey conducted on November 13 and 14, 2007.
Measurements do not include GGS operations noise.

Table 7.5-4
Short-Term Measurement Data
(dBA)

Measurement Identification	Start Time	End Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}
ST1	15:28	15:40	59.8	51.3	74.6	62.4	57.4	52.9
NT1	0:11	0:21	45.7	42.7	52.9	46.9	45.4	43.9
ST2	15:07	15:19	69.3	58.0	80.3	72.9	66.4	60.4
NT2	0:35	0:45	60.4	57.6	74.3	60.9	58.9	58.4
ST3	14:46	14:56	68.4	54.4	79.4	71.4	66.9	61.4
NT3	1:00	1:15	49.1	45.3	57.1	51.4	47.9	46.9

Notes:
Measurement survey conducted on November 14, 2007.
Measurements do not include GGS operations noise.

Table 7.5-5
Existing L_{90} Sound Level and Estimated MLGS L_{90} Sound Level

Receptor	Distance from Source to Receptor[1]	Measured Sound Level (L_{90})*	Calculated Project Sound Level (L_{90})	Calculated Project Plus Measured (L_{90})	Project Change (L_{90})
LT-1	2,100 feet	46.6 dBA	46.4 dBA	49.5 dBA	2.9 dBA
LT-2	2,900 feet	41.8 dBA	42.9 dBA	45.4 dBA	3.6 dBA
ST-1	2,050 feet	52.9 dBA	46.8 dBA	53.9 dBA	1.0 dBA
ST-2	2,640 feet	60.4 dBA	44.0 dBA	60.5 dBA	0.1 dBA
ST-3	2,960 feet	61.4 dBA	42.9 dBA	61.5 dBA	0.1 dBA
NT-1	2,050 feet	43.9 dBA	46.8 dBA	48.6 dBA	4.7 dBA
NT-2	2,640 feet	58.4 dBA	44.0 dBA	58.6 dBA	0.2 dBA
NT-3	2,960 feet	46.9 dBA	42.9 dBA	48.4 dBA	1.5 dBA

Note: L90 for LT-1 and LT-2 is the arithmetic average of the L90 during the quietest consecutive 4 hours of the 25-hour measurement period.
[1] Distance measured from the approximate center of the plant.

Table 7.5-6 Maximum Estimated Construction Noise Levels (dBA)		
Construction Phase	**Maximum estimated noise levels at nearest sensitive receptor and onsite during construction (L_{eq})**	
	LT-1 (1,500 feet from Plant Construction Activity)	**100 feet from Construction Activity**
Excavation, site preparation	56	80
Concrete pouring	52	76
Steel erection	56	80
Mechanical, electrical	51	75
Cleanup	46	70

Table 7.5-7 Existing L_{eq} Sound Level and Estimated MLGS L_{eq} Sound Level					
Receptor	**Distance from Source to Receptor[1]**	**Measured Sound Level (L_{eq})**	**Calculated Project Sound Level (L_{eq})**	**Calculated Project Plus Measured (L_{eq})**	**Project Change (L_{eq})**
LT-1	2,100 feet	59 dBA	48 dBA	59.3 dBA	0.3 dBA
LT-2	2,900 feet	61 dBA	45 dBA	61.1 dBA	0.1 dBA
ST-1	2,050 feet	60 dBA	49 dBA	60.3 dBA	0.3 dBA
ST-2	2,640 feet	69 dBA	46 dBA	69.0 dBA	0.0 dBA
ST-3	2,960 feet	68 dBA	45 dBA	68.0 dBA	0.0 dBA
NT-1	2,050 feet	46 dBA	49 dBA	50.8 dBA	4.8 dBA
NT-2	2,640 feet	60 dBA	46 dBA	60.2 dBA	0.2 dBA
NT-3	2,960 feet	49 dBA	45 dBA	50.5 dBA	1.5 dBA

Note:
[1]Distance measured from the approximate center of the plant.

Table 7.5-8
Applicable Noise Laws, Ordinances, Regulations, and Standards

Agency	Laws, Ordinances, Regulations, and Standards	Applicability	AFC Section
Federal			
U.S. EPA	Environmental Protection Agency (EPA) Report 550/9-74-004. The EPA set this guideline as the level of environmental noise requisite to protect public health and welfare with an adequate margin of safety.	Not applicable by statute.	Section 8.5.1.1 discusses this guideline. As designed, the project will comply with this guideline.
State			
CEC	The CEC uses their siting guidelines (CEC-140-2007-003) in combination with local noise regulations and standards to evaluate the significance of noise impacts through the comparison of existing ambient noise levels with the noise levels projected to result from a project.	This requirement is applicable to the control of operation noise from the project. It evaluates noise increases of 5 dBA or greater in nearby noise sensitive areas.	Section 8.5.1.2 discusses conformance with this requirement. The project has been designed to comply with this requirement.
Cal/OSHA	Occupational exposure to noise is regulated by Cal/OSHA in Title 8, Group 15, Article 105, Sections 5095 – 5100	This requirement is applicable to protect employees from significant noise exposure during a work period.	Section 8.5.1.2 discusses conformance with is requirement. The project has been designed to comply with this requirement.
Local			
Contra Costa County	Contra Costa County Municipal Code Chapter 82-44	This requirement is applicable to noise generated during construction of the project as a "Temporary Event"	Section 8.5.1.3 discusses this requirement. The project has been planned to comply with this requirement.
City of Antioch	City of Antioch Municipal Code Chapter 5: Zoning, Article 19: Noise Attenuation Requirements, Section 9-5.1901	This requirement is applicable to noise generated during operation of the project. Does not restrict the hours of day that construction is permitted.	Section 8.5.1.3 discusses this requirement. The project has been planned to comply with this requirement.

Table 7.5-9 Contra Costa County Allowable Exterior Noise Levels		
Cumulative Duration of Noise	**9 a.m. – 8 p.m.**	**8 p.m. – 10 p.m.**
30 minutes per hour	60 dBA	55 dBA
15 minutes per hour	65 dBA	60 dBA
5 minutes per hour	70 dBA	65 dBA
1 minute per hour	75 dBA	70 dBA
Level not to be exceeded at any time	80 dBA	75 dBA

LEGEND

⬟	LT	Long-Term Monitoring Site
■	ST	Short-Term Monitoring Site
■	NT	Night-Time (Short-Term) Monitoring Site

NOISE MEASUREMENT SITE LOCATIONS

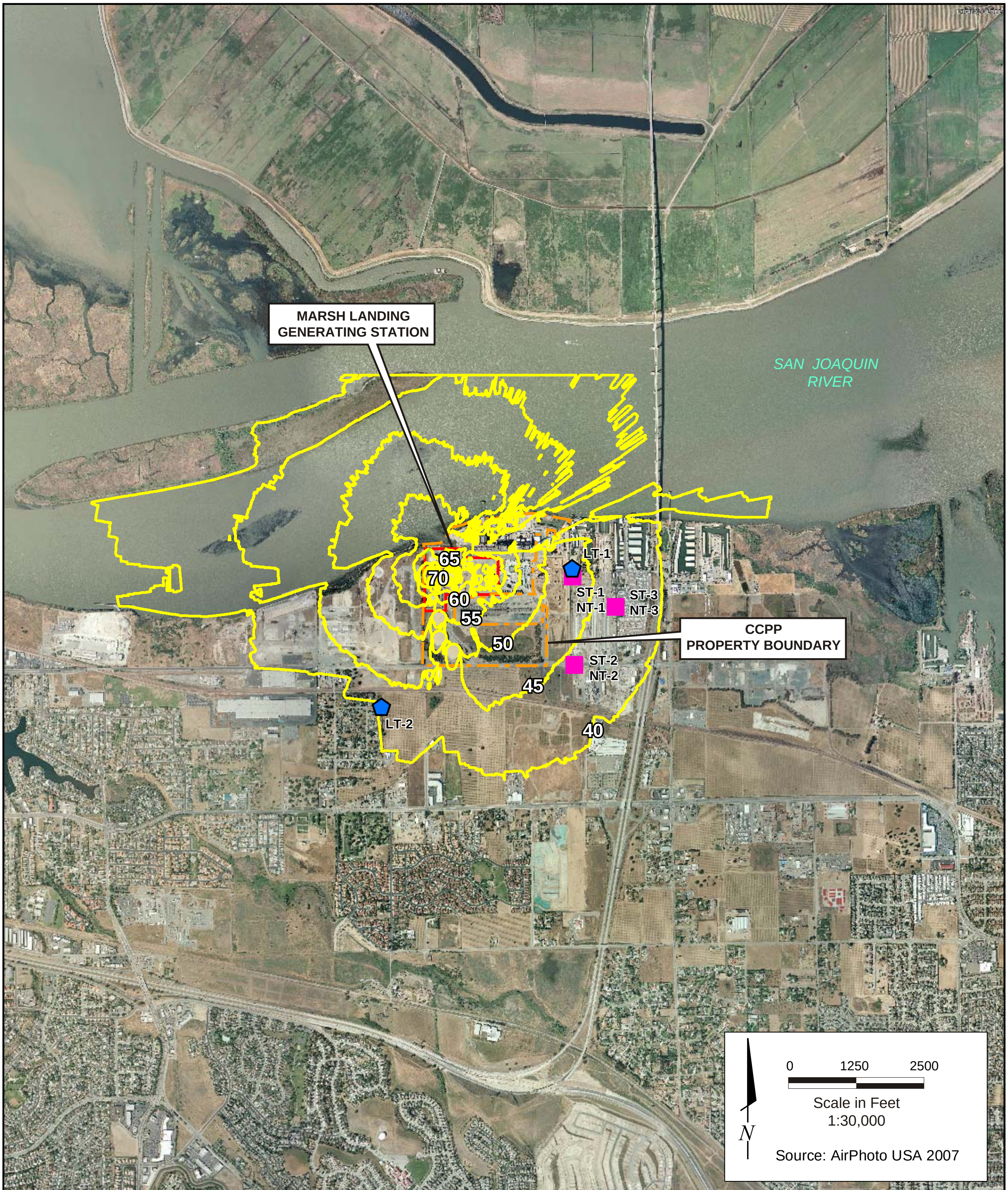
Marsh Landing Generating Station
Mirant Marsh Landing, LLC
Contra Costa County, California

May 2008
28067344

URS

FIGURE 7.5-1

5/21/08 vsa ..\T:\Mirant Contra Costa-Marsh Landing\Graphics\7.05 Noise\7.5-1_noise locs.ai



LEGEND

- LT Long-Term Monitoring Site
- ST Short-Term Monitoring Site
- NT Night-Time (Short-Term) Monitoring Site
- Noise Contour (dBA)

L_{90} NOISE LEVELS DURING MLGS OPERATION

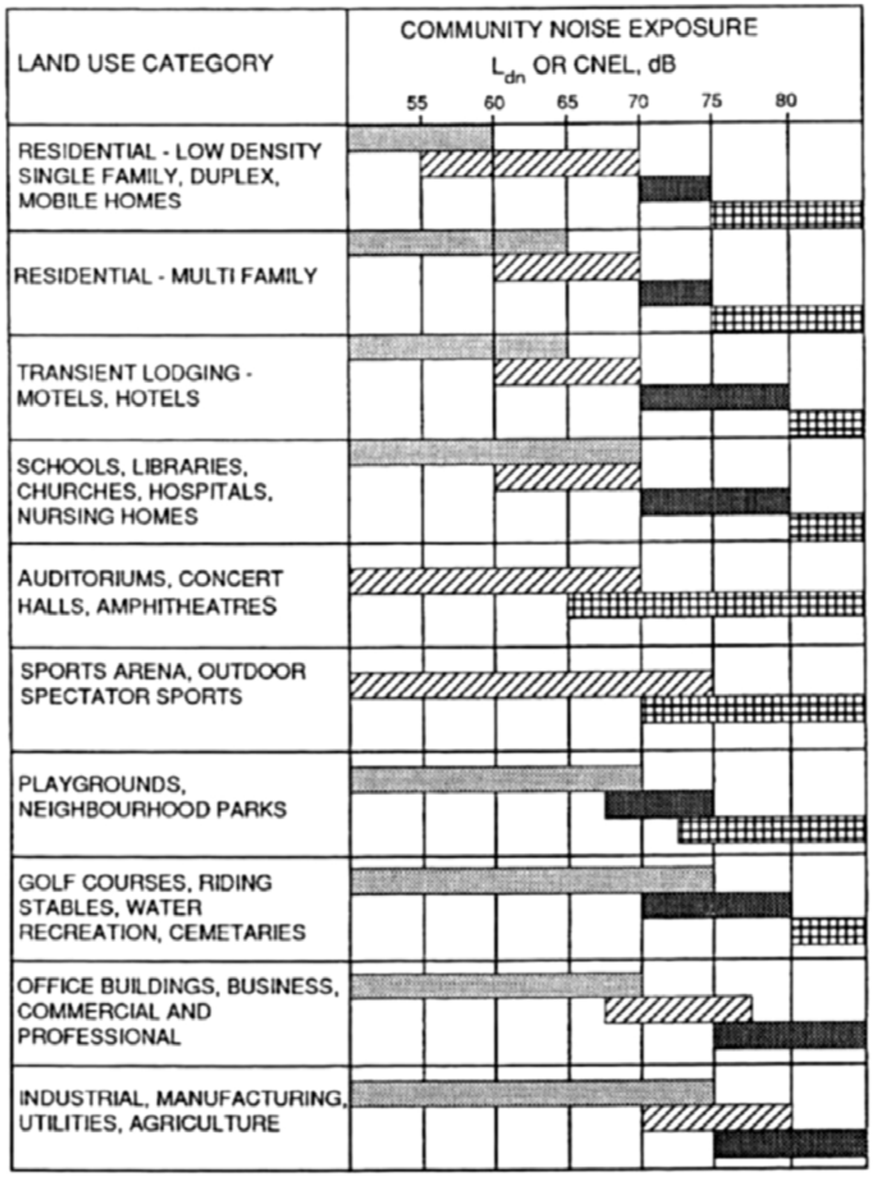
Marsh Landing Generating Station
Mirant Marsh Landing, LLC
Contra Costa County, California

May 2008
28067344

URS

FIGURE 7.5-2

5/21/08 vsa/hk ..\T:\Mirant Contra Costa-Marsh Landing\Graphics\7.05 Noise\7.5-2_L90.ai



NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

NORMALLY UNACCEPTABLE
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development clearly should not be undertaken.

For lands within 3 miles of Buchanan Field and the East Contra Costa County Airports noise compatibility shall be adjusted to those of the ALUC which are roughly 5 CNEL lower than shown on this table.

Source:
Contra Costa County, 2005

COUNTY OF CONTRA COSTA
LAND USE COMPATIBILITY

Marsh Landing Generating Station
Mirant Marsh Landing, LLC
Contra Costa County, California

May 2008
28067344

URS

FIGURE 7.5-3

5/8/08 vsa/hk ..\T:\Mirant Contra Costa-Marsh Landing\Graphics\7.05 Noise\7.5-3_land use comp.ai