3.8 NOISE

This section includes a summary of applicable regulations related to noise and vibration, a description of ambient-noise conditions, and an analysis of potential short-term construction and long-term operational noise impacts associated with the project. Mitigation measures are recommended as necessary to reduce significant noise and vibration impacts.

During public review of the NOP, a comment was received that identified the potential need for a noise wall along the southern property line and western edge of development.

This analysis uses the following noise and vibration descriptors:

- **A-Weighted Decibels (dBA):** Noise levels are commonly reported in decibels using the A-weighting decibel scale (dBA). The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds.
- **Equivalent Continuous Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound level that occurs during the same period. For instance, the 1-hour equivalent sound level, also referred to as the hourly L_{eq}, is the energy average of sound levels occurring during a 1-hour period and is the basis for noise abatement criteria used by the California Department of Transportation (Caltrans) and Federal Transit Administration (FTA) (Caltrans 2013:Table 2-11; FTA 2018:Tabe 5-1).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period (Caltrans 2013:Table 2-11; FTA 2018).
- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-decibel (dB) "penalty" applied to sound levels occurring during nighttime hours between 10 p.m. and 7 a.m. (Caltrans 2013:Table 2-11; FTA 2018:Table 5-1).
- **Community Noise Equivalent Level (CNEL):** CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10 dBA penalty applied to sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m. and a 5 dBA penalty applied to the sound levels occurring during evening hours between 7 p.m. and 10 p.m., to account for added human sensitivity to noise during these periods (Caltrans 2013:Table 2-11).
- **Vibration Decibels (VdB):** VdB is the vibration velocity level in decibel scale (FTA 2018:Table 5-1).
- **Peak Particle Velocity (PPV):** PPV is the peak signal value of an oscillating vibration waveform. Usually expressed in inches/second (FTA 2018:Table 5-1).

3.8.1 Regulatory Setting

FEDERAL

U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. 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, documents and research completed by the EPA Office of Noise Abatement and Control continue to provide value in the analysis of noise effects.

Federal Transit Administration

To address the human response to ground vibration, the FTA has set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are presented in Table 3.8-1.

Table 3.8-1 Groundborne Vibration Impact Criteria for General Assessment

Land Use Category	GVB Impact Levels (VdB re 1 micro-inch/second) Frequent Events[1]	GVB Impact Levels (VdB re 1 micro-inch/second) Occasional Events[2]	GVB Impact Levels (VdB re 1 micro-inch/second) Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 [4]	65 [4]	65 [4]
Category 2: Residences and buildings where people normally sleep.	72	75	80
Category 3: Institutional land uses with primarily daytime uses.	75	78	83

Notes: GBV = groundborne vibration.

VdB = vibration decibels referenced to 1 µ inch/second and based on the root mean square (RMS) velocity amplitude.

[1] "Frequent Events" is defined as more than 70 vibration events of the same source per day.

[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.

[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.

[4] This criterion is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define acceptable vibration levels.

Source: FTA 2018

In addition to vibration criteria, FTA has also established construction noise criteria based on the land use type affected by noise and depending on whether or not construction noise would occur during the daytime or nighttime. The FTA criteria are as follows:

- Residential: 90 dBA L_{eq} (day) and 80 dBA L_{eq} (night)
- Commercial/Industrial: 100 dBA L_{eq} (day and night)

STATE

California General Plan Guidelines

The State of California General Plan Guidelines, published by the California Governor's Office of Planning and Research (2017), provides guidance for the compatibility of projects within areas of specific noise exposure. Acceptable and unacceptable community noise exposure limits for various land use categories have been determined to help guide new land use decisions in California communities. In many local jurisdictions, these guidelines are used as the basis for local noise standards and guidance. Citing U.S. Environmental Protection Agency materials and the state Sound Transmissions Control Standards, the state's general plan guidelines recommend interior and exterior CNEL of 45 and 60 dB for residential units, respectively (OPR 2017:378).

California Department of Transportation

In 2013, Caltrans published the Transportation and Construction Vibration Manual (Caltrans 2013). The manual provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 3.8-2 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous/frequent intermittent sources of vibration.

Table 3.8-2 Caltrans Recommendations Regarding Levels of Vibration Exposure

Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Notes: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans 2013

California State University

Cal Poly Administrative Policies

General Policy. Section 141.3.2.1 of the "Campus Administrative Policies" states the following:

- Outdoor events and activities that involve amplified music or speech are limited to the hours of: 7:00 a.m. to 10:00 p.m., Monday through Sunday, and University scheduling protocols must be followed (see sections 144.4 and 141.3.2.2).
- Outdoor events and activities that do not require use of amplified sound (for speech or music) may be held between 7:00 a.m. and midnight, Monday through Sunday. Use of the University's scheduling protocols is encouraged, to facilitate coordination with other events and among potential campus service providers. Regardless of the time they are held, events and activities must be conducted in a manner consistent with Section 141.3.1 (General Limitations) and in conformity with any additional guidelines pertinent to a particular venue.

General Policy. Section 141.3.1 of the "Campus Administrative Policies" states the following:

- All campus events and activities shall be conducted consistent with Federal and State law, with existing University policies, with the orderly conduct of University business, with preservation of the campus learning environment, with the preservation of public safety, with maintenance of University property and with the free flow of pedestrian and vehicular traffic. Entrances to campus facilities shall not be obstructed. No individual or group shall abridge, halt or disrupt the right of others to present their views. In addition, plans for outdoor events and activities should address potential impacts on residential communities, on and off campus.

LOCAL

Cal Poly Humboldt is part of the CSU, which is a statutorily and legislatively created, constitutionally authorized State entity. As explained in the "California State University Autonomy" section of Chapter 3 of this EIR, the CSU is not subject to local government planning and land use plans, policies, or regulations. Nevertheless, in the exercise of its discretion, Cal Poly Humboldt does reference, describe, and address local plans, policies, and regulations where appropriate and for informational purposes. This evaluation is also intended to be used by local agencies for determining, as part of their permit processes, the project's consistency with local plans, policies, and regulations.

City of Arcata General Plan

The City of Arcata General Plan contains goals and policies related to noise. Relevant policies are included below:

- **Policy N-1a: Noise attenuation measures.** Noise attenuation measures and stationary noise source controls shall include the use of barriers, setbacks, site design, baffles, enclosures, silencers, and improved facade construction techniques.

- **Policy N-1b: Noise attenuation guidelines.** Noise attenuation measures and stationary noise source controls shall follow the guidelines provided in the technical document entitled: *Noise Control Manual* (which is considered an implementation measure).
- **Policy N-1c: Noise mitigation.** Where noise mitigation measures are required, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project.
- **Policy N-2c: Noise created by new or proposed stationary noise sources.** Noise created by new or proposed stationary noise sources, or the expansion or alteration of an existing use, shall be mitigated so as not to exceed noise level standards (Table N-1) [Table 3.8-3 in this EIR] at noise-sensitive land uses. All noise generators not in compliance with these standards will be encouraged to mitigate impacts.
- **Policy N-2d: Acceptable noise levels**. New construction and retrofits at existing buildings shall include appropriate insulation, glazing, and other sound attenuation measures so that they comply with standards contained in Table N-1 [Table 3.8-4 in this EIR]. These standards are intended to set levels for external noise sources that could potentially impact a new dwelling or other noise-sensitive use.

Table 3.8-3 City of Arcata Noise Standards for New Projects and Retrofits

Land Use Noise Level Descriptor	Exterior 7 am-7 pm	Exterior 7 pm to 10 pm	Exterior 10 pm to 7 am	Interior 7 am to 7 pm	Interior 7 pm to 10 pm	Interior 10 pm to 7 am
Residences, Transient Lodging, Hospitals, Nursing Homes						
Hourly L_{eq}	55 dB	50 dB	45 dB	45 dB	40 dB	35 dB
Maximum	75 dB	75 dB	70 dB	65 dB	65 dB	60 dB
Auditoriums, Theaters, Libraries, Schools, Churches						
Hourly L_{eq}	55 dB	55 dB	n/a	40 dB	40 dB	n/a
Maximum	75 dB	75 dB	n/a	60 dB	60 dB	n/a

The City can impose noise level standards which are up to 5 dB less than those specified above based upon determination of existing low ambient noise levels in the vicinity of the project site.

These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

The standards will be applied at the outdoor activity areas of the receiving land use, and at the building facade for upper floor receivers which do not have an outdoor activity area facing the noise source. Where no outdoor activity area is identified, the City has the option to apply only the interior noise level performance standards.

Source: City of Arcata 2020.

Table 3.8-4 City of Arcata Maximum Allowable Transportation Noise Sources Exposure

Property Receiving Noise Type of Use	Property Receiving Noise Outdoor Activity Areas[1] L_{dn}/CNEL, dB	Interior Spaces L_{dn}/CNEL, dB	Interior Spaces $L_{eq, dB}$[2]
Residential	60[3]	45	--
Transient Lodging	60[4]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	60[3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	—	--

Notes: CNEL = community noise equivalent level; L_{dn} = day-night average noise level

[1] Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use.

[2] As determined for a typical worst-case hour during periods of use.

[3] Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB Ldn/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

[4] In the case of hotel/motel facilities or other transient lodging, outdoor activity areas such as pool areas may not be included in the project design. In these cases, only the interior noise level criterion will apply.

Source: City of Arcata 2020.

- **Policy N-3a: New development of noise-sensitive land uses**. New development of noise receptors will not be permitted in areas exposed to existing or projected levels of transportation noise exceeding levels specified in Table N-2 [Table 3.8-4 in this EIR] unless exterior noise or noise levels in interior spaces can be reduced to meet City Standards (Table N-2) [Table 3.8-3 in this EIR].
- **Policy N-3c: Roadway projects.** To minimize noise impacts, the following criteria may be used as a test of significance for roadway projects:
  1. Where existing traffic noise levels are less than 60 dB L_{dn} at the outdoor activity areas of noise receptors, a +5 dB L_{dn} increase in noise levels due to a roadway improvement project will be considered significant.
  2. Where existing traffic noise levels range between 60 and 65 dB L_{dn} at the outdoor activity areas of noise receptors, a +3 dB L_{dn} increase in noise levels due to a roadway improvement project will be considered significant.
  3. Where existing traffic noise levels are greater than 65 dB L_{dn} at the outdoor activity areas of noise receptors, a + 1.5 dB L_{dn} increase in noise levels due to a roadway improvement project will be considered significant.
- **Policy N-5a: Intrusive noise**. When intrusive noise sources have been identified, the detrimental effects (sleep interference or the potential for annoyance) shall be disclosed to neighboring receptor properties.
- **Policy N-5b: Noise levels due to non-transportation sources.** Noise levels due to non-transportation sources which may be intermittent or recurring, impulsive noises, pure tones, or noises consisting primarily of speech or music, shall be subject to the criteria contained within Table N-1 [Table 3.8-3 in this EIR], with a 5 dB penalty applied to the criteria.
- **Policy N-5c: Rhythmic, recurring, or impulsive noise sources.** When noise sources have been identified to be rhythmic, reoccurring, or impulsive in nature or comprised mainly of music or speech, they may comply with applicable noise level criteria and still be annoying to individuals. When these types of noise sources have been identified, they may be subject to additional mitigation or mediation.

- **Policy N-5d: Construction site tool or equipment noise.** The following shall apply to construction noise from tools and equipment:
  1. The operation of tools or equipment used in construction, drilling, repair, alteration or demolition shall be limited to between the hours of 8 a.m. and 7 p.m. Monday through Friday, and between 9 a.m. and 7 p.m. on Saturdays.
  2. No heavy equipment related construction activities shall be allowed on Sundays or holidays.

  This shall apply to construction noise from tools and equipment which are subject to the review of the City, and which may affect receptor uses. This policy shall not apply to emergency work of public service utilities or by variance under a noise ordinance.
- **Policy N-5e: Stationary and construction equipment noise.** All stationary and construction equipment shall be maintained in good working order and fitted with factory approved muffler systems.

City of Arcata Municipal Code

Article 2 of the City of Arcata's Municipal Code sets exterior noise level standards for the Downtown Plaza area of the city; however, because the project is not within the Downtown Plaza, those standards do not apply. Chapter 9.30.050 Noise Standards adopts the noise standards from the General Plan. In accordance with this section of the municipal code, noise level standards shown in Table 3.8-3 above would apply to operational non-transportation noise sources and the standards shown in Table 3.8-4 would apply to operational transportation noise sources. Last, this section also establishes limitations on hours of construction Monday through Friday from 8:00 a.m. to 7:00 p.m., Saturday from 9:00 a.m. to 7:00 p.m., and no heavy equipment-related construction activities on Sundays and holidays.

3.8.2 Environmental Setting

SOUND, NOISE, AND ACOUSTICS

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a human ear. Noise is defined as a loud, unexpected, annoying, or unwanted sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz, or thousands of hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this large range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB).

Addition of Decibels

Because decibels are logarithmic units, SPLs cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dB increase. In other words, when two identical sources

are each producing sound of the same loudness at the same time, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one idling truck generates an SPL of 70 dB, two trucks idling simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level approximately 5 dB louder than one source.

A-Weighted Decibels

As noted above, the decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz and perceive sounds within this range better than sounds of the same amplitude with frequencies outside of this range. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an "A-weighted" sound level (expressed in units of A-weighted decibels) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels. Table 3.8-5 describes typical A-weighted noise levels for various noise sources.

Table 3.8-5 Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet	— 100 —	
Gas lawn mower at 3 feet	— 90 —	
Diesel truck at 50 feet at 50 miles per hour	— 80 —	Food blender at 3 feet, Garbage disposal at 3 feet
Noisy urban area, daytime, Gas lawn mower at 100 feet	— 70 —	Vacuum cleaner at 10 feet, Normal speech at 3 feet
Commercial area, Heavy traffic at 300 feet	— 60 —	
Quiet urban daytime	— 50 —	Large business office, Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime	— 30 —	Library, Bedroom at night
Quiet rural nighttime	— 20 —	
	— 10 —	Broadcast/recording studio
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013: Table 2-5

Human Response to Changes in Noise Levels

The doubling of sound energy results in a 3 dB increase in the sound level. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear can discern 1-dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000–8,000 Hz) range. In general, the healthy human ear is most sensitive to sounds between 1,000 and 5,000 Hz and perceives both higher and lower frequency sounds of the same magnitude with less intensity (Caltrans 2013:2-18). In typical noisy environments, changes in noise of 1–2 dB are generally not perceptible. However, it is widely accepted that people can begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5 dB increase is generally

perceived as a distinctly noticeable increase, and a 10 dB increase is generally perceived as a doubling of loudness (Caltrans 2013:2-10). Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3 dB increase in sound would generally be perceived as barely detectable.

Vibration

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. 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). 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 and RMS vibration velocity are normally described in inches per second (in/sec) or in millimeters per second. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. 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; Caltrans 2013:6).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2018; Caltrans 2020:7). This is based on a reference value of 1 micro inch per second.

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Ground vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2018; Caltrans 2020:27).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur to fragile buildings. Construction activities can generate sufficient ground vibrations to pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2018).

Vibrations generated by construction activity can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations are generated by vibratory pile drivers, large pumps, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment.

Table 3.8-6 summarizes the general human response to different ground vibration-velocity levels.

Table 3.8-6 Human Response to Different Levels of Ground Noise and Vibration

Vibration-Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception for many humans.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level annoying.
85 VdB	Vibration tolerable only if there are an infrequent number of events per day.

Note: VdB = vibration decibels referenced to 1 µ inch/second and based on the root mean square (RMS) velocity amplitude.

Source: FTA 2018.

Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which a noise level decreases with distance depends on the following factors.

Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Roads and highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources, thus propagating at a slower rate in comparison to a point source. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

Ground Absorption

As the path of noise from a source to a receiver is generally linear, it generally proceeds in a manner very close to the ground. As a result, the ground itself, as well as structures and/or features, located between source and receptor reduce (i.e., attenuate) noise over distance. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no additional attenuation beyond that associated with geometric spreading is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver, such as soft dirt, grass, or scattered bushes and trees), additional ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. Taking into consideration the standard attenuation rate of a line source (e.g., roadways) identified above, attenuation of noise from a roadway over an acoustically soft site would equate to a reduction in noise levels of 4.5 dB per doubling of distance. This would also hold true for point sources, resulting in an overall attenuation rate of up to 7.5 dB per doubling of distance over soft/absorptive (e.g., grassy) ground.

Atmospheric Effects

Receivers located downwind from a source can be exposed to increased noise levels in anything other than calm conditions, whereas locations upwind can experience lowered noise levels, as wind can carry sound. Sound levels can also be increased at considerable distances (e.g., more than 500 feet) from the source because of atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also affect sound attenuation.

Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receiver attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction (Caltrans 2013:2-41; FTA 2018). Barriers higher than the line of sight provide increased noise reduction (FTA 2018). Vegetation between the source and receiver is rarely effective in reducing noise because it does not create a solid barrier unless there are multiple rows of vegetation (FTA 2018).

EXISTING NOISE ENVIRONMENT

Existing Noise Sources and Ambient Levels

The predominant noise source in the project area is vehicle traffic associated with US 101, located adjacent to the project site, with the nearest lane of traffic located approximately 80 feet to the east of the project site. Noise associated with Mad River Lumber Company, located across St. Louis Road (approximately 30 feet from the project site's northern boundary), is audible at the project site during periods of on-site lumber movement and cutting. Noise measurements were conducted on the project site in 2017. Based on those measurements, noise levels on the project site range from 60.4 dBA L_{eq} (on-site at the point farthest from US 101) to 68.5 dBA L_{eq} (at a location closest to US 101 on the eastern edge of the site) (City of Arcata 2017). To the northwest of the project site, existing vegetation along

Janes Creek provides a natural buffer and noise attenuating feature between the project site and the Janes Creek residential development. Additionally, topographic differences between the project site and the residential neighborhood to the west and southwest largely prevent line of sight and noise levels from the residential neighborhood from reaching the project site and vice versa.

Existing Noise- and Vibration-Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels, and because of the potential for nighttime noise to result in sleep disruption. Additional land uses such as schools, transient lodging, historic sites, cemeteries, and places of worship are also generally considered sensitive to increases in noise levels. These land use types are also considered vibration-sensitive land uses in addition to commercial and industrial buildings, where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

The nearest noise-sensitive receptors to the project site are located along the site's western and southern boundaries and include single-family homes at the north end of Eye Street, at the east end of Stromberg Avenue, and along Maple Lane. The nearest residential receptors (structures) are located within 10 feet of the site's southern boundary and approximately 25 feet from the project site's western boundary.

3.8.3 Environmental Impacts and Mitigation Measures

METHODOLOGY

Construction Noise and Vibration

To assess potential short-term (construction-related) noise and vibration impacts, sensitive receptors and their relative exposure were identified. Project-generated construction source noise and vibration levels were determined based on methodologies, reference emission levels, and usage factors from FTA's *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2018) and FHWA's *Roadway Construction Noise Model User's Guide* (FHWA 2006). Reference levels for noise and vibration emissions for specific equipment or activity types are well documented and the usage thereof common practice in the field of acoustics.

Operational Noise and Vibration

With respect to non-transportation noise sources (e.g., stationary) associated with project implementation, the assessment of long-term (operational-related) impacts was based on reference noise emission levels, and measured noise levels for activities and equipment associated with project operation (HVAC Units, parking facilities), and standard attenuation rates and modeling techniques.

To assess potential long-term (operation-related) noise impacts due to project-generated increases in traffic, noise levels were estimated using calculations consistent with the Federal Highway Administration's Traffic Noise Model and project-specific traffic data (Appendix D). The analysis is based on the reference noise emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and ground attenuation factors. Truck usage and vehicle speeds on area roadways were estimated from field observations and the project-specific traffic report. Note that the modeling conducted does not account for any natural or human-made shielding (e.g., the presence of walls or buildings) or reflection off building surfaces.

THRESHOLDS OF SIGNIFICANCE

Cal Poly Humboldt does not have adopted noise standards or policies. Therefore, although State projects are exempt from local ordinances and standards, this analysis relies on adopted noise standards of the City of Arcata, as well as

other appropriate agencies (e.g., FTA) where local standards are not available. It is considered appropriate to use these standards because they were adopted to protect the community from excessive noise exposure and associated adverse effects. Impacts related to noise would be significant if implementation of the project would result in:

- Construction noise levels that exceed an adopted local or other applicable noise standard or a substantial temporary increase in noise that has the potential to cause an adverse effect to a sensitive receptor. Based on the City's adopted municipal code, this criterion is applied in the following manner:
  - Construction noise that occurs outside of the allowable daytime hours (i.e., before 8:00 a.m. or after 7:00 p.m., Monday through Friday, before 9:00 a.m. or after 7:00 p.m. on Saturdays, on any Sundays or holidays);
  - An exceedance of FTA's construction noise criteria of 90 dBA L_{eq} (day) and 80 dBA L_{eq} (night) at residential receptors; or
  - An increase by 5 dBA or more over existing ambient noise levels.
- Generation of a substantial permanent traffic noise increase in ambient levels in the vicinity of the project. Based on FTA standards, this criterion is applied in the following manner:
  - Where existing traffic noise levels are less than 60 dB L_{dn}, a 5 dB L_{dn} increase in noise levels;
  - Where existing traffic noise levels range between 60 and 65 dB L_{dn}, a 3 dB L_{dn} increase in noise levels; or
  - Where existing traffic noise levels are greater than 65 dB L_{dn}, a 1.5 dB L_{dn} increase in noise levels.
- Generation of a substantial permanent stationary noise increase in ambient noise levels in the vicinity of the project in excess of exterior noise standards for stationary noise sources of 55 L_{eq}/75 L_{max} during the daytime hours (7:00 a.m. to 7:00 p.m.), 50 L_{eq}/75 L_{max} during the daytime hours (7:00 p.m. to 10:00 p.m.), and 45 L_{eq}/70 L_{max} during the nighttime hours (10:00 p.m. to 7:00 a.m.) at noise-sensitive land uses; or
- Construction vibration levels exceeding FTA's recommended standards with respect to the prevention of structural building damage (i.e., 0.2 PPV in/sec for non-engineered timber and masonry building) or FTA's maximum-acceptable-vibration standard with respect to human response/sleep disturbance (i.e., 80 VdB for residential uses) at nearby existing vibration-sensitive land uses;
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels; or
- For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels.

ISSUES NOT DISCUSSED FURTHER

Airport/Airstrip-Related Noise Exposure

The project site is not located within an airport influence area, and no public or private airport/airstrip is located within two miles of the project site. Thus, the project would not result in noise impacts related to the exposure of people residing or working in the project area to excessive aircraft-related noise levels. This issue is not discussed further.

Long-Term Operational Vibration

Project implementation would not introduce any major sources of long-term or permanent ground vibration (in contrast to construction vibration, which is evaluated in impact analysis, below). Additionally, no major stationary sources of ground-borne vibration were identified in the project area that would result in the long-term exposure of proposed on-site land uses to unacceptable levels of ground vibration. Thus, long-term or permanent ground vibration levels in exceedance of the significance thresholds are not anticipated as a result of project implementation. This issue is not discussed further.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact 3.8-1: Generate Substantial Temporary (Construction) Noise

Hourly noise levels during construction activities would range from approximately 84 dBA to 86 dBA at the nearest residential receptor (i.e., residence at 2590 Eye Street). Based on available existing noise level data for the project site, hourly noise levels closest to the nearest sensitive receptor are 68.5 dBA L_{eq}. Considering that noise levels at this location could reach as high as 86 dBA L_{eq}, (i.e., 17 dBA over existing levels), construction noise would constitute a substantial increase (perceived more than doubling of the existing noise levels) for an extended period of time. This impact would be **significant.**

Construction would take approximately 18-24 months and is estimated to begin in 2023 and be completed by 2024/2025, with occupancy and operation planned for Fall 2025. Consistent with the construction hour limits established by Section 9.30.050 of the City's Municipal Code, construction would occur Monday through Friday between the hours of 8:00 a.m. and 7:00 p.m., with the potential for weekend construction on Saturday between 9:00 a.m. and 7:00 p.m. No construction would occur on Sundays or holidays. Overall construction activities would include site grading and excavation, utility trenching, building foundation pouring, and building construction.

The types of heavy equipment used during project construction would include dozers, backhoes, excavators, graders, scrapers, cranes, concrete trucks, generators, welders, compressors, and haul trucks. No pile driving or blasting would occur as part of the project. Reference noise levels of heavy equipment that would be used during project construction are summarized in Table 3.8-7.

Table 3.8-7 Noise Emission Levels from Construction Equipment

Equipment Type	Typical Noise Level (L_{max} dBA) @ 50 feet
Backhoe	80
Concrete Mixer	85
Compactor	80
Crane/Lift	85
Dozer	85
Dump Truck	84
Excavator	85
Flat Bed Truck	84
Front End Loader	80
Generator	70
Grader	85
Paver	89
Roller	85
Pickup Trucks	54
Scraper	85

Notes: Assumes all equipment is fitted with a properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are manufacture-specified noise levels for each piece of heavy construction equipment.

Source: FTA 2018: 176

Construction noise can be characterized based on the type of activity and associated equipment needed and, in this analysis, is evaluated by considering noise levels associated with site preparation, grading, building construction, and paving, all construction phases that would occur throughout the buildout of the project and activities that generate the most noise. Using construction equipment typically associated with these construction phases, reference noise levels shown in Table 3.8-8, and assuming the simultaneous use of multiple pieces of equipment, worst-case noise levels were modeled for each phase of construction.

Table 3.8-8 Estimated Temporary Noise Levels During Each Construction Phase

Noise-Sensitive Receptor	Construction Phase	Modeled dBA L_{eq} at Receptor	Reference dBA L_{max} at Receptor
Residences along Eye Street (within 50')	Site Preparation	84.3	88.2
	Grading	85.8	89.8
	Construction	85.5	90.3
	Paving	85.8	89.8

Source: Modeled by Ascent in 2022. Refer to Appendix D

It should be noted that the reference noise levels for construction equipment were obtained from FTA's Transit Noise and Vibration Impact Assessment Manual and are all referenced to a distance of 50 feet from the operation of equipment. When discussing noise levels, providing a reference distance from the source is necessary to be able to calculate perceived noise levels at various distances from the source (i.e., noise reduces as distance between the source and receiver increase). Reference distances and associated noise levels can be used to calculate perceived noise levels at nearby receptors, at distances beyond 50 feet and within 50 feet. In addition, it should be further clarified that these noise levels represent a conservative estimate based on the assumptions that multiple pieces of equipment would operate at the same location and time affecting the same individual receptors. However, typically, construction equipment moves about a site and individual pieces of equipment operate at varying frequencies throughout the day, thus, noise levels tend to fluctuate during the day, resulting in varying noise levels at surrounding receptors. In addition, this analysis is focused on the nearest receptors to the construction activities because these receptors would be exposed to the loudest noise levels. At receptors located at further distances, noise levels would be reduced. Table 3.8-8 below summarizes hourly noise levels (L_{eq}) and maximum noise levels (L_{max}) associated with grading, building construction, and paving activities at nearby sensitive receptors. However, consistent with FTA guidance, the L_{eq} is the most appropriate metric for construction noise assessment. Additionally, construction noise was based on a distance from the acoustical center of where equipment would operate to the nearest offsite receptor. This approach accounts for the fact that individual pieces of equipment move about a site throughout a workday, some approaching the edge of the site and likewise an offsite receptor at one point in time, while others are further away and contributing less to the overall noise exposure at that specific time. Further, the noise modeling assumes all equipment operate at the same single location, but in reality, this cannot occur because of the physical space needed between pieces of equipment to operate safely; thus, measuring from the acoustical center (rather than property boundary) adjusts for these variables and fluctuations in noise exposure at the offsite receptors.

As shown above in Table 3.8-8, hourly noise levels during construction activities would range from approximately 84 dBA to 86 dBA at the nearest residential receptors. The City and CSU have not adopted construction-related numerical noise limits, thus, for informational purposes and to provide context as to the level of exposure receptors would be exposed to, noise levels in the range of 84 dBA to 86 dBA is comparable to a diesel truck driving by. In addition, FTA has established noise criteria for the purpose of conducting construction noise assessments, which are 90 dBA L_{eq} for residential receptors. Based on the modeling conducted, this level would not be exceeded at nearby sensitive land uses, during any phase of the construction.

However, when considering impacts from construction noise, not only is the maximum noise exposure important, but the duration of noise exposure as well as the perceived increase in noise over existing ambient levels also important. Regarding duration of noise exposure, FTA evaluates long-term construction noise impacts using a 30-day average noise standard and other jurisdictions (e.g., City of San Jose) have identified extended periods of construction as a 12-month period. Project construction is anticipated to occur over an 18- to 24-month period, which would be considered an extended period of time to be exposed to increased noise levels. Further, based on available existing noise conditions on the project site, hourly noise levels closest to the nearest sensitive receptor at 2590 Eye Street, is 68.5 dBA L_{eq} (City of Arcata 2017). Considering that noise levels at this location could reach as high as 86 dBA L_{eq}, (i.e., 17 dBA over existing levels), construction noise would result in a substantial increase (perceived as more than doubling of the existing noise levels) for an extended period of time at the nearest receptor. Based on preliminary modeling, construction noise levels generated at the project site would be perceivable (i.e., equivalent to or greater than 3 dBA L_{eq} above existing noise levels) within 200 feet of the project site (e.g., houses along Maple Lane, Stromberg Avenue east of Maple Lane, and within 200 feet of construction along Eye Street). As a result, this impact would be **significant**.

Mitigation Measures

Mitigation Measure 3.8-1: Implement Construction-Noise Reduction Measures

For all construction activities, Cal Poly Humboldt shall implement or incorporate the following noise reduction measures into construction specifications for contractor(s) implementation during project construction:

- All construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturer recommendations. Equipment engine shrouds shall be closed during equipment operation.
- All construction equipment and equipment staging areas shall be located as far as possible from nearby noise-sensitive land uses, and/or located to the extent feasible such that existing or constructed noise attenuating features (e.g., temporary noise wall or blankets) block line-of-site between affected noise-sensitive land uses and construction staging areas.
- Individual operations and techniques shall be replaced with quieter procedures (e.g., using welding instead of riveting, mixing concrete off-site instead of on-site, using electric powered equipment instead of pneumatic or internal combustion powered equipment) where feasible and consistent with building codes and other applicable laws and regulations.
- Stationary noise sources such as generators or pumps shall be located as far away from noise-sensitive uses as feasible.
- No less than 1 week prior to the start of construction activities at a particular location, a notification shall be provided to nearby off-campus, noise-sensitive land uses (e.g., residential uses) that are located within 150 feet of the construction site (i.e., based on the construction noise modeling, distance at which noise-sensitive receptors would experience noise levels of 5 dBA over existing ambient levels).
- When construction requires material hauling, a haul route plan shall be prepared for construction of each facility and/or improvement for review and approval by the Cal Poly Humboldt that designates haul routes as far as feasible from sensitive receptors.
- The contractor shall designate a disturbance coordinator and post that person's telephone number conspicuously around the construction site and provide to nearby residences. The disturbance coordinator shall receive all public complaints and be responsible for determining the cause of the complaint and implementing any feasible measures to alleviate the problem.
- When construction activities would occur within 150 feet of existing residential land uses, the following measures shall be implemented:
    - Use of noise-reducing enclosures and techniques around stationary noise-generating equipment (e.g., concrete mixers, generators, compressors).
    - Installation of temporary noise curtains installed as close as possible to the boundary of the construction site within the direct line of sight path of the nearby sensitive receptor(s) and consist of durable, flexible composite material featuring a noise barrier layer bounded to sound-absorptive material on one side.
    - Retain a qualified noise specialist to develop a noise monitoring plan and conduct noise monitoring to ensure that noise reduction measures are achieved the necessary reductions such that levels at the receiving land uses do not exceed 5 dBA over existing levels.

Significance after Mitigation

Mitigation Measure 3.8-1 would reduce noise by locating equipment as far away from receptors as possible, requiring the proper use of available noise-reduction equipment, including use of alternatively powered equipment, exhaust mufflers, engine shrouds, equipment enclosures, and barriers for activities in the vicinity of noise-sensitive uses, and require on-site monitoring to ensure noise levels do not exceed allowable limits. Implementation of these noise-reduction features can reduce construction noise levels by 10 dBA or more (NCCHP 1999). With mitigation,

construction-generated noise levels would be substantially reduced. However, construction noise levels would still exceed ambient levels by up to 17 dBA and a reduction in noise of 10 dBA would still result in an increase in noise by 7 dBA, which is considered distinctly perceptible by most people. Thus, even with implementation of all feasible mitigation, construction noise could still result in potential construction noise impacts or residences within 200 feet of the project site, including 2590 Eye Street. Therefore, this impact would remain **significant and unavoidable**.

Impact 3.8-2: Generate Substantial Temporary (Construction) Vibration Levels

The operation of heavy-duty construction equipment can generate various levels of vibration that could result in disturbance to nearby sensitive land uses or potentially structural damage. Based on modeling conducted, vibration levels for a vibratory roller at the nearest structure to the project site, approximately 30 feet from where the use of construction equipment could occur, would be 91.6 VdB and 0.16 PPV in/sec. Construction vibration would occur during the less-sensitive times of the day when people are less likely to be disturbed and would be further masked by nearby existing roadway noise on US 101; thus, the potential for disturbance to nearby receptors is low. In addition, FTA's criteria of 0.2 PPV in/sec would not be exceeded at the nearest structure. This impact would be **less than significant**.

Construction activities generate varying degrees of temporary ground vibration, depending on the specific construction equipment used and activities involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. The effects of ground vibration may be imperceptible at the lowest levels, result in low rumbling sounds and detectable vibrations at moderate levels, and, at high levels, cause annoyance, sleep disturbance, or damage to nearby structures.

Pile driving and blasting are the types of construction activities that typically generate the highest vibration levels and are, therefore, of greatest concern when evaluating construction-related vibration impacts. However, pile driving and blasting would not be conducted as part of the project. Table 3.8-9 presents vibration levels for typical pieces of equipment used during construction.

Table 3.8-9 Vibration Reference Levels for Construction Equipment

Equipment		PPV at 25 ft, in/sec	Approximate Lv * at 25 ft
Pile Driver (impact)	upper range	1.518	112
	typical	0.644	104
Pile Driver (sonic)	upper range	0.734	105
	typical	0.17	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.21	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Note: *RMS velocity in decibels, VdB re 1 micro-in/sec

Source: FTA 2018:184

Based on reference vibration levels for typical construction equipment (Table 3.8-10), the piece of equipment that could generate the greatest levels of ground vibration would be a vibratory roller which generates ground vibration levels of 0.210 in/sec PPV and 94 VdB at 25 feet (FTA 2018:184). Adjusting the reference vibration levels for a vibratory roller to the nearest structure to the project site, located at 2590 Eye Street, approximately 30 feet from where the use of construction equipment could occur, vibration levels would be 91.6 VdB and 0.16 PPV in/sec. Considering FTA's criteria of 80 VdB for places where people sleep, vibration levels could exceed the recommended levels and cause annoyance or sleep disturbance. However, as discussed above, the use of heavy equipment would not occur during sensitive times of the day when people are more sensitive to disturbance. Although vibration may be perceptible at nearby receptors because it would occur during the daytime hours when existing ambient noise levels are higher (especially considering existing roadway noise from the nearby US 101), higher ambient noise levels can mask vibration noise, thereby reducing the potential to result in intolerable levels (Caltrans 2020). Regarding the potential for structural damage, based on the modeling conducted, vibration levels at the nearest existing residential structure would be below applicable FTA criteria; thus, there would be a low potential for structural damage. This impact would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

Impact 3.8-3: Generate Substantial Increase in Long-Term (Traffic) Noise Levels

Long-term increases in traffic noise could occur as a result of increased vehicular trips on local roads near the project site. Based on modeling conducted using project-specific daily traffic volumes and applying Arcata's allowable increase levels for transportation noise sources of 5 dB where existing levels are less than 60 dBA CNEL, 3 dB where existing levels range between 60 dBA CNEL and 65 dBA CNEL, and 1.5 dB increase when existing levels are greater than 65 dBA CNEL, in all cases, based on existing noise levels of modeled roadways, these levels would not be exceeded. This impact would be **less than significant.**

Long-term increases in traffic noise could occur as a result of increased vehicular trips on local roads near the project site. Based on project-generated traffic associated with the proposed residential land uses, traffic noise modeling was conducted using average daily trip volumes, which considered existing traffic volumes and associated noise levels and existing plus project anticipated traffic volumes and associated noise level increases. See Appendix D for modeling inputs and outputs. Traffic noise modeling results is summarized below in Table 3.8-10.

Table 3.8-10 Long-Term Traffic Noise Increases

Roadway Segment/Segment Description	dBA CNEL at 50 feet from Roadway Centerline Existing	dBA CNEL at 50 feet from Roadway Centerline Existing + Project	Change
Spear Avenue from Alliance Road to West End Road	62.7	63.4	+0.7
West End Road from Spear Avenue to West End Court	62.9	63.4	+0.5
St. Louis Road from West End Road to US 101 Overcrossing	62.7	63.9	+1.2
US 101 Overcrossing from West End Road to L.K. Wood Boulevard	63.1	65.8	+2.6
L.K. Wood Boulevard from Granite Avenue to Sunset Avenue	66.3	67.3	+1.0
L.K. Wood Boulevard from Sunset Avenue to Plaza Avenue	67.0	67.5	+0.5
Sunset Avenue from G Street to L.K. Wood Boulevard	67.3	67.7	+0.4

Notes: dBA= A-Weighted Decibel, CNEL= Community Equivalent Noise Level

Source: Modeled by Ascent Environmental 2022

As shown above in Table 3.8-10, traffic noise increases would range from less than 1 dB (which is not perceptible) to 2.6 dBA (which is barely perceptible). It should also be noted that maximum allowable transportation noise levels for residential land uses of 60 dBA CNEL are currently not being met. Applying Arcata's allowable increase levels of 5 dB where existing levels are less than 60 dBA CNEL, 3 dB where existing levels range between 60 dBA CNEL and 65 dBA CNEL, and 1.5 dB increase when existing levels are greater than 65 dBA CNEL, in all cases, based on existing noise levels of modeled roadways, these levels would not be exceeded. Further, the segment that experiences the greatest increase in noise is an overpass that crosses US 101, where no sensitive receptors are located. This impact would be **less than significant**.

Mitigation Measures

No mitigation measures are required.

Impact 3.8-4: Generate Substantial Long-Term Increase in Stationary Noise

Noise generated by building mechanical equipment and parking lot activity would not exceed established noise standards for sensitive receptors exposed to non-transportation noise sources. This impact would be **less than significant**.

Noise sources commonly associated with the facilities proposed for the project would include parking lot activities (e.g., opening and closing of vehicle doors, people talking); and the use of onsite building equipment such as HVAC systems. Noise levels associated with these noise sources are discussed separately, below.

<u>Building Mechanical Equipment</u>

Implementation of the project would result in stationary source noise, primarily associated with building mechanical equipment (e.g., HVAC systems). Specific equipment type, size, and location of proposed HVAC equipment is not available at this time. However, noise levels commonly associated with larger commercial-use air conditioning systems can reach levels of up to 78 dBA at 3 feet (Lennox 2019). Applying this reference noise level as an hourly average (L_{eq}) and assuming a 50 percent usage range, would result in a 75 dBA L_{eq} at 3 feet from the source. Based on the modeling conducted (refer to Appendix D), nighttime noise standards (i.e., 45 dBA L_{eq}) would be achieved if equipment were located beyond 40 feet from residential uses. By achieving the lowest standards (i.e., nighttime), the project would also achieve daytime and evening standards. Further, HVAC equipment would be located on the roofs of new structures, located well beyond 42 feet from any offsite nearby sensitive receptor; thus, all stationary noise standards (i.e., 55 dBA L_{eq} from 7:00 a.m. to 7:00 p.m., 50 dBA L_{eq} from 7:00 p.m. to 10:00 p.m., and 45 dBA L_{eq} from 10:00 p.m. to 7:00 a.m.) would be achieved. As a result, project-generated equipment noise would not exceed established criteria.

<u>Parking Facilities</u>

Parking areas would be located along the perimeter of the project site and would provide approximately 340 single-occupancy vehicle spaces. The majority of on-site surface parking would be located in the western and southern portions of the site with some parking located along the western developable edge of the site. Based on preliminary site plans (see Figure 2-9 in Chapter 2, "Project Description"), up to 40 spaces may be located within 50 feet of an existing single-family home located off-site. Assuming 50 percent of the total number of spaces (i.e., 20 vehicles) would be accessed/active in a single hour, noise levels associated with the parking lot would be 45.4 dBA L_{eq} at 50 feet and 51.4 dBA L_{eq} at 25 feet. As on-site parking would be provided as close as close as 25 feet to the residence at 2590 Eye Street, a noise exposure of 51.4 dBA L_{eq} during a peak hour (i.e., between the hours of 7:00 a.m. to 7:00 p.m.). Based on the modeling conducted, parking lot noise would not exceed City of Arcata noise standards during all times of the day (i.e., 55 dBA L_{eq} from 7:00 a.m. to 7:00 p.m., 50 dBA L_{eq} from 7:00 p.m. to 10:00 p.m., and 45 dBA L_{eq} from 10:00 p.m. to 7:00 a.m.). In addition, the parking lot noise of 51.4 dBA L_{eq}, would be more than 10 dBA less than measured ambient noise levels at the project site (68.5 dBA L_{eq}) (City of Arcata 2017). Generally, a difference in 10 dBA between two noise levels, which in this case is project-generated operational noise and existing noise from US 101, does not result in a perceptible increase in ambient noise levels. As a result, parking lot noise associated with the project would not be perceptible, and project-generated parking lot noise would not exceed established criteria.

Summary

Operation of on-site uses, including HVAC equipment and parking facilities, would not result in an exceedance of appropriate noise standards (i.e., 55 dBA L_{eq} from 7:00 a.m. to 7:00 p.m., 50 dBA L_{eq} from 7:00 p.m. to 10:00 p.m., and 45 dBA L_{eq} from 10:00 p.m. to 7:00 a.m.). This impact would be **less than significant**.

Mitigation Measures

No mitigation measures are required. Implementation of Mitigation Measure 3.1-4, as provided in Section 3.1, "Aesthetics," would provide fencing along the western and southern boundaries, which would further reduce potential noise levels from the project.