4.10 Noise and Vibration

This section describes the existing noise conditions of the project site and vicinity, identifies associated regulatory requirements, evaluates potential project and cumulative impacts, and identifies mitigation measures for any significant or potentially significant impacts related to implementation of the of the Santa Cruz Water Rights Project (Proposed Project). The analysis is based on noise modeling conducted for the Proposed Project as part of the preparation of this environmental impact report (EIR). The results of the noise modeling are summarized in this section, and are included in Appendix H.

A summary of the comments received during the scoping period for this EIR is provided in Table 2-1 in Chapter 2, Introduction, and a complete list of comments is provided in Appendix A. There were no comments related to noise.

4.10.1 Existing Conditions

4.10.1.1 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 4.10-1.

Table 4.10-1. 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 3 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 2020a.
Notes: dBA = A-weighted decibels; mph = miles per hour.

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 (Hz), 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 to 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 decibels (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. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

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 dB (typical for hard surfaces, such as asphalt) to 4.5 dB (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 dB to 7.5 dBA per doubling of distance for hard and soft sites, respectively.

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, or 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 built features such as buildings, concrete berms and walls may be effective barriers for the reduction of source noise levels.

4.10.1.1 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 as follows:

- **L_{max} (Maximum Noise Level):** The maximum instantaneous noise level during a specific period of time.
- **L_{min} (Minimum Noise Level):** The minimum 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}.
- **SEL (Sound Exposure Level):** The cumulative exposure to sound energy over a stated period of time; typically, the energy of an event, summed into a 1-second period of time.

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 equivalent sound level (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 1 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.

4.10.1.2 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 (Egan 1988). 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. Perception and reaction to changes in noise levels in this manner is thought to be most applicable in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

4.10.1.3 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 (FTA 2018). 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) with a reference quantity of 1 micro-inch per second. 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.

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.

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. The range of vibration relevant to this analysis occurs from approximately 60 VdB, which is the typical background vibration-velocity level; to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings (FTA 2018). Table 4.10-2 identifies some common sources of vibration, corresponding VdB levels, and associated human perception and potential for structural damage.

Table 4.10-2. Typical Levels of Groundborne Vibration

Human/Structural Response	Velocity Level, VdB (re 1 µ-inch/sec, RMS)	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 reading a video or 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.
Notes: µ-inch/sec = micro-inch per second; re = in reference to; RMS = root-mean-square; VdB = vibration decibels.

4.10.2 Existing Noise Environment

4.10.2.1 Study Area

As described in the Project Description, the Proposed Project is located within Santa Cruz County (County), California and involves the water system and areas served of the City of Santa Cruz (City), and water service area of San Lorenzo Valley Water District (SLVWD), Scotts Valley Water District (SVWD), Soquel Creek Water District (SqCWD), and Central Water District (CWD). The components of the Proposed Project are located within Santa Cruz County, the City of Santa Cruz and are generally bounded by the unincorporated communities of Aptos and Le Selva Beach on the east, Bonny Doon Road on the west, Boulder Creek on the north, and the Pacific Ocean on the south (see Figure 3-1 in Chapter 3, Project Description). While the project area is much broader, the study area for noise is focused on the project and programmatic infrastructure component sites where construction and ground disturbance could occur and where new or upgraded facilities would be located (see Figure 3-4 in Chapter 3, Project Description). These sites include the following: aquifer storage and recovery (ASR) sites where known, intertie improvement sites, Felton Diversion fish passage improvement site, and the Tait Diversion and Coast Pump Station improvement site. ASR would include new

ASR facilities at unidentified locations (referred to as "new ASR facilities" in this EIR) and Beltz ASR facilities at the existing Beltz well facilities (referred to as "Beltz ASR facilities" in this EIR). As there are no definitive sites identified to date for new ASR facilities, site-specific conditions are not available. This section describes the existing noise environment within the vicinity of the project and programmatic infrastructure components of the Proposed Project.

4.10.2.2 Sensitive Noise Receptors

Certain land uses are particularly sensitive to noise, such as schools, hospitals, and rest homes. Residential land uses are also considered noise sensitive, especially during evening and nighttime hours when occupants would typically be relaxing or resting. Noise-sensitive receptors are located immediately adjacent to or within close proximity to the project and programmatic infrastructure component sites.

4.10.2.3 Existing Ambient Noise Measurements

Dudek staff visited the locations of the Beltz ASR components of the Proposed Project on May 13, 2020 to measure ambient sound levels in the vicinity of the Beltz ASR sites. Short-term (ST) measurements were conducted with a calibrated Larson Davis Laboratories Model 831 precision integrating sound level meter, placed on a tripod with the microphone positioned approximately 5 feet above the ground. The short-term measurements were 15 minutes in duration at all locations. Figure 4.10-1 shows the measurement locations. Table 4.10-3 presents the results of the short-term noise measurements at the Beltz ASR sites and includes ambient noise information for the Tait Diversion and Coast Pump Station provided by the City. Additional measurement details can be found in Appendix H.

Table 4.10-3. Short-Term Sound Level Measurements

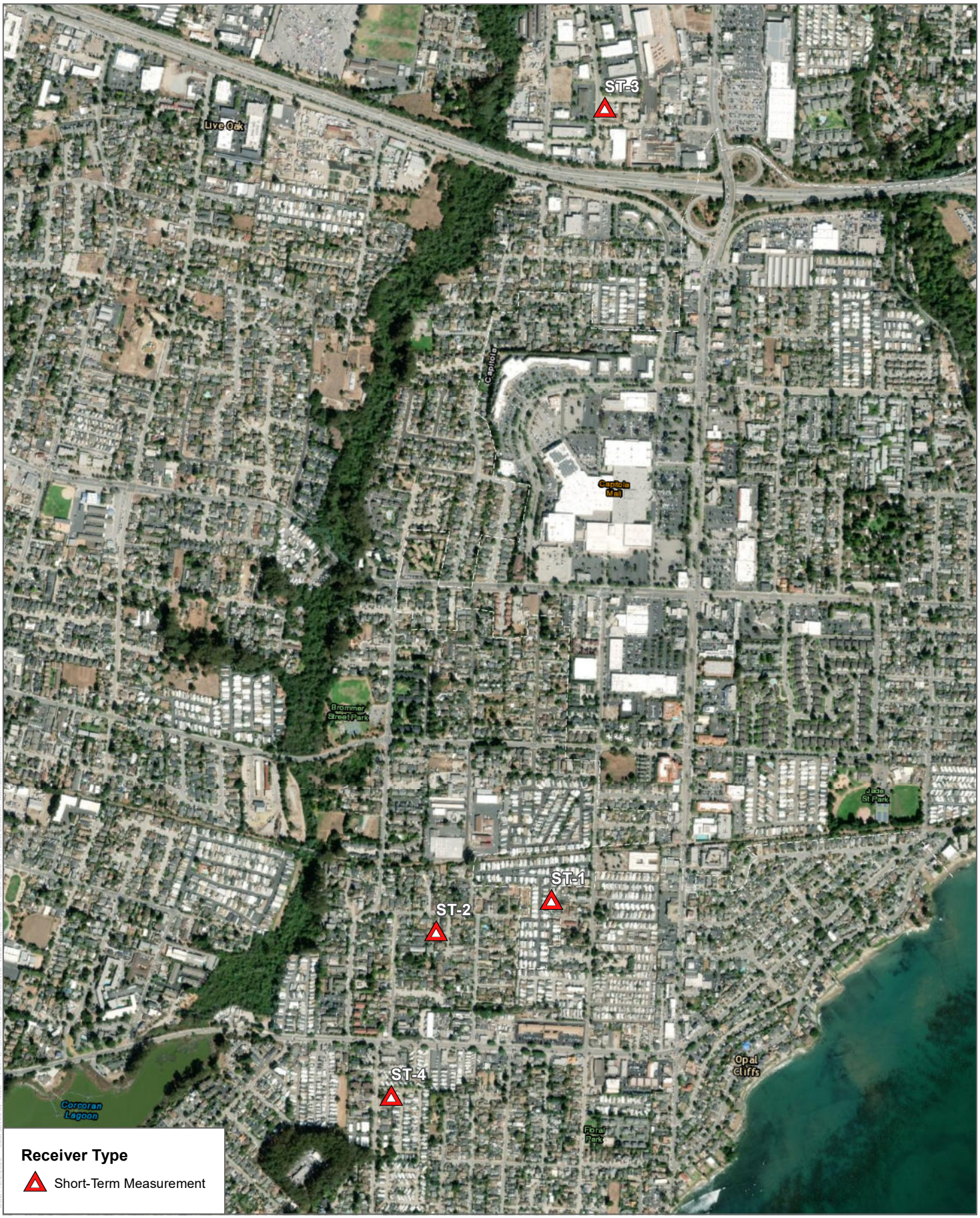
Site	Description/Noise Sources Observed	Time	L_{eq} (dBA)
ST1: Beltz 8	Birds, distant aircraft, distant dog barking, distant traffic, rustling leaves	8:43 a.m. to 8:58 a.m.	42.9
ST2: Beltz 10	Approximately 15 feet from the cooling fan for VFD control for submersible pump on northern property boundary[1]	9:20 a.m. to 9:35 a.m.	59.4
ST3: Beltz 12	Distant aircraft, distant industrial, rustling leaves, State Highway 1 traffic	10:07 a.m. to 10:22 p.m.	53.6
ST4: Beltz 9	Traffic, birds, distant aircraft, distant dog barking, distant kids playing, rustling leaves	10:40 a.m. to 10:55 a.m.	45.7
Tait Diversion[2] (Location 2)	Water movement in river, distant traffic, distant pump noise	12/17/2019 to 12/20/2019	56.9 – 59.0

Notes: L_{eq} = equivalent noise level (time-averaged sound level); ST = short-term; VFD = variable frequency drive.
Conditions: All short-term measurements were performed on May 13, 2020. Temperature: 66°F, clear sky, 1-mile-per-hour calm wind.

1 Sound levels measured at ST2 and generated by the VFD cooling fan are not typical operational noise levels for the equipment. Excluding the noise generated by the cooling fan, the ambient noise environment would not have been influenced by the well equipment.

2 Tait Diversion and Coast Pump Station ambient noise levels obtained from the City.

Results shown in Table 4.10-3 show sound levels with all results less than 60 dBA L_{eq} across the measurement periods. The highest level measured in the Beltz site vicinity was 59 dBA adjacent to the variable frequency drive (VFD) controller cooling fan at the existing Beltz 10 site. Sound levels generated by the VFD controller cooling fan are not typical for the well equipment and are typically indicative of a minor maintenance issue, such as being out of balance, having movement impeded or the fan inlet/outlet being obscured. Excluding the temporarily elevated noise levels generated by the cooling fan, the ambient noise environment was not observed to be substantially influenced by the operation of the Beltz well equipment. The ambient noise environment at the Beltz sites was primarily influenced by traffic, community noise, distant industrial/commercial activities and the natural environment.



SOURCE: Dudek 2020, Bing 2020

DUDEK

0 0.075 0.15 Miles

FIGURE 4.10-1

Noise Monitoring Locations

Santa Cruz Water Rights Project

Existing ambient noise level data in the vicinity of the Tait Diversion and Coast Pump Station was obtained from the City for three locations surrounding the component site. The ambient noise levels measured in the vicinity of the Tait Diversion and Coast Pump Station were reported to be primarily influenced by the sounds of water movement within the river, distant traffic noise and distant pump noise from the Coast Pump Station. Of the three measurement locations, "Location 2" would be most representative of the noise-sensitive receptor nearest the proposed improvements at the Tait Diversion and Coast Pump Station. Location 2 was located on the east bank of the San Lorenzo River, approximately 60 feet north of the existing Tait Diversion. Ambient noise levels cataloged at measurement Location 2 ranged from approximately 56 to 59 dBA L_{eq}.

4.10.2.4 Existing Sources of Noise

The project and programmatic infrastructure component sites are located primarily in suburban areas of the County, with the Felton Diversion and one of the pump stations located further into more rural foothills. The character of the ambient noise environment at the infrastructure component sites varies from quiet rural areas to industrial areas that are exposed to substantial traffic noise. As described in the observed noise sources column of Table 4.10-3, common sound sources in the site vicinity include traffic, aircraft, mechanical noise and general community sounds. The primary noise sources affecting the infrastructure component sites are described below. No railroads are located near the sites.

Aircraft Noise

During the noise monitoring survey minimal aircraft overflights were observed and were not found to affect the ambient noise measurement underway. The Felton Diversion programmatic component site is located approximately 3 miles southeast of the Bonny Doon Village Airport and the Beltz ASR project component sites are approximately 10 miles northwest of the Watsonville Municipal Airport. The project and programmatic infrastructure component sites are not located within any currently adopted 60 or 65 dB CNEL/L_{dn} airport noise contours. As such, noise associated with existing and future aircraft operations in the area is not a substantial contributor to the ambient noise environment.

Industrial Noise

The ambient noise environment in the overall study area is influenced to commercial and light industrial noise levels to a small degree; however, the Beltz 12 ASR site is the only location that has commercial and light industrial uses in the immediate vicinity. During the ambient noise measurement visit to the Beltz 12 ASR site, industrial activities included commercial truck deliveries and auto repair activities. However, the measured sound pressure levels were primarily attributable to vehicle traffic on State Highway 1.

Roadway Traffic Noise

Existing traffic noise levels were modeled for roadway segments in the study area based on the Federal Highway Administration (FHWA) Highway Traffic Noise Model (TNM) prediction methodologies (FHWA 1998), traffic volume data from Santa Cruz County (Count of Santa Cruz 2016) and the California Department of Transportation (Caltrans 2019). The FHWA TNM incorporates sound emissions and sound propagation algorithms based on well-established theory and accepted international standards. The acoustical algorithms contained within the FHWA TNM have been validated with respect to carefully conducted noise measurement programs and show excellent agreement in most cases for sites with and without noise barriers. The noise modeling accounted for factors as vehicle volume, speed, vehicle type, roadway configuration, distance to the receiver, and propagation over different types of ground (acoustically soft and hard ground).

Modeled existing traffic noise levels are summarized in Table 4.10-4, at a representative distance of 100 feet from the centerline of each major roadway in the study area and distances from roadway centerlines to the 60-dBA, 65-dBA, and 70-dBA L_{dn} traffic noise level contours. The location of the 60-dBA L_{dn} traffic noise contour along the local roadway network ranges from within the right-of-way to approximately 1,800 feet from the centerline of the modeled roadways. The extent to which existing land uses in the study area are affected by existing traffic noise depends on their respective proximity to the roadways and their individual sensitivity to noise. Refer to Appendix H of this report for complete modeling inputs and results.

Table 4.10-4. Summary of Modeled Existing Traffic Noise Levels

Roadway	Segment		ADT	L_{dn} at 100 feet	Distance to L_{dn} Contour (feet)		
	From	*To*			*70 dBA*	*65 dBA*	*60 dBA*
State Highway 1			102,000	79.4	421	908	1,955
State Highway 9			21,900	61.9	29	62	134
State Highway 17			60100	76.7	279	602	1297
41st Avenue	South of Cory Street		24,232	67.8	72	155	333
41st Avenue	Portola Drive	Railroad Corridor	13,732	59.0	16	40	86
Brommer Street	Bulb Ave	41st Avenue	6,664	55.9	11	25	53
Portola Drive	West of 41st Avenue		16,056	59.7	21	44	96
Soquel Drive	Rodeo Gulch Road	41st Avenue	23,618	64.7	44	95	206

Notes: ADT = average daily traffic; dBA = A-weighted decibels; L_{dn} = average day-night noise level.
Not accounting for shielding provided by natural or man-made intervening objects. Actual distance to real-world noise level contours will be dependent upon shielding effects in the environment under consideration.

Vibration

Transportation-related vibration from roadways in the study area is the primary source of groundborne vibration. Heavy truck traffic can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the roadway right-of-way (Caltrans 2020).

4.10.2.5 Infrastructure Component Site Conditions

This section provides the noise conditions at each of the known project and programmatic infrastructure component sites for which improvements and new facilities are proposed. As there are no definitive sites identified to date for new ASR facilities, no site conditions are provided.

The primary noise source occurring in the ambient noise environment surrounding the infrastructure component sites is vehicular traffic noise on the local and regional roadway network. Roadway traffic noise levels presented in Table 4.10-4, based on the Caltrans and Santa Cruz County Annual Average ADT volume data, would attenuate based on the distance to the noise-sensitive receptors and shielding provided by intervening objects between the source roadway and the receptors. Based on these roadway traffic noise levels, modeled traffic noise levels at the infrastructure component sites are presented below in Table 4.10-5.

Table 4.10-5. Modeled Traffic Noise Levels at Project Locations

Project Element	Composite Traffic Noise Level, L_{eq} dBA
Beltz ASR Sites	
Well 8 ASR site	53.4
Well 9 ASR site	53.2
Well 10 ASR site	53.3
Well 12 ASR site	67.8
City/SVWD Intertie Improvement Sites[1]	
Pipeline site	~65 to 79
Pump station site	~66
City/SqCWD/CWD Intertie Improvement Sites[1]	
Soquel Village pipeline site	~62 to 71
Park Avenue pipeline site	~63 to 72
McGregor Drive pump station upgrade site	73.9
Freedom Boulevard pump station site	~65
Valencia Road pump station site	~52
Surface Water Diversion Improvement Sites	
Tait Diversion and Coast Pump Station site	57.7
Felton Diversion site	48.5

Notes: CWD = Central Water District; dBA = A-weighted decibels; L_{eq} = equivalent average noise level; SqCWD = Soquel Creek Water District; SVWD = Scotts Valley Water District.

1 As the exact location and configuration of the intertie improvement components are unknown, traffic noise levels are presented for the approximate locations representing the nearby noise-sensitive receptors.

4.10.3 Regulatory Framework

4.10.3.1 Federal

Federal Noise Control Act

The U.S. Environmental Protection Agency's (EPA's) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. After its inception, the EPA's Office of Noise Abatement and Control issued the Federal Noise Control Act of 1972, establishing programs and guidelines to identify and address the effects of noise on public health, welfare, and the environment. In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982, responsibilities for regulating noise control policies were transferred to state and local governments. However, noise control guidelines and regulations contained in the EPA rulings in prior years are still adhered to by designated federal agencies where relevant. No federal noise regulations are applicable to the Proposed Project.

4.10.3.2 State

The State of California has adopted noise standards in areas of regulation not preempted by the federal government. State standards regulate noise levels of motor vehicles, sound transmission through buildings, occupational noise control, and noise insulation.

Governor's Office of Planning and Research General Plan Guidelines

The Governor's Office of Planning and Research (OPR), published the State of California General Plan Guidelines (OPR 2003), which provides guidance for the acceptability of projects within specific L_{dn} contours. Table 4.10-6 summarizes acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to help craft noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Table 4.10-6. Summary of Land Use Noise Compatibility Guidelines

Land Use Category	Community Noise Exposure (dBA L_{dn})			
	Normally Acceptable[1]	*Conditionally Acceptable*[2]	*Normally Unacceptable*[3]	*Clearly Unacceptable*[4]
Residential—Low-Density Single-Family, Duplex, Mobile Home	<60	55–70	70–75	75+
Residential—Multifamily	<65	60–70	70–75	75+
Transient Lodging—Motel, Hotel	<65	60–70	70–80	80+
Schools, Libraries, Churches, Hospitals, Nursing Homes	<70	60–70	70–80	80+
Auditoriums, Concert Halls, Amphitheaters	—	<70	65+	—
Sports Arena, Outdoor Spectator Sports	—	<75	70+	—
Playgrounds, Neighborhood Parks	<70	—	67.5–75	72.5+
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75	—	70–80	80+
Office Building, Business Commercial, and Professional	<70	67.5–77.5	75+	—
Industrial, Manufacturing, Utilities, Agriculture	<75	70–80	75+	—

Source: OPR 2003.

Notes: dBA = A-weighted decibels; L_{dn} = day-night average noise level.

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

2 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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

3 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. Outdoor areas must be shielded.

4 New construction or development should generally not be undertaken.

Generally, residential uses (e.g., single-family homes, mobile homes, etc.) are considered to be acceptable in areas where exterior noise levels do not exceed 60 dBA L_{dn}. Residential uses are normally unacceptable in areas exceeding 70 dBA L_{dn} and conditionally acceptable within 55 to 70 dBA L_{dn}. Schools are normally acceptable in areas up to 70 dBA L_{dn} and normally unacceptable in areas exceeding 70 dBA L_{dn}. Commercial uses are normally acceptable in areas up to 70 dBA L_{dn}. Between 67.5 and 77.5 dBA L_{dn}, commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements.

California Department of Transportation Guideline Vibration Damage Potential Threshold Criteria

There are no state standards for vibration; however, California Department of Transportation (Caltrans) compiled a synthesis of research on the effects of vibration with thresholds ranging from 0.08 in/sec PPV to 4.0 in/sec PPV for "fragile historic buildings" and "structures of substantial construction," respectively. Based on the synthesis of research, Caltrans developed recommendations for guideline threshold criteria of 0.3 in/sec PPV for older residential structures and 0.25 in/sec PPV for historic buildings and some old buildings exposed to continuous/frequent intermittent sources. For extremely fragile historic buildings, ruins, and ancient monuments, Caltrans recommends a threshold of 0.08 in/sec PPV (Caltrans 2020b).

4.10.3.3 Local

County of Santa Cruz General Plan

The County of Santa Cruz General Plan Noise Element, Chapter 9 (County of Santa Cruz 2020b) contains updated goals, objectives, and policies intended to protect citizens from exposure to excessive noise. The Noise Element establishes standards and policy to promote compatible noise environments for new development or redevelopment projects and to control excessive noise exposure of existing land uses. The following policies and standards are considered, where relevant, in the noise analysis for the Proposed Project.

Objective 9.2 Noise Exposure of Existing Sensitive Uses and Receptors

Minimize exposure of existing noise-sensitive land uses and receptors to excessive, unsafe or disruptive noise that may be generated by new land uses and development projects.

Policies

9.2.1 Require acoustical studies for all new development projects that may affect the existing noise environment affecting sensitive land uses and receptors and that may not conform to the Normally Acceptable Noise Exposure in Table 9-2 (Table 4.10-7 in this EIR).

9.2.2 Require site-design and noise reduction measures for any project, including transportation projects that would cause significant degradation of the noise environment due to project effects that could:

(a) Increase the noise level at existing noise-sensitive receptors or areas by 5 dB or more, where the post-project CNEL or DNL will remain equal to or below 60 dB;

(b) Increase the noise level at existing noise-sensitive receptors or areas by 3 dB or more, where the post-project CNEL or DNL would exceed 60 dB;

This policy shall not be interpreted in a manner that would limit the ability of the County to require noise related mitigation measures or conditions of approval for projects that may generate lesser increases than the above. Special consideration may also be applied to special events or activities subject to permit requirements, or to land use development permits for uses and activities exempted from County noise control regulations.

9.2.3 Incorporate noise considerations into the site plan review process, particularly with regard to parking and loading areas, ingress/egress points and refuse collection areas.

9.2.4 For all new commercial and industrial developments which would increase noise levels above the normally acceptable standards in Table 9-2 (shown as Table 4.10-7 in this EIR) or the maximum allowable standards in Table 9-3 (Table 4.10-8 in this EIR), the best available control technologies shall be used to minimize noise levels. In no case shall the noise levels exceed the standards of Table 9-3 (Table 4.10-8 in this EIR).

9.2.5 The following noise mitigation strategies are preferable to construction of conventional masonry noise barriers where these strategies are a feasible option to reduce impacts on sensitive uses:

- Avoid placement of noise sensitive uses in noisy areas.
- Avoid placement of significant noise generators in noise sensitive areas.
- Increase setbacks between noise generators and noise sensitive uses.
- Orient buildings such that the noise sensitive portions of a project (e.g. bedrooms) are shielded from noise sources (such as through careful design of floor plan).
- Use sound-attenuating architectural design and building features.
- Employ technologies that reduce noise generation, such as alternate pavement materials on roadways, when appropriate.
- Employ traffic calming measures where appropriate.

9.2.6 Require mitigation and/or best management practices to reduce construction noise as a condition of project approvals, particularly if noise levels would exceed 75 dBA at neighboring sensitive land uses or if construction would occur for more than 7 days.

Table 4.10-7. Acceptable through Unacceptable Ranges of Noise Exposure by Land Use

Land Use		Community Noise Exposure DNL or CNEL dB(A)					
		55	*60*	*65*	*70*	*75*	*80*
A	Residential/Lodging – Single Family, Duplex, Mobile Home, Multi Family						
B	Schools, Libraries, Religious Institutions, Meeting Halls, Hospitals						
C	Outdoor Sports Arena or Facility, Playgrounds, Neighborhood Parks						
D	Office Buildings, Business Commercial and Professional						
E	Industrial, Manufacturing, Utilities, Agriculture						

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, and can meet the indoor noise standards.

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 to meet interior and exterior noise standards, where applicable.

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 to meet interior and exterior noise standards, where applicable.

Unacceptable: New construction or development should generally not be undertaken.

Source: County of Santa Cruz 2020a, Table 9-2.
Note: Outdoor noise exposure measured at the property line of receiving land use.

Table 4.10-8. Maximum Allowable Noise Exposure Stationary Noise Sources[1]

Noise Metric	Daytime[5] (7:00 a.m. to 10:00 p.m.)	Nighttime[2,5] (10:00 p.m. to 7:00 a.m.)
Hourly L_{eq} – average hourly noise level, dB[3]	50	45
Maximum Level, dB[3]	70	65
Maximum Level dB – Impulsive Noise[4]	65	60

Source: County of Santa Cruz 2020a, Table 9-3.
Notes: dB = decibel; L_{eq} = equivalent noise level (time-averaged sound level).
1 As determined at the property line of the receiving land use. When determining effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.
2 Applies only where the receiving land use operates or is occupied during nighttime hours.
3 Sound of the measurements shall be made with "slow" meter response.
4 Sound level measurements shall be made with "fast" meter response.
5 Allowable levels shall be raised to the ambient noise level were the ambient level exceeds the allowable levels. Allowable levels shall be reduced five dBA if the ambient hourly L_{eq} is at least 10 dBA lower than the allowable level.

Santa Cruz County Code

The Santa Cruz County Code contains additional guidance with the intent to control noise, to promote and maintain the health, safety and welfare of its citizens. Chapter 8.30 of the Santa Cruz County Code enumerates general standards, limitations and exemptions pertaining to noise within the County. Additionally, Chapter 13.15 institutes "Noise Planning", which codifies General Plan policies and aids in regulating noise throughout the County through land use planning and permitting. The regulations presented below are considered, where relevant, in the noise analysis for the Proposed Project.

8.30.10 Offensive Noise

(A) No person shall make, cause, suffer, or permit to be made any offensive noise.

(B) "Offensive noise" means any noise which is loud, boisterous, irritating, penetrating, or unusual, or that is unreasonably distracting in any other manner such that it is likely to disturb people of ordinary sensitivities in the vicinity of such noise, and includes, but is not limited to, noise made by an individual alone or by a group of people engaged in any business, activity, meeting, gathering, game, dance, or amusement, or by any appliance, contrivance, device, tool, structure, construction, vehicle, ride, machine, implement, or instrument.

(C) The following factors shall be considered when determining whether a violation of the provisions of this section exists:

(1) Loudness (Intensity) of the Sound.

(a) Day and Evening Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 8:00 a.m. and 10:00 p.m. and it is:

(i) Clearly discernible at a distance of 150 feet from the property line of the property from which it is broadcast; or

(ii) In excess of 75 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data. A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

(b) Night Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 10:00 p.m. and 8:00 a.m. and it is:

(i) Made within 100 feet of any building or place regularly used for sleeping purposes; or

(ii) Clearly discernible at a distance of 100 feet from the property line of the property from which it is broadcast; or

(iii) In excess of 60 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data. A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

(2) Pitch (frequency) of the sound, e.g., very low bass or high screech;

(3) Duration of the sound;

(4) Time of day or night;

(5) Necessity of the noise, e.g., garbage collecting, street repair, permitted construction activities;

(6) The level of customary background noise, e.g., residential neighborhood, commercial zoning district, etc.; and

(7) The proximity to any building regularly used for sleeping purposes.

13.15.040 Exemptions

(A) Noise sources normally and reasonably associated with construction, repair, remodeling, or grading of any real property, provided a permit has been obtained from the County as required, and provided said activities take place between the hours of 8:00 a.m. and 5:00 p.m. on weekdays unless the Building Official has in advance authorized said activities to start at 7:00 a.m. and/or continue no later than 7:00 p.m. Such activities shall not take place on Saturdays unless the Building Official has in advance authorized said activities, and provided said activities take place between 9:00 a.m. and 5:00 p.m. and no more than three Saturdays per month. Such activities shall not take place on Sunday or a federal holiday unless the Building Official has in advance authorized such work on a Sunday or federal holiday, or during earlier morning or later evening hours of a weekday or Saturday.

(B) Emergency Work. The provisions of this chapter shall not apply to the emission of sound for the purpose of alerting persons to the existence of an emergency or in the performance of emergency work.

13.15.050 General Noise Regulations and Unlawful Noise

(A) No use, except a temporary construction operation, shall be permitted which creates noise which is found by the Planning Commission not to conform to the noise parameters established by Table 9-2 and Table 9-3 of the Santa Cruz County General Plan beyond the boundaries of the project site at standard atmospheric pressure.

(B) Backup emergency generators shall only be operated during power outages and for other temporary purposes. If the generator is located within 100 feet of a residential dwelling unit, noise attenuation measures shall be included to reduce noise levels to an A-weighted maximum exterior noise level of 60 dB at the property line and a maximum interior noise level of 45 dB within nearby residences.

13.15.070 Noise Generating Land Use

(A) New commercial and industrial development that would increase noise levels above the normally acceptable range in Table 9-2 or the levels in Table 9-3 of the Santa Cruz County General Plan Noise Element shall require acoustic studies to determine the noise reduction requirements to be included as conditions of approval. Noise levels shall not exceed the standards in Table 9-3, and require, as conditions of approval, site design and sound reducing measures if the project would:

(1) Increase the noise level at existing noise-sensitive receptors or areas by five (5) dB L_{dn} or more, where the post-project L_{dn} would remain equal to or below 60 dB.

(2) Increase the noise level at existing noise-sensitive receptors or areas by three (3) dB L_{dn} or more, where the post-project L_{dn} would exceed 60 dB.

(B) The standards in this section shall not limit the ability of the County to impose conditions of approval on projects that increase noise levels at existing noise-sensitive receptors or areas by any amount.

13.15.080 Exterior Noise Standards

New development shall not be exposed to noise levels that exceed the normally acceptable levels in Table 9-2 of the Santa Cruz County General Plan Noise Element, which establishes acceptable through unacceptable ranges of noise exposure by land use.

City of Santa Cruz General Plan

Applicable noise standards in the City of Santa Cruz General Plan are contained within Chapter 8 of the General Plan (Hazards, Safety, and Noise) (City of Santa Cruz 2012). The Hazards, Safety, and Noise chapter contains specific goals, policies, and standards for use in planning and land compatibility determinations within the City of Santa Cruz. In particular, the Hazards, Safety, and Noise chapter establishes noise/land-use compatibility standards which are applicable to all new residential, commercial, and mixed-use projects (Figure 2 of the Hazards, Safety, and Noise chapter and Goal HZ3.2.1), and the General Plan seeks to ensure that noise standards are met in the siting of noise-sensitive uses (Goal HZ3.2).

The Hazards, Safety, and Noise chapter policies establish a maximum interior noise level threshold of 45 dBA L_{dn} for all residential uses, consistent with California noise insulation standards. Figure 2 of the Hazards, Safety, and Noise chapter indicates that exterior noise levels up to 60 dBA L_{dn} are normally acceptable for residential development and exterior noise levels up to 65 dBA L_{dn} are normally acceptable for multi-family residential and transient residential development; with noise levels up to 70 dBA L_{dn} considered conditionally acceptable. Hazards, Safety, and Noise chapter Policy HZ3.2.3 reiterates the "noise level target" of 65 dBA L_{dn} for outdoor activity areas associated with new multi-family residential developments. Policies HZ3.1.3 and HZ3.1.5 qualitatively discuss the management and monitoring of construction noise levels to minimize noise impacts on surrounding land uses.

City of Santa Cruz Municipal Code

Chapters 9.36 and 24.14 of the City of Santa Cruz Municipal Code (City of Santa Cruz 2020) include provisions for noise regulations. The former prohibits excessive noise during nighttime hours (10:00 p.m. through 8:00 a.m.) (Section 9.36.010, Subsection(a)), but without any quantitative (numerical) limits. For the purposes of construction activities performed in support of public works, the nighttime noise restriction shall not apply during the hours of 7:00 a.m. to 8:00 a.m.

Subsection (d) of Chapter 9.36 states that "Subsection (a) shall not apply to any person engaged in performance of a contract for public works awarded by the City of Santa Cruz, in the event of an emergency and if the city manager of the City of Santa Cruz so authorizes work."

Subsection (e) of Chapter 9.36 allows for specific construction activities to occur between the hours of 10:00 p.m. and 8:00 a.m. where either the chief building inspector, public works director, planning and community development director or water department director have provided written determination and consent that said task is required commence or be completed between said hours.

Section 9.36.025 states "This chapter shall not apply to refuse collection, recyclable collection or street sweeping activities undertaken by, or pursuant to contract with, the city of Santa Cruz. Similarly, this chapter shall not apply to any other activity undertaken by the city, another governmental agency, or city contractor, for public health and safety purposes when, in the judgment of the city or governmental agency, such activity cannot be undertaken effectively or efficiently in compliance with the regulations set forth in this chapter.

In addition to the Chapter 9.36 regulations, Section 24.14 describes performance standards which limit noise production with respect to noise production from residential and commercial/industrial land uses: up to a 5 dB or 6 dB increase, respectively, above existing outdoor ambient sound levels.

City of Scotts Valley General Plan

The City of Scotts Valley General Plan, Chapter 5, Noise Element discusses the noise environment within the City of Scotts Valley and presents goals, policies and actions to help guide planning decisions and protect against exposure to excessive. The Scotts Valley Noise Element does not contain specific noise level thresholds for the evaluation of noise levels within the City but establishes allowable noise level increases for which a project must not exceed. The Scotts Valley noise increase standards are shown in Table 4.10-9. The Scotts Valley General Plan does not contain guidance or noise level standards for noise generated by construction activities.

Table 4.10-9. Noise Increase Standards

Proposed New Use/Location of dBA Reading	Maximum Noise Increase in (L_{dn}) dBA Adjacent to Existing:			
	Sensitive	*Residential*	*Commercial*	*Industrial*
Sensitive				
At Property Line	3	5	5	5
50 feet from Property Line	3	3	–	–
Residential				
At Property Line	3	5	5	5
50 feet from Property Line	3	3	–	–
Commercial				
At Property Line	3	5	5	5
50 feet from Property Line	3	3	–	–
Industrial				
At Property Line	3	5	5	7
50 feet from Property Line	3	3	–	–

Source: City of Scotts Valley General Plan, Chapter 5, Noise Element, Table 3.

City of Scotts Valley Municipal Code

The City of Scotts Valley establishes qualitative guidance for the control and enforcement of the City's noise environment within Chapter 5.17 of the Scotts Valley Municipal Code, as presented below. The noise restrictions presented in the Scotts Valley Municipal Code do not address noise generated from construction activities.

5.17.030 - Exemptions.

A. The proper use of a siren or other alarm by a police, fire or authorized emergency vehicle as defined in the California Vehicle Code. Likewise, any stationary fire alarm operated by the fire district of the city is exempt from the provisions of this chapter;

B. The proper use of emergency generators by any privately owned service facility, up to a maximum of 75 dBA measured at the property line, necessary to maintain service essential to the public health, safety or welfare;

1. Noise generated by city-permitted construction activities occurring during authorized construction hours as set forth elsewhere in this Code.

5.17.040 - Violations and Penalties

A. No person shall make, cause, suffer or permit to be made any offensive noises which disturb or annoy people of ordinary sensitiveness or which are so harsh or so prolonged or unnatural or unusual in their use, time or place as to cause physical discomfort to any person, and which are not necessary in connection with any lawfully conducted activities.

B. No person shall, between the hours of ten p.m. and eight a.m., make, cause, suffer or permit to be made any offensive noise within the vicinity of any building or place regularly used for sleeping purposes.

City of Capitola General Plan Noise Element

The City of Capitola has developed and adopted guidelines, goals and policies with the intent of controlling and diminishing environmental noise and protecting inhabitants from exposure to excessive noise levels. Applicable noise standards are contained in Table SN-1 of the City of Capitola General Plan Noise Element. Goal SN-7 of the General Plan contains the City of Capitola policies on noise, with the primary intent of minimizing the community's exposure to excessive noise.

Noise level exposure at low density, single-family residential land uses are considered to be "normally acceptable" at levels up to 60 dBA CNEL/DNL and "conditionally acceptable" from 55 to 70 dBA CNEL/DNL. Noise Level exposure at commercial land uses are considered to be "normally acceptable" at levels up to 70 dBA CNEL/DNL and "conditionally acceptable" up to 77.5 dBA CNEL/DNL.

City of Capitola Noise Ordinance

City of Capitola Noise Ordinance is enumerated as Municipal Code Section 9.12, Noise. The Capitola Noise Ordinance does not contain quantitative performance standards for the evaluation of noise generated by sources other than mechanical sweeping devices, vacuum machines and leaf blowers. All other noise sources within the City of Capitola are evaluated on a more subjective basis, at the discretion of the Capitola Police and the City Council. As such, the City of Capitola Municipal Code Noise Ordinance does not have specific thresholds of significance that can be applied to the evaluation of operational noise generated by the Proposed Project.

The City of Capitola Municipal Code Section 9.12.010 provides qualitative discussion on prohibited noise levels within the City. Municipal Code Section 9.12.010 A, establishes that it is unlawful to generate noise levels that could be considered a nuisance, within 200 feet of any place (residence, transient lodging, etc.) regularly used for sleeping purposes between the hours of 10:00 p.m. and 8:00 a.m. Municipal Code Section 9.12.010 B establishes limitations on the generation of construction noise, except when otherwise approved by the City of Capitola. Generally, generation of construction noise is limited to the hours of 7:30 a.m. to 9:00 p.m. Monday through Friday and 9:00 a.m. to 4:00 p.m. on Saturday. Construction noise is not allowed on Sundays.

4.10.4 Impacts and Mitigation Measures

This section contains the evaluation of potential environmental impacts associated with the Proposed Project related to noise. The section identifies the standards of significance used in evaluating the impacts, describes the methods used in conducting the analysis, and evaluates the Proposed Project's impacts and contribution to significant cumulative impacts, if any are identified.

4.10.4.1 Standards of Significance

The standards of significance used to evaluate the impacts of the Proposed Project related to noise are based on past and current versions of Appendix G of the CEQA Guidelines and the City of Santa Cruz CEQA Guidelines, as listed below. A significant impact would occur if the Proposed Project would:

A. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
B. Result in 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.
C. Result in excessive groundborne vibration or groundborne noise levels.
D. Expose people residing or working in the project area to excessive noise levels in 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 2 miles of a public airport or public use airport.

In analyzing noise and vibration impacts associated with the Proposed Project, pertinent noise standards introduced in Section 4.10.3.3, Local, for the County of Santa Cruz and the cities of Santa Cruz, Scotts Valley, and Capitola have been considered and utilized, in part, to develop the following quantified significance criteria (presented in Table 4.10-10) for Significance Standards A and B above related to permanent increases in ambient noise levels.

Table 4.10-10. Significant Change in Permanent Ambient Noise Levels

Existing Ambient Noise Level, L_{dn}/CNEL	Significant Increase
<60 dBA	+ 5 dB or Greater
>60 dBA	+ 3 dB or Greater

Source: Adapted from FICON 1992 and Caltrans 2020.
Notes: dBA = Decibel A-weighted; CNEL = Community Noise Equivalent Level; L_{dn} = day-night average noise level.

It is important to consider significance thresholds based on the degradation of the existing ambient noise environment. Using a single absolute value to evaluate an impact relating to a noise level increase would not account for the

preexisting ambient noise environment to which a person has become accustomed. The County of Santa Cruz, the City of Santa Cruz and City of Scotts Valley have established varying standards to address increases in the ambient noise environment that occur due to the development of a project, or the addition of a new noise source. These relative noise level thresholds allow for an increase above the existing ambient noise levels ranging from 3 to 6 dBA L_{dn}, depending on the ambient noise level without the project element or the land uses involved. The City of Capitola has not established a threshold to define what would be considered a significant increase above the existing ambient.

For community noise assessments Caltrans considers that it is "generally not significant" if no noise-sensitive uses are located within the project area, or if increases in community noise levels associated with implementation of the project would not exceed +3 dB at noise-sensitive locations in the project vicinity (Caltrans 2020a). Research assessing the percentage of people who are highly annoyed by changes in ambient noise levels indicate that when ambient noise levels are low, a greater change is needed to cause a response. As ambient noise levels increase, a lesser change in noise levels is required to elicit significant annoyance. Based on this premise, the significance thresholds outlined in Table 4.10-10 for permanent increases in ambient noise levels are considered to correlate well with human response to changes in such noise levels and assess degradation of ambient community noise environment. These significance thresholds are consistent with those outlined by the County of Santa Cruz and would provide compliance with the City of Santa Cruz and City of Scotts Valley relative increase standards.

Given the above, the quantified significance thresholds for Significance Standards A, B, and C are as follows:

- **Significance Standard A**. The Proposed Project would result in the generation of a substantial permanent increase in ambient noise levels resulting in a significant impact in the vicinity of the project and programmatic infrastructure component sites if they would cause an increase of +5 dBA L_{dn} in the ambient noise level exposure, where existing ambient noise levels are below 60 dBA L_{dn} or a +3 dBA L_{dn} increase in the ambient noise level exposure, where existing ambient noise levels are above 60 dBA L_{dn}, based on Table 4.10-10. (These thresholds are consistent with those outlined by the County of Santa Cruz and would provide compliance with the City of Santa Cruz and City of Scotts Valley relative increase standards.)
- **Significance Standard B**. The Proposed Project would result in the generation of a substantial temporary or permanent noise levels in the vicinity of the project and programmatic infrastructure component sites if they would:
    - Construction Noise. For temporary construction activities on the project and programmatic infrastructure component sites in any location, a significant impact would generally result if construction noise exceeds 60 dBA between 10:00 p.m. and 8:00 a.m. or 75 dBA between 5:00 p.m. and 10:00 p.m. Between the hours of 8:00 a.m. to 5:00 p.m. on weekdays, construction noise is not limited, based on Santa Cruz County Code Section 8.30.10. Other factors considered in the determination of significance are pitch, duration of sound, time of day or night, necessity of the noise, and proximity to buildings used for sleeping.
    - Operational Noise. For operational noise in any location the same quantified significance thresholds as identified for Significance Standard A would apply.
- **Significance Standard C.** The Proposed Project would result in the generation of a substantial temporary ground borne noise or vibration levels resulting in a significant impact in the vicinity of project and programmatic infrastructure component sites if it would result in groundborne noise or vibration levels that exceed the Caltrans guidance (i.e., 0.3 in/sec PPV for older residential structures and 0.25 in/sec PPV for historic buildings and some old buildings exposed to continuous/frequent intermittent sources) (Caltrans 2020).

4.10.4.2 Analytical Methods

This section evaluates the potential noise impacts associated with construction and operation of the Proposed Project. The analysis of potential impacts addresses the various project and programmatic components listed in Table 4.10-11, which are described in detail in Chapter 3, Project Description.

Table 4.10-11. Project and Programmatic Components

Proposed Project Components	Project Components	Programmatic Components
WATER RIGHTS MODIFICATIONS		
Place of Use	✓	
Points of Diversion	✓	
Underground Storage and Purpose of Use	✓	
Method of Diversion	✓	
Extension of Time	✓	
Bypass Requirement (Agreed Flows)	✓	
INFRASTRUCTURE COMPONENTS		
Water Supply Augmentation		
Aquifer Storage and Recovery (ASR)		✓
New ASR Facilities at Unidentified Locations		✓
Beltz ASR Facilities at Existing Beltz Well Facilities	✓	
Water Transfers and Exchanges and Intertie Improvements		✓
Surface Water Diversion Improvements		
Felton Diversion Fish Passage Improvements		✓
Tait Diversion and Coast Pump Station Improvements		✓

Potential noise impacts associated with the Proposed Project were calculated and analyzed based on project construction and operations information; information contained in the traffic analysis and air quality analysis prepared for the Proposed Project; and data obtained during on-site noise measurements. Observations made during the site survey along with land use information and aerial photography were used to determine potential locations of sensitive receptors near the project and programmatic infrastructure components.

Construction

The principal source of project-generated noise would be associated with construction activities on the project and programmatic infrastructure component sites; therefore, the analysis focuses on construction noise and vibration. Construction-related noise effects were assessed with respect to nearby noise-sensitive receptors and their relative exposure (accounting for intervening topography, barriers, distance, etc.), based on application of FHWA Roadway Construction Noise Model and FTA reference noise level data and usage-factors. The FTA and FHWA have measured and documented maximum noise levels and operational characteristics for a wide range of construction machinery, which are summarized in Table 4.10-12. The phases and individual equipment mix for each of the project and programmatic components were based on the construction information presented in Section 4.2, Air Quality, and

Appendix E and the construction noise modeling for the project and programmatic infrastructure components is presented in Appendix H.

Table 4.10-12. Typical Construction Equipment Noise Emission Levels

Equipment Description	Acoustical Use Factor (%)	L_{max} at 50 feet (dBA, slow)[1]
Auger Drill Rig	20	85
Backhoe	40	80
Compactor (ground)	20	93
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Concrete Saw	20	90
Crane	16	85
Dozer	40	85
Dump Truck	40	80
Excavator	40	85
Flat Bed Truck	40	84
Front End Loader	40	80
Generator	50	82
Grader	40	85
Jackhammer[2]	20	85
Mounted Impact Hammer (hoe ram)[2]	20	90
Paver	50	85
Pneumatic Tools	50	85
Pumps	50	77
Rock Drill	20	85
Roller	20	85
Scraper	40	85
Tractor	40	84
Vacuum Excavator (Vac-truck)	40	85

Sources: DOT 2006; FTA 2018.
Notes: L_{max} = maximum noise level; dBA = A-weighted decibels.
1 All equipment fitted with a properly maintained and operational noise control device, per manufacturer specifications.
2 Impulsive/impact device.

Additional noise sources associated with the project and programmatic infrastructure components would be off-site construction traffic on the local and regional roadway network. Project-related traffic was evaluated qualitatively based on the passenger car equivalent (PCE) vehicle trips and existing traffic volumes used as an input.

Groundborne vibration impacts were qualitatively assessed based on existing reference documentation (e.g., vibration levels produced by specific construction equipment operations), through the application of Caltrans methodology outlined within the *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020) and the relative distance to potentially sensitive receptors from a given vibration source. Representative groundborne vibration levels for various types of construction equipment, developed by FTA, are summarized below in Table 4.10-13. Based on the reference vibration levels presented in Table 4.10-12, the distance at which the equipment would exceed the applicable Caltrans thresholds was calculated for the project and programmatic infrastructure components.

Table 4.10-13. Representative Vibration Levels for Construction Equipment

Equipment		PPV at 25 feet (in/sec)[1,2]	Approximate Lv (VdB) at 25 feet[3]
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (vibratory/sonic)	Upper range	0.734	105
	Typical	0.170	93
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large Bulldozer		0.089	87
Caisson Drilling		0.089	87
Heavy-duty Trucks (Loaded)		0.076	86
Jackhammer		0.035	79
Small Bulldozer		0.003	58

Source: FTA 2018.
Notes:
1 Where PPV is the peak particle velocity.
2 Vibration levels can be approximated at other locations and distances using the above reference levels and the following equation: PPVequip = PPVref (25/D)$^{1.5}$ (in/sec); where "PPV ref" is the given value in the above table, "D" is the distance for the equipment to the new receiver in feet.
3 Where Lv is the RMS velocity expressed in vibration decibels (VdB), assuming a crest factor of 4.

Operation

The Proposed Project's operation and maintenance activities for existing infrastructure (i.e., Beltz facilities, intertie pipelines, McGregor Drive pump station, Felton Diversion and Tait Diversion and Coast Pump Station) would generally remain similar to existing activities and would have a similar frequency and intensity. Similar to existing conditions, operation and maintenance would include: weekly station checks involving cleaning, inspections of equipment, testing of any generators, and landscape maintenance; annual inspections of equipment; and ingress/egress maintenance. The Proposed Project components are discussed qualitatively based on existing and similar facilities, existing ambient noise levels and nearby noise-sensitive receptors.

Application of Relevant Standard Practices

The Proposed Project includes a standard construction practice (see Section 3.4.5.2, Standard Construction Practices), that the City or its contractors would implement to avoid or minimize effects related to noise and vibration. This practice and its effectiveness in avoiding and minimizing effects is described below.

Standard Construction Practice #26 requires the City to designate a Construction Noise Coordinator and notify adjacent property owners regarding planned nighttime construction activities, and specifies the protocol for responding to any local complaints that are received about construction noise. When a noise complaint is received, the Construction Noise Coordinator shall notify the City within 48 hours, determine the cause of the complaint, and implement as possible reasonable measures to resolve the complaint as deemed acceptable by the City. This measure is somewhat effective in that it provides an avenue for adjacent property owners to communicate with the City to express noise complaints, if any; however, it does not include enforceable, objective measures or standards that the Proposed Project must achieve related to construction noise.

If the Proposed Project would have potentially significant impacts even with the implementation of the above standard construction practice, the impact analysis identifies mitigation measures.

4.10.4.3 Project Impact Analysis

Areas of No Impact

The Proposed Project would not **expose people to excessive aircraft noise (Significance Standard C)**. The nearest airstrip to the Proposed Project is the Bonny Doon Village Airport, which is a private use airport located approximately 3 miles northwest of the Felton Diversion. The nearest public or public-use airport is Watsonville Municipal Airport, which is located approximately 10 miles southeast of the Beltz ASR facility sites. Watsonville Municipal Airport is not part of an adopted airport land use plan, and the study area is not located within the airport influence area (County of Santa Cruz 2020c). Therefore, the Proposed Project would have no impact related to exposure of people in the project area to excessive airport-related noise, and this standard is not further evaluated.

Impacts

This section provides a detailed evaluation of noise impacts associated with the Proposed Project.

Impact NOI-1: Substantial Permanent Increase in Ambient Noise Levels (Significance Standard A). Operation of the Proposed Project would result in generation of a substantial permanent increase in ambient noise levels during long-term operation in the vicinity of one of the programmatic infrastructure components. ***(Less than Significant with Mitigation)***

Water Rights Modifications

The water rights modifications would not directly result in operational activities that could cause noise. Given that, the water rights modifications would not result in the generation of substantial permanent increase in ambient noise levels. Therefore, this project component of the Proposed Project would have no direct impact.

The following analysis evaluates the potential indirect impacts related to operational noise as a result of the proposed water rights modifications, that once approved could result in the implementation of the other project and programmatic infrastructure components of the Proposed Project.

Infrastructure Components

Aquifer Storage and Recovery Facilities

New ASR Facilities. Specific locations and configurations for the proposed new ASR facilities are not known. However, the proposed ASR facilities are anticipated to be configured in a manner similar to the Beltz ASR 12 site. The Beltz 12 ASR site incorporates an enclosed pump and chemical storage building, a water treatment system consisting of pressurized tanks, backwash tanks, a sand separator and necessary infrastructure connections. The primary noise generating sources associated with the Beltz 12 configuration are the pump and appurtenances that are located within a building made of concrete masonry unit (CMU) blocks that would provide approximately 20 dB or more of interior to exterior noise reduction (City of Santa Cruz 2011). Operational noise levels generated by this programmatic component are anticipated to be reduced to levels less than the ambient

noise level in the study area and would not expose nearby receptors to noise levels exceeding ambient noise levels in the vicinity. Therefore, this programmatic component would result in a less-than-significant impact.

Beltz ASR Facilities. Facilities upgrades at the Beltz ASR sites would include new injection pipelines, back flow prevention devices, and upgrades to the existing submersible pumps and motors. The existing submersible pump and motor assemblies would be upgraded to improve efficiency and capacity; however, as these pumps are submerged below grade and enclosed, the proposed pump and motor improvements would not result in increased noise levels at the Beltz ASR facilities. In addition to the facilities upgrades discussed above, the Beltz 9 ASR site could install up to three additional approximately 2-inch monitoring wells on the existing site. Once construction is completed, the monitoring wells would not introduce new noise sources above the ambient noise environment.

Similar to existing conditions, operation and maintenance would include: weekly station checks involving cleaning, inspections of equipment, testing of any generators, and landscape maintenance; annual inspections of equipment; and ingress/egress maintenance. The Beltz ASR facility upgrades would not introduce new operation and maintenance tasks that would generate permanent noise levels above the ambient noise environment. Therefore, this project component would result in a less-than-significant impact.

Water Transfers and Exchanges and Intertie Improvements

City/SVWD Intertie Improvements. The City/SVWD intertie programmatic component would construct a new pipeline and pump station interconnecting SCWD and SVWD. Once construction is complete, the intertie pipeline would not introduce any new noise sources in the ambient noise environment. The proposed City/SVWD intertie pump station is anticipated to be constructed in a manner consistent with other pump stations in the study area, which locate all pumps motors and noise generating components within a CMU brick building. The enclosed CMU brick buildings housing the equipment at existing pump stations within the area generate noise levels at or below the existing ambient levels. Additionally, the general location for the City/SVWD pump station is located between approximately 150 and 500 feet from the centerline of Highway 17. As such existing and future traffic noise levels at the proposed pump station location would result in an elevated ambient noise environment. Operational noise levels generated by the proposed City/SVWD intertie pump station are anticipated to be at or below ambient noise levels in the immediate vicinity. Therefore, this programmatic component would result in a less-than-significant impact.

City/SqCWD/CWD Intertie Improvements. The City/SqCWD/CWD intertie programmatic component would construct two new intertie pipelines and two new pump stations. Additionally, the existing SqCWD McGregor Drive pump station would be upgraded to increase efficiency and capacity. The upgrades to the McGregor Drive pump station are anticipated to be located within the existing CMU building. Overall, operations and noise emissions associated with McGregor Drive pump station upgrade would remain similar to those of the existing pump station.

Once construction is complete, the intertie pipeline would not introduce any new noise sources in the ambient noise environment. The two proposed new City/SqWD/CWD intertie pump stations are anticipated to be constructed in a manner consistent with other pump stations in the study area, which locate all pumps, motors and noise generating components within a CMU brick building. The enclosed CMU brick buildings housing the equipment at new pump stations would reduce noise levels to at or below the existing ambient noise levels. Therefore, this programmatic component would result in a less-than-significant impact.

Felton Diversion Improvements

The Felton Diversion Fish Passage improvements do not incorporate new long-term operational noise generating sources. Therefore, this programmatic component would result in a less-than-significant impact.

Tait Diversion and Coast Pump Station Improvements

Improvements at the Tait Diversion dam could include a new or modified intake, hydraulic improvements, improvements to the check dam, and fish passage upgrades. The Tait diversion dam improvements do not incorporate long-term operational noise generating components.

Improvements at the Coast Pump Station could include new pumps and motors, power upgrades, including a possible substation upgrade, a new or modified concrete wet well and a solids handling system. Upgrades to the pumps, motors and facility power supply would have the potential to introduce new long-term operational noise sources or increase existing noise levels due to upgrades and modifications. Specific equipment types, configurations, and locations of the Coast Pump Station improvements are unknown at this time. Based on the proximity of potential noise-sensitive receptors in the immediate vicinity, improvements of the Coast Pump Station could result in noise levels exceeding the applicable noise level thresholds and therefore would result in a potentially significant impact.

Implementation of MM NOI-1 would avoid a substantial permanent increase in ambient noise levels by requiring the selection of equipment that inherently complies with the applicable thresholds where feasible, and where not feasible, full or partial enclosures to reduce equipment noise levels shall be required to comply with the applicable thresholds. The effectiveness of the noise reduction enclosure shall be demonstrated through submittal of an acoustical assessment. Therefore, with the implementation of this mitigation measure, the impacts of this programmatic component would be reduced to a less-than-significant impact level.

Mitigation Measures

Implementation of the following mitigation measure would reduce potentially significant impacts of the Proposed Project related to permanent increases in ambient noise levels to a less-than-significant level, as described above.

MM NOI-1: Operational Noise Levels (Applies to Coast Pump Station Improvements). The Proposed Project shall implement the following measures to reduce the potential for exposure of nearby noise-sensitive receptors to excessive noise levels:

- Where feasible, a primary element for the selection of proposed noise-generating equipment (e.g., pumps, motors, transformers, etc.) shall be equipment that inherently does not generate an increase of +3 dB in the ambient noise levels where the existing ambient is below 60 dBA L_{dn}, or a +5 dB increase in the ambient noise levels where the existing ambient is above 65 dBA L_{dn}, as measured at the nearest sensitive receptor.
- Where this is not feasible, noise-generating equipment shall be located within a full or partial noise reduction enclosure. The effectiveness of the equipment enclosure to reduce noise level exposure to within the applicable noise level threshold shall be demonstrated through submittal of a focused acoustical assessment.

Impact NOI-2: Substantial Increase in Ambient Noise Levels in Excess of Standards (Significance Standard B). Construction of the Proposed Project would result in generation of a substantial temporary increase in ambient noise levels in the vicinity of some project and programmatic infrastructure components in excess of applicable standards established in local general plans or noise ordinances. ***(Significant and Unavoidable)*** Operation of the Proposed Project would result in generation of a substantial permanent increase in ambient noise levels in the vicinity of one of the programmatic infrastructure components in excess of applicable standards. (***Less than Significant with Mitigation***)

Construction

Water Rights Modifications

The water rights modifications would not directly result in construction activities that could cause noise. Given that, the water rights modifications would not result in the generation of substantial temporary increase in ambient noise levels. Therefore, this project component of the Proposed Project would have no direct impact.

The following analysis evaluates the potential indirect impacts related to construction noise as a result of the proposed water rights modifications, that once approved could result in the implementation of the other project and programmatic infrastructure components of the Proposed Project.

Infrastructure Components

The Proposed Project includes project and programmatic infrastructure components that would have the potential to impact ambient noise during construction. The Proposed Project also includes the implementation of Standard Construction Practice #26 that requires that adjacent property owners be notified of nighttime construction schedules and that a Construction Noise Coordinator be identified that will be responsible for responding to local complaints about construction noise. See Section 4.10.4.2, Analytical Methods, for additional information about this measure and its effectiveness.

Construction associated with development of the project and programmatic infrastructure components of the Proposed Project would generate noise levels associated with the operation of heavy construction equipment and construction related activities (see Table 4.10-12 for typical construction equipment noise levels). The effects of construction noise depends largely on the types and specific locations of construction activities occurring on any given day, noise levels generated by those activities, distances to noise-sensitive receptors,[1] and the existing ambient noise environment in the vicinity of the receiver. Construction generally occurs in several discrete phases, with each phase varying the equipment mix and the associated noise. These phases alter the characteristics of the noise environment generated on the project and programmatic infrastructure component sites and in the surrounding community on any given day and for the duration of construction.

The phases and individual equipment mix for each of the components discussed below were based on the construction information present Section 4.2, Air Quality, and Appendix E and the construction noise modeling for the project and programmatic infrastructure components is presented in Appendix H. Noise levels for the phases were calculated using the FHWA and FTA reference noise levels presented in Table 4.10-12.

[1] Distances of construction activities to noise-sensitive receptors can vary throughout a given day and over the course of construction as construction equipment and activities move around a discrete construction site or along a linear pipeline construction site.

Aquifer Storage and Recovery Facilities

New ASR Facilities. As discussed in Chapter 3, Project Description, the new ASR facilities would likely consist of: (1) a pump control and chemical storage building; (2) a treatment system; (3) backwash tank(s) used in the treatment system; (4) a water well and monitoring wells, submersible pump and concrete pedestal, station piping including treated water pipelines, sewer connections, and stormwater drainage facilities that would connect to nearby facilities in adjacent roadways. The potential locations and specific on-site configurations for the new ASR facilities are unknown at this time. However, based on similar ASR facility construction requirements, typical construction equipment assumptions and fleet mixes are known. These construction equipment assumptions include the use of graders, a borehole drill rig, forklifts, pumps, tractors/loaders, cranes, generators, and other smaller pieces of equipment.

The loudest mix of equipment associated with construction of new ASR facilities would occur during the "Mobilization" phase; with the borehole drilling, reaming, and test pump removal phases being marginally quieter. The Mobilization phase would incorporate the use of a grader, a drill rig, a loader and a tractor; with a resulting noise level of 85.2 dBA L_{eq} at a distance of 50 feet. Accounting for an attenuation rate of 6 dB per doubling of distance, construction of the new ASR facilities would exceed the daytime noise level threshold of 75 dBA at a distance of 124 feet and the 60 dBA nighttime threshold at a distance of 472 feet.

Given that the locations of the proposed new ASR facilities are unknown and with the population density of the overall area, it is possible that the proposed facilities would be located within 472 feet of nearby noise-sensitive receptors. Additionally, as indicated in Chapter 3, Project Construction, borehole drilling operations would occur on a continuous, 24-hour-per-day basis for a construction period of approximately 3 months, to avoid the risk of the borehole wall collapsing during construction. Therefore, it is possible that exceedance of the noise level thresholds could occur on a continuous basis over the construction period of approximately 3 months, which is a lengthy duration, as opposed to typical construction noise that is intermittent and varies throughout the construction period. Therefore, the construction of the new ASR facilities would result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of new ASR facilities by restricting construction hours; requiring the location of noise generating equipment as far as possible from noise-sensitive receptors, within an acoustically rated enclosure, shroud or temporary barrier when construction hours cannot be restricted; requiring certain types of construction equipment be located within such enclosures, shrouds or temporary barriers regardless of hours of construction; requiring the use of mufflers and noise suppressors on equipment; and limiting equipment idling. With the exception of the borehole drilling operations, implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this programmatic component, with the exception of noise from drilling operations, would be reduced to a less-than-significant level.

During the construction period requiring continuous borehole drilling the implementation of MM NOI-2, which restricts the construction hours of operations to less sensitive daytime hours, would not be possible. As the location of the construction activities and the distance to potential nearby noise-sensitive receptors is unknown and borehole drilling operations during construction would occur during the more sensitive nighttime period, temporary noise from these operations could still exceed the noise level thresholds noted above, after incorporation of MM NOI-2. Additionally, it is possible that exceedance of the noise level thresholds could occur on a continuous basis over the construction period of approximately 3 months and therefore the exceedance could occur over a lengthy duration. As a result, this programmatic component would have a significant and unavoidable impact related to construction noise.

Beltz ASR Facilities. Facility upgrades and improvements at the existing Beltz 8, 9, 10, and 12 ASR facilities would include the addition of permanent supply pipeline, backflow prevention devices and submersible pumps with higher capacity than the existing submersible pumps. In addition, the Beltz 9 ASR facility site would install up to three additional approximately 2-inch monitoring wells on the existing site. The loudest mix of equipment associated with the construction of the Beltz ASR facilities would occur during the: borehole well drilling, injection line, backflow meter, electrical conduit, and control installation phase. This portion of the project component would result in a composite construction noise level of 88.1 dBA L_{eq} at a distance of 50 feet from the center of construction operations. Accounting for an attenuation rate of 6 dB per doubling of distance, this project component would exceed the 60 dBA threshold at a distance of 610 feet and the 75 dB threshold at a distance of 250 feet.

Noise-sensitive receptors near the Beltz 8, 9, 10 and 12 ASR sites are located immediately adjacent to the existing operations. Additionally, as indicated in Chapter 3, Project Construction, borehole drilling operations at the Beltz 9 ASR facility would occur on a continuous, 24-hour-per-day basis for a construction period of approximately one month, to avoid the risk of the borehole wall collapsing during construction. Therefore, it is possible that exceedance of the noise level thresholds could occur on a continuous basis over the construction period of approximately one month, which is a lengthy duration, as opposed to typical construction noise that is intermittent and varies throughout the construction period. As such, construction of the proposed Beltz ASR facilities would result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of Beltz ASR facilities, as described above for new ASR facilities. With the exception of the borehole drilling operations at the Beltz 9 ASR facility, implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this project component, with the exception of noise from drilling operations at the Beltz 9 ASR facility, would be reduced to a less-than-significant level.

During the construction period requiring continuous borehole drilling the implementation of MM NOI-2, which restricts the construction hours of operations to less sensitive daytime hours, would not be possible. As the borehole drilling operations during construction at the Beltz 9 ASR facility would occur during the more sensitive nighttime period, temporary noise from these operations could still exceed the noise level thresholds noted above, after incorporation of MM NOI-2. Additionally, it is possible that exceedance of the noise level thresholds at the Beltz 9 ASR facility could occur on a continuous basis over the construction period of approximately 3 months and therefore the exceedance could occur over a lengthy duration. As a result, the Beltz 9 ASR facility would have a significant and unavoidable impact related to construction noise.

City/SVWD Intertie Improvements. The City/SVWD intertie could result in the placement of a new pipeline along Sims Road and La Madrona Road and construction of a new pump station. Construction of the City/SVWD intertie pipeline is assumed to occur within the respective roadway rights-of-way. The pipeline construction is anticipated to occur within close proximity to noise-sensitive receptors, as existing residential land uses are located adjacent to the transportation rights-of-way.

Noise generating phases of the pipeline construction would be the pipeline installation and paving phases. The loudest construction noise levels would occur during the paving phase of the pipeline construction, with predicted composite construction noise levels of 85.8 dBA L_{eq} at a distance of 50 feet from the centerline of the linear construction area active at that time. Paving operations associated with the intertie pipeline would generate noise levels exceeding the 60 dBA threshold at distances less than 500 feet and the 75 dBA threshold at distances less than 131 feet.

The pump station, proposed in the general vicinity of La Madrona Drive and Altenitas Drive, would be constructed in phases. The phases would be site preparation, building construction, architectural coating, paving and testing; with building construction being the loudest phase, with a predicted composite construction noise level of 86.2 dBA L_{eq} at a distance of 50 feet from the center of construction operations. Based on noise levels associated with pipeline noise levels, the proposed pump station construction would generate noise levels exceeding the 60 dBA threshold at a distance of 518 feet and the 75 dBA threshold at a distance of 136 feet.

Based on the proximity of potential nearby noise-sensitive receptors, construction of the City/SVWD intertie pipeline and pump station would exceed the noise level thresholds in some locations for a limited duration. Construction of the pipeline would progress along the pipeline corridor rapidly and therefore the exposure of sensitive receptors would be limited in duration. Likewise, construction of the pump station would occur over a two-month period and therefore exposure of sensitive receptors would also be limited in duration. These construction activities would generate typical construction noise that is intermittent and varies throughout the construction period depending on the construction activity, equipment being used, location of equipment on the pipeline corridor or pump station site, etc. However, this programmatic component is conservatively assumed to result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of the City/SVWD intertie, as described above for new ASR facilities. Implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this programmatic component would be reduced to a less-than-significant level.

City/SqCWD/CWD Intertie Improvements. The City/SqCWD/CWD intertie would result in replacement of an existing pipeline in two segments, one in Soquel Village and one in Park Avenue. It is assumed that the City/SqCWD/CWD intertie pipeline would occur within or adjacent to the roadway rights-of-way. The current pipeline alignment would result in construction activities occurring within the immediate vicinity of noise-sensitive single-family and multi-family receptors at approximate distances as close as 25 to 75 feet. The loudest construction noise exposure generated by the City/SqCWD/CWD intertie pipeline construction would occur during the paving phase with a predicted composite construction noise levels of 85.8 dBA L_{eq} at a distance of 50 feet from the centerline of the linear construction area active at that time. Paving operations associated with the intertie pipeline construction would generate noise levels exceeding the 60 dBA threshold at distances less than 500 feet and the 75 dBA threshold at distances less than 131 feet.

The City/SqCWD/CWD McGregor Drive pump station upgrade element would be performed in up to four phases: demolition (removal/replacement of equipment), structural rehabilitation if any, building reconstruction and testing, based on a worst-case assessment of what could be required for the upgrade. The building reconstruction phase would be the loudest with a predicted composite construction noise level of 86.0 dBA L_{eq} at a distance of 50 feet from the center of the construction. Based on the predicted noise levels, the pump station upgrade would generate noise levels exceeding the 60 dBA threshold at a distance of 510 feet and the 75 dBA threshold at a distance of 134 feet.

The portion of the City/SqCWD/CWD intertie that would connect SqCWD and CWD would require the construction of two new pump stations, one on Valencia Road and one on Freedom Boulevard; however precise locations are not known at this time. The proposed pump stations would be constructed in phases, including site preparation, building construction, architectural coating, paving and testing. The loudest construction phase was building construction with a predicted composite construction noise level of 86.2 at a distance of 50 feet. Based on the

predicted construction noise levels, construction of the proposed new pump stations would generate noise levels exceeding the 60 dBA threshold at a distance of 518 feet and the 75 dBA threshold at a distance of 212 feet.

Based on the proximity of potential nearby noise-sensitive receptors, construction of the propose pipelines, pump station upgrade and new pump stations would exceed the noise level thresholds in some locations for a limited duration. Construction of the pipelines would progress along the pipeline corridors rapidly and therefore the exposure of sensitive receptors would be limited in duration. Likewise, construction of the upgraded and new pump stations would each occur over a two-month period and therefore exposure of sensitive receptors would also be limited in duration. These construction activities would generate typical construction noise that is intermittent and varies throughout the construction period depending on the construction activity, equipment being used, location of equipment on the pipeline corridors or pump station sites, etc. However, this programmatic component is conservatively assumed to result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of the City/SqCWD/CWD intertie, as described above for new ASR facilities. Implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this programmatic component would be reduced to a less-than-significant level.

Felton Diversion Improvements. This programmatic component would involve minor modifications to the existing fish passage at the Felton Diversion. The proposed improvements would be constructed on the west side of the Felton Diversion structure. Felton diversion improvements would typically occur from 8:00 a.m. to 10:00 p.m. The nearest noise-sensitive receptor is the single-family residence located approximately 100 feet west of the west end of the Felton Diversion.

The predicted composite noise level for the fish passage improvements is 85.2 dBA L_{eq} at a distance of 50 feet from the center of the construction operations. Based on the predicted construction noise levels, the Felton Diversion improvements would generate noise levels exceeding the 60 dBA threshold at a distance of 475 feet and the 75 dBA threshold at a distance of 124 feet.

Based on the proximity of the nearest noise-sensitive receptor (100 feet) and an attenuation rate of 6 dB per doubling of distance, construction of the propose fish passage improvements would exceed the noise level thresholds for a limited duration. Construction of the Felton Diversion improvements would occur over a three-month period and construction activities would generate typical construction noise that is intermittent and varies throughout the construction period depending on the construction activity, equipment being used, location of equipment, etc. However, this programmatic component is conservatively assumed to result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of the Felton Diversion improvement site, as described above for new ASR facilities. Implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this programmatic component would be reduced to a less-than-significant level.

Tait Diversion and Coast Pump Station Improvements. This programmatic component would implement several improvements at the existing Tait Diversion and Coast Pump Station. Improvements could include new or modified intake design, hydraulic modifications, improvements to the check dam, required fish passage upgrades and pump upgrades. The proposed improvements would be implemented in phases, including site-preparation, and a phase for each of the proposed improvements listed above. The loudest phase would be the site preparation phase, with a predicted composite noise level of 85.8 dBA L_{eq} at a distance of 50 feet from the center of the construction area.

The nearest noise-sensitive receptors in the vicinity the Tait Diversion and Coast Pump Station improvements are located within the City of Santa Cruz. Construction activities are assumed to occur at distances ranging from approximately 150-feet up to 400-feet from the nearest noise-sensitive receptor. At this distance, the predicted composite noise level for the site preparation phase would be attenuate to 68 dBA L_{eq}. The loudest construction noise phase would be approximately 68 dBA L_{eq} at the outdoor activity area of the nearest noise-sensitive land use and would comply with the 75 dBA threshold, but would not comply with the 60 dBA threshold.

Based on the proximity of the nearest noise-sensitive receptor (150 to 400 feet) and an attenuation rate of 6 dB per doubling of distance, construction of the propose improvements would exceed the noise level thresholds for a limited duration. Construction of the Tait Diversion and Coast Pump Station improvements would occur over an eight-month period and construction activities would generate typical construction noise that is intermittent and varies throughout the construction period depending on the construction activity, equipment being used, location of equipment, etc. However, this programmatic component is conservatively assumed to result in a potentially significant impact.

Implementation of MM NOI-2 would reduce the temporary increase in ambient noise levels during construction in excess of applicable standards in the vicinity of the Tait Diversion and Coast Pump Station, as described above for new ASR facilities. Implementation of MM NOI-2 would result in the minimization of elements of construction noise that would be typically considered to be unreasonably disturbing, such as noise having excessive intensity, duration, or pitch. Therefore, with the implementation of MM NOI-2 project-related construction noise for this programmatic component would be reduced to a less-than-significant level.

Operation

Water Rights Modifications

As indicated in Impact NOI-1, the water rights modifications would not directly result in operational activities that could cause noise. Given that, the water rights modifications would not result in the generation of substantial permanent increase in ambient noise levels. Therefore, this project component of the Proposed Project would have no direct impact.

The following analysis evaluates the potential indirect impacts related to operational noise as a result of the proposed water rights modifications, that once approved could result in the implementation of the other project and programmatic infrastructure components of the Proposed Project.

Infrastructure Components

As indicated in Impact NOI-1, operational noise levels generated by most of the various project and programmatic infrastructure components would not permanently increase ambient noise levels and therefore also would not exceed applicable noise standards established in local general plans or noise ordinances. The possible exception

involves the operation of the Tait Diversion and Coast Pump Station component and specifically the Coast Pump Station element. Based on the proximity of potential noise-sensitive receptors in the immediate vicinity, as described in Impact NOI-1, improvements of the Coast Pump Station could result in operational noise levels exceeding the applicable noise level thresholds and therefore would result in a potentially significant impact.

Implementation of MM NOI-1 would avoid a substantial permanent increase in ambient noise levels in excess of applicable standards by requiring the selection of equipment that inherently complies with the applicable thresholds where feasible, and where not feasible, full or partial enclosures to reduce equipment noise levels shall be required to comply with the applicable thresholds. The effectiveness of the noise reduction enclosure shall be demonstrated through submittal of an acoustical assessment. Therefore, with the implementation of this mitigation measure, the impacts of this programmatic component would be reduced to a less-than-significant impact level.

Mitigation Measures

Implementation of MM NOI-1 described above would reduce potentially significant operational noise to a less-than-significant level. Implementation of the following mitigation measure would reduce potentially significant construction noise impacts of the Proposed Project related to increases in ambient noise levels to a less-than-significant level for most project and programmatic infrastructure components. However, as indicated above, the new ASR facilities and the Beltz 9 ASR facilities would have significant and unavoidable construction noise impacts due to well drilling operations during construction.

MM NOI-2: **Construction Noise (Applies to all Infrastructure Components).** The Proposed Project shall implement the following measures related to construction noise:

- Restrict construction activities and use of equipment that have the potential to generate significant noise levels (e.g., use of concrete saw, mounted impact hammer, jackhammer, rock drill, etc.) to between the hours of 8:00 a.m. and 5:00 p.m., unless specifically identified work outside these hours is authorized by the City's Water Director as necessary to allow for safe access to a construction site, safe construction operations, efficient construction progress, and/or to account for prior construction delays outside of a contractor's control (e.g., weather delays).
- Construction activities requiring operations continuing outside of the standard work hours of 8:00 a.m. and 5:00 p.m. (e.g., borehole drilling operations) shall locate noise generating equipment as far as possible from noise-sensitive receptors, and/or within an acoustically rated enclosure (meeting or exceeding Sound Transmission Class [STC] 27), shroud or temporary barrier as needed to prevent the propagation of sound into the surrounding areas in excess of the 60 dBA nighttime (10:00 p.m. to 8:00 a.m.) and 75 dBA daytime (8:00 a.m. to 10:00 p.m.) criteria at the nearest sensitive receptor. Noisy construction equipment, such as temporary pumps that are not submerged, aboveground conveyor systems, and impact tools will likely require location within such an acoustically rated enclosure, shroud or barrier to meet these above criteria. Impact tools, in particular, shall have the working area/impact area shrouded or shielded whenever possible, with intake and exhaust ports on power equipment muffled or suppressed. Impact tools may necessitate the use of temporary or portable, application-specific noise shields or barriers to achieve compliance.

- Portable and stationary site support equipment (e.g., generators, compressors, and cement mixers) shall be located as far as possible from nearby noise-sensitive receptors.
- Construction equipment and vehicles shall be fitted with efficient, well-maintained mufflers that reduce equipment noise emission levels at the project site. Internal-combustion-powered equipment shall be equipped with properly operating noise suppression devices (e.g., mufflers, silencers, wraps) that meet or exceed the manufacturer's specifications. Mufflers and noise suppressors shall be properly maintained and tuned to ensure proper fit, function, and minimization of noise.
- Construction equipment shall not be idled for extended periods of time (i.e., 5 minutes or longer) in the immediate vicinity of noise-sensitive receptors.

Impact NOI-3: **Groundborne Vibration (Significance Standard B).** Construction of the Proposed Project would result in the potential generation of excessive groundborne vibration or groundborne noise levels. *(Less than Significant with Mitigation)*

Water Rights Modifications

The water rights modifications would not directly result in construction activities and therefore would not cause vibration. Therefore, this project component of the Proposed Project would have no direct impact.

The following analysis evaluates the potential indirect impacts related to vibration as a result of the proposed water rights modifications, that once approved could result in the implementation of the other project and programmatic infrastructure components of the Proposed Project.

Infrastructure Components

Construction activities on the project and programmatic infrastructure sites may result in varying degrees of temporary groundborne vibration or noise, depending on the specific construction equipment used and operations involved. Pile driving and blasting are not currently expected to be utilized in the construction of the components of the Proposed Project. The construction phases and equipment mixes used in this analysis are consistent with those used in Impact NOI-2. The Proposed Project is not anticipated to incorporate equipment or processes that would generate substantial groundborne noise or vibration during operations, as such, groundborne noise and vibration sources would be limited to construction activities.

Aquifer Storage and Recovery Facilities

New ASR Facilities. Groundborne noise and vibration sources are anticipated to include a borehole drill rig and heavy equipment (e.g., excavator, tractors, vibratory roller, etc.). Use of a vibratory roller during the paving portions of pipeline installations would produce vibration levels exceeding the Caltrans threshold of 0.3 in/sec PPV at distances less than 15 feet from the vibratory roller. Aside from the vibratory roller, the borehole drill rig and heavy equipment would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. While it is unlikely that the new ASR programmatic components would be located within 15 feet of existing sensitive receptors, the proposed locations for these facilities are unknown at this time. Therefore, there is a possibility for this programmatic component construction operations to generate significant groundborne noise and vibration levels. Therefore, generation of groundborne noise and vibration levels associated with this programmatic component would result in a potentially significant impact.

Implementation of MM NOI-3 would avoid the generation of excessive groundborne vibration or groundborne noise levels by requiring construction vibration practices to minimize vibration including a prohibition on the use of vibratory rollers or compactors near sensitive receptors and a requirement that only rubber-tire heavy equipment be used near sensitive receptors. Therefore, with the implementation of this mitigation measure the impact of this programmatic component would be reduced to a less-than-significant impact level.

Beltz ASR Facilities. Groundborne noise and vibration sources associated with the Beltz ASR facility improvements are anticipated to include the use of heavy equipment (e.g., excavator, tractors, etc.), pumps and power hand tools. Construction operations associated with the Beltz ASR facility improvements would occur at the location of the existing equipment at Belts 8, 9, 10, and 12. The heavy equipment associated with the Beltz ASR facility improvements would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. The closest sensitive receptors to the Beltz ASR facility sites range from approximately 25 to 45 feet from the center of the proposed construction activities. Therefore, generation of groundborne noise and vibration levels associated with this project component would result in a less-than-significant impact.

Water Transfers and Exchanges and Intertie Improvements

City/SVWD Intertie Improvements. The City/SVWD intertie would result in the placement of a new pipeline along Sims Road and La Madrona Road and construction of a new pump station. Groundborne noise and vibration sources associated with the City/SVWD intertie programmatic component are anticipated to include the use of heavy equipment (e.g., excavator, tractors, dozers, vibratory roller), air compressors, cement mixer trucks and powered hand tools. Construction operations associated with the City/SVWD intertie would include linear construction for pipeline installation and construction of the proposed pump station. Use of a vibratory roller during the paving portions of pipeline installation would produce vibration levels exceeding the Caltrans threshold of 0.3 in/sec PPV at distances less than 15 feet from the vibratory roller. The heavy equipment associated with the construction of the proposed pump station would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. As the precise construction limits have not been specifically defined at this time, there is a possibility for the proposed programmatic component construction operations to generate significant groundborne noise and vibration levels at adjacent sensitive receptors. Therefore, generation of groundborne noise and vibration levels associated with this programmatic component would result in a potentially significant impact.

Implementation of MM NOI-3 would avoid the generation of excessive groundborne vibration or groundborne noise levels, as described above for new ASR facilities. Therefore, with the implementation of this mitigation measure the impact of this programmatic component would be reduced to a less-than-significant impact level.

City/SqCWD/CWD Intertie Improvements. The City/SqCWD/CWD intertie would result in replacement of an existing pipeline in two segments, one in Soquel Village and one in Park Avenue, and upgrade of an existing pump station on McGregor Drive. Groundborne noise and vibration sources associated with the City/SqCWD/CWD intertie programmatic components are anticipated to include the use of heavy equipment (e.g., excavator, tractors, dozers, vibratory roller), air compressors, cement mixer trucks and powered hand tools. Construction operations associated with the City/SqCWD/CWD intertie would include linear construction for pipeline installation and upgrades at the existing pump station. Use of a vibratory roller during the paving portions of pipeline installation would produce vibration levels exceeding the Caltrans threshold of 0.3 in/sec PPV at distances less than 15 feet from the vibratory roller. The heavy equipment associated with the construction of the proposed pump station upgrade would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet.

The portion of the City/SQCWD/CWD intertie that would connect SqCWD and CWD would require the construction of two new pump stations, one on Valencia Road and one on Freedom Boulevard; however precise locations are not known at this time. Groundborne noise and vibration sources associated with the new City/SqCWD/CWD pump stations are anticipated to include the use of heavy equipment (e.g., excavator, tractors, dozers, vibratory roller), air compressors, cement mixer trucks and powered hand tools. Use of a vibratory roller during the paving portions of pump station construction would produce vibration levels exceeding the Caltrans threshold of 0.3 in/sec PPV at distances less than 15 feet from the vibratory roller. The heavy equipment associated with the construction of the proposed pump station would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. As the precise construction limits have not been specifically defined at this time, there is a possibility for the City/SqCWD/CWD intertie construction operations to generate significant groundborne noise and vibration levels. Therefore, generation of groundborne noise and vibration levels associated with this programmatic component would result in a potentially significant impact.

Implementation of MM NOI-3 would avoid the generation of excessive groundborne vibration or groundborne noise levels, as described above for new ASR facilities. Therefore, with the implementation of this mitigation measure the impact of this programmatic component would be reduced to a less-than-significant impact level.

Felton Diversion Improvements

This programmatic component would reconfigure and upgrade the existing fish passage located at the western portion of the Felton Diversion. Groundborne noise and vibration sources associated with the improvements are anticipated to include the use of heavy equipment (e.g., excavator, tractors, etc.), generators, pumps and powered hand tools. The equipment associated with the Felton Diversion improvements would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. The closest sensitive receptors to the Felton Diversion are more than 175 feet from the proposed construction activities. Therefore, generation of groundborne noise and vibration levels associated with this programmatic component would result in a less-than-significant impact.

Tait Diversion and Coast Pump Station Improvements

This programmatic component would implement improvements to the check dam, the fish passage, intake, hydraulic modifications, and pump upgrades at the coast pump station. Groundborne noise and vibration sources associated with the improvements are anticipated to include the use of heavy equipment (e.g., excavator, tractors, etc.), generators, cement mixer trucks, pumps and powered hand tools. Construction operations associated with the Tait Diversion and Coast Pump Station improvements would occur at the location of the existing equipment, dam and fish passage. The equipment associated with the improvements to the Tait Diversion and Coast Pump Station would produce vibration levels exceeding the Caltrans 0.3 in/sec PPV threshold at distances less than 9 feet. The closest sensitive receptors to the Tait Diversion and Coast Pump Station are more than 150 feet from the proposed construction activities. Therefore, generation of groundborne noise and vibration levels associated with this programmatic component would result in a less-than-significant impact.

Mitigation Measures

Implementation of the following mitigation measure would reduce the potentially significant impact related to construction vibration to a less-than-significant level.

MM NOI-3: **Construction Vibration (Applies to New Aquifer Storage and Recovery Facilities and all Intertie Improvements).** The Proposed Project shall implement the following measures to reduce the potential for structural damage from groundborne noise and vibration:

- Vibratory rollers or compactors shall not be used within 15 feet of sensitive receptors.
- Heavy equipment required to operate within 9 feet of sensitive receptors shall be limited to rubber-tired equipment.

4.10.4.4 Cumulative Impacts Analysis

This section provides an evaluation of cumulative noise impacts associated with the Proposed Project and past, present, and reasonably foreseeable future projects, as identified in Table 4.0-2 in Section 4.0, Introduction to Analyses, and as relevant to this topic. The geographic area of potential cumulative noise and vibration impacts is limited to the immediate vicinity of the project and programmatic infrastructure components, areas immediately adjacent to the routes designated for access, hauling or linear construction and areas within approximately 650 feet of the Proposed Project construction activities.

The Proposed Project would not contribute to cumulative impacts related to **aircraft noise (Significance Standard C)** because it would have no impact related to this standard as described above. Therefore, this significance standard is not further evaluated. Additionally, the proposed water rights modifications are not further evaluated given no noise impacts were identified for this project component (see Impact NOI-1 through Impact NOI-3) and therefore this component would not contribute to cumulative impacts.

Impact NOI-4: **Cumulative Noise Impacts (Significance Standards A and B).** Construction and operation of the Proposed Project, in combination with past, present, and reasonably foreseeable future development, would not result in a significant cumulative impact related to noise and vibration. ***(Less than Significant)***

Cumulative noise impacts could occur if sensitive receptors were exposed to elevated noise and vibration levels from multiple cumulative projects simultaneously and in close proximity. Construction of the project and programmatic infrastructure components would occur over several phases, beginning in 2022 and ending in 2028. As shown in Table 4.0-2, a number of cumulative projects are located at or near the infrastructure component sites and could be under construction during this same period of time. Table 4.0-2 displays the estimated construction schedule for cumulative projects, where known.

Construction of the project and programmatic infrastructure components of the Proposed Project would have the potential to generate noise and vibration levels in excess of the applicable standards, as described in Impact NOI-2 and NOI-3. Specifically, construction of the new ASR facility injection wells and the Beltz 9 ASR facility monitoring wells would require continuous 24-hour borehole drilling for up to 3 months, which would be a significant contribution to the immediate noise environment when drilling operations are underway. As indicated in Impact NOI-2, this impact would be significant unavoidable specifically related to the well drilling activities due to the continuous nature of the noise and its duration. However, bore-hole drilling associated with the well installation would not likely occur in close enough proximity to allow for drill rig noise levels to combine with cumulative projects and therefore would not result in a significant cumulative noise impact. The bore-hole drilling would also cease after 3 months. Other elements of the Proposed Project construction activities, not utilizing a drill rig, would not generate noise levels that would contribute to a significant cumulative noise impact. Therefore, the Proposed Project's cumulative construction noise impact would be less than significant, despite the significant unavoidable project-specific noise impacts of limited physical extent and duration associated with bore-hole drilling.

Operation of the project and programmatic infrastructure components of the Proposed Project would result in new facilities, equipment, and operational noise sources, including equipment at new pump stations, equipment at the new ASR facilities, and new equipment at the Coast Pump Station. New stationary equipment could generate operational noise above the applicable noise thresholds at the Coast Pump Station, as indicated in Impact NOI-1 and Impact NOI-2. However, because of the distance of all of these proposed facilities from other cumulative noise-generating projects, and implementation of MM NOI-1 during operation, the Proposed Project would not generate noise levels that would contribute to a significant cumulative noise impact. Therefore, the Proposed Project's cumulative operational noise impact would be less than significant.

4.10.5 References

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