4.10 NOISE AND VIBRATION

This section of the EIR presents an analysis of the potential noise and vibration impacts associated with the development and implementation of the proposed Master Plan, including five near-term development components (Project). This section presents the environmental setting, regulatory framework, impacts of the Project on the environment, and proposed measures to mitigate significant or potentially significant impacts. Information in this section is based on information derived from the Transportation Analysis prepared by Fehr & Peer (Appendix H) and the Noise Measurements and Calculations (Appendix G).

No public and agency comments related to noise and vibration were received during the public scoping periods in response to the original Notice of Preparation (NOP) or the Revision to Previously Issued NOP. For a complete list of public comments received during the public scoping periods refer to Appendix B.

4.10.1 Environmental Setting

4.10.1.1 Study Area

The study area for the evaluation of noise and vibration includes the 1,396-acre CSUMB campus, located in the northwestern portion of the former Fort Ord military base, and locations surrounding the campus. Section 4.10.3.2, Analytical Methods provides additional information about how noise and vibration were evaluated in this section of the EIR.

4.10.1.2 Noise Concepts

To help frame the discussion of predicted noise levels and corresponding potential impacts attributed to the Project, the following is a brief presentation of noise terminology and fundamental acoustical concepts.

Sound, Noise, Acoustics

Sound is a mechanical wave or vibration that travels through the air or another medium, entailing a process that consists of three components: the source, the path, and the receiver. All three components must be present for sound to exist and be perceived. Without a source to produce sound or a medium to transmit sound pressure waves, there is no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired.

Sound Pressure Levels and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases with increasing amplitude. Sound pressure amplitude is measured in units of micro-Newton per square meter, also called micro-Pascal. One micro-Pascal is approximately one-hundred billionths of normal atmospheric pressure. The pressure of a very loud sound may be 200 million micro-Pascals, or 10 million times the pressure of the weakest audible sound. Because expressing sound levels in terms of micro-Pascal would be very cumbersome, sound pressure level in logarithmic units is used instead to describe the ratio of actual sound pressures to a reference pressure squared. These units are called Bels. To provide a finer resolution, a Bel is subdivided into 10 decibels, abbreviated dB.

A-Weighted Sound Level

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. 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 not only in the range of audible frequencies but also in the way it perceives the sound in that range. In general, the healthy human ear is most sensitive to sounds between 1,000 Hertz (Hz) and 5,000 Hz, and it perceives a sound within that range as more intense than a sound of higher or lower frequency with the same magnitude. To approximate the frequency response of the human ear, a series of sound level adjustments is usually applied to the sound measured by a sound level meter. The adjustments (referred to as a weighting network) are frequency dependent.

The A-scale weighting network approximates the frequency response of the average healthy ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special situations (e.g., B-scale, C-scale, D-scale), but these scales are rarely used in conjunction with most environmental noise. Noise levels are typically reported in terms of A-weighted sound levels. All sound levels discussed in this section are A-weighted (dBA). Examples of typical noise levels for common indoor and outdoor activities are depicted in Table 4.10-1.

Table 4.10-1
Typical Sound Levels in the Environment and Industry

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
--	110	Rock Band
Jet Fly-over at 300 meters (1,000 feet)	100	--
Gas Lawn Mower at 1 meter (3 feet)	90	--
Diesel Truck at 15 meters (50 feet), at 80 kilometers/hour (50 miles/hour)	80	Food Blender at 1 meter (3 feet) Garbage Disposal at 1 meter (3 feet)
Noisy Urban Area, Daytime Gas Lawn Mower at 30 meters (100 feet)	70	Vacuum Cleaner at 3 meters (10 feet)
Commercial Area Heavy Traffic at 90 meters (300 feet)	60	Normal Speech at 1 meter (3 feet)
Quiet Urban Daytime	50	Large Business Office Dishwasher Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	30	Library
Quiet Rural Nighttime	20	Bedroom at Night, Concert Hall (Background)
--	10	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Source: Caltrans 2013a.

Human Responses to Changes in Noise Levels

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dB when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, the trained ear can detect changes of 2 dB in normal environmental noise. It is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dB. A change of 5 dB is readily perceptible, and a change of 10 dB is perceived as twice or half as loud. A doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g., doubling the volume of traffic on a road) would result in a barely perceptible change in sound level.

Noise Descriptors

Additional units of measure have also been developed to evaluate the long-term characteristics of sound. The equivalent sound level (L_{eq}) is also referred to as the energy-average sound level. It is the equivalent steady-state sound level that in a stated period of time would contain the same acoustical energy as the time-varying sound level during the same time period. The 1-hour A-weighted equivalent sound level, commonly notated as L_{eq} (h) or L_{eq1h}, is the energy average of the A-weighted sound levels occurring during a 1-hour period and is the basis of many jurisdictions for establishing thresholds for noise emission at property boundaries.

People are generally more sensitive and annoyed by noise occurring during the evening and nighttime hours. Thus, another noise descriptor used in community noise assessments, the Community Noise Equivalent Level (CNEL), was introduced. The CNEL scale represents a time-weighted 24-hour average noise level based on the A-weighted sound level. The CNEL accounts for the increased noise sensitivity during the evening hours (7:00 p.m. to 10 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.) by adding 5 dB and 10 dB, respectively, to the average sound levels occurring during the nighttime hours.

Sound Propagation

Sound propagation (i.e., the passage of sound from a noise source to a receiver) is influenced by several factors. These factors include geometric spreading, ground absorption, and atmospheric effects, as well as shielding by natural and/or man-made features. Sound levels are attenuated at a rate of approximately 6 dB per doubling of distance from an outdoor point source due to the geometric spreading of the sound waves. Additional sound attenuation can result from man-made features such as intervening walls and buildings, as well as natural features such as hills and dense woods. Atmospheric conditions such as humidity, temperature, and wind gradients can temporarily either increase or decrease sound levels. In general, the greater the distance the receiver is from the source, the greater the potential for variation in sound levels due to atmospheric effects.

4.10.1.3 Vibration Fundamentals

Groundborne vibration is a small, rapidly oscillating motion transmitted through the ground. The strength of groundborne vibration attenuates fairly rapidly over distance. Some soil types transmit vibration quite efficiently; other types (primarily sandy soils) do not. Several basic measurement units are commonly used to describe the intensity of ground vibration. The descriptors used by the Federal Transit Administration (FTA) are peak particle velocity (PPV), in units of inches per second, and vibration velocity decibel (VdB). The calculation to determine PPV at a given distance is as follows:

$$PPV_{dist} = PPV_{ref} * (25/D)^{\wedge}1.5$$

In the above expression PPV_{dist} = the peak particle velocity in inches per second (ips) of the vibrating equipment (or transient vibration source, such as a pile-driver hammer drop or controlled detonation) adjusted for distance; PPV_{ref} = the reference vibration level in ips at a reference distance of 25 feet; and D = the distance from the vibration source to the receiver.

The velocity parameter (instead of acceleration or displacement) best correlates with human perception of vibration. Thus, the response of humans, buildings, and sensitive equipment to vibration is described in this report in terms of the root-mean square (rms) velocity level in VdB units relative to 1 micro-inch per second. As a point of reference, the average person can just barely perceive vibration velocity levels below 70 VdB (typically in the vertical direction). The calculation to determine the rms at a given distance is as follows:

$$L_v(D) = L_v(25 \text{ feet}) - 30*\log(D/25)$$

In the above expression $L_v(D)$ = the vibration level at the receiver; $L_v(25 \text{ feet})$ = the reference source vibration level; and D = the distance from the vibration source to the receiver.

Typical background vibration levels in residential areas are no greater than 50 VdB (FTA 2006); and the vibration velocity level at which most residential building occupants will detect and become annoyed with is approximately 94 VdB, or 0.2 inches per second rms PPV. The risk level for minor cosmetic damage to typical residential buildings featuring non-engineered timber and masonry is comparable, generally beginning at 94 VdB, or a PPV value of 0.2 inches per second (FTA 2006).

4.10.1.4 Existing Conditions

The primary noise source in the Project area is vehicle traffic along Highway 1, as well as local roads including Second Avenue, Inter-Garrison Road, Imjin Road, Imjin Parkway, and General Jim Moore Boulevard. Noise is also generated by students and people at various events on campus. Aircraft operations at Monterey Peninsula Airport and Marina Municipal Airport are intermittent, secondary noise sources at the CSUMB campus. Existing and 20-year forecast noise contour figures from the 2019 Marina Municipal Airport Land Use Compatibility Plan (Monterey County Airport Land Use Commission 2019) show that CSUMB lands that are south of Old County Road (see Chapter 3, Project Description, Figure 3-2) are well outside the 60 dBA CNEL aviation noise contour, which includes all developed portions of the Main Campus and East Campus. Therefore, the airport does not expose people residing or working in the Project area to excessive noise levels.

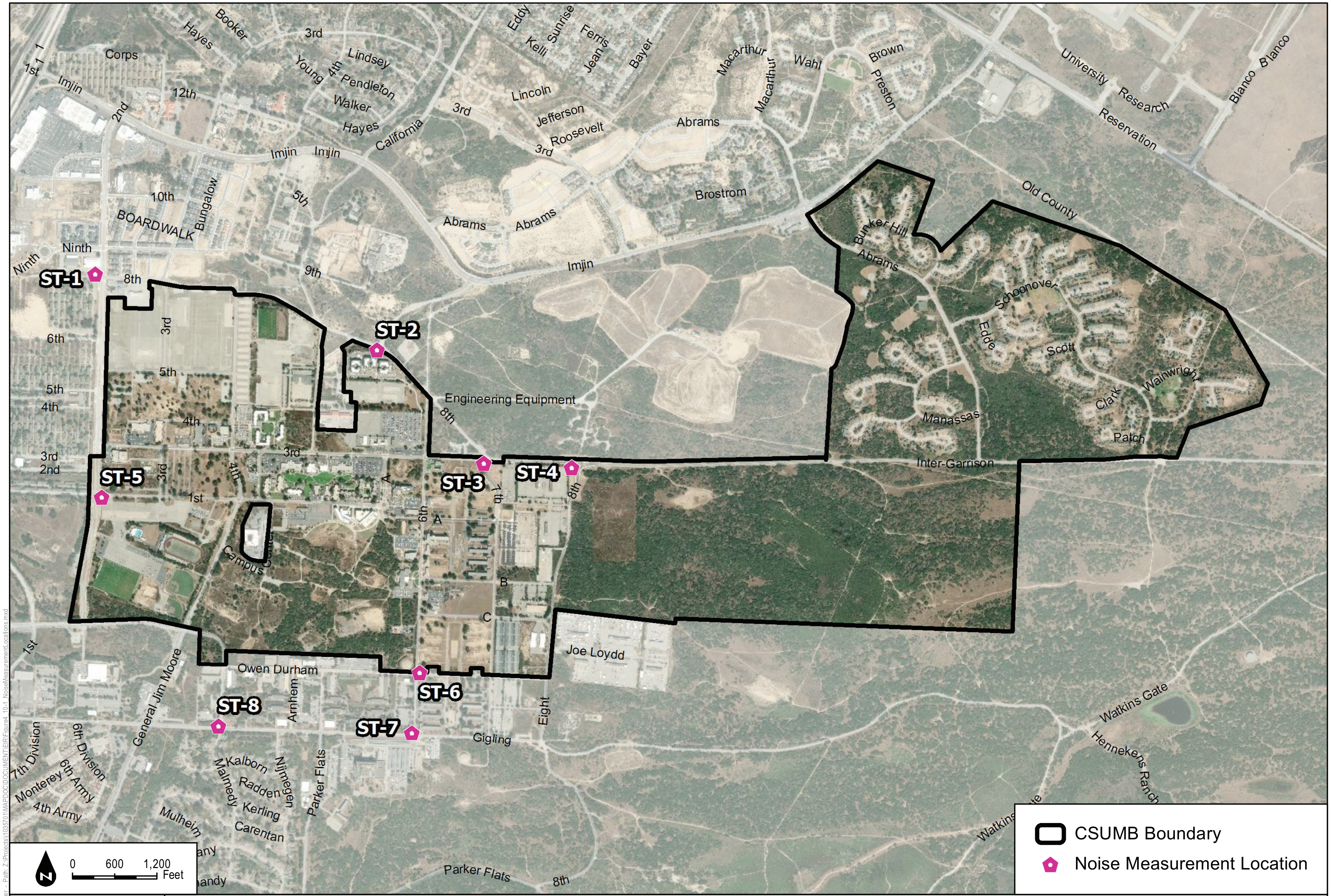
Noise measurements were conducted in and around the campus on May 23, 2019 to determine the existing noise levels. The measurements were made using a calibrated Piccolo II integrating sound-level meter, which meets the current American National Standards Institute standard for a Type 2 precision sound-level meter. The sound level meter was positioned at a height of approximately 5 feet above ground on a tripod, and the measurement microphone was covered with a windscreen.

The noise measurement locations are depicted as Sites ST-1 through ST-8 in Figure 4.10-1. These sites were selected to provide samples of typical ambient noise levels at existing and future representative noise-sensitive land uses in the Project vicinity (see Section 4.10.3.2, Analytical Method, for additional information). Noise-sensitive land uses, also called noise-sensitive receivers, in the Project vicinity include on- and off-campus residences and on-campus classrooms and other academic uses. As summarized in Table 4.10-2, the measured outdoor noise level (L_{eq}) ranged from 53.6 dBA at Site ST-4 to 67.5 dBA at Site ST-8. More detailed field survey data sheets describing these outdoor sound level measurements and the surrounding environmental conditions are provided in Appendix G.

Table 4.10-2
Measured Outdoor Noise Levels

Site	Location and Perceived Sound Source(s) Description	Date, Time	L_{eq}[1]	L_{max}[2]	L_{min}[3]	L_{90}[4]	L_{50}[5]	L_{10}[6]
ST-1	10 feet from edge of pavement, traffic	2019-05-23, 10:05 AM to 10:25 AM	55.7	74.2	45.4	49.2	52.6	59.1
ST-2	5 feet from edge of pavement, traffic	2019-05-23, 10:52 AM to 11:12 AM	58.1	83.3	36.2	40	47.7	60.8
ST-3	10 feet from edge of pavement, traffic, distant construction vehicle beeping, birds	2019-05-23, 11:43 AM to 12:03 PM	53.8	69.9	39	44	49.1	58.8
ST-4	10 feet from edge of pavement, traffic, birds	2019-05-23, 12:24 PM to 12:44 PM	53.6	71.5	33.9	40.1	48	58.2
ST-5	5 feet from edge of pavement, traffic	2019-05-23, 1:12 PM to 1:32 PM	59.2	75.6	48.5	52.2	55.9	62.8
ST-6	1 foot from edge of pavement, traffic	2019-05-23, 1:55 PM to 2:15 PM	55.9	75.3	38.3	44.4	50	59.5
ST-7	3 feet from edge of pavement, traffic, buzzing gate across the street (approx. 160 ft.) when vehicles enter/exit facility	2019-05-23, 2:30 PM to 2:50 PM	63.5	87.7	38.8	50.3	56.6	66.1
ST-8	3 feet from edge of pavement, traffic, birds	2019-05-23, 3:05 PM to 3:25 PM	67.5	90.9	44.7	54.2	62.7	70.9

Source: Appendix G
Notes:
1 Equivalent continuous sound level (energy-average sound level)
2 Maximum sound level during the measurement period
3 Minimum sound level during the measurement period
4 Sound level exceeded 90% of the time during the measurement period
5 Sound level exceeded 50% of the time during the measurement period
6 Sound level exceeded 10% of the time during the measurement period



SOURCE: Bing Maps

FIGURE 4.10-1

Noise Measurement Location

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CSU Monterey Bay Master Plan EIR

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4.10.1.5 Site Conditions for Near-Term Development Components

The noise and vibration setting for the near-term development component sites is generally described above. Additional information is provided below related to specific conditions on each site, including existing development conditions. Section 3, Project Description provides additional information about the location of each development component site.

Student Housing Phase III

The approximately 6.4-acre Student Housing Phase III site is located on an existing parking lot and does not contain housing or any other buildings. North Quad Housing (Buildings 301, 302 and 303) is located immediately east of the site, Health and Wellness Services and the Black Box Cabaret (Buildings 80 and 81) are located to the west of the site across General Jim Moore Boulevard, and the Alumni and Visitor Center is located to the south of the site across Inter-Garrison Road.

Academic IV

The approximately 4.0-acre Academic IV site contains the Science Research Lab Annex (Building 13), parking lots, and landscaping and does not contain housing. The Chapman Science Academic Center (Building 53) is located to the north of the site, the World Languages and Cultures buildings and the Science Instructional Lab Annex (Buildings 48 through 50) are located to the east, and the Cinematic Arts and Technology building (Building 27) is located to the south of the site (see Figure 3-14D)

Student Recreation Center Phases I and II

The approximately 8.5-acre Student Recreation Center Phases I and II site is located south of the Main Quad and contains two buildings (Buildings 21 and 23) and portions of two parking lots, as well as undeveloped land; no housing is located on the site. The Academic III building is under construction to the east of the site and residence halls (Buildings 208, 210 and 211) are located to the north across Divarty Street (see Figure 3-14C).

Student Housing Phase IIB

The approximately 7.2-acre Student Housing Phase III site is located on a vacant paved lot south of the Promontory housing and does not contain housing or any other buildings. The CSUMB Visual and Public Art Center and the central plant facilities are located to the south of the site and City of Marina facilities are located to the southwest of the site (see Figure 3.14A)

Academic V

The approximately 2.7-acre Academic V site is located in the Main Quad and is developed with Administration and Playa and Del Mar academic buildings (Buildings 1, 2 and 3), a parking lot, and landscaping; no housing is located on the site. Residence halls are located to the east and west of the site (Buildings 202 through 211) and student services buildings are located to the north (Buildings14, and 16) (see Figure 3-14C).

4.10.2 Regulatory Framework

4.10.2.1 Federal

The Noise Control Act of 1972 recognized the role of the federal government in dealing with major commercial noise sources, which require uniform treatment. Since Congress has the authority to regulate interstate and foreign commerce, regulation of noise generated by such commerce also falls under congressional authority. The federal government specifically preempts local control of noise from aircraft, railroads, and interstate highways. The U.S. Environmental Protection Agency (EPA) has identified acceptable noise levels for various land uses to protect the public, with an adequate margin of safety, as described in its "Levels Document" guidance (EPA 1974). In the absence of local noise regulations, the EPA public-protecting guideline of 55 dBA L_{dn} would be assessed at the exterior of any existing noise sensitive land use where the existing outdoor ambient sound level is not already in excess of this value. Noise sensitive land uses are understood to include but are not limited to residences.

The Department of Housing and Urban Development standards define day-night average sound levels (L_{dn}) below 65 dBA outdoors as acceptable for residential areas. Outdoor levels up to 75 dBA L_{dn} may be made acceptable through the use of insulation in buildings. (See 24 CFR § 51.)

When evaluating potential construction noise impacts, especially when other quantitative standards may be lacking, guidance from the Federal Transit Administration (FTA) recommends the following daytime standards (FTA 2006): at residential land uses, no more than 80 dBA L_{eq} energy-averaged over an 8-hour period (L_{eq8hr}); and for a commercial land use, or similar space where occupancy is limited to daytime hours (e.g., classroom), the acceptable exterior threshold is 85 dBA L_{eq8h}.

4.10.2.2 State

The pertinent State of California noise regulations are contained in the California Code of Regulations. Title 24, Noise Insulation Standards, establishes the acceptable interior environmental noise level (45 dBA L_{dn}) for multifamily dwellings (the regulation may be extended by local legislative action to include single-family dwellings). An interior acoustical study is also required demonstrating that interior noise levels due to exterior sources will be less than or equal to 45 CNEL for affected multifamily structures that are exposed to exterior noise levels in excess of 60 CNEL.

Government Code § 65300 requires local land use planning jurisdictions to prepare a general plan (Cal. Gov. Code § 65300) and the Noise Element is a mandatory component of the general plan (Cal. Gov. Code § 65302(f)). It may include general community noise guidelines developed by the California Department of Health Services and specific planning guidelines for noise/land use compatibility developed by the local jurisdiction. The state noise compatibility guidelines also recommend that the local jurisdiction should consider adopting a local noise control ordinance. The California Department of Health Services has developed guidelines (1987) for community noise acceptability for use by local agencies. Selected relevant levels are as follows (L_{dn} may be considered approximately equivalent to CNEL):

- CNEL below 60 dBA – normally acceptable for low-density residential use;
- CNEL of 55 to 70 dBA – conditionally acceptable for low-density residential use;
- CNEL below 65 dBA – normally acceptable for high-density residential uses;
- CNEL of 60 to 70 dBA – conditionally acceptable for high-density residential use, transient lodging, churches, educational and medical facilities; and
- CNEL below 70 dBA – normally acceptable for playgrounds and neighborhood parks.

"Normally acceptable" is defines as satisfactory for the specified land use, assuming that normal conventional construction is used in building. "Conditionally acceptable" may require some additional noise attenuation or special study. Under most of these land use categories, overlapping ranges of acceptability and unacceptability are presented, leaving some ambiguity in areas where noise levels fall within the overlapping range.

The State of California additionally regulates the noise emission levels of licensed motor vehicles traveling on public thoroughfares, sets noise emission limits for certain off-road vehicles and watercraft, and sets required sound levels for light-rail transit vehicle warning signals. The extensive state regulations pertaining to worker noise exposure are, for the most part, applicable only to the construction phase of any project (e.g. the California Occupational Safety and Health Administration (Cal-OSHA) Occupational Noise Exposure Regulations) or workers in a central plant and/or maintenance facility or involved in the use of landscape maintenance equipment or heavy machinery.

As a State of California entity, the CSU system has "Contract General Conditions for Collaborative Design-Build Major Projects" that include the following Sound Control

Requirements of Design-Builders that would construct near-term and other site-specific projects implemented under the Master Plan:

- The Design-Builder shall comply with all sound control and noise level rules, regulations and ordinances which apply to the work. In the absence of any such rules, regulations and ordinances, the Design-Builder shall conduct its work to minimize disruption to others due to sound and noise from the workers, and shall be responsive to the Trustees' requests to reduce noise levels.
- Design-Builder shall not cause or allow sounds to be produced in excess of 65 decibels measured at the job site between the hours of 7:00 p.m. and 7:00 a.m. Design-Builder shall not cause or allow sounds to be produced in excess of 85 decibels measured at the job site between the hours of 7:00 a.m. and 7:00 p.m. without the consent of the University.
- Each internal combustion engine, used for any purpose on the Project or related to the Project, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the Project without a muffler.
- Loading and unloading of construction materials will be scheduled so as to minimize disruptions to University activities. Construction activities will be scheduled to minimize disruption to the University and to University users.

The above-bulleted 85 dBA threshold for construction noise during daytime hours (7:00 a.m. to 7:00 p.m.) is compatible with the FTA guidance of 85 dBA for non-residential receiving land uses.

4.10.2.3 Local

The CSUMB campus, which is located in the City of Marina, City of Seaside, and an unincorporated portion of Monterey County (County), would have the potential to impact off-campus noise-sensitive land uses in the cities and County. While, as a state entity, CSUMB is not subject to local government permitting or planning regulations, policies, or ordinances, such as the general plans and ordinances for the cities of Marina and Seaside and the County of Monterey, this noise and vibration analysis considers them in the context of guidance to develop appropriate noise and vibration significance thresholds for assessing impacts. Thus, the following are excerpts from the City of Marina General Plan, City of Seaside General Plan, and the County of Monterey General Plan, which supplement the previously described federal and state-level guidance for suitable noise and vibration impact significance thresholds. See Section 4.10.3.1 for additional information about noise and vibration impact significance thresholds.

City of Marina

The Community Design and Development section of the City of Marina General Plan sets maximum allowable noise levels at the property lines of residences and other noise-sensitive receptors as follows:

- Daytime (7 a.m. – 10 p.m.) – 50 dB hourly L_{eq}, 70 dBA L_{max}; and,
- Nighttime (10 p.m. – 7 a.m.) – 45 dB hourly L_{eq}, 65 dBA L_{max}

Section 15.04.055 of the City of Marina municipal code limits allowable construction hours to between 7 a.m. and 7 p.m. on Mondays through Saturdays, with 10 a.m. to 7 p.m. allowed on Sundays and holidays for any construction activities that require a building, grading, demolition, use or other city permit. During daylight savings time, construction hours may be extended to 8:00 p.m. However, no construction activities, tools, or equipment may produce a noise level of more than 60 dBA for twenty-five percent of an hour at any receiving property line.

City of Seaside

The Seaside General Plan noise element includes implementation plans N-1.3.1 and N-1.3.3 that call for enforcement of the municipal code standards for non-transportation noise and construction noise, respectively. Section 17.30.060 of the municipal code sets the following exterior limits on noise as received by the following land uses:

- Residential – 65 dBA CNEL;
- Mixed-use Residential, Commercial, Office, Public Facilities – 70 dBA CNEL; and,
- Industrial – 75 dBA CNEL.

County of Monterey

<u>Noise Ordinance</u>

Section 10.60.030 of the County of Monterey noise ordinance prohibits operation of any machine, equipment or device that produces a noise level exceeding 85 dBA at a distance 50 feet. However, the regulations do not apply to noise-producing equipment in excess of 2,500 feet away from an occupied dwelling unit. Operation of most typical construction equipment, according to Federal Highway Administration (FHWA) data (DOT 2006), would be expected to comply with this threshold (85 dBA at 50 feet).

Section 10.60.040(B) and (D) of the Monterey County Code limits nighttime noise to 45 dBA hourly L_{eq} as measured at the property line from the source of emission.

General Plan

Per the Monterey County General Plan, Safety element Policy S-7.8 requires submission of a pre-construction vibration level study if usage of heavy construction equipment is expected to occur within 100 feet of a structure. Policy S-7.9 prohibits construction activities within 500 feet of a noise-sensitive land use when they create noise above "acceptable" levels (per Policy S-7.1) during the evening hours of Monday through Saturday, or anytime on Sundays or holidays prior to completion of a noise mitigation study. Noise protection measures, in the event of an impact, may include constructing temporary barriers or using quieter equipment than normal. Policy S-7.10 provides that construction projects shall include the following standard noise projection measures:

- Construction shall occur only during times allowed by ordinance/code unless such limits are waived for public convenience;
- All equipment shall have properly operating mufflers; and
- Lay-down yards and semi-stationary equipment such as pumps or generators shall be located as far from noise-sensitive land uses as practical.

Summarized Land Use Compatibility Guidelines

The cities and County use the land use compatibility guidelines in Table 4.10-3 to guide planning.

Table 4.10-3
Summarized Land Use Compatibility Guidelines

Uses	Cities				Monterey County[3]	
	Marina[1]		Seaside[2]			
	Indoor	Outdoor	Indoor	Outdoor	Indoor	Outdoor
Residence	45	60	45	65	N/A	60
Live/Work	50	65	45	70	N/A	65
Hotel/ Motel	50	65	N/A	70	N/A	65
Office	55	67	50	70	N/A	70
Industrial	60	70	55	75	N/A	75
School, Library	45	60	50	50	N/A	70
Parks and Playfields	N/A	65	50	70	N/A	70

Notes:
1 City of Marina General Plan Noise Element
2 City of Seaside General Plan Noise Element
3 County of Monterey General Plan Noise Element

4.10.3 Impacts and Mitigation Measures

This section presents the evaluation of potential environmental impacts associated with the Project related to noise and vibration. The section identifies the thresholds of significance used in evaluating the impacts, the methods used in conducting the analysis, and the evaluation of Project impacts and the Project's contribution to significant cumulative impacts. In the event significant impacts within the meaning of CEQA are identified, appropriate mitigation measures, where feasible, are recommended.

4.10.3.1 Thresholds of Significance

The significance thresholds used to evaluate the impacts of the Project related to noise and vibration are based on Appendix G of the CEQA Guidelines. Based on the above, a significant impact related to noise and vibration would occur if the Project would:

A. Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

B. Generate excessive groundborne vibration or groundborne noise levels.

C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

In analyzing noise and vibration impacts associated with the Project, pertinent noise standards introduced in Section 4.10.2 have been considered and utilized to develop the following quantified significance thresholds for A and B above.

- Temporary Construction Noise (Threshold A): For temporary construction activities associated with the Project, a significant impact would result if construction noise during daytime hours (7 a.m. to 7 p.m.) exceeds 80 dBA L_{eq} over an 8-hour period at the exterior of a residential land use, or 85 dBA L_{eq} over an 8-hour period at the exterior of a classroom, based on FTA guidance. Project construction would be anticipated to be carried out as sequential phases but could have concurrent activities across the Project site.

- Permanent Noise – Stationary Sources (Threshold A): For stationary sound source emission (e.g., heating, ventilating, and air conditioning [HVAC] system noise, stadium noise) attributed to the Project, exceedance of 65 dBA CNEL at a sensitive receptor would be considered significant. Where the source of new stationary noise is expected to be continuous or steady-state in character, such as air-conditioning operating 24-hours a day to keep building occupants comfortable, the corresponding hourly L_{eq} would need to be 6.7 dBA less (i.e., 58.3 dBA) to account for the evening and nighttime dB penalties that are part of the CNEL value derivation.

- Permanent Noise – Mobile Sources (Threshold A): For Project-attributed increases to local roadway traffic volumes, a significant permanent increase to the outdoor sound environment (either described with CNEL or L_{dn}) would be defined as an increase of 3 dBA or greater, where exterior noise levels would already exceed 65 dBA CNEL (an outdoor noise level considered "normally acceptable"); or, if as a result of the Project increase in roadway noise, the predicted with-Project noise level exceeds 65 dBA CNEL. An increase of 3 dBA is perceived by the average healthy human ear as barely perceptible.

- Permanent Noise – Combined Stationary and Mobile Sources Increase Over Pre-Project Ambient (Threshold A): Because *both* roadway noise and sound from stationary sources (e.g., HVAC) associated with a newly-built or renovated on-campus facility implemented under the Project represent durable or "permanent" potential increases to the outdoor sound environment at a receptor near a new or renovated facility, the logarithmic sum of the A-weighted overall sound pressure levels from these two transportation and non-transportation sound sources would be considered a significant impact if it causes either of the following:
  - A 5 dB increase in noise where existing noise levels are below 65 dBA CNEL, or
  - A 3 dB increase in noise where existing noise levels are above 65 dBA CNEL.
- Vibration (Threshold B): Due to a lack of quantified vibration level regulation or policy guidance at the local level, this impact analysis will apply FTA and Caltrans guidance that suggests 0.2 ips PPV (or 94 VdB) as both an annoyance-based criterion for occupants of inhabited buildings and a risk level for minor cosmetic damage to typical residential buildings featuring non-engineered timber and masonry (Caltrans 2013b). For multi-story modern reinforced-concrete buildings, however, the risk threshold for potential damage would be less stringent—on the order of 0.5 ips PPV. For buildings that house vibration-sensitive processes, such as operation of electron microscopes, the FTA guidance would be 65 VdB (FTA 2006); however, this guidance is to prevent damage to equipment and does not constitute a significance criterion for vibration.

4.10.3.2 Analytical Method

Program- and Project-Level Review

The noise and vibration impact analysis in this section includes a program-level analysis under CEQA of the proposed Master Plan and project design features (PDFs), as described in Chapter 3, Project Description. The analysis also includes a project-level analysis under CEQA of the 5 near-term development components that would be implemented under the proposed Master Plan, as described in Chapter 3, Project Description. Both construction and operation of the Project are considered in the impact analysis, where relevant. In the event significant adverse environmental impacts would occur with the implementation of the Project even with incorporation of applicable regulations and proposed PDFs, mitigation measures would be identified to reduce impacts to less than significant, where feasible.

Project Design Features

The proposed PDF relevant to this topic is PDF-D-8, which is a component of the Project and considered in the impact analysis. PDF-D-8 indicates that when individual building projects are being pursued, CSUMB will prepare an acoustical study(s) of sound emission from proposed stationary noise sources to be located near existing sensitive receptor locations, including receptor locations within 150 feet of new stationary sources. The study(s) will determine the need for sound insulation in new buildings with noise-sensitive occupants so that interior sound levels of habitable spaces do not exceed 45 dBA CNEL. Best engineering practices will be implemented to reduce noise from such stationary sources to comply with applicable standards at existing sensitive receptor locations. CSUMB would implement this PDF to avoid or minimize stationary noise impacts on noise-sensitive receptors or occupants. See Chapter 3, Project Description for the details of this PDF.

Noise Analysis Sites

As described in Section 4.10.1.4, Existing Conditions, ambient outdoor sound level measurements were conducted to quantify the existing daytime noise environment at eight sites (see Figure 4.10-1), which represent potential sensitive receptors or sensitive land uses within or adjacent to the campus. The representative sites, which were used for assessing noise impacts in this analysis, were selected due to consideration of two primary factors: 1) one or more projected peak hour traffic volumes contributing to nearby roadway intersections would be expected to increase substantially (e.g., doubling); and 2) proximity to existing on-campus noise-sensitive receptors and those associated with the five proposed near-term development components. Peak hour traffic volumes were taken from the Transportation Analysis (Appendix H). Additionally, nearby noise sensitive receptors within 150 feet of new stationary noise sources are also considered in the analysis.

Construction Noise

To evaluate potential noise and vibration impacts from construction activities associated with implementation of the Project as described in this assessment, six typical construction phases are studied, with usually anticipated equipment for each comparable to CalEEMod default inputs (i.e., for analyzing Air Quality impacts) and reference equipment noise and vibration levels from industry-accepted FHWA and FTA sources. Using an Excel-based prediction model that emulates the FHWA Roadway Construction Noise Model,[1] significant impact screening distances for each phase are estimated to show where development implemented under the Project would be

1 Although the Roadway Construction Noise Model was funded and promulgated by the FHWA, it is often used for non-roadway projects, because the same types of construction equipment used for roadway projects are often used for other types of construction.

sufficiently proximate to existing noise-sensitive receptors to cause a significant impact and need for noise and/or vibration mitigation.

Similarly, evaluating potential noise and vibration impacts from construction activities associated with each of the five near-term development components entails use of the same Excel-based prediction model. As the location of the pre-existing nearest noise-sensitive receptor (e.g., a student dormitory) with respect to a project-specific site can be identified, noise exposure levels and hence construction noise mitigation needs for each of the five near-term development components can be estimated. Additionally, combined construction noise from a potential scenario representing two adjoining and potentially concurrent near-term development components is also evaluated herein.

Roadway Noise

As appropriate, the collected existing outdoor ambient sound level data at the eight sites were used to validate the predictive modeling of existing roadway traffic noise, which were then modified with inputs representing future parameters to predict future noise levels. Consistent with the Transportation Analysis (Appendix H), noise levels were modeled for each of the following four scenarios: (i) existing conditions; (ii) existing with project conditions; (iii) cumulative conditions; and (iv) cumulative with project conditions. This noise analysis uses the FHWA Traffic Noise Model (version 2.5) to estimate these existing and future roadway traffic noise levels for the eight representative assessment sites.

Stadium Noise

Stadium noise associated with replacement of the current 6,000-seat stadium, field house, and field with a new approximate 10,000-seat stadium with the Project has the potential to change the outdoor ambient sound environment. The additional seating would generate additional spectator noise from the stadium during sporting and special events. The analysis provides a qualitative assessment of the potential for this stadium replacement to exceed the applicable noise threshold at nearby noise-sensitive land uses.

Other Operational Noise

In addition to acoustical contributions due to changes in area roadway traffic and stadium operations, the Project has the potential to change the campus outdoor ambient sound environment due to the creation of new stationary sources of noise, such as anticipated rooftop HVAC systems and other electro-mechanical or fluid-handling equipment that tend to operate continuously and would be exposed to the outdoors. This category of potential stationary noise emitters would also include intermittent operation of standby generators that require regular testing to help ensure operation during actual emergencies. Without information on site-specific development projects (and their component noise-producing mechanical systems) that may be implemented with the Project, assessment of stationary source noise can be done qualitatively to determine conditions under which detailed quantitative analyses of HVAC noise (and refinement of noise-reducing design features) would be needed.

For the near-term development components studied herein and for which preliminary or planning-level site-specific information is available, estimates of stationary noise emission attributed to the five near-term development component sites are calculated using an Excel-based model that relies on input parameters that include building gross square footage, interior space usage or function, and the proximity of sensitive receptors to expected major HVAC equipment noise producers (e.g., air handling unit fans).

Increase over Ambient

Assessment of permanent changes to the outdoor ambient sound environment includes a logarithmic summation of estimated roadway traffic noise and predicted stationary source sound emission from development of individual projects arising from implementation of the proposed Master Plan. The near-term development components are used as illustrations of this potential for a permanent, post-construction change to the outdoor ambient sound level and are assessed against the noise thresholds identified in Section 4.10.3.1, Thresholds of Significance.

4.10.3.3 Issues Not Evaluated Further

The Project would have no impact with respect to the following threshold of significance and therefore this topic is not further evaluated:

- <u>Exposure to Excessive Airport Noise (Threshold C).</u> As described in Section 4.10-1, Environmental Setting, existing and 20 year forecast noise contour figures from the 2019 Marina Municipal Airport Land Use Compatibility Plan (Monterey County Airport Land Use Commission 2019) show that CSUMB lands that are south of Old County Road (see Chapter 3, Project Description, Figure 3-2) are well outside the 60 dBA CNEL aviation noise contour, which includes all developed portions of the Main Campus and East Campus Housing. The Project would not expose people residing or working in the Project area to excessive airport noise levels and therefore would have no impacts.

4.10.3.4 Project Impacts and Mitigation Measures

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

Impact NOI-1:	**Substantial Temporary Increase in Ambient Noise Levels (Threshold A**). The Project would generate a substantial temporary construction-related 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. (*Potentially Significant*)

Master Plan

Campus growth accommodated by the proposed Master Plan would result in an increase of approximately 6,066 full-time-equivalent students (FTES) and 752 full-time-equivalent faculty/staff over existing levels (academic year 2016-2017). To accommodate the growth in students, faculty and staff, the Project would also result in a net increase of approximately 2.6 million gross square feet (GSF) of new academic, administration, student life, athletic and recreational, and institutional partnership facilities, and housing. The construction of new facilities on the campus would result in construction noise.

Construction of Project facilities would temporarily generate noise that could expose nearby receptors to elevated noise levels that may disrupt communication and routine activities. The magnitude of the impact would depend on the type of construction activity, equipment, duration of the construction, distance between the noise source and receiver, and intervening structures.

Construction equipment would vary day-to-day depending on the phase of construction and the activities occurring. Typical construction activities would include grubbing/clearing of on-site areas, excavation, and relocation of soil/rock on the site, backfilling and compaction of soils, construction of utilities (i.e., potable and non-potable water conveyance, wastewater conveyance, storm water drainage facilities, and electrical and natural gas infrastructure), and construction of proposed buildings. Equipment that would be in use during construction would include, in part, graders, backhoes, rubber-tired dozers, loaders, cranes, forklifts, cement mixers, pavers, rollers, and air compressors. Typical noise levels generated by various types of construction equipment likely to be used are identified in Table 4.10-4.

Table 4.10-4
Typical Construction Equipment Maximum Noise Levels

Equipment Type	Typical Equipment Noise Level (L_{max}, dBA at 50 feet)
All Other Equipment > 5 HP	85
Backhoe	78
Compressor (Air)	78
Concrete Mixer Truck	79
Concrete Saw	90
Crane	81
Dozer	82
Front End Loader	79
Generator	72
Grader	85
Man Lift	75
Paver	77
Roller	80
Scraper	84
Slurry Trenching Machine	80
Tractor	84
Welder / Torch	73

Source: DOT 2006
Note: L_{max} = maximum sound level; dBA = A-weighted decibels

Maximum noise levels at a reference distance of 50 feet tend not to exceed 85 dBA L_{max} for common equipment and vehicles anticipated for this kind of academic, residential and mixed-use development on a college campus. Exceptions typically include impact-type equipment, concrete saws, drills and other processes where the noise generated is not merely due to engine or motor performance, but from the forceful and/or rapid contact of the equipment tool on the worked material. Hourly L_{eq} values at this reference distance, however, would vary depending on duty cycle. For instance, an air compressor at a stationary position on a construction site may operate continuously, but the pneumatic hammer it is powering may only be active and performing work for a fraction of a given hour during a typical work-shift.

Construction noise in a well-defined area typically attenuates at approximately 6 dB per doubling of distance, as each piece of equipment can be approximated as an individual point-type source. Alternately, a set of equipment in proximity to one another could be considered geographically a common point source; or, on average with respect to time, a set of operating equipment with uncertain positions within a defined area could be considered a common point-source.

The geographical common-point consideration is comparable to the FTA "general assessment" guidance for evaluating construction noise at a sensitive receptor near a construction site when the specific locations of individual operating equipment are unknown. The technique assumes noise from the two loudest pieces of equipment (operating at full power and thus exhibiting L_{max} corresponding with the comparable equipment types and values shown in Table 4.10-4) on a construction site will be dominant, and that the acoustic combination can be treated as a single point source from which sound would propagate towards the offsite receptor of interest. Emulating this FTA-based "two-loudest" method, Table 4.10-5 presents the source-to-receptor distances, for each of five construction phases, within which predicted noise from construction site activity would likely exceed the 8-hour L_{eq} FTA-based thresholds at the exteriors of residential and non-residential commercial (i.e., classroom uses) receptors.

Table 4.10-5
Predicted Construction Noise Impact Screening Distances

Typical Construction Phase	Anticipated Two Loudest Noise-Producing Equipment[1]	Distance (feet) to Residential Receptor[2,3]	Distance (feet) to Commercial (Educational Use) Receptor[2,4]
Demolition	concrete saw, dozer	175	100
Site Preparation	grader, scraper	125	70
Grading	grader, tractor	125	70
Building Construction	crane, tractor	100	55
Paving	roller, tractor	100	55
Architectural Finishes	air compressor (2)	60	35

Notes:
1 Assumes two pieces of equipment operating at full power (L_{max}) all eight hours; noise from other phase equipment neglected.
2 Assumes the distance is between the construction site acoustical centroid (AC) and the receptor exterior façade.
3 Federal Transit Administration (FTA) guidance threshold for construction noise received by Residential land use is 80 dBA 8-hour equivalent sound level (L_{eq}).
4 FTA guidance threshold for construction noise received by Commercial land use is 85 dBA 8-hour L_{eq}.

Therefore, construction activity and associated temporary noise impacts from implementation of the proposed Master Plan within the indicated distances shown in Table 4.10-5 could be *potentially significant*.

Near-Term Development Components

The construction activities for the Project will be varied by expected land usage and location. Aggregate noise emission from construction activities, broken down by sequential phase, was predicted for each of the five near-term development components at two distances to the nearest existing noise-sensitive receptor: 1) from the nearest position of the construction site boundary; and 2) from the geographic center-point of the construction site, which serves as the time-averaged location or "acoustical centroid" of active construction equipment for the phase under study. The intent of the former distance is to help evaluate anticipated construction noise from equipment or vehicle activity expected to be at the boundary for some period of time, which would be most appropriate for phases such as site preparation, grading, and paving. The latter distance is used in a manner similar to the "general assessment" technique as described in the FTA guidance for construction noise assessment, when the location of individual equipment for a given construction phase is uncertain over some extent (or the entirety) of the construction site area. For example, this distance would be considered relevant for building erection and architectural coating phases, when most activity would be at or near a new building façade and thus likely away from the site boundary. Reflecting this anticipated distance relevance by phase, Table 4.10-6 summarizes these two distances to the apparent closest noise-sensitive receptors by construction phase for each near-term development component.

Table 4.10-6
Near-Term Development Components Construction Phase Distances to Nearest Pre-Existing Noise-Sensitive Receptors

Construction Phase	Student Housing IIB		Student Housing III		Student Recreation Center		Academic V		Academic IV	
	to SB[1] (feet)	to AC[2] (feet)	to SB[1] (feet)	to AC[2] (feet)	to SB[1] (feet)	to AC[2] (feet)	to SB[1] (feet)	to AC[2] (feet)	to SB[1] (feet)	to AC[2] (feet)
Demolition	75	--	30	--	125	--	40	--	80	--
Site Preparation	75	--	30	--	125	--	40	--	80	--
Grading	75	--	30	--	125	--	40	--	80	--
Building Construction	--	233	--	136	--	262	--	134	--	173
Paving	75	--	30	--	125	--	40	--	80	--
Architectural Finishes	--	233	--	136	--	262	--	134	--	173

Source: Appendix G
Notes:
1 Distance to site boundary (SB).
2 Distance to acoustical centroid (AC), or the geographic center-point of the construction site and active construction equipment for the phase under study.

An Excel-based noise prediction model emulating and using reference data from the FHWA Roadway Construction Noise Model (DOT 2006) was used to estimate construction noise levels at the nearest occupied noise-sensitive land use. Input variables for the predictive modeling consist of the equipment type and number of each (e.g., two graders, a loader, a tractor), the duty cycle for each piece of equipment (e.g., percentage of time within a specific time period, such as an hour, when the equipment is expected to operate at full power or capacity), and the distance from the noise-sensitive receiver. The predictive model also considers how many hours that equipment may be on site and operating (or idling) within an established work shift. No topographical or structural shielding was assumed in the modeling. The Roadway Construction Noise Model has default duty-cycle values for the various pieces of equipment, which were derived from an extensive study of typical construction activity patterns. Those default duty-cycle values were used for this noise analysis.

Equipment that would be in use during construction would include, in part, graders, backhoes, rubber-tired dozers, loaders, cranes, forklifts, cement mixers, pavers, rollers, and air compressors. Maximum noise levels at a reference distance of 50 feet tend not to exceed 85 dBA L_{max} for common equipment and vehicles anticipated for this kind of residential and mixed-use development on a college campus. Exceptions typically include impact-type equipment, saws, drills and other processes where the noise generated is not merely due to engine or motor performance, but from the forceful and/or rapid contact of the equipment tool on the worked material. Hourly L_{eq} values at this reference distance, however, would vary depending on duty cycle. For instance, an air compressor at a stationary position on a construction site may operate continuously, but the pneumatic hammer it is powering may only be active and performing work for a fraction of a given hour during a typical work-shift.

Construction noise in a well-defined area typically attenuates at approximately 6 dB per doubling of distance, as each piece of equipment can be approximated as an individual point-type source. Alternately, a set of equipment in proximity to one another could be considered geographically a common point source; or, on average with respect to time, a set of operating equipment with uncertain positions within a defined area could be considered a common point-source. Project construction would take place both near and far from adjacent, existing noise-sensitive uses, as the distance values in Table 4.10-6 indicate. Table 4.10-7 provides the construction noise estimates for each near-term development component and an analysis for each component is provided below. Appendix G provides details on the calculations of estimated construction noise.

Where predicted construction noise levels presented in Table 4.10-7 exceed the applicable construction noise threshold, the decibels to reduce the noise levels to below the threshold is no more than 10 dBA. As detailed in MM-NOI-1, practical options for noise control and sound abatement can be expected to provide this reduction and yield impacts that would be less than significant. For example, a properly designed and installed temporary noise barrier can be expected to provide approximately 10 dBA of noise reduction when it is solid (i.e., non-porous and no air-gaps), sufficiently massive, and implemented in proximity to the sound source or the receptor. Alternately, since this analysis presumes that construction equipment would be onsite and either operating or idling for a full eight hours (i.e., a typical daytime work-shift), any halving of equipment idling or actively operating time can yield 3 dBA of noise reduction from an individual piece of equipment. Therefore, if a grader at some fixed distance to a receptor was operating for less than one cumulative hour instead of the full eight hours, its acoustical contribution would be reduced by at least 10 dBA.

Table 4.10-7
Predicted Near-Term Development Components Construction Noise Estimates at Nearest Pre-Existing Noise-Sensitive Receptors

Construction Phase	Student Housing IIB L_{eq8h} (dBA)	Student Housing III L_{eq8h} (dBA)	Student Recreation Center L_{eq8h} (dBA)	Academic V L_{eq8h} (dBA)	Academic IV L_{eq8h} (dBA)
Demolition	**82**	**90**	78	**87**	81
Site Preparation	80	**88**	76	**86**	80
Grading	**82**	**90**	78	**88**	81
Building Construction	68	73	67	73	71
Paving	**82**	**90**	77	**87**	81
Architectural Finishes	61	65	60	64	63
*FTA guidance-based criterion**	*80*	*80*	*80*	*80*	*85*

Source: Appendix G
Notes:
Leq8h = 8-hour energy-equivalent sound level; FTA = Federal Transit Administration
Bold values indicate predicted construction noise levels that exceed the threshold, which depends on type of existing receptor: residential (80 dBA) or commercial (85 dBA)

Student Housing Phase III

The proposed new Student Housing Phase III would be located west of the existing three-building Vineyard Suites dormitories, which is a noise-sensitive receptor. Depending on the construction phase as shown in Table 4.10-6, construction activities could occur as close as 30 feet to the nearest existing western building façade. Estimated noise exposure levels due to activities for the six identified construction phases were predicted at the appropriate distance and are presented in Table 4.10-7. Based on these predicted noise levels for four of the six listed phases, construction noise for this near-term development component would exceed FTA-based guidance criteria of 80 dBA over an eight-hour period at this nearest existing noise-sensitive residential receptor; thus, the construction noise impact of this near-term development component would be considered *potentially significant*.

Academic IV Building

Academic IV would be located west of the Science Instructional Lab Annex, an existing daytime-only noise-sensitive receptor on the basis of it having occupied learning spaces and related interior uses. Depending on construction phase, as shown in Table 4.10-6, construction activities could occur as close as 80 feet to the nearest existing western building façade. Estimated noise exposure levels due to activities for the six identified construction phases were predicted at the appropriate distance and are presented in Table 4.10-7. Based on these predicted noise levels, construction noise for this near-term development component would be less than the FTA-based guidance criteria of 85 dBA over an eight-hour period at this nearest existing non-residential noise-sensitive receptor; thus, the construction noise impact associated with this near-term development component would be *less than significant*.

Student Recreation Center Phases I and II

The Student Recreation Center Phases I and II would be located south of the existing Avocet Hall, which is a residential-type noise-sensitive receptor. Depending on the construction phase, as shown in Table 4.10-6, construction activities could occur as close as 125 feet to the nearest existing southern building façade. Estimated noise exposure levels due to activities for the six identified construction phases were predicted at the appropriate distance and are presented in Table 4.10-7. Based on these predicted noise levels, construction noise for this near-term development component would be less than the FTA-based guidance criteria of 80 dBA over an eight-hour period at this nearest existing noise-sensitive residential receptor; thus, the construction noise impact associated with this near-term development component would be *less than significant*.

Student Housing Phase IIB

Student Housing Phase IIB would be located just south of the existing three-building Promontory West dormitories, which is a noise-sensitive receptor. Depending on the construction phase, as shown in Table 4.10-6, construction activities could occur as close as 75 feet to the nearest existing southern building façade. Estimated noise exposure levels due to activities for the six identified construction phases were predicted at the appropriate distance and are presented in Table 4.10-7. Based on these predicted noise levels for three of the six listed phases, construction noise for this near-term development component would exceed FTA-based guidance criteria of 80 dBA over an eight-hour period at this nearest existing noise-sensitive residential receptor; thus, the construction noise impact would be considered *potentially significant*.

Academic V

Academic V would be located east of Avocet Hall, but would be potentially closer to Yarrow Hall, an existing dormitory building and residential-type noise-sensitive receptor to the east of this development component site. Depending on the construction phase, as shown in Table 4.10-6, construction activities could occur as close as 40 feet to the nearest existing western building façade. Estimated noise exposure levels due to activities for the six identified construction phases were predicted at the appropriate distance and are presented in Table 4.10-7. Based on these predicted noise levels for four of the six listed phases, construction noise for this near-term development component would exceed FTA-based guidance criteria of 80 dBA over an eight-hour period at this nearest existing noise-sensitive residential receptor; thus, the construction noise impact would be considered *potentially significant*.

Student Recreation Center & Academic V

There is potential for concurrent construction activities within the two adjoining near-term development component sites: Academic V and the Student Recreation Center. Were this to occur, the existing on-campus residential building Avocet Hall would be the nearest occupied residential receptor exposed to construction noise emission from both site-specific projects. While the preceding analysis for the Student Recreation Center already considers Avocet Hall the nearest sensitive receptor, the preceding analysis for the Academic V facility would need to make adjustments to the input distance values in Table 4.10-6 and predicted noise results in Table 4.10-7 to reflect this residence hall (and thus not Yarrow Hall). The Avocet Hall eastern façade appears to be 250 feet from the Academic V acoustic centroid, and 65 feet from the Academic V construction area boundary. Since the timing of concurrency is uncertain at this time, Table 4.10-8 displays a matrix of predicted noise levels for thirty-six (36) possible scenarios of combined construction phases—one from each of the near-term development components. The predicted 8-hour L_{eq} values represent logarithmic sums of aggregate construction noise from each of the two compared near-term development component site phases. For example, if grading for Academic V took place during demolition activity at the Student Recreation Center site, the predicted combined level would be 84 dBA L_{eq8h} and exceed the FTA-based guidance threshold of 80 dBA at the Avocet Hall facade; but if this demolition phase for the Student Recreation Center occurred during Academic V building construction phase, the combined noise level would only be 78 dBA L_{eq8h} and thus be less than the FTA threshold.

Table 4.10-8
Predicted Combined Construction Noise Levels at Nearest Pre-Existing Noise-Sensitive Receptor for Student Recreation Center and Academic V

Student Recreation Center Construction Phase	Predicted Noise Level (dBA, 8-hour L_{eq}) of Combined Construction Noise Emission* from Near-Term Development Components					
	Academic V Construction Phase					
	Demolition	Site Preparation	Grading	Building Construction	Paving	Architectural Finishes
Demolition	**84**	**83**	**84**	78	**84**	78
Site Preparation	**84**	**83**	**84**	77	**84**	76
Grading	**84**	**83**	**84**	78	**84**	78
Building Construction	**83**	**82**	**83**	70	**83**	68
Paving	**84**	**83**	**84**	77	**84**	77
Architectural Finishes	**83**	**82**	**83**	68	**83**	63

Notes:
* assessed from the construction site boundary of each indicated near-term development component to a common receptor: the eastern façade of Avocet Hall.

L_{eq} = energy-equivalent sound level

Bold values indicate predicted construction noise levels that exceed the threshold of 80 dBA 8-hourly L_{eq}

Based on these predicted noise levels displayed in Table 4.10-8, concurrent construction noise for these two near-term development component sites would exceed the FTA-based guidance criteria of 80 dBA over an eight-hour period during demolition, site preparation, grading and paving phases at the Academic V site. Therefore, the construction noise impact of concurrent construction at these two buildings would be *potentially significant*.

Mitigation Measure

MM-NOI-1: CSUMB shall require that construction contractors implement the following practices and measures:

- Construction activity shall generally be limited to the daytime hours between 7:00 a.m. and 7:00 p.m. on weekdays and between 8:00 a.m. and 8:00 p.m. on weekends and holidays. If nighttime construction is required, noise levels shall not exceed 65 dB L_{max} (slow response) when measured at the construction site boundary between the hours of 7:00 p.m. and 7:00 a.m. Loud construction activity (e.g., asphalt removal, large-scale grading operations) shall not be schedule during finals week and preferably will be scheduled during holidays, summer/winter break, etc.
- All construction equipment shall be properly maintained and equipped with noise-reducing air intakes, exhaust mufflers, and engine shrouds in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.
- Electrical power, rather than diesel equipment, shall be used to run compressors and similar power tools and to power any temporary structures, such as construction trailers.
- All stationary construction equipment (e.g., electrical generators, pumps, refrigeration units, and air compressors) and equipment staging areas shall be located as far as feasible from occupied residences or educational land uses.
- When anticipated construction activities are expected to occur less than 175 feet from an existing on-campus or off-campus residential land use, one or more of the following techniques shall be employed to keep noise levels below an eight-hour A-weighted energy-equivalent level (L_{eq8h}) of 80 dBA at the potentially affected sensitive receptors:
    - Reduce construction equipment and vehicle idling and active operation duration.

- Install or erect on-site a temporary, solid noise wall (or acoustical blanket having sufficient mass, such as the incorporation of a mass-loaded vinyl skin or septum) of adequate height and horizontal extent so that it linearly occludes the direct sound path between the noise-producing construction process(es) or equipment and the sensitive receptor(s) of concern.
- Where impact-type equipment is anticipated on site, apply noise-attenuating shields, shrouds, portable barriers or enclosures, to reduce the magnitudes of generated impulse noises.

Significance After Mitigation

Implementation of MM-NOI-1 would avoid substantial temporary increases in ambient noise levels during construction of the Project, including but not limited to Student Housing Phase III, Student Housing Phase IIB, and Academic V by: limiting construction noise to the less sensitive times of day; properly maintaining all construction equipment; ensuring all equipment is properly equipped with noise-reducing air intakes, exhaust mufflers, and engine shrouds; using electrical power to run power tools and to power temporary structures; siting all stationary construction equipment and staging areas as far away as feasible from residences and educational land uses; and implementing special procedures when construction activities are expected to occur less than 175 feet from existing residences. With the implementation of MM-NOI-1 the construction noise impact of the Project would be reduced to *less than significant*.

While not required to reduce a significant impact, MM-NOI-1 would be implemented to further reduce the temporary noise impact associated with construction of the Academic IV and the Student Recreation Center Phases I and II.

Impact NOI-2:	**Substantial Permanent Increase in Ambient Noise Levels (Threshold A)**. The Project would generate a substantial 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, due to roadway and stadium noise. (*Potentially Significant*)

Master Plan

Roadway Noise

To assess the Project's potential operational impacts relative to vehicle traffic noise, a roadway noise analysis was conducted to establish baseline conditions and quantify the potential increases in roadway noise resulting from implementation of the Project. Roadway noise levels were predicted with the FHWA Traffic Noise Model, using inputs based on traffic projections included in the Transportation Analysis (Appendix H). Noise levels were predicted at the same locations shown in Figure 4.10-1 and presented in Table 4.10-2. The roadway intersections identified in Table 4.10-9 at these assessment locations represent the major thoroughfares in and around the CSUMB Main Campus where the highest Project-attributed roadway noise level increases were anticipated on the basis of predicted upward change in future traffic volumes. Roadway intersections and segments further from the CSUMB Main Campus, where all the Project's capital improvements would be located, would be expected to experience less Project-related traffic increases and thus correspondingly less likelihood of potential impact due to Project-related roadway noise increases.

Consistent with the Transportation Analysis (Appendix H), noise levels were modeled for existing conditions and existing with Project conditions. See Impact NOI-4 for an analysis of cumulative impacts. The results of the noise modeling predictions are shown on Table 4.10-9, which lists the following for each of the eight representative sites: the represented roadway intersection, the existing conditions roadway noise level (using the CNEL descriptor), existing with Project conditions roadway noise, and the arithmetic difference between the two estimated noise levels. Note that for the existing conditions (i.e., without contribution from the Project) predicted levels have been validated with the field-collected data presented in Table 4.10-2.

The predicted CNEL values shown in Table 4.10-9 are considered conservative estimates because they do not take into account acoustical shielding from existing buildings or the noise-reducing effects of path-intervening terrain. Compared to existing conditions, predicted roadway noise levels in and around the CSUMB Main Campus were estimated to increase by up to 3.6 dBA CNEL (see increase for ST-2 in Table 4.10-9) as a result of the Project.

Table 4.10-9
Roadway Noise Modeling Results Summary

Site	Roadway Intersection	Existing CNEL (dBA)	Existing with Project CNEL (dBA)	Increase (dB)	Impact?
ST-1	Eighth Street and Second Avenue	61.5	62	0.5	No
ST-2	Eighth Street and Injin Road	58.4	62	3.6	No
ST-3	Eighth Street and Inter-Garrison Road	61.7	61.5	-0.2	No
ST-4	Eighth Avenue and Inter-Garrison Road	60.9	63.4	2.5	No
ST-5	Second Avenue and Divarty Street	64.1	66.3	2.2	No
ST-6	Sixth Avenue and Col. Durham Street	62.7	63.1	0.4	No
ST-7	Sixth Avenue and Gigling Road	67.4	70.7	**3.3**	Yes
ST-8	Lightfighter Drive and Gigling Road	62	63.6	1.6	No

Source: Appendix G
Notes:
CNEL = community noise equivalent level
Bold values indicate predicted roadway noise level increases exceed the threshold

As described in Section 4.10.3.1, an increase in ambient noise levels of 3 dBA CNEL or more attributable to the Project would be considered a significant impact only when the existing or future outdoor ambient sound level already exceeds 65 dBA CNEL; or, if as a result of the Project increase in roadway noise, the predicted with-Project noise level exceeds 65 dBA CNEL. As mentioned in Section 4.10.4, an exterior sound level of 65 dBA CNEL is considered "normally acceptable" for high-density residential use that would characterize existing dormitories and similar new residential housing proposed as part of implementation of the Project. A change in average outdoor noise levels of less than 3 dBA is usually considered not discernible to the general population; however, an increase in average noise levels of from 3 to 5 dBA is considered clearly perceptible to most people (Caltrans 2013a). At ST-2, while the predicted increase due to the Project is greater than 3 dBA, the resultant CNEL would remain less than 65 dBA and thus, like the predicted noise levels at the other studied representative locations, roadway noise impacts at this location would be considered *less than significant*.

In contrast, at representative off-campus location ST-7, located at Sixth Avenue and Gigling Road, the with-Project roadway noise level increase is greater than 3 dBA and the resultant CNEL would exceed 65 dBA. Therefore, the impact of roadway noise at this off-campus location would be *potentially significant*.

Stadium Noise

The Project would ultimately replace the current 6,000-seat stadium, field house, and field with a new approximate 10,000-seat stadium sized and equipped to host intercollegiate soccer and track events and designed to specifically meet future athletic and student needs. The additional seating would generate additional spectator noise from the stadium during sporting and special events. The nearest noise sensitive receptors on- and off-campus include residences approximately 1,800 feet northeast and approximately 0.51 miles south, respectively. The nearest academic building is approximately 1,500 feet from the stadium site. Detailed information regarding the replacement stadium and associated improvements are not yet available. Because specific stadium improvements, event types, and timing of events are unknown at this time, this EIR conservatively assumes that operational noise levels associated with the stadium replacement could exceed applicable noise threshold of 65 dBA CNEL at nearby noise-sensitive land uses. Therefore, the noise impact associated with stadium noise would be *potentially significant.*

Mechanical Noise

Mechanical equipment associated with the operation of new campus facilities could include heating, ventilation, and air-conditioning (HVAC) equipment, backup generators, and various fans, pumps, and compressors that often can be significant noise sources. Emergency/back-up generators would be used for continued periods of time during power outages or building equipment malfunctions and, therefore, do not substantially contribute to increases in average ambient noise levels. Further, back-up equipment would be tested periodically for short periods of time during the daytime hours, consistent with typical work shifts of maintenance personnel. Therefore, due to the infrequent, intermittent, and temporary use characteristics of these noise sources, in combination with that fact that typical maintenance activity would occur during the less sensitive times of the day, noise generated from new emergency/back-up generators would not be considered a substantial permanent increase in noise that could disturb nearby receptors.

The loudest sources of continuous noise from a building are typically the operation of HVAC systems and other electromechanical equipment, which emit sound levels that can exceed noise thresholds and thus create a noise impact when located in sufficient proximity to noise sensitive receptors such as residences, campus housing, classrooms, or the library, if not properly designed. While it is CSUMB's objective to have all new buildings on central heating and cooling from the central plant, it may not be feasible for buildings at greater distances from the central plant. Anticipated new on-site stationary operating mechanical equipment associated with future buildings proposed as part of the Project are typical major producers of relatively continuous or "steady-state" outdoor noise that include rooftop air-handling units that supply air conditioning to occupied structures, and exhaust fans for new laboratories or parking structures having subsurface levels. For new Project buildings that the campus central plant would not provide remote chilled water for air-conditioning cooling, or where refrigeration might otherwise need to be supplied locally, rooftop-mounted air-cooled condensing units and compressors would be considered additional noise-producing equipment exposed to the outdoors.

Although project-level design details are not known at this time, the air-handling units and other equipment featuring fans would likely be located on the top of proposed buildings and surrounded by rooftop parapet walls or be otherwise partially enclosed (or fully, such as a basement or penthouse dedicated for housing central HVAC systems); thus, it is unlikely that most noise-sensitive receivers would have a direct view of such equipment. Implementation of PDF-D-8 as part of the Project would require that an acoustical study of sound emission from proposed stationary noise sources be prepared during the schematic design process and as part of selection of these systems to ensure they comply with identified noise thresholds at sensitive receptor locations, as applicable. Therefore, the noise impact associated with mechanical noise sources would be *less than significant*.

Near-Term Development Components

Roadway Noise

The roadway noise analysis conducted for the proposed Master Plan includes analysis of the near-term development components, as these developments are included in the proposed Master Plan. Based on Table 4.10-9 and Appendix G, roadway noise would not exceed the roadway noise threshold of 3 dBA or greater, where exterior noise levels would already exceed 65 dBA CNEL, with the exception of one representative location (ST-7) at Sixth Avenue and Gigling Road, which is off campus. Therefore, the impact of roadway noise at this off-campus location from the near-term development components would also be *potentially significant*.

Mechanical Noise

As stated previously, the loudest sources of continuous noise from a building are typically the operation of HVAC systems. Table 4.10-10 summarizes expected HVAC equipment sound source level quantities associated with the near-term development components, based on a technique that relates building information (gross square footage, primary use or function), industry-accepted ventilation airflow rates for occupancy-based indoor air quality, and acoustical fan design parameters (Storm 2018). This analysis further determined that other stationary noise sources would not meaningfully contribute to the surrounding outdoor ambient sound environment, for one or more of the following reasons:

- New noise-producing electro-mechanical and/or fluid handling systems will be sufficiently enclosed or otherwise attenuated to comply with applicable standards at sensitive receptor locations, as specified in PDF-D-8; and,
- The near-term development components would rely on existing CSUMB utilities and associated infrastructure, such as a central utility plant that would provide chilled water, in lieu of installing new refrigeration that would require outdoor air-cooled condensers for new or renovated individual buildings.

Table 4.10-10
Anticipated Major Stationary Operating Sources of Outdoor Noise by Near-Term Development Component

Near-Term Development Component	Gross Square Footage (GSF), and Interior Use or Occupancy	Description of Anticipated Major Stationary Sound Source	Estimated Source Noise Level (dBA L_{eq}) [1,2]	Assumed Height above Grade (feet)
Student Housing IIB	160,000 gsf dormitory	Rooftop Air-Handling Units (plenum-type centrifugal fan drawing outside air into the building)	87	6 feet above top of roof
Student Housing III	240,000 gsf dormitory	Rooftop Air-Handling Units (plenum-type centrifugal fan drawing outside air into the building)	88	6 feet above top of roof
Student Recreation Center	70,000 gsf sporting spectator area	Rooftop Air-Handling Units (plenum-type centrifugal fan drawing outside air into the building)	94	6 feet above top of roof
Academic V	76,700 gsf classroom	Rooftop Air-Handling Units (plenum-type centrifugal fan drawing outside air into the building)	87	6 feet above top of roof
Academic IV	72,200 gsf classroom	Rooftop Air-Handling Units (plenum-type centrifugal fan drawing outside air into the building)	87	6 feet above top of roof

Source: Appendix G
Notes:
1 Sound pressure level (SPL) distance-adjusted to a reference distance of one meter (approximately 3 feet).
2 SPL depends on the equipment airflow capacity as suggested by building gross square footage and function or usage.

Using an Excel-based model that incorporates industry-accepted point-source sound propagation algorithms and the estimated reference noise levels due to stationary sources shown in Table 4.10-10, outdoor sound exposure levels were predicted at the nearest noise-sensitive receiver locations associated with each of the five near-term development components presented in Table 4.10-11.

Under these analysis conditions, the predicted hourly L_{eq} values at the nearest noise-sensitive receptors to the near-term development components are all below 58.3 dBA, and would thus result in CNEL values less than the identified threshold of 65 dBA (on the basis of a continuous sound source having that steady hourly L_{eq} sound level causing the CNEL to be 6.7 dB greater). Additionally, Table 4.10-12 shows that the anticipated increases of the outdoor ambient sound level attributed to major stationary operating sources of outdoor noise for each near-term development component are expected to be less than the thresholds in Section 4.10.3.1. At all five of the nearest noise-sensitive receptors identified in Table 4.10-11, the existing CNEL values are less than 65 dBA, which means the allowable increase to the outdoor ambient sound level due to the combination of Existing with Project traffic and added stationary sound sources would be 5 dB or less, which Table 4.10-12 shows would be satisfied.

Table 4.10-11
Anticipated Major Stationary Operating Sources of Outdoor Noise by Near-Term Development Component

Near-Term Development Components	Approximate Distance to Nearest Noise-sensitive Receptor (feet)[1]	Description of Nearest Existing Noise-sensitive Receptor	Estimated Noise Level at Receptor	
			Hourly L_{eq} (dBA) [1]	CNEL (dBA) [2]
Student Housing IIB	233	south façade of Promontory West	42	49
Student Housing III	136	west façade of Vineyard Suites	48	55
Student Recreation Center	262	south façade of Avocet Hall	48	55
Academic V	134	west façade of the Science Instruction Lab Annex	47	54
Academic IV	173	west façade of Yarrow Hall	45	52

Notes:
1 Assumes the distance is between the near-term development component site acoustical centroid (AC) per Table 4.10-6 and the nearest noise-sensitive receptor exterior façade.
2 Assumes continuous operation of the major noise-producing stationary equipment that provide building interior comfort and ventilation excludes occasional test operation of emergency generators.

Table 4.10-12
Anticipated Increase over Existing Outdoor Ambient at Nearest Noise-sensitive Receptors due to Near-Term Development Components

Near-Term Development Components	Nearest Surveyed Location	Existing Outdoor CNEL (dBA)[1]	Existing Plus Project Roadway Noise CNEL (dBA)[1]	Estimated CNEL from Near-Term Development Stationary Sources (dBA)[2]	Logarithmic Sum of Existing Plus Project Roadway Noise and Stationary Sources CNEL (dBA)	Increase over Existing Outdoor CNEL (dB)	Impact?
Student Housing IIB	ST-2	58.4	62	49	62.2	3.8	No
Student Housing III	ST-5	64.1	66.3	55	66.6	2.5	No
Student Recreation Center	ST-5	64.1	66.3	55	66.6	2.5	No
Academic V	ST-2	58.4	62	54	62.6	4.2	No
Academic IV	ST-3	61.7	61.5	52	62.0	0.3	No

Notes:
1 from Table 4.10-9
2 from Table 4.10-11

Based on this predictive analysis with results presented in Table 4.10-11 and Table 4.10-12, potential noise impacts from stationary sources like HVAC systems associated with the near-term development components would be *less than significant*.

Mitigation Measures

MM-NOI-2 Stadium Noise. To minimize noise levels generated by the replacement of the existing stadium with an expanded stadium with additional seating capacity, a noise assessment shall be conducted by a qualified acoustical engineer or noise specialist to evaluate potential increases in noise levels associated with the proposed new and expanded stadium. The assessment shall be conducted prior to final design. Noise reduction measures shall be incorporated into the design to reduce increases in existing operational noise levels at nearby noise-sensitive land uses to below the applicable threshold (i.e., less than 65 dBA CNEL). Such measures may include, but are not limited to, the incorporation of structural shielding, enclosed bleachers, and revised placement for amplified sound system speakers.

Significance After Mitigation

Implementation of MM-NOI-2 would avoid a substantial permanent increase in ambient noise levels in the vicinity of the Project due to stadium noise by requiring a noise assessment prior to final design and incorporation of noise reduction measures into the design to reduce increases in existing operational noise levels at nearby noise-sensitive land uses to below the applicable threshold. With the implementation of MM-NOI-2, the permanent noise impact of the Project due to stadium noise would be reduced to *less than significant*.

Regarding the potentially significant roadway noise impact at one off-campus location (ST-7), located at Sixth Avenue and Gigling Road, the University does not have jurisdiction over adjacent land uses or proposed development in this off-campus location. Given that there are no feasible mitigation measures that the University can implement to reduce the roadway noise to less than significant at this location, the roadway noise impact would be considered *significant and unavoidable*. However, as indicated in Impact NOI-4, the cumulative impact of the Project related to roadway noise is less than significant, as the Project's contribution to the cumulative impact does not exceed the threshold.

Impact NOI-3:	**Excessive Vibration (Threshold B).** The Project would not generate excessive groundborne vibration or groundborne noise levels. *(Less than Significant)*

Master Plan

Heavier pieces of conventional construction equipment and vehicles used at construction sites could include dozers, graders, cranes, loaded trucks, water trucks, and pavers. But aside from these vehicles, on-site construction activities causing the most groundborne vibration and noise would be associated with impact-type equipment: pile-driving for building foundations.

During grading, the largest groundborne vibration levels are anticipated to be generated by large bulldozers and loaded trucks used for earthmoving. According to the FTA, vibration levels associated with the use of bulldozers (based on size) range from approximately 0.003 to 0.089 ips PPV and 58 to 87 VdB at 25 feet (FTA 2006), as shown in Table 4.10-13. Additionally, loaded trucks used for soil hauling during grading could generate vibration levels of approximately 0.076 ips PPV and 86 VdB at 25 feet.

Per Table 4.10-6, sensitive receptors adjacent to capital improvements would likely range from approximately 30 to 125 feet from the boundary of the construction area. Using the vibration velocity propagation expression explained in Section 4.10.2.2, the two right-most columns of Table 4.10-13 present estimated PPV at these receptor distances for the listed sample equipment. As none of the listed sample construction activities are anticipated to result in continuous vibration levels of 0.2 ips PPV that typically annoy people or risk damage to residential structures (see Section 4.10.3.1), the vibration impact associated with the proposed Master Plan would be considered *less than significant*.

While not needed to reduce a significant impact, it is recommended that MM-NOI-3 be implemented where vibration-sensitive instruments or processes are present in adjacent buildings during construction, as construction vibration does have the potential to disrupt the normal operation of some sensitive equipment.

Table 4.10-13
Typical Construction Equipment Vibration Levels

Equipment	PPV (inches per second) at 25 feet	Lv (rms vibration velocity dB [VdB]) at 25 feet	PPV (inches per second) at the receptor* (30 feet)	PPV (inches per second) at the receptor* (125 feet)	Impact?
Pile drive (impact)–typical	0.644	104	0.160	0.019	No
Pile drive (sonic)–typical	0.170	93	0.042	0.005	No
Vibratory roller	0.210	94	0.050	0.006	No
Jackhammer	0.035	79	0.021	0.001	No
Large bulldozer	0.089	87	0.018	0.003	No
Loaded trucks	0.076	86	0.004	0.002	No
Small bulldozer	0.003	58	0.001	< 0.001	No

Notes:
PPV = peak particle velocity; Lv = vibration level; rms = root mean square; dB = decibel.
* includes the effect of a 10 VdB foundation coupling loss for large, multi-story buildings (FTA 2006)

Near-Term Development Components

Per Table 4.10-6, the closest sensitive receptor to any of the five near-term development components ranges from approximately 30 to 125 feet from the boundary of the construction area. Using the vibration velocity propagation expression explained in Section 4.10.2.2, the two right-most columns of Table 4.10-13 present estimated PPV at these receptor distances for the listed sample equipment. As none of the listed sample construction activities are anticipated to result in continuous vibration levels of 0.2 ips PPV that typically annoy people or risk damage to residential structures, the vibration impact for the near-term development components would also be considered *less than significant*.

If the existing CSUMB Science Instructional Lab Annex contains vibration-sensitive instruments, construction of Academic IV could disrupt the use of this equipment for their intended purposes. The estimated vibration velocity levels from pile driving or a vibratory roller, if such equipment were used at the Academic IV construction site, would be greater than 69 VdB and thus exceed the FTA vibration velocity guidance limit of 65 VdB for facilities housing the operation of highly sensitive instruments. While not needed to reduce a significant impact, it is recommended that

MM-NOI-3 be implemented during the construction of Academic IV and comparable circumstances where vibration-sensitive instruments or processes are present in adjacent buildings during construction.

Mitigation Measures

MM-NOI-3: <u>Recommended Vibration Monitoring Plan.</u> While not required to reduce a significant impact, it is recommended that CSUMB or its designee prepare a vibration monitoring plan by a qualified acoustician prior to beginning construction of any project that involves pile driving (or any heavy construction operation known to exhibit a reference vibration velocity level of 0.2 ips PPV or greater magnitude at 25 feet) within 250 feet of an existing facility housing medical, semiconductor, testing, manufacturing, musical recording, or other instruments and processes that are known to be highly sensitive to vibration and may thus have function compromised by undue levels of groundborne-transmitted vibration. At a minimum, the vibration monitoring plan shall require data be sent to the University noise control officer or designee on a weekly basis or more frequently as determined by the noise control officer. The data shall include vibration level measurements taken during the previous work period. In the event that there is reasonable probability that future measured vibration levels would exceed FTA guidance (65 VdB or more stringent criteria as the existing facility activities may require), the University shall take the steps necessary to ensure that future vibration levels do not exceed such limits, including suspending further construction activities that would result in excessive vibration levels until either alternative equipment or alternative construction procedures can be used. Construction activities not associated with vibration generation could continue.

In addition to the data described previously, the vibration monitoring plan shall also include the location of vibration monitors, the vibration instrumentation used, a data acquisition and retention plan, and exceedance notification and reporting procedures.

Significance After Mitigation

Mitigation measures are not required because a significant impact related to vibration has not been identified. However, the implementation of MM-NOI-3 is recommended where vibration-sensitive instruments could potentially be disrupted during construction.

4.10.3.5 Cumulative Impacts

This section provides an evaluation of noise and vibration impacts associated with the Project, including near-term development components, when considered together with other reasonably foreseeable cumulative development, as identified in Table 4.0-1 in Section 4.0, Introduction to Analysis, and as relevant to the evaluation of noise. The geographic area considered in the cumulative analysis for this topic is described in the impact analysis below.

Impact NOI-4:	**Cumulative Noise and Vibration Impacts (Thresholds A and B).** The Project would not result in a cumulatively considerable contribution to significant cumulative impacts related to noise and vibration. *(Less than Significant)*

The geographic scope for cumulative noise and vibration impacts is generally limited to areas within approximately 0.5 mile of the campus or less, as described below. This geographic scope is appropriate for noise and vibration because the Project's noise impacts are localized and site-specific.

Construction Noise

The distribution of cumulative projects shown in Figure 4.0-1 suggest that several on- and off-campus developments are near the campus boundary and include the following: the Monterey Bay Charter School New School project, the Freeman Stadium Facilities Renovation Project, and the Second Avenue Development Project on the CSUMB campus; and the Campus Town Specific Plan, the Dunes on Monterey Bay, the Projects at Main Gate Specific Plan, and the Concourse Auto Dealership surrounding the campus. Development of one or more of these off-campus projects concurrent with implementation of the Project, including five near-term development components, would create the potential for a cumulative construction noise and vibration impact only when such sites are sufficiently proximate. Since sound is only energy that attenuates naturally and rapidly with increasing distance travelled from a source, a potentially impacted noise-sensitive receptor would need to be physically near multiple concurrent projects. Therefore, unless construction of cumulative projects occurs at the same time and in close proximity to Project development sites (i.e., less than 500 feet), noise and vibration from individual construction projects would not likely combine to create cumulative impacts. For these reasons, cumulative noise and vibration impacts from construction are generally less than significant.

Noise and vibration associated with construction of new buildings and campus facilities associated with the Project would be intermittent, temporary, and would fluctuate over the years as new buildings are constructed and existing buildings are maintained or repaired. Additionally, MM-NOI-1 would require that: construction noise be limited to the less sensitive times of day; proper maintenance of construction equipment; all equipment is properly equipped with noise-reducing air intakes, exhaust mufflers, and engine shrouds; electrical power be used to run power tools and to power temporary structures; siting all stationary construction equipment and staging areas as far away as feasible from residences and educational land uses; and implementing special procedures when construction activities are expected to occur less than 175 feet from existing residences.

Given that construction activities associated with the Project would be dispersed throughout the campus and none of the off-campus projects listed in Table 4.0-1 and shown in Figure 4.0-1 are located within 500 feet of the campus, construction activities would not combine with construction noise and vibration from other construction activities in the area to result in a substantial increase in cumulative noise and vibration levels. Further, such off-campus cumulative projects would need to comply with municipal or County requirements for controlling construction noise. Given the above, cumulative impacts related to construction noise and vibration would be *less than significant*.

Operational Noise

Roadway Noise

Consistent with the Transportation Analysis (Appendix H), noise levels were modeled for Cumulative without Project Conditions and Cumulative with Project Conditions (see Table 4.10-14) in addition to modeling conducted for Existing Conditions and Existing with Project Conditions. Table 4.10-14 identifies the cumulative change in roadway noise by comparing the Cumulative with Project to Existing Conditions to determine whether a significant cumulative roadway noise impact could result due to all cumulative development, including the Project. As indicated in Table 4.10-14, potentially significant cumulative roadway noise impacts could result at ST-5 through ST-8 as the threshold would be exceeded. However, as the Project would cause less than a 2 dBA CNEL increase in roadway noise the Project's contribution to this impact would not be cumulatively considerable. As such, the cumulative impact of the Project related to roadway noise would be *less than significant*.

Table 4.10-14
Roadway Noise Modeling Results Summary

Site	Roadway Intersection	Existing CNEL (dBA) (1)	Cumulative without Project CNEL (dBA) (2)	Cumulative with Project CNEL (dBA) (3)	Cumulative Change (3-1)	Cumulative Change due to Project (dB) (3-2)	Cumulative Contribution to Significant Impact?
ST-1	Eighth Street and Second Avenue	61.5	63.7	64.1	2.6	0.4	No

Table 4.10-14
Roadway Noise Modeling Results Summary

Site	Roadway Intersection	Existing CNEL (dBA) (1)	Cumulative without Project CNEL (dBA) (2)	Cumulative with Project CNEL (dBA) (3)	Cumulative Change (3-1)	Cumulative Change due to Project (dB) (3-2)	Cumulative Contribution to Significant Impact?
ST-2	Eighth Street and Injin Road	58.4	62.6	63.5	5.1	0.9	No
ST-3	Eighth Street and Inter-Garrison Road	61.7	63.1	62.9	1.2	-0.2	No
ST-4	Eighth Avenue and Inter-Garrison Road	60.9	62.7	64.2	3.3	1.5	No
ST-5	Second Avenue and Divarty Street	64.1	67.4	67.4	**3.3**	0	No
ST-6	Sixth Avenue and Col. Durham Street	62.7	65.1	65.3	**2.6**	0.2	No
ST-7	Sixth Avenue and Gigling Road	67.4	70.2	71.7	**4.3**	1.5	No
ST-8	Lightfighter Drive and Gigling Road	62	65	65.1	**3.1**	0.1	No

Source: Appendix G
Notes:
CNEL = community noise equivalent level
Bold values indicate predicted roadway noise level increases exceed the threshold

Stationary Noise

Cumulative development listed in Table 4.0-1 and shown in Figure 4.0-1, as well as the Project, would include stationary equipment associated with building mechanical equipment. However, noise from these sources would be localized and would not combine with noise sources from other related projects in the area given the likely distance between sources. Further, off-campus cumulative projects would need to comply with municipal or County requirements for controlling stationary noise. On-campus projects would comply with PDF-D-8 which would require that an acoustical study of sound emission from proposed stationary noise sources be prepared during the schematic design process and as part of selection of these systems to ensure they comply with identified noise thresholds at sensitive receptor locations, as applicable. Therefore, substantial increases in cumulative noise levels from stationary sources would not be expected and the cumulative noise impact from stationary sources would be *less than significant.*

4.10.4 References

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