12 NOISE

12.1 INTRODUCTION

This chapter includes a description of acoustic fundamentals, a summary of applicable regulations, characterization of the existing noise environment, and analyses of potential short- and long-term noise impacts of the project alternatives.

The primary issues raised during scoping that pertain to noise included:

- concern regarding loud motor boats and boat speed limits,
- suggestions to enforce noise limits consistent with California boating noise laws,
- concern over the level of enforcement and education for boaters regarding noise and no-wake zones, and
- noise threshold attainment and maintenance.

The methods of analysis and noise propagation calculations for construction noise and vibration, operational noise, and traffic noise used in this chapter are consistent with the recommendations of the Tahoe Regional Planning Agency (TRPA), Federal Transit Authority (FTA), Federal Highway Administration (FHWA), and California Department of Transportation (Caltrans).

Where appropriate, specific issues that are not applicable to the project have been scoped out of this analysis; therefore, the following issues are not addressed in this chapter. Exposure to noise from airports would not occur because the Shoreline Plan does not include development of structures where people would reside or work near existing airports. In addition, no residential or tourist accommodation uses are proposed; therefore, noise-sensitive uses would not be placed in areas where existing noise levels exceed applicable limits.

12.1.1 Acoustic Fundamentals

Background information on sound, noise, vibration, and common noise descriptors is included to provide context and a better understanding of the technical terms and regulations referenced throughout this section.

The noise descriptors referenced or used in this section (Caltrans 2009) are defined as follows:

- Decibel (dB): a sound level expressed in decibels that is the logarithmic ratio of two like-pressure quantities, with one pressure quantity being a reference sound pressure of 20 micropascals.

- A-weighted decibel (dBA): the frequency-response adjustment of a sound level meter that conditions the output signal to approximate human hearing response. All noise levels in this analysis are A-weighted unless otherwise noted.

- Equivalent continuous sound level (L_{eq}): the equivalent steady-state sound level in a stated period that would contain the same acoustic energy as the time-varying sound level during the same period (i.e., average noise level).

- Maximum sound level (L_{max}): the highest instantaneous noise level during a specified period.

- Community noise equivalent level (L_{dn}/CNEL): similar to L_{dn}, L_{dn}/CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to sound levels occurring between 10 p.m. and 7 a.m. and a 5-dB penalty applied to sound levels occurring during evening hours between 7 p.m. and 10 p.m.

SOUND, NOISE, AND ACOUSTICS

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium to the human ear. In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

Sound Pressure Levels and Decibels

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

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. That is, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than if only one of the sound sources was producing sound under the same conditions. For example, if one automobile generates 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB.

A-Weighted Decibels

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

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

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgment correlates well with the A-scale sound levels of those sounds. Thus, noise levels are typically reported in terms of A-weighted decibels or dBA. Table 12-1 describes typical A-weighted noise levels for various noise sources.

Table 12-1 Typical A-Weighted Noise Levels

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

Source: Caltrans 2009

Human Response to Changes in Noise Levels

As discussed above, the doubling of sound energy results in a 3 dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different from what is measured. Under controlled conditions in an acoustical laboratory, the trained, healthy human ear can discern 1-dBA changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000–8,000 Hz) range. With respect to how humans perceive and react to changes in noise levels, a 1-dBA increase is imperceptible, a 3-dBA increase is barely perceptible, a 6-dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 2007).

In typical noisy environments, changes in noise of 1–2 dBA are generally not perceptible. However, it is widely accepted that people can begin to detect sound level increases of 3 dBA in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dBA increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dBA increase in sound would generally be perceived as barely detectable.

VIBRATION

Vibration is the periodic oscillation of a medium or object with respect to a given reference point. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous (e.g., operating factory machinery) or transient in nature. Vibration levels can be depicted in terms of amplitude and frequency, relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (FTA 2006; Caltrans 2013). PPV and RMS vibration velocity are normally described in inches per second (in/sec).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as vibration decibels (VdB), which serves to compress the range of numbers required to describe vibration (FTA 2006). This is based on a reference value of 1 micro inch per second (µin/sec).

The typical background vibration-velocity level in residential areas is approximately 50 VdB. Ground vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006).

Typical outdoor sources of perceptible ground vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Table 12-2 describes the general human response to different ground vibration-velocity levels.

Table 12-2 Human Response to Different Levels of Ground Noise and Vibration

Vibration-Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Note: VdB = vibration decibels referenced to 1 µin/sec and based on the RMS velocity amplitude.

Source: FTA 2006

12.2 REGULATORY SETTING

Key federal, state, and local regulatory requirements applicable to the project for noise-related impacts are discussed below.

12.2.1 Federal

FEDERAL NOISE CONTROL ACT OF 1972

The Federal Noise Control Act of 1972 established a requirement that all federal agencies must comply with applicable federal, state, and local noise control regulations. Federal agencies are directed to administer their programs in a manner that promotes an environment free from noise that jeopardizes public health or welfare.

U.S. DEPARTMENT OF TRANSPORTATION

To address the human response to ground vibration, the FTA established guidelines for maximum-acceptable vibration criteria for different types of land uses. These guidelines are used to determine potential impacts from plan-related construction and operational-related ground vibration, and include the following:

- 65 VdB, referenced to 1 µin/sec and based on the RMS velocity amplitude, for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities);

- 80 VdB for residential uses and buildings where people normally sleep; and
- 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA 2006).

12.2.2 Tahoe Regional Planning Agency

THRESHOLDS

TRPA has established environmental thresholds, known as Environmental Threshold Carrying Capacities (thresholds), for nine resources, including noise. There are two noise threshold indicators: single noise events and cumulative noise events, discussed separately below. Table 12-3 shows all adopted thresholds and Table 12-4 summarizes the status of attainment.

Single Noise Events

Single noise event threshold standards adopted by TRPA are based on the numerical value associated with the maximum measured level in acoustical energy during an event. This threshold establishes maximum noise levels (Table 12-3) for aircraft, watercraft, motor vehicles, motorcycles, off-road vehicles, and snowmobiles.

Cumulative Noise Events

TRPA adopted cumulative noise standards, expressed using the 24-hour community noise equivalent metric (CNEL) for different zones within the region to account for expected levels of serenity. Table 12-3 summarizes thresholds for single events (L_{max}) and thresholds for community noise events.

The noise limitations established in Chapter 68 of the TRPA Code of Ordinance (TRPA Code), including the noise standards of individual area plans, plan area statements (PAS), and community plans, do not apply to noise from TRPA-approved construction or maintenance projects, or the demolition of structures, provided that such activities are limited to the hours between 8:00 a.m. and 6:30 p.m. Further, the noise limitations of Chapter 68 do not apply to emergency work to protect life or property.

Table 12-3 TRPA Maximum Allowable Noise Levels

Single Noise Event Thresholds	
Types of Operations	**dBA L_{max}**
Aircraft	80 dBA/77.1 dBA[1] at 6,500 m- start of takeoff roll, 2,000 m-runway threshold approach
Boats (not to exceed any of 3 tests)	Pass-By Test: 82 dBA measured at 50 feet with engine at 3,000 rpm
	Shoreline Test: 75 dBA, microphone 5 ft above water, 2 ft above curve of shore, dock, or platform; watercraft in lake, no minimum distance (standard adopted 7/03)
	Stationary Test: 88 dBA if watercraft manufactured on or after 1/1/93 and 90 dB if watercraft manufactured before 1/1/93, microphone 3.3 ft from exhaust outlet-5 ft above water. (standard adopted 7/03)
Motor vehicles (less than 6,000 pounds GVW)	76 dBA running at <35/mph (82 dBA running at >35/mph) measured at 50 feet
Motor vehicles (greater than 6,000 pounds GVW)	82 dBA running at <35/mph (86 dBA running at >35/mph) measured at 50 feet
Motorcycles	77 dBA running at <35/mph (86 dBA running at >35/mph) measured at 50 feet
Off-road vehicles	72 dBA running at <35/mph (86 dBA running at >35/mph) measured at 50 feet
Snowmobiles	82 dBA running at <35/mph measured at 50 feet

Table 12-3 TRPA Maximum Allowable Noise Levels

Cumulative Noise Level Thresholds	
Use Type	**dBA CNEL**
Land-Use Based Thresholds	
High density residential	55
Low density residential	50
Hotel/motel facilities	60
Commercial area	60
Industrial	65
Urban outdoor recreation	55
Rural outdoor recreation	50
Wilderness and roadless areas	45
Critical wildlife areas	45
Transportation Corridor Thresholds[2]	
U.S. 50	65
State Routes 89, 207, 28, 267, and 431	55[)]
South Lake Tahoe Airport	60

Notes: CNEL = community noise equivalent level; dB = decibels; dBA = A-weighted decibels; mph = miles per hour; rpm = revolutions per minute; m = meter; ft = feet; GVW = gross vehicle weight.

[1] Between the hours of 8 p.m. and 8 a.m.

[2] The transportation corridor noise threshold overrides the land use–based CNEL thresholds and is limited to an area within 300 feet from the edge of the road.

Source: TRPA Code of Ordinances, Chapter 68

Table 12-4 Status of TRPA Noise Thresholds

Threshold Status	Noise Events
At or somewhat better than target	Low-density residential, hotel and motel, commercial areas, industrial areas, urban outdoor recreation areas, rural outdoor recreation areas, roadless areas, and U.S. 50 and State Route 431 corridors.
Somewhat worse than target	Aircraft departures and arrivals, watercraft (shoreline test), high-density residential, the South Lake Tahoe airport transportation corridor, and the State Route 28, 89, and 267 corridors.
Considerably worse than target	Critical wildlife habitat
Insufficient data to determine status or no target established	Watercraft (pass-by test), watercraft (stationary test), motor vehicles (less and greater than 6,000 GVW) motorcycles, off-road vehicles, and snowmobiles.

Note: GVW= gross vehicle weight.

Source: TRPA 2016

GOALS AND POLICIES

The Noise Subelement of the Goals and Policies document includes a goal to attain and maintain single-event noise standards that are relevant to the project (Goal N-1) and a goal to attain and maintain community noise equivalent levels (Goal N-2). The underlying policy intended to help achieve Goal N-1 includes preparing a model ordinance and encouraging local governments and the U.S. Coast Guard to adopt and enforce the model ordinance. As part of the policy, TRPA also encourages marinas and other boat

launching facilities to participate in implementation of the single-event threshold standard. The relevant policies intended to help achieve Goal N-2 include establishing specific site design criteria for projects to reduce noise from transportation corridors, which may include using earthen berms and barriers.

CODE OF ORDINANCES

Chapter 68, "Noise Limitations," of the TRPA Code is intended to implement the Noise Subelement of the Goals and Policies document and to attain and maintain the TRPA thresholds (discussed above). TRPA Code Section 68.4, "Community Noise Levels," states that TRPA shall use CNELs to measure community noise levels and that area plans, PASs, and community plans shall set forth CNELs that shall not be exceeded by any one activity or combination of activities. The CNELs set forth in the area plan, PASs, and community plans are based on the land use classification, the presence of transportation corridors, and the applicable threshold standard.

COMMUNITY PLANS, PLAN AREA STATEMENTS, AND AREA PLANS

As a means for providing orderly growth and development consistent with the TRPA Regional Plan, various community plans have been developed for specific urbanized areas, as determined by the Goals and Policies document. Each community plan establishes goals, objectives, special policies, programs, and strategies for funding and implementation of the unique community area. Each community plan contains unique maximum CNEL noise standards for the entire community plan area and for any special areas that it may contain. Following adoption of a community plan, all projects within the plan area must be consistent with the community plan.

TRPA has established PASs to direct development and preserve the natural character of the land surrounding Lake Tahoe. Boundaries for each of the plan areas have been established based upon similar land uses and the unique character of each geographic area. Each PAS contains noise standards based on the intensity of development in the PAS that are generally consistent with the environmental threshold standards for the land uses shown in Table 12-3. Maximum CNEL standards range from as low as 45 dBA CNEL in PASs where residential density is low and undisturbed land is ample (i.e., Mount Rose) to 65 dBA CNEL in PASs that contain entire communities (e.g., Ponderosa Ranch).

Area plans—a relatively new type of planning instrument borne out of the 2012 Regional Plan—supersede previously adopted community plans and PASs intended to implement the 1987 Regional Plan. Placer County, Douglas County, and the City of South Lake Tahoe have adopted area plans. As with community plans and PASs, area plans identify noise standards based on intensity of development.

Where a highway corridor overlaps an area plan, PAS, or community plan with a lower maximum CNEL standard, the highway corridor CNEL standard supersedes the CNEL standard established in those planning documents.

TRPA Best Construction Practices Policy

TRPA requires the following standard conditions for all project construction activity that involves grading; these conditions also apply to development within the shorezone of Lake Tahoe:

- Any normal construction activities creating noise in excess of the TRPA noise standards shall be considered exempt from said standards provided all such work is conducted between the hours of 8:00 a.m. and 6:30 p.m.

- Engine doors shall remain closed during periods of operation except during necessary engine maintenance.

- Stationary equipment (e.g., generators or pumps) shall be located as far as feasible from noise-sensitive receptors and residential areas. Stationary equipment near sensitive noise receptors or residential areas shall be equipped with temporary sound barriers.

12.2.3 California

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

CALIFORNIA STATE BUILDING CODE TITLE 24

The State of California's noise insulation standards are codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 2, California Building Code. Title 24 is applied to new construction in California and states that interior noise levels attributable to exterior sources shall not exceed 45 dBA in any habitable room. An acoustical analysis documenting compliance with the interior sound level standards shall be prepared for structures containing habitable rooms within the CNEL noise contours of 60 dBA or greater.

CALIFORNIA DEPARTMENT OF TRANSPORTATION

Caltrans Standard Specification 14-8.02, Noise Control, states that noise levels from construction activity between the hours of 9:00 p.m. and 6:00 a.m. shall not exceed 86 dBA L_{max} at 50 feet from the construction site (Caltrans 2015).

TRANSPORTATION- AND CONSTRUCTION-INDUCED VIBRATION

In 2013, Caltrans published the Transportation-and Construction Vibration Guidance Manual, which provides general guidance on vibration issues associated with construction and operation of projects in relation to human perception and structural damage. Table 12-5 below presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

Table 12-5 Caltrans Recommendations Regarding Vibration Levels

PPV (in/sec)	Effect on Buildings
0.4-0.6	Architectural damage and possible minor structural damage
0.2	Risk of architectural damage to normal dwelling houses
0.1	Virtually no risk of architectural damage to normal buildings
0.08	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.006-0.019	Vibration unlikely to cause damage of any type

Note: PPV = peak particle velocity.

Source: Caltrans 2013

12.2.4 Nevada

The State of Nevada does not have any specific laws pertaining to noise control. In Nevada, local cities and counties have the authority to regulate noise through local code.

12.3 AFFECTED ENVIRONMENT

12.3.1 Sensitive Land Uses

Noise-sensitive land uses generally include those uses where noise exposure could result in health risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, schools, historic sites, cemeteries, and recreation areas are also generally considered sensitive to increases in exterior noise levels. Places of worship and transient lodging, and other places where low interior noise levels are essential, are also considered noise sensitive. Those noted above are also considered vibration-sensitive land uses in addition to commercial and industrial buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance. Older buildings are also more prone to vibration-induced damage.

Existing sensitive land uses exist throughout the project vicinity around the lake. Because of the regional scale of this project and analysis, identification of individual receptors that might be affected by future, as yet unknown projects would not be possible. Noise levels and potential impacts are addressed generally because specific locations of future development are unknown.

12.3.2 Existing Noise Levels

The sound levels in most communities fluctuate, depending on the activity of nearby and distant noise sources, time of the day, or season of the year. Noise sources around Lake Tahoe include roadway traffic, aircraft, watercraft, and recreational activity (e.g., people talking, music playing, dogs barking). Other secondary noise influences include noise attributed to construction and natural events, such as thunderstorms.

As a part of continuing efforts to monitor and achieve established noise thresholds, TRPA conducts threshold evaluations every 4 years, and part of those evaluations includes taking noise measurements at various locations around the lake. Noise monitoring includes measuring noise associated with different land uses and single-noise events (e.g., boats, airplanes). For purposes of characterizing the existing ambient noise environment, cumulative/CNEL noise levels are presented here, as documented in the TRPA 2015 Threshold Evaluation Report (TRPA 2016). The status of all TRPA noise thresholds (i.e., land-use based, single event, transportation corridor) are discussed above and shown in Table 12-4.

Areas that are included in the threshold noise monitoring program where boat activity may be part of the ambient noise levels are listed below, along with their most recent documented maximum 24-hour CNEL measured during the threshold monitoring period. While most of these are upland areas that are not within the shorezone, many are areas that draw and concentrate boater traffic.

- Tahoe Keys Marina (High-Density Residential): 56.2 dBA CNEL,
- Rubicon Estates (Low-Density Residential): 47.6 dBA CNEL,
- Carnelian Bay Tourist Area (Hotel/Motel Areas): 52.2 dBA CNEL,
- Kingsbury Commercial Area (Commercial Areas): 57.1 dBA CNEL,
- Old Fish Hatchery (Urban Outdoor Recreation Areas): 50.1 dBA CNEL,
- Eagle Falls Parking Lot (Rural Outdoor Recreation): 45.8 dBA CNEL, and
- Rubicon Point (Critical Wildlife Habitat): 65.3 dBA CNEL.

12.4 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

12.4.1 Methods and Assumptions

To assess potential short-term, construction-related noise and vibration impacts, project-generated construction noise and vibration levels were determined based on methodologies, reference emission levels, and usage factors from the FTA *Guide on Transit Noise and Vibration Impact Assessment* methodology (FTA 2006) and the Federal Highway Administration *Roadway Construction Noise Model User's Guide* (FHWA 2006). Reference levels are noise and vibration emissions for specific equipment or activity types that are well documented in the field of acoustics.

The assessment of long-term increases in noise (e.g., watercraft and traffic) was based on available documentation pertaining to watercraft threshold attainment (i.e., TRPA 2015 Threshold Evaluation Report) and projected boat activity developed for the Shoreline Plan alternatives, as well as traffic generation rates developed for the project. Commonly used and accepted principles of acoustics were used for the assessment.

The Shoreline Plan establishes ordinances to guide and regulate resource management and development within the shorezone and lakezone of Lake Tahoe. Although it is anticipated that new boating structures (e.g., slips, buoys, lifts, boat ramps) would be located in areas near existing development or areas where boating structures are currently concentrated, the Shoreline Plan does not identify specific locations, timing of new structures to be built, or type of structures that would be constructed in any one location on the lake. Thus, due to the large geographic scale of the Shoreline Plan and the local nature of noise impacts (proximity of a noise source to an existing sensitive land use), individual sensitive receptors were not identified. Rather, a programmatic approach to the noise analysis was conducted. Adopted TRPA noise thresholds were evaluated generally based on available boating and traffic data. Specific noise standards pertaining to area plans, PASs, community plans, and for various land use types were not evaluated. Rather, long-term increases in noise are discussed generally in comparison to existing conditions and how they would affect the entire Tahoe Basin or overall threshold attainment.

12.4.2 Significance Criteria

Significance criteria related to noise and vibration are summarized below. The applicable TRPA threshold standards, the noise criteria from the TRPA Initial Environmental Checklist, and other relevant information were considered in the development of the significance criteria. An impact would be considered significant if it:

- causes a substantial temporary (or periodic) increase in ambient noise levels in the project vicinity above levels existing without the project;
- exposes existing structures to levels of ground vibration that could result in structural damage (i.e., exceedance of Caltrans's recommended level of 0.2 in/sec PPV with respect to the prevention of structural damage for normal buildings or FTA's maximum acceptable level of 80 VdB with respect to negative human response for noise-sensitive uses);
- increases existing CNELs beyond those permitted in applicable area plans, PASs, or community plans; or if traffic noise levels would exceed the contour-based transportation corridor noise thresholds;
- causes a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project (i.e., a long-term noise level increase of 3 dB or greater at a noise-sensitive receptor such as a residence, hotel, or tourist accommodation unit); or
- results in a substantial increase in the number of watercraft exceeding the 75-dBA single-event noise standard.

12.4.3 Environmental Effects of the Project Alternatives

Impact 12-1: Construction noise impacts

Construction activities would occur under all alternatives, including the No Project Alternative. Activities associated with construction of shorezone structures, including new piers, pier modifications, marinas, or new boat ramps would generate varying levels of noise. However, all activities would be carried out in a manner consistent with TRPA's standard permit conditions such that exposure of nearby receptors to construction-related noise is minimized and construction is limited to daytime hours. In addition, the types of activities associated with constructing new boating structures would be relatively minor, localized, temporary, and intermittent, and would not result in a substantial increase in temporary noise levels. Given the relatively low intensity of construction activities associated with shorezone structures and compliance with standard permit conditions, construction noise impacts associated with all four Shoreline Plan alternatives would be **less than significant**.

Alternative 1: Proposed Shoreline Plan

With Alternative 1, some construction activity would be associated with new piers and boat ramps. In addition, some of the existing buoys would be converted to slips, requiring minor construction work. Construction activities associated with new piers would require pile driving, material hauling, and heavy-duty equipment such as cranes. Construction of new boat ramps would require dredging, concrete pouring, and earth movement. Slip construction would be relatively minor but could involve material hauling and localized construction activity.

Construction equipment use would vary by project and phase but would generally involve operation of heavy-duty diesel equipment. Typical noise levels generated by various types of construction equipment likely to be used are identified in Table 12-6.

Table 12-6 Typical Noise Levels from Construction Equipment

Type of Equipment	Noise Level (dBA L_{max}) at 50 feet
Pile driver (for pier construction)	95
Crane/dozer/excavator/paver	85
Loader	80
Pickup trucks	55

Source: FHWA 2006

Construction noise can vary depending on equipment type, number of pieces of equipment operating simultaneously, and duration of activities. Different equipment and construction methods would be used for pier, boat ramp, and slip construction. Slip construction would be relatively minor and would not require use of heavy-duty construction equipment. Thus, this analysis focuses on pier and boat ramp construction, discussed separately below.

Pier Construction/Modification

Under the Shoreline Plan, 138 additional piers would be constructed, and existing piers could be modified; both types of activities would require construction. Although specific locations of new piers and pier modifications are unknown, pier construction would involve the use of cranes mounted on watercraft, pile driving to place pier poles, and other support equipment such as heavy-duty trucks to haul materials and light-duty trucks and vehicles for worker transportation. Boats or barges may be used during construction, but boat use would be minor and typically stationary during construction activities. The equipment used during pier construction is similar to those described above (e.g., excavator, loader, crane). Based on reference noise levels (Table 12-6), pile driving would result in the greatest noise levels.

Based on reference maximum noise levels for pile driving, and considering typical equipment usage factors, noise generated during pier construction or modification could result in noise levels of 95 dBA L_{max} and 88 dBA L_{eq} at 50 feet from construction. There are numerous locations around the shoreline where existing residential, tourist accommodation units, and other noise-sensitive land uses (e.g., recreational areas) currently exist. Because piles are typically needed for pier construction, and existing receptors are located within 50 feet of the shoreline in some parts of the lake, it is possible that pile driving for new pier construction could take place within 50 feet of an existing receptor, resulting in noise levels of up to 95 dBA L_{max}, depending on the actual location of piles and existing sensitive land uses.

Boat Ramps

Under the proposed Shoreline Plan, up to two new public boat ramps would be allowed. Construction activities would include dredging, material movement and site preparation, and paving. Although dredging may require the use of a barge or other watercraft, the equipment used during dredging is similar to those described above (e.g., excavator, loader, crane), and thus, reference noise levels shown in Table 12-6 were used to model noise levels associated with dredging. Based on reference maximum noise levels and considering typical equipment usage factors as well as multiple construction equipment operating simultaneously, boat ramp construction (dredging and paving) could result in noise levels of approximately 83 dBA L_{eq} and 89 dBA L_{max} at 50 feet (see Appendix D for modeling assumptions and outputs). Actual locations of the two new public boat ramps are unknown. Because specific locations of new or relocated boat ramps are unknown, and existing sensitive land uses exist within 50 feet of the shoreline, it is possible that construction from boat ramps results in noise levels of up to 89 dBA L_{max} at existing sensitive land uses.

All Construction

As discussed above, construction activities associated with new piers, pier modifications, and new boat ramps could generate varying levels of noise. However, construction activities would be consistent with TRPA's standard permit conditions that require measures to minimize the exposure of nearby receptors to construction-related noise. One of the key required measures is to limit noise-generating construction activity to the hours between 8:00 a.m. and 6:30 p.m. (TRPA No Date). In addition, the construction activities associated with all project components would be relatively minor, temporary, localized, and intermittent, not resulting in a substantial temporary increase in noise. Given the nature of such construction, and that construction would only occur during the less-sensitive daytime hours, this impact would be **less than significant**.

Alternative 2: Maintain Existing TRPA Shorezone Regulations (No Project)

Under the No Project Alternative, there would be no numeric cap on moorings. Construction of up to 4,871 buoys, 1,897 new slips, and 168 boat lifts could occur. Additionally, up to 476 new piers and modifications to existing piers could be constructed in accordance with current TRPA Code and guidelines, and up to six new boat ramps and two new marinas could be authorized.

Construction noise associated with new piers, pier modifications, boat slips, and boat ramps would be the same as described above for Alternative 1, but with the number of structures allowed, it is possible or even likely that construction of multiple shoreline structures would occur simultaneously and in close proximity. Noise associated with marina construction would be similar to that described for piers and pier modification, as similar equipment would be used, but it would be larger scale, over a larger area, and for a longer duration. Although construction activities are assumed to be generally greater under Alternative 2 in terms of the number of active sites at one time, potential proximity, and intensity, all construction activities within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, reducing noise exposure during the more sensitive times of the day. This impact would be **less than significant**.

Alternative 3: Limit New Development

Alternative 3 would authorize fewer structures than Alternative 1 or 2, with up to 365 new public buoys or slips, five new public piers, 86 new private piers, and one new public boat ramp. Construction noise associated with new piers, pier modification, boat slips, and boat ramps would be the same as described above for Alternative 1. All construction activities occurring within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, minimizing noise exposure during the more sensitive times of the day. This impact would be **less than significant**.

Alternative 4: Expand Public Access and Reduce Existing Development

The goal of Alternative 4 is to expand public access by providing new public piers and reduce existing shoreline development through transfer ratios that would reduce the number of shoreline structures on the lake. This alternative would allow 15 new public piers and no other new shoreline structures. Construction noise associated with new piers would be the same as described above for Alternative 1. All construction activities occurring within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, minimizing noise exposure during the more sensitive times of the day. This impact would be **less than significant.**

Mitigation Measures

No mitigation is required.

Impact 12-2: Construction vibration impacts

Construction activates would occur under all alternatives. Construction activities associated with new shorezone structures, including new piers, pier modifications, marinas, and new boat ramps would generate varying levels of vibration. Pile driving would be required for pier construction/modification and marina construction, resulting in vibration levels that could potentially damage existing structures if located within 55 feet. In accordance with TRPA standard construction practices, all construction activity would take place during the day, minimizing the potential for disturbance during noise-sensitive evening and nighttime hours. However, because specific locations of pile driving activity is unknown, there is a potential that existing structures could be exposed to excessive vibration levels that could result in structural damage. This impact would be **significant**. Mitigation would require site-specific acoustical analysis for projects that require pile driving activities close to existing structures and would ensure proper precautions to protect nearby structures from damage. With mitigation, this impact would be reduced to a **less-than-significant** level.

Alternative 1: Proposed Shoreline Plan

As discussed under Impact 12-1, new piers and pier modification construction work would require pile driving. Construction of other structures (e.g., boat slips, lifts) would involve minor construction activities but would not require the use of major vibration-inducing construction equipment (e.g., pile driving, blasting). Thus, the focus of this analysis is pile driving associated with 183 new piers or modification to existing piers.

According to FTA, vibration levels associated with typical pile drivers are 0.644 in/sec PPV and 104 VdB at 25 feet (FTA 2006). Based on FTA's recommended procedure for applying a propagation adjustment to these reference levels, vibration levels from pile driving could exceed Caltrans recommended level of 0.2 in/sec PPV with respect to the structural damage within 55 feet of pile driving activities and could exceed FTA's maximum acceptable level of 80 VdB with respect to human response within 160 feet of pile driving activities. Refer to Appendix D for attenuation calculations.

There are numerous existing private and public piers located around the lake at varying distances to existing structures, in some cases within 55 feet of existing buildings. It is unknown where additional future piers would be constructed but based on the location of some existing piers around the lake, it is possible that new piers would also be located within 55 feet of existing structures, potentially exposing the structures to ground vibration levels exceeding 0.2 in/sec PPV. Regarding disturbance to sensitive receptors from pile driving activity, all construction activity would be limited to the less sensitive times of the day, in accordance with TRPA's standard permitting requirements and best management practices. Nonetheless, the potential exists for pier construction to generate vibration that could exceed applicable thresholds of significance. This impact would be **significant**.

Alternative 2: Maintain Existing TRPA Shorezone Regulations (No Project)

Under the No Project Alternative, there would be no numeric cap on moorings. Alternative 2 could allow for construction of up to 1,897 new slips, 168 boat lifts, 476 new piers and modifications to existing piers, up to six new boat ramps, and two new marinas.

Pile driving would be required for pier construction and potentially for marina construction. Vibration levels would be the same as discussed for Alternative 1, but with the number of structures allowed, it is possible or that construction of multiple shoreline structures would occur simultaneously and in close proximity. As discussed above for Alternative 1, all construction activities occurring within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, minimizing vibration exposure during the more sensitive times of the day. However, because specific locations of future pier construction and pile driving is unknown and given that existing piers are located close to existing structures, it is possible that pile driving activity associated with Alternative 2 could exceed vibration thresholds at existing structures. This impact would be **significant**.

Alternative 3: Limit New Development

Alternative 3 would authorize fewer structures than Alternative 1 or 2, with up to 365 new public buoys or slips, five new public piers, 86 new private piers, and one new public boat ramp. Similar to Alternative 1, vibration associated with pile driving would be the primary source of ground vibration. As discussed above for Alternative 1, all construction activities occurring within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, minimizing vibration exposure during the more sensitive times of the day. However, because specific locations of future pier construction and pile driving is unknown and given that existing piers are located close to existing structures, it is possible that pile driving activity associated with Alternative 3 could exceed vibration thresholds at existing structures. This impact would be **significant**.

Alternative 4: Expand Public Access and Reduce Existing Development

The goal of Alternative 4 is to expand public access by providing new public piers and reduce existing shoreline development through transfer ratios that would reduce the overall number of shoreline structures on the lake. This alternative would allow 15 new public piers and no other new shoreline structures. Vibration levels associated with pile driving for new pier construction would be the same as described above for Alternative 1. All construction activities occurring within the Shoreline Plan area would be required to comply with TRPA's construction best management practices, minimizing vibration exposure during the more sensitive times of the day. However, because specific locations of future pier construction and pile driving is unknown and given that existing piers are located close to existing structures, it is possible that pile driving activity associated with Alternative 4 could exceed vibration thresholds at existing structures. This impact would be **significant**.

Mitigation Measures

Mitigation Measure 12-2: Vibration reduction measures

This mitigation measure applies to Alternatives 1, 2, 3, and 4.

To address potential vibration impacts associated with shorezone projects that involve pile driving activity, TRPA shall revise TRPA Permit Attachment S, "Standard Conditions of Approval for Shorezone Projects," to incorporate the following vibration reduction measures:

- All construction equipment, including vibration-inducing impact equipment, on construction sites shall be operated as far away from vibration-sensitive uses as reasonably possible.
- Earthmoving and ground-disturbing operations shall be phased so as not to occur simultaneously in areas close to sensitive uses, to the extent feasible. The total vibration level produced could be significantly less if each vibration source is operated at separate times.
- To prevent structural damage, minimum setback requirements for different types of ground vibration-producing activities (e.g., pile driving) for the purpose of preventing damage to nearby structures shall be established based on the proposed pile driving activities and locations, once determined. Factors to be considered include the specific nature of the vibration producing activity (e.g., type and duration of pile driving), local soil conditions, and the fragility/resiliency of the nearby structures. Established setback

requirements (i.e., 55 feet) can be breached if a project-specific, site specific analysis is conducted by a qualified geotechnical engineer or ground vibration specialist that indicates that no structural damage would occur at nearby buildings or structures or provides further recommendations (e.g., alternative pile driving methods, site monitoring requirements) to avoid damaging nearby structures.

Significance after Mitigation

Implementation of Mitigation Measure 12-2 would reduce vibration exposure at nearby receptors by locating equipment as far from receptors as possible, and by phasing operations for shorezone projects that are close enough to each other to combine to produce greater vibration levels. Further, if pile driving would be required near existing structures or sensitive receptors, a site-specific analysis would be required to determine appropriate measures that would prevent structural damage, and would consider site-specific and project-specific details, proximity of structures to pile driving activity, and specific vibration levels based on proposed pile driving parameters. These measures would result in compliance with recommended levels to prevent structural damage. With implementation of Mitigation Measure 12-2, this impact would be reduced to a **less-than-significant** level.

Impact 12-3: Increases in operation-related watercraft noise

Alternatives 1, 2, and 3 would result in additional boating structures (e.g., slips, buoys, lifts, boat ramps) that would contribute to an overall increase in boating activity over time. Because boating is generally a daytime activity and increases in boating activity would be distributed across the lake, it would have a negligible effect on CNEL, which considers noise levels in a given location over a 24-hour period. Single-event noise levels are affected by individual boater behaviors (e.g., exceeding speed limits in the no-wake zone) and boat/engine type. Under Alternatives 1, 2, and 3, TRPA would increase enforcement of the no-wake zone through additional boat crews, signage, and increased boater education, which would reduce such boater behaviors that contribute to exceedances of single-event noise standards. Further, none of the alternatives would result in a substantial increase (i.e., 3 dBA) in CNEL from increases in boating activity. This impact would be **less than significant**. With Alternative 4, no increases in boating activity would occur and there would be **no impact**.

As described above in the "Regulatory Setting" section, TRPA has established single-event noise standards for watercraft and cumulative noise standards for various land use types around the lake. In addition, noise standards are also established within area plans, PASs, and community plans. Implementation of the Shoreline Plan alternatives, except Alternative 4, would result in varying levels of boating activity increases around the lake; Alternative 4 is projected to retain boating levels at existing levels. Long-term operational increases in boating-related noise are addressed below for each alternative. The single-event noise standard for watercraft and the cumulative noise standards are considered separately.

Alternative 1: Proposed Shoreline Plan

Single-Event Noise

Single-noise-event threshold standards adopted by TRPA are based on the numerical value associated with the maximum measured level in acoustical energy during an event. These thresholds are intended to minimize noise associated with relatively short but loud noise events, such as boat engines that, at high levels, could disturb sleep or speech. As shown in Table 12-3, noise from watercraft shall not exceed 75 dBA as monitored at a distance of 5 feet above water.

TRPA has conducted noise monitoring since 2009 to determine compliance with the established 75 dBA threshold, and publishes results periodically, the latest in the 2015 Threshold Evaluation Report. Single-event noise standard exceedances are measured in number of average daily exceedances, based on monitoring conducted at nine different locations around the lake, during the peak boating season of July 4 through Labor Day. Based on the most recent 2015 Threshold Evaluation Report there has been little to no change in the total number of exceedances per day and the status of the threshold is somewhat worse than the target of zero exceedances (TRPA 2016). Also, as discussed in the 2015 Threshold Evaluation Report,

confidence in the trend for all single-event noise exceedances due to watercraft was low, with little statistical significance.

Additional monitoring was conducted in 2016 and 2017, with 2017 data representing the highest number of daily exceedances and 2013 the lowest (average of all sites) since monitoring began in 2009 (TRPA 2017). Annual boating data was also available for years 2013, 2015, 2016, and 2017, obtained from the total number of boat stickers issued in those years. The total number of boats on the lake in 2013 was 14,472, with a steady annual increase up to 16,625 boats in 2017 (Driscoll, pers comm., 2018). However, it is important to note that many factors contribute to the recorded exceedances of the single-event noise standard. For example, daily boating activity, boat types, boater behavior, and compliance (or lack thereof) with the no-wake zone can vary greatly and there could be more or fewer boats on any given day in proximity to where the noise monitoring is being conducted. Further, in some years monitoring occurred for as few as 10 days and in other years monitoring occurred for as many as 47 days, resulting in various sample sizes over the years of monitoring. Complete data regarding daily boating activity and boat type that resulted in the measured exceedances is not available.

Considering the variation in number of exceedances of the single-event noise standard recorded over the past 9 years and the many factors contributing to exceedances (e.g., individual boater behavior, boat engine type, enforcement level, boating activity in proximity to noise meter), the number of daily exceedances have not been shown to be positively correlated with increases in the number of boat trips. Likewise, there is not enough information to conclude that increases in boating activity would not lead to increases in single-event noise standard exceedances. In fact, it would be reasonable to assume that more boats on the lake in a given period could result in more people not complying with the no-wake zone, resulting in exceedance of the single-event noise standards. Currently, the daily and annual level of boating activity in combination with the level of TRPA enforcement of the no-wake zone results in exceedances of the single-event noise thresholds. Consistent with previous findings, the threshold is still not being achieved as any level of noncompliance results in non-attainment.

Noise sources from motorized watercraft include the engine revving, exhaust noise, and the boat slapping the water. Shoreline topography and wind can also influence noise levels. Currently, TRPA enforces a 600-foot no-wake zone, which requires boaters to limit their speed to 5 miles per hour (mph) within 600 feet of the shore and in all areas of Emerald Bay, with an exception of up to 7 mph for tour boats. Limiting boat speed reduces engine noise, exhaust noise, and wake-slapping noise, thus substantially reducing boat noise levels at the shore. Nonetheless, individual boater behavior (i.e., exceeding the speed limit in the 600-foot zone) and boat/engine type continue to cause exceedances of the single-event noise standard. In addition, boats that have malfunctioning or illegal exhaust systems also contribute to excessive noise levels that can exceed the standards.

Alternative 1 would authorize additional boating structures (e.g., slips, buoys, lifts, boat ramps) that would lead to a 13 percent increase in boating activity over existing conditions (Table 12-7). Considering that existing levels of enforcement and boating behavior results in incidences of exceedance of the standard, it is likely that the single-event noise standard would continue to be exceeded in the future regardless of the total number of boats on the lake at any given time. However, as discussed in further detail in the Chapter 2, “Description of Proposed Project and Alternatives,” enforcement of the no-wake zone would be increased under the Shoreline Plan. A new funding source would be created, and an additional TRPA boat crew would be established to increase enforcement of the no-wake zone. New signage would be installed in key areas along the shoreline such as marinas and state parks to remind boaters of the no-wake rules, and TRPA would increase education and training for staff at boat inspection sites and motorized rental concessions to increase public awareness of the no-wake rules around the lake.

Exceedance of the watercraft single-event noise level standard is directly related to individual boater behavior, boat type, and enforcement of the existing 600-foot no-wake zone requirement. Considering that annual average boating activity has continued to increase on the lake and will continue to increase with the Shoreline Plan, it is plausible that the likelihood for the single-event noise exceedances would increase if nothing were to be done in comparison to existing conditions. However, because enforcement and education

of the no-wake zone rules will be increased around the lake, future increases in the exceedance of the single-event noise standard would be likely be reduced or avoided. Because TRPA will expand enforcement of current regulations designed to reduce single-event boat noise, and there is no evidence to suggest that a 13 percent increase in boat use would substantially increase the number of exceedances of the 75-dBA single-event noise standard, Alternative 1 would result in a **less-than-significant** impact with regard to single-event noise.

Ambient Noise Levels

In addition to single-event noise standards, TRPA maintains cumulative noise standards, measured using a weighted average of all measured noise over a 24-hour period using the CNEL indicator. Adopted CNEL standards range from 40 dBA where residential density is low and undisturbed land is ample, to 65 dBA in highway corridors. CNEL standards are also established for area plans, PASs, and community plans. See Table 12-3 for complete list of TRPA CNEL noise standards.

Boat trips originate from buoys, slips, boat houses, boat lifts, boat ramps, and marinas. As such, boat activity can be estimated based on the number of each type of structure on the lake. Implementation of this alternative would regulate the number of allowable structures on the lake, thereby reducing overall boat activity in comparison to Alternative 2, under which caps on boating structures would not be put in place. Alternative 1 would authorize additional buoys, slips, boat lifts, and boat ramps, resulting in increases in boating activity or boat trips originating and ending at shoreline structures (Table 12-7).

Table 12-7 Effects of Alternative 1 on Boating Activity

Boat-Trip Generating Structure	Existing Trips (peak day)	Existing + Alternative 1 Trips (peak day)	Percent Increase
Buoy	1,050	1,551	48
Slip	1,478	1,501	2
Boat house	27	27	0
Boat lift	93	109	17
Boat ramps	2,492	2,719	9
Marina	49	49	0
Rental concessions	710	710	0
Total	5,899	6,666	13

Source: Boat use estimates prepared by the Joint Fact-Finding Committee (Appendix A)

As shown in Table 12-7, total boat trips are anticipated to increase by 13 percent with implementation of this alternative. The greatest increase in trips would be associated with additional buoys. In assessing increases in noise, a doubling of the noise source results in a 3-dBA increase. This principle applies to all noise sources, including boats. Thus, when considering overall average noise increases on the lake, a 13 percent increase in boat trips (i.e., noise source) would not result in a substantial increase in average noise over existing conditions. Further, additional buoys would contribute the most to projected increases in boating activity and increased boat trips would be dispersed throughout the lake, depending on location of new buoys. Therefore, although overall boating activity would increase by 13 percent lake wide, the increase in activity at any one location would be far less than 13 percent and depending on distribution, would likely be indiscernible.

TRPA has adopted land-use-based CNEL standards, which consider noise over a 24-hour period. Because boating typically takes place during daytime hours, it has less of an effect on CNEL noise levels. Further, due to the 600-foot no-wake zone enforced by TRPA, noise from boats is not typically the primary noise source within the land uses surrounding the lake; roadway noise, recreation activity, special events, and other environmental noise sources are often more pronounced. Exceptions to this would include areas where these noise sources are not present such as undeveloped portions of the shoreline without adjacent

roadways. However, as discussed above, increased enforcement of the no-wake zone would include identifying primary areas of concern which include state parks and places where preserving the quiet natural setting is important. Ensuring that boat noise is minimal near the shoreline would reduce the overall effect of boat noise on the CNEL standards at receiving land uses, as noise dissipates rapidly with increased distance from the source. Thus, given the increase in TRPA enforcement around the lake and the fact that primary noise sources in many parts of the lake are not a result of boating activity, increases in boating activity would have little to no effect on land use-based CNEL standards.

Up to two new boat ramps could be constructed under this alternative, resulting in localized noise increases at the boat ramp locations. However, for the same reasons discussed above, boat activity at new boat ramps would not contribute substantially to the CNEL noise levels associated with land use types (e.g., residential, commercial, recreational) or established in area plans, PASs, or community plans. Alternative 1 would not result in substantial increases in noise over existing conditions. In fact, adoption of the Shoreline Plan would limit overall boating activity over the long-term, resulting in relatively small increases in watercraft use and activity compared to what might occur with no limits on boating activity. This impact would be **less than significant**.

Alternative 2: Maintain Existing TRPA Shorezone Regulations (No Project)

Alternative 2 would authorize additional boating structures (e.g., slips, buoys, lifts, boat ramps, marinas) that would lead to a 51 percent increase in boating activity over current conditions (Table 12-8). For the same reasons discussed above for Alternative 1, increases in boating activity under this alternative would not be expected to result in a substantial increase in the number of exceedances of the watercraft single-event noise threshold. Additional boat trips would be dispersed throughout the lake, resulting in lower increases at any one location on the lake than reported for total boating activity associated with all structure types (Table 12-8). For example, this alternative would result in an increase of approximately 1,200 trips associated with all new buoys. However, the buoys would be distributed throughout the lake and trips originating from each buoy would be variable with regard to path, distance, destination, and timing, thereby dispersing the noise source. Because total boating activity would not double in any given location at a given time, and boat trips would be dispersed throughout the lake, increases in boating activity would not result in a substantial (i.e., 3 dBA) increase in noise over existing conditions. This impact would be **less than significant**.

Table 12-8 Effects of Alternative 2 on Boating Activity

Boat-Trip Generating Structure	Existing Trips (peak day)	Existing + Alternative 2 Trips (peak day)	Percent Increase
Buoy	1,050	2,268	117
Slip	1,478	2,161	46
Boat house	27	27	0
Boat lift	93	152	40
Boat ramps	2,492	3,171	27
Marina	49	49	0
Rental concessions	710	710	0
Total	5,899	8,537	45

Source: Data provided by TRPA in 2018

Alternative 3: Limit New Development

Alternative 3 would authorize additional boating structures (e.g., slips, buoys, lifts, boat ramps) that would lead to a 4 percent increase in boating activity over current conditions (Table 12-9). For the same reasons discussed above for Alternative 1, increases in boating activity under this alternative would not result in a substantial increase in the number of exceedances of the watercraft single-event noise standard. Further, for the same reasons described above, overall boating activity would not result in a doubling of the noise source and, therefore, would not result in a substantial (i.e., 3 dBA) increase in noise over existing

conditions. Additional boating structures and associated boating activity with this alternative would be less than Alternatives 1 and 2 but would still result in some level of increase over existing conditions. However, given that total increases in boating activity would be modest and new structures would be distributed across the lake, additional boating activity under this alternative would not result in an audible increase (i.e., 3 dBA) in noise. This impact would be **less than significant**.

Table 12-9 Effects of Alternative 3 on Boating Activity

Boat-Trip Generating Structure	Existing Trips (peak day)	Existing + Alternative 3 Trips (peak day)	Percent Increase
Buoy	1,050	1,125	7
Slip	1,478	1,501	2
Boat house	27	27	0
Boat lift	93	103	11
Boat ramps	2,492	2605	5
Marina	49	49	0
Rental concessions	710	710	0
Total	5,899	6,121	4

Source: Data provided by TRPA in 2018

Alternative 4: Expand Public Access and Reduce Existing Development

The goal of Alternative 4 is to expand public access by providing new public piers and reduce existing shoreline development through transfer ratios that would reduce the overall number of shoreline structures on the lake. This alternative would allow 15 new public piers and no other new shoreline structures. Because no additional mooring or boat ramps would be allowed with this alternative, boat trips on the lake would be essentially the same as existing conditions. Existing pier locations and other structures may be relocated, simply shifting or relocating some of the existing boat activity. However, because no increases in boat activity would occur, existing noise levels would not change and there would be **no impact**.

Mitigation Measures

No mitigation is required.

Impact 12-4: Increases in operational-related traffic noise

Alternatives 1, 2, and 3 would result in additional boating structures (e.g., slips, buoys, lifts, boat ramps) that would lead to an overall increase in boating activity, and commensurate increases in roadway traffic as compared to existing conditions. However, Alternatives 1, 2, and 3 would not result in a substantial increase (i.e., 3 dBA) in average noise levels from increases in traffic. This impact would be **less than significant**. With Alternative 4, no increases in boating activity or additional vehicle trips would occur and there would be **no impact**.

Alternative 1: Proposed Shoreline Plan

As described above, Alternative 1 would allow additional boating structures (e.g., slips, buoys, lifts, boat ramps) that could generate increased boating activity. As a result, increases in roadway traffic could occur on the various roads that would serve these new recreational amenities.

Major roadways, typically used by people entering and leaving the region, have been identified in the TRPA Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS) and are summarized in Chapter 13, “Automotive Transportation and Circulation.” Because locations of future boating structures are unknown at this time, traffic noise increases on specific roadway segments cannot be evaluated. This analysis considers the potential increases in traffic associated with this alternative in comparison to existing

volumes for the 24 roadway segments identified in the RTP/SCS, which are primary roadways used to access the lake and associated amenities.

Based on the traffic modeling conducted and summarized in Chapter 13, "Automotive Transportation and Circulation," this alternative could result in an increase of up to 632 daily vehicle trips during the peak boating season. As discussed above in the "Affected Environment" section and under Impact 12-3, a doubling of a noise source results in a 3-dBA increase in noise. Of the 24 study segments, the lowest existing traffic volume of 3,400 daily trips occurs on State Route 89 from U.S. 50 to Pomo Street. Even in the highly unlikely situation that all new trips occurred on this segment, existing volumes would not double and traffic noise increases would be less than 3 dBA. Further, existing volumes on the other identified road segments range from 3,400 to 39,500 daily trips. Thus, an additional 632 trips during the peak boating season would represent substantially smaller incremental increases on other roadways in the basin.

In accordance with the requirements of Mitigation Measure 3.6-1 in the 2012 Regional Plan Update (RPU) EIS (TRPA 2012:3.6-15 through 3.6-16) and Mitigation Measure 3.6-4 of the 2012 RTP/SCS EIR/EIS, TRPA developed its Region-wide traffic noise mitigation program. This program aims to reduce traffic noise levels along highways where they currently exceed applicable TRPA standards and to maintain traffic noise levels along highways where they currently do not exceed TRPA thresholds. With this mitigation, the 2012 RTP/SCS EIR/EIS determined that transportation corridor noise levels would be in attainment of TRPA thresholds. Moreover, individual future actions that require permits from TRPA (e.g., buoys, marinas, boat ramps, slips, lifts) would be subject to project-level environmental review and TRPA would only approve individual projects that can demonstrate compliance with TRPA's adopted thresholds.

In summary, additional trips associated with this alternative would not result in substantial noise increases on any study roadway segment and future development would be required to comply with adopted TRPA thresholds. This impact would be **less than significant**.

Alternative 2: Maintain Existing TRPA Shorezone Regulations (No Project)

Without additional regulation on boat structures with this alternative, boat activity and associated traffic would increase by 2,723 trips during the peak boating season. Although traffic and associated noise would be higher with this alternative compared to Alternative 1, for the same reasons described above for Alternative 1, traffic noise increases would still be below 3 dBA on all roadway segments. Also, future development that require permits from TRPA (e.g., buoys, marinas, boat ramps, slips, lifts) would be subject to project-level environmental review and TRPA would only approve individual projects that can demonstrate compliance with TRPA's thresholds. In summary, additional trips associated with this alternative would not result in substantial noise increases on any study roadway segment and future development would be required to comply with adopted TRPA standards. This impact would be **less than significant**.

Alternative 3: Limit New Development

Alternative 3 would authorize additional boating structures (e.g., slips, buoys, lifts, boat ramps) that would lead to an overall increase in boating activity. As a result, increases in traffic could occur on the various roads that would serve these new recreational amenities. Based on the traffic modeling conducted, this alternative could result in an increase of up to 423 daily trips during the peak boating season. Similar to the discussion for Alternative 1, increases of 423 daily vehicle trips would not result in a substantial increase in noise on any affected roadway. Any future development that requires a permit from TRPA (e.g., buoys, marinas, boat ramps, slips, lifts) would be subject to project-level environmental review and TRPA would only approve individual projects that can demonstrate compliance with TRPA's thresholds. In summary, additional trips associated with this alternative would not result in substantial noise increases on any study roadway segment and future development would be required to comply with adopted TRPA standards. This impact would be **less than significant**.

Alternative 4: Expand Public Access and Reduce Existing Development

The goal of Alternative 4 is to expand public access by providing new public piers and reduce existing shoreline development through transfer ratios that would reduce the overall number of shoreline structures on the lake. This alternative would allow 15 new public piers and no other new shoreline structures. Because

no additional mooring or boat ramps would be allowed with this alternative, boat trips and associated traffic increases are not anticipated to increase over existing conditions. Existing pier locations and other structures may be relocated, simply shifting or relocating some of the existing boat activity. However, because no increases in boat activity and associated traffic would occur, existing noise levels would not change and there would be **no impact**.

Mitigation Measures

No mitigation is required.

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