4.8—NOISE

This section of the Draft EIR describes existing noise and vibration conditions near the Clayton Quarry, summarizes applicable jurisdictional laws and regulations associated with noise and vibration, and presents the significance criteria and thresholds for the evaluation of noise and vibration-related environmental impacts. This section then describes analysis methodologies and identifies the potential noise and vibration effects of the proposed project. Measures to mitigate potential noise and vibration impacts are recommended, as appropriate.

4.8.1 Environmental Setting

4.8.1.1 Technical Background

Acoustic Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature, and can vary substantially from person to person. Common sources of environmental noise and relative noise levels are shown in Table 4.8-1, "Typical Noise Levels Associated with Common Activities."

A sound wave is initiated in a medium by a vibrating object (e.g., vocal cords, the string of a guitar, the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz, which is equivalent to one complete cycle per second.

Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel (dB) scale was introduced. Sound level expressed in decibels (dB) is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure and the second pressure being that of the sound source of concern. For sound pressure in air, the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive.

A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly added. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.

The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to noise from the environment, including noise from transportation and stationary sources.

TABLE 4.8-1
TYPICAL NOISE LEVELS ASSOCIATED WITH COMMON ACTIVITIES

Common Outdoor Activities	Noise Level *(dBA)*	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, 50 mph		Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher (in next room)
Quiet Urban Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing (Healthy)	0	Lowest Threshold of Human Hearing (Healthy)

Source: Caltrans 2013a.

Noise can be generated by a number of sources, including mobile sources (transportation) such as automobiles, trucks, and airplanes, and stationary sources (non-transportation) such as construction sites, machinery, and commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (e.g., walls, building façades, berms). Noise generated from mobile sources generally attenuate at a rate of 3 dBA (typical for hard surfaces, such as asphalt) to 4.5 dBA (typical for soft surfaces, such as grasslands) per doubling of distance, depending on the intervening ground type. Stationary noise sources spread with more spherical dispersion patterns that attenuate at a rate of 6 to 7.5 dBA per doubling of distance for hard and soft sites, respectively (Caltrans 1998).

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction or "shielding" provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural barriers such as earthen berms, hills, or dense woods as well as man-made features such as buildings, concrete berms and walls may be effective barriers for the reduction of source noise levels.

Noise Descriptors

The intensity of environmental noise levels can fluctuate greatly over time and as such, several different descriptors of time-averaged noise levels may be used to provide the most effective means of expressing the noise levels. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment near the receptor(s). Noise descriptors most often used to describe environmental noise are defined below.

L_{max} (Maximum Noise Level): The maximum instantaneous noise level during a specific period of time.

Lx (Statistical Descriptor): The noise level exceeded "X" percent of a specific period of time. For example, L50 is the median noise level, or level exceeded 50% of the time.

L_{eq} (Equivalent Noise Level): The average noise level. The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft over-flights, the L_{eq} value is heavily influenced by the magnitude and number of single events that produce the high noise levels.

L_{dn} (Day-Night Average Noise Level): The 24-hour L_{eq} with a 10-dBA "penalty" for noise events that occur during the noise-sensitive hours between 10 p.m. and 7 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

CNEL (Community Noise Equivalent Level): The CNEL is similar to the L_{dn} described above, but with an additional 5-dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for relaxation, conversation, reading and television. When the same 24-hour noise data are used, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

Community noise is commonly described in terms of the ambient noise level which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or L_{eq} which corresponds to the steady-state A-weighted sound level containing the same total energy as the time-varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptors such as L_{dn} and CNEL, as defined above, and shows very good correlation with community response to noise. Use of these descriptors along with the maximum noise level occurring during a given time period provides a great deal of information about the ambient noise environment in an area.

Negative Effects of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory effects on humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance and dissatisfaction, which lead to interference with activities such as communications, sleep and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The majority of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise source, relative to the environment an individual has become accustomed to, the less tolerable the new noise source will be to an individual.

With respect to how humans perceive and react to changes in noise levels, a 1 dBA increase is generally imperceptible outside of a laboratory environment, a 3 dBA increase is barely perceptible, a 6 dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Charles M. Salter Associates 1998). These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state, pure tones or broad-band noise and to changes in levels of a given noise source.

Vibration Fundamentals

Vibration is similar to noise in that it is a pressure wave traveling through an elastic medium involving a periodic oscillation relative to a reference point. Vibration is most commonly described in respect to the excitation of a structure or surface, such as in buildings or the ground. Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions, impacts). Vibration levels can be depicted in terms of amplitude and frequency; relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal, or the quantity of displacement measured from peak to trough of the vibration wave. RMS is defined as the positive and negative statistical measure of the magnitude of a varying quantity. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of one second. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (Federal Transit Administration [FTA] 2018). Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. Human response to vibration has been found to correlate well to average vibration amplitude; therefore, vibration impacts on humans are evaluated in terms of RMS vibration velocity.

PPV and RMS vibration velocity are nominally described in terms of inches per second (in/sec). However, as with airborne sound, vibration velocity can also be expressed using decibel notation as vibration decibels (VdB). The logarithmic nature of the decibel serves to compress the broad range of numbers required to describe vibration and allow for the presentation of vibration levels in familiar terms.

Typical outdoor sources of perceptible groundborne vibration include construction equipment, steel-wheeled trains, and vehicles on rough roads. Although the effects of vibration may be imperceptible at low levels, effects may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the elevated levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in damage to structural components. Table 4.8-2, "Typical Levels of Groundborne Vibration," identifies some common sources of vibration, corresponding VdB levels, and associated human perception and potential for structural damage.

TABLE 4.8-2
TYPICAL LEVELS OF GROUNDBORNE VIBRATION

Human/Structural Response	Velocity Level RMS *(VdB)*	Typical Events (50-foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
	95	Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as watching a video or reading a computer screen	90	Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events	75	Commuter rail, typical bus or truck over bump or on rough roads
Residential annoyance, frequent events	72	Rapid transit, typical
Approximate human threshold of perception to vibration	65	Buses, trucks, and heavy street traffic
	60	Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: FTA 2018.

4.8.1.2 Sensitive Receptors in the Project Vicinity

Nearest Noise and Vibration Sensitive Receptors

Sensitive receptors are defined as land uses where noise-sensitive people may be present or where noise-sensitive activities may occur. Examples of noise-sensitive land uses include residences, schools, hospitals, and retirement homes. Examples of noise-sensitive activities are those that occur in locations such as churches and libraries.

The nearest sensitive receptors to the project site consist of: 1) single family residences located east of Mitchell Canyon Road, approximately 50 feet east of the project site; 2) single family residences located approximately 300 feet southeast of the project site, 3) single family residences located approximately 440 feet north of the project site; and 4) Mt. Diablo State Park, with the nearest trail located approximately 650 feet at the closest distance southeast of the project site. The locations of these receptors are shown on Figure 4.8-1, "Nearest Sensitive Receptors to the Clayton Quarry."

4.8.1.3 Ambient Noise and Vibration Environment

In Contra Costa County, transportation-related noise sources are the primary sources of noise and include traffic along freeways, traffic along major arterials, railroad corridors, Bay Area Rapid Transit Lines, and airports. Industrial plant and materials processing plant noise can be important noise sources to specific localities.

The existing ambient noise environment at the Clayton Quarry is defined primarily by existing CEMEX excavation and processing operations, traffic along Mitchell Canyon Road, and natural sounds (wind, birds, insects, etc.). The project site is not located near a highway, arterial, or railroad corridor. Traffic noise in the area was estimated as less than 60 dBA L_{dn} under both existing and future conditions in the *Contra Costa County General Plan* (Contra Costa County 2014). The project site is also not located near an airport and is not subject to airport noise.

4.8.1.4 Ambient Vibration Environment

The use of earthmoving equipment on the Clayton Quarry may have the potential to generate vibration in close proximity to the equipment, but does not generate perceptible vibration off-site because vibration attenuates rapidly with distance. No other potential sources of vibration are located in the vicinity of the Clayton Quarry.

4.8.2 Regulatory Setting

4.8.2.1 Federal

40 Code of Federal Regulation (CFR),Part 205(B)

Federal regulations establish noise limits for medium and heavy trucks weighing more than 4.5 tons (gross vehicle weight rating) under Title 40 of the Code of Federal Regulations (CFR), Section 205.50 et seq. Under this regulation, the truck pass-by noise standard is 80 dBA at 15 meters from the vehicle pathway center line. These controls are implemented through regulatory controls on truck manufacturers.

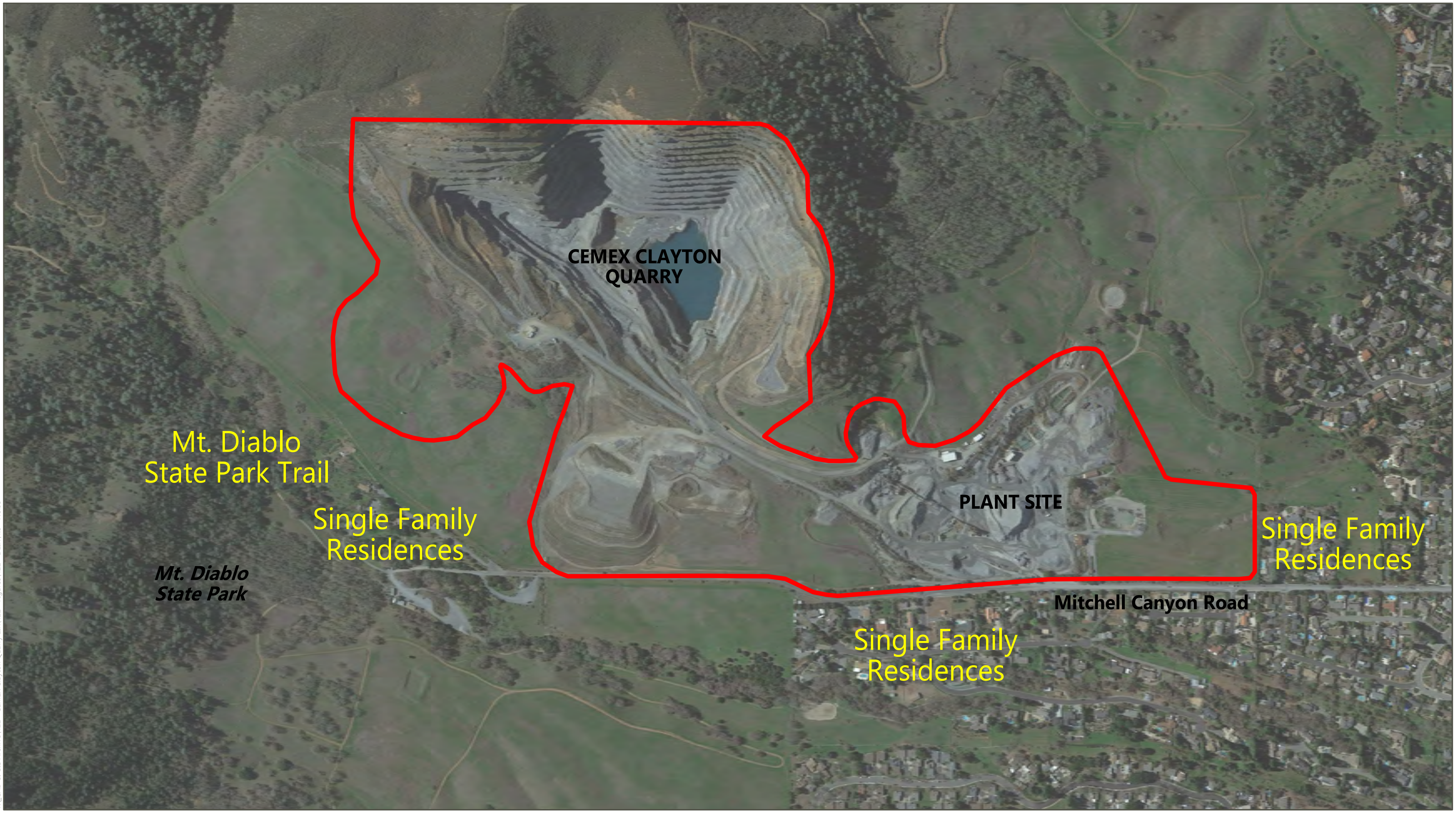
Occupational Health and Safety Administration

Federal codes, primarily the Occupational Safety and Health Act of 1970 (OSHA), govern worker exposure to noise levels. These regulations would be applicable to all phases of the proposed project and are designed to limit worker exposure to noise levels of 85 dB or lower over an 8-hour period (29 CFR 1910.95). Additionally, this regulation also establishes maximum impulse or impact noise (e.g., blasting noise) of 140 dB peak sound pressure level, which is approximately the threshold of pain. Noise exposure of this type is dependent on work conditions and is addressed through a facility’s Health and Safety Plan, as required under OSHA.

4.8.2.2 State

California Noise Control Act

Sections 46000 to 46080 of the California Health and Safety Code codify the California Noise Control Act of 1973. The California Noise Control Act established the Office of Noise Control under the California Department of Health Services. The California Noise Control Act required that the Office of Noise Control adopt, in coordination with the Governor’s Office of Planning and Research (OPR), guidelines for the preparation and content of noise elements for general plans. The most recent guidelines are contained in General Plan Guidelines, published by the OPR (2017). The document provides guidelines for cities and counties to use in their general plans to reduce conflicts between land use and noise.



SOURCE: Aerial—Google Earth (flown 2-10-2020); compiled by Benchmark Resources in 2021

Site Location

BENCHMARK RESOURCES

N 0 400 800 1,600 Feet

Nearest Sensitive Receptors to the Clayton Quarry

CLAYTON QUARRY RECLAMATION PLAN AMENDMENT
DRAFT EIR

Figure 4.8-1

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California Occupational Safety and Health Administration (Cal/OSHA) Regulations

Noise exposure of construction workers is regulated by the California Occupational Safety and Health Administration (Cal/OSHA). Title 8 of the California Code of Regulations (CCR), Sections 5095 et seq. (Control of Noise Exposure) sets noise exposure limits for workers and requires employers who have workers who may be exposed to noise levels above these limits to establish a hearing conservation program, make hearing protection available, and keep records of employee noise exposure measurements.

4.8.2.3 Local

Contra Costa County Code of Ordinances

The Contra Costa County Code of Ordinances does not have a specific noise ordinance, but does require noise generated as part of grading to be controlled to prevent nuisances to public and private ownerships, and indicates that noise control is an appropriate permit condition for surface mining operations:

> **Division 716—Grading**
>
> ***716-8.1108—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.
>
> **Division 88—Special Land Uses**
>
> **Chapter 88-11—Surface Mining and Reclamation**
>
> ***88-11.610—Conditions-Operations and Maintenance:***
> Examples of permit conditions relating to mining operations and site maintenance are:
>
> > (1) Land uses permitted on the site; (2) Temporary and finished slopes, and benches; (3) Setbacks from property lines, roads, water channels; and other features; (4) Fencing and screening; (5) Limiting use of explosives; (6) Drainage and use of surface water or groundwater; (7) Storing minerals and overburden; (8) Salvaging topsoil and vegetation; (9) Controlling noise, dust, and bright lights; (10) Limiting hours of operation; (11) Ingress, egress and traffic management; (12) Hauling management; (13) Limited duration of the permit; (14) Phasing excavation; (15) Controlling sedimentation.

Contra Costa County General Plan

The *Contra Costa County General Plan* (Contra Costa County 2014) establishes the following goals and policies associated with noise that are relevant to the proposed project.

Noise

Goal 11-A: To improve the overall environment in the County by reducing annoying and physically harmful levels of noise for existing and future residents and for all land uses.

Goal 11-B: To maintain appropriate noise conditions in all areas of the County.

Goal 11-C: To ensure that new developments will be constructed so as to limit the effects of exterior noise on the residents.

Goal 11-E: To recognize citizen concerns regarding excessive noise levels, and to utilize measures through which the concerns can be identified and mitigated.

Policy 11-8: Construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods.

4.8.3 Significance Criteria and Analysis Methodology

4.8.3.1 Significance Criteria

Based on Appendix G of the CEQA Guidelines, the proposed project would have a significant noise impact if it would result in:

a) generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
b) generation of excessive groundborne vibration or groundborne noise levels;
c) for a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

The Clayton Quarry is not located in the vicinity of a private airstrip, an airport land use plan, or within two miles of a public airport or public use airport. Therefore criterion (c) is not applicable and not discussed further in this Draft EIR.

4.8.3.2 Significance Thresholds

The Appendix G significance criteria are qualitative criteria and do not quantitatively define a substantial noise increase or excessive vibration. The quantitative thresholds used in the analysis of potential noise and vibration impacts are described below.

Noise Thresholds (Criterion a)

Similar to construction-type activities, noise generated during the proposed reclamation activities would be temporary and generated by construction equipment, therefore the FTA daytime construction noise threshold of 90 dBA L_{eq} was used to assess the potential for substantial noise generation to occur at nearby sensitive receptors. In addition, consistent with Policy 11-8 of the *Contra Costa County General Plan*, this analysis considers temporary increases in ambient noise levels generated by any nighttime reclamation activities to be significant.

Vibration Thresholds (Criterion b)

Table 4.8-3, "Vibration Thresholds to Prevent Disturbance," presents the FTA vibration thresholds for assessing the potential of annoyance to occur at buildings with sensitive land uses, residences, and institutional land uses. Because construction equipment would move across the site during proposed reclamation activities, it is unlikely that a given receptor would be exposed to more than 70 vibration generating events per day. Therefore, "Occasional Events" FTA threshold of 75 RMS (VdB) was applied to the analysis of potential annoyance of nearby residential receptors.

TABLE 4.8-3
VIBRATION THRESHOLDS TO PREVENT DISTURBANCE

Land Use Category	Root Mean Square (RMS) *(Vibration Decibels [VdB])*		
	Frequent Events	Occasional Events	Infrequent Events
Category 1: Buildings where vibration would interfere with interior ops.	65[d]	65[d]	65[d]
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Source: FTA 2018.
Notes:
a. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
b. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
c. "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.
d. This criterion limit is based on levels that are acceptable for most moderately-sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels.

Table 4.8-4, "Vibration Criteria to Prevent Damage to Structures," presents the FTA vibration thresholds for assessing the potential for vibration damage to buildings. The 0.3 in/sec PPV threshold for buildings of typical construction was used to determine the potential for cosmetic damage to occur to nearby receptors.

TABLE 4.8-4
VIBRATION CRITERIA TO PREVENT DAMAGE TO STRUCTURES

Building Category	Peak Particle Velocity (PPV) *(inches per second)*	Root Mean Square (RMS) *(Vibration Decibels [VdB])*
Reinforced-concrete, steel or timber (no plaster)	0.5	102
Engineered concrete and masonry (no plaster)	0.3	98
Non-engineered timber and masonry buildings	0.2	94
Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2018.

4.8.3.3 Analysis Methodology

Noise Methodology

In accordance with FTA guidance for the general assessment of construction noise (FTA 2018), the combined noise levels of the two noisiest pieces of equipment used during the proposed reclamation activities were calculated to represent the potential reasonable worst case noise levels that would occur during each phase of reclamation. The following equation was applied to estimate the L_{eq} (dBA) of each piece of construction equipment:

$$L_{eq.equip} = L_{emission} + 10 \log Adj_{usage}$$

Where:

$L_{emission}$ is the noise emission level of the particular piece of equipment at the reference distance of 50 feet.

Adj_{usage} is the usage factor to account for the fraction of time that the equipment is in use over the specified time period.

The usage factor, which represents the time period of one-hour during which the equipment is in full power operation, was assumed to be 1 because most construction equipment operates continuously for one-hour or more during typical construction activities. This is also a reasonable assumption for construction equipment operated during reclamation activities.

The construction equipment and phases are summarized in Table 4.8-5, "Equipment for Reclamation Activities."

TABLE 4.8-5
EQUIPMENT FOR RECLAMATION ACTIVITIES

Phase Name	Proposed Equipment
OVERBURDEN FILL AREAS	
Finish Slopes and Drainage	Backhoe, water truck
Revegetation	Hydroseed truck
QUARRY PIT AREA	
Contour Final Knoxville Slope	Excavator, loader, haul truck, water truck
Riprap Knoxville Slope Face	Excavator, loader, haul truck, water truck
Drainage: East Rim Haul Road	Grader, loaders (2), backhoe, water truck
Drainage: Rock Slope Protection Swales on Knoxville Face	Backhoe, excavator, loader, haul truck, water truck, concrete pumper truck
Drainage Outlet Structure	Backhoe, loader, welder, water truck, concrete pumper truck
Jack and Bore: Excavate Receiving Pit	Excavator, loader
Jack and Bore: Boring Sub Casing Pipe	Boring machine, loader, 25-ton hydro crane
Tree Screen Along East Rim Road	Backhoe
Install Drainage Outlet Pipe to Mitchell Canyon Road	Excavator, loader, welder
Riprap Mound at Quarry Drainage Outlet	Excavator, loader, haul truck, water truck
Fencing and Gates	Backhoe
Revegetation	Hydroseed truck
PLANT AREA	
Landscape Screening Berm	Loader, scrapers (2), dozer, water truck
Removal of Processing Plant and Support Structures	80-ton rough terrain crane, excavators (3), loaders (3), dozer, concrete industrial saws (3), welders (3), forklift, water truck
Contour Grading and Resoiling	Dozers (2), scrapers (3), loader, grader, water truck
Revegetation	Hydroseed truck

Source: Appendix D-1.
Notes: This table is also included as Table 2-2 in Chapter 2, "Project Description," of this Draft EIR.

Vibration Methodology

The vibration analysis compared the distance between the proposed reclamation activities and the nearest receptors to the buffer distance required for vibration generated by construction equipment to be reduced to below the annoyance threshold of 75 RMS VdB and the 0.3 in/sec PPV. This distance was estimated by applying the following propagation adjustments to the known vibration generated by typical construction equipment:

$$PPV2 = PPV1 \times \left(\frac{D1}{D2}\right)^{1.1}$$

Where:

PPV1 is the reference vibration level at a specified distance, and PPV2 is the calculated vibration level.

D1 is the reference distance (in this case 25 feet), and D2 is the distance from the equipment to the receiver.

$$RMS2 = RMS1 - 30\ \log_{10}\left(\frac{D2}{D1}\right)$$

Where:

RMS1 is the reference vibration level at a specified distance, and RMS2 is the calculated vibration level.

D1 is the reference distance (in this case 25 feet, and D2 is the distance from the equipment to the receiver.

4.8.4 Project Impacts and Mitigation Measures

Impact 4.8-1: Generation of a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project Site in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies

Traffic Noise

The proposed project would temporarily increase vehicular travel to and from the project site, which would potentially increase noise along local area roadways. As determined under the Air and Greenhouse Gases Emissions Study (see Appendix D-1), the proposed project would generate up to 98 daily vehicle trips per day, including all worker, vendor, and hauling trips, during removal of the processing plant, which is the reclamation activity with the highest trip count. The peak number of daily vehicle trips generated would be far less than existing traffic levels associated with mining and processing operations at the site (see Appendix D-1). Based on the additive properties of noise discussed in Section 4.8.1.1, above, the number of vehicle trips must nearly double for a perceptible increase in noise to occur. Because the peak project-generated vehicle trips generated would be far less than those generated by existing Clayton Quarry operations, it would also be far less than existing traffic along local area roadways that includes both quarry-generated and non-quarry traffic. Therefore, the proposed project does not have the potential to double traffic along local area roadways, and the traffic noise generated would not be perceptible or substantial. After final reclamation, the project site would be converted to open space land use and vehicular trips to the site would be minimal and intermittent, and would not be a substantial source of traffic noise. Therefore, the potential of the proposed project to result in a substantial traffic noise impact would be less than significant.

Level of Significance: Less than significant.

Mitigation Measure: None required.

Mining-Period Reclamation Activities

Mining-period reclamation activities under the revised reclamation plan would not alter existing mining activities by the development of new facilities or by bringing substantially different activities to the project site. As described in Section 2.5.13, "Mining and Reclamation Sequence and Schedule," in Chapter 2, "Project Description," slope contouring and revegetation of the overburden fill areas would occur concurrent with ongoing mining activities to the extent feasible. Noise generated from these activities would consist of haul, water, and hydroseed trucks; backhoes; loaders; scrapers; bulldozers; and excavators (see Table 4.10-5). As described in Section 2.5.12, "Equipment for Reclamation Activities," in Chapter 2, this equipment is already used on-site for mining activities (not part of the proposed project). Furthermore, the noise generated by mining and processing operations on the project site would be greater than the noise generated by the periodic use of existing construction equipment for reclamation instead of mining. Therefore, the potential of mining-period reclamation activities to generate substantial daytime noise would be less than significant.

The use of construction equipment at night to conduct reclamation during the mining period could be a significant source of nighttime noise relative to existing conditions because mining and processing operations do not generally occur at night. The Applicant has agreed to Mitigation Measure 4.1-4, "Daily Limitation of Construction Activities," which limits reclamation activities to daytime hours (7 a.m. to 7 p.m. Monday through Friday. With the incorporation of Mitigation Measure 4.1-4, no reclamation activities would occur at night. Therefore, the potential of mining-period reclamation activities to generate substantial nighttime noise would be less than significant with mitigation.

Level of Significance: Less than significant.

Mitigation Measure: None required.

Final Reclamation Activities

After mining is complete, which is currently anticipated to be in 2068, final reclamation activities would occur over the course of approximately one year and would be the primary source of noise on the project site. The existing processing plant facilities would be removed, and the disturbed areas outside of the quarry pit (including the processing plant facilities and overburden fill areas) would be contour graded, resoiled, revegetated, and converted to open space land uses. Additionally, a 24-inch diameter drainage pipeline would be installed to convey flows from the quarry pit lake to the 18-inch stormwater line located along Mitchell Canyon Road, and erosion control and stormwater management facilities would be installed, as described in Section 2.5.4, "Drainage, Sediment, and Erosion Control," in Chapter 2.

Final reclamation activities, including finish slope contouring, revegetation, development of drainage facilities along the east rim haul road, placement of rip-rap along the east rim of the quarry pit lake, demolition and removal of existing processing plant facilities on the site, and development of an outlet and drainage pipeline at the quarry pit lake, would utilize the equipment summarized in Table 4.8-5.

Table 4.8-6, "Noise Levels from Reclamation Equipment," summarizes the estimated noise levels of the two noisiest pieces of equipment that would be used on the project site during each reclamation phase.

TABLE 4.8-6
NOISE LEVELS FROM RECLAMATION EQUIPMENT

Phase Name	Two Highest Noise Generating Equipment	Noise Level at 50 Feet *(dBA Lmax)*	Addition of Two Noisiest Pieces of Equipment at 50 Feet *(dBA Leq)*
OVERBURDEN FILL AREAS			
Finish Slopes and Drainage	Backhoe Water truck	80 84	85
Revegetation	Hydroseed truck[a]	84[a]	84[a]
QUARRY PIT AREA			
Contour Final Knoxville Slope Riprap Knoxville Slope Face Riprap Mound at Quarry Drainage Outlet Drainage: Rock Slope Protection Swales on Knoxville Face	Excavator Haul truck	85 84	88
Drainage: East Rim Haul Road	Grader Water truck	85 84	88
Drainage Outlet Structure	Concrete pumper truck Water truck	82 84	88
Jack and Bore: Excavate Receiving Pit Install Drainage Outlet Pipe to Mitchell Canyon Road	Excavator Loader	85 80	86
Jack and Bore: Boring Sub Casing Pipe	Crane (25-ton) Boring Machine	85 80	86
Tree Screen Along East Rim Road Fencing and Gates	Backhoe[a]	80[a]	80[a]
Revegetation	Hydroseed truck[a]	84[a]	84[a]
PLANT AREA			
Landscape Screening Berm	Scraper Dozer	85 85	88
Removal of Processing Plant and Support Structures	**Concrete Saw Crane (80-ton rough terrain)**	**90 85**	**91**
Contour Grading and Resoiling	Dozer Grader	85 85	88
Revegetation	Hydroseed truck[a]	84[a]	84[a]

Sources: Appendix D-1; FTA 2018.
Notes: Bold text indicates noise generated during this phase would meet or exceed the 90 dBA L_{eq} significance threshold.
a. Only one noise generating piece of equipment is anticipated to be used in this phase of work.

Based on Table 4.8-6, the removal of the processing plant and support structures would have the potential to generate noise levels at the nearest sensitive receptors above the 90 dBA L_{eq} significance threshold. All remaining activities would generate noise levels below these thresholds at the nearest sensitive receptors. It should be noted that the remaining activities would typically be located further than 50 feet from the nearest sensitive receptors. The project site is approximately 190 acres, and the distance between equipment on the project site and the nearest sensitive receptors would vary from a minimum of 50 feet and a maximum of more than 3,500 feet. As described in Section 4.8.1.1, above, noise levels decrease by approximately 7.5 dBA for every doubling of distance over a soft surface.

Therefore, the majority of noise generated during final reclamation activities would be substantially below the noise levels presented in Table 4.8-6. Nevertheless, noise levels generated during the removal of the processing plant and support structures could generate noise with the potential to exceed 90 dBA L_{eq} at the nearest sensitive receptors. It is anticipated that this phase of final reclamation would be completed in approximately 3 months within the course of the approximately one year duration of final reclamation. The implementation of Mitigation Measure 4.8-1 would require the proposed project to implement noise control measures during the removal of the processing plant and support structures, and implement notification and complaint procedures. In addition the implementation of Mitigation Measure 4.1-4 would limit the hours and days of demolition to periods that would be least likely to be disruptive to the surrounding community. With implementation of Mitigation Measures 4.8-1 and 4.1-4, the potential of the proposed final reclamation activities to generate substantial noise would be less than significant with mitigation.

Level of Significance Before Mitigation: Potentially significant.

Mitigation Measures:

Mitigation Measures: *Implement Mitigation Measure 4.1-4 (see Impact 4.1-4).*

Mitigation Measure 4.8-1: *Noise Reduction During Removal of Processing Plant and Support Structures*

To reduce potential construction-equipment reclamation-related noise impacts associated with the removal of processing plant and support structures on the project site, the following multi-part mitigation measure shall be implemented during the removal of the processing plant and support structures:

- *The operator of the Clayton Quarry (Operator), employees, and the demolition contractor shall ensure that all internal combustion engine-driven equipment are equipped with mufflers that are in good condition and appropriate for the equipment.*
- *The demolition contractor shall locate stationary noise-generating equipment as far as feasible from sensitive receptors. In addition, the construction contractor shall place such stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.*
- *The demolition contractor shall locate, to the maximum extent practical, on-site equipment in staging areas to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site.*
- *The demolition contractor shall prohibit unnecessary idling of internal combustion engines.*
- *An on-site complaint and enforcement manager (manager) shall be available to respond to and track noise complaints. The telephone number of the manager shall be posted at the entrance to the quarry site. The manager shall be trained to use a sound level meter and should be available during all construction hours to respond to noise complaints. The manager shall be responsible for responding to any noise complaints regarding construction noise and for coordinating with the adjacent land uses. The manager will determine the cause of any complaints and coordinate with the demolition team to implement effective measures (considered technically and economically feasible, such as noise curtains, temporary sound walls, berms, etc.) to correct the problem. The complaints and noise reduction measures shall be documented and provided to the County upon request.*

- *At least one week prior to commencement of the removal of the processing plant and supporting structures, the Operator shall prepare a notice that the demolition work will commence. The notice shall be posted at the site and mailed to all the owners and occupants of property within 300 feet of the exterior boundary of the project site as shown on the latest equalized assessment roll. The notice shall include the telephone number of the complaint and enforcement manager. A copy of the notice shall be mailed to Contra Costa County Department of Conservation and Development.*
- *This mitigation measure 4.8-1 only applies to reclamation activities, not to operational activities.*

Level of Significance After Mitigation: Less than significant.

Post-Reclamation Conditions

Upon completion of final reclamation activities, the site would be converted to an open space land use. With the exception of periodic monitoring and maintenance of the quarry pit lake and associated drainage pipeline, no other activities would occur on the site. Monitoring and maintenance activities would be short-term, intermittent, limited to daytime hours, and would generally not require the use of noise-generating equipment. Therefore, the potential of the proposed project to generate substantial noise after the completion of reclamation would be less than significant.

Level of Significance: Less than significant.

Mitigation Measure: None required.

Impact 4.8-2: Generate Excessive Groundborne Vibration or Groundborne Noise from Reclamation Activities

Vibration generated during reclamation-period mining activities and final reclamation would be generated by the operation of the earthmoving equipment summarized in Table 4.8-5 during proposed reclamation activities. Table 4.8-7, "Vibration Levels of Earthmoving Equipment," shows the reference vibration levels for types of equipment similar those that would be operated on the project site during reclamation.

TABLE 4.8-7
VIBRATION LEVELS OF EARTHMOVING EQUIPMENT

Equipment	PPV at 25 Feet[a] (in/sec)	RMS at 25 Feet[b] (VdB)	Buffer Distances for Vibration Disturbance (Feet) On-Site and Off-Site Receptors (75 VdB Threshold)	Buffer Distances for Vibration Damage (Feet) On- and Off-Site Receptors (0.3 in/sec PPV Threshold)
Large bulldozer	0.089	87	43	8
Caisson drilling	0.089	87	43	8
Loaded trucks	0.076	86	40	7
Jackhammer	0.035	79	23	4
Small bulldozer	0.003	58	5	1

Source: FTA 2018; Caltrans 2013b
Notes: NA = Not available.
a. PPV = peak particle velocity, in/sec = inches per second,
b. RMS = root mean square, VdB = vibration decibel

Based on the buffer distances for vibration damage presented in Table 4.8-7, the proposed reclamation activities would not have the potential to generate vibration that could disturb the nearest sensitive receptors or cause damage to buildings because the nearest receptors and buildings are located approximately 50 feet from the project site, and the distances within which potentially significant impacts could occur are 43 feet and 8 feet, respectively.

Note that although vibration estimates are not available for tunnel boring machine equipment, the vibration generated would be similar to caisson drill vibration, as tunnel boring machines drill through the ground surface. Furthermore, the use of a boring machine would be limited to the first 300-foot-segment of the proposed drainage pipeline, which is located in the central portion of the project site, approximately 1,000 feet from the nearest sensitive receptor. Vibration dissipates rapidly with distance, therefore, the use of a tunnel boring machine to develop a 24-inch-diameter pipeline would not have the potential to generate excessive groundborne vibration at any nearby receptors.

Upon completion of final reclamation activities, the project site would be converted to an open space land use, which would not contain any activities or uses that could be a source of excessive groundborne vibration.

For these reasons, the potential for vibration damage or disturbance to occur during proposed reclamation activities would be less than significant.

Level of Significance: Less than significant.

Mitigation Measure: None required.