4.9 NOISE

INTRODUCTION

This section evaluates the potential short-term construction and long-term operational noise impacts of the proposed Alamitos Bay Marina Rehabilitation Project. This analysis is intended to satisfy the City of Long Beach's requirement for a project noise impact analysis by examining the short-term construction and long-term operational impacts on on-site and off-site land uses involving sensitive receptors and evaluating the effectiveness of proposed mitigation measures. Noise calculation sheets developed during preparation of the following noise analysis are included in Appendix I.

4.9.1 EXISTING ENVIRONMENTAL SETTING

4.9.1.1 Fundamentals of Noise

Noise Definition. Noise impacts can be described in three categories. The first is audible impact, which refers to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3.0 decibels (dB) or greater, because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1.0 and 3.0 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise levels of less than 1.0 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant and adverse.

Characteristics of Sound. Sound is increasing in the environment and can affect quality of life. Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep. To the human ear, sound has two specific characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations (or cycles per second) of a wave, resulting in the tone's range from high to low. Loudness is the strength of a sound and describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves, combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with

instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent noise sensitive land uses.

Measurement of Sound. Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level deemphasizes low and very high frequencies of sound similar to the human ear's deemphasis of these frequencies. Unlike linear units, such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve.

For example, 10 dB are 10 times more intense than 1 dB, 20 dB are 100 times more intense, and 30 dB are 1,000 times more intense. Thirty decibels (30 dB) represent 1,000 times as much acoustic energy as 1 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 A-weighted decibels (dBA) (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source, such as highway traffic or railroad operations, the sound decreases 3 dB for each doubling of distance in a hard-site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases 4.5 dB for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. Equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. The predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally exchangeable. The noise adjustments are added to the noise events occurring during the more sensitive hours.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels, denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions and addresses the annoying aspects of intermittent noise.

Another noise scale often used together with the L_{max} in noise ordinances for enforcement purposes is noise standards in terms of percentile noise levels. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Psychological and Physiological Effects of Noise. Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions and thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160–165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in less-developed areas.

Vibration. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by the occupants as motion of building surfaces, rattling of items on shelves or wall hangings, or a low-frequency rumbling noise. The rumble noise is caused by the vibrating walls, floors, and ceilings radiating sound waves. Groundborne vibration is usually measured in terms of vibration velocity, either the root-mean-square (rms) velocity or peak particle velocity (PPV). Root-mean-square is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and sensate ranges in buildings very close to the site. Problems with groundborne vibration from construction sources are usually localized to areas within approximately 100 feet (ft) from the vibration source.

4.9.1.2 Sensitive Land Uses in the Project Vicinity

Certain land uses are considered more sensitive to noise than others. Examples of these include residential uses, educational facilities, hospitals, childcare facilities, outdoor recreation areas, and senior housing. The sensitive land uses within the vicinity of the proposed project include the existing residences and Marina Park within the Marina. These land uses are located within 100 to 250 ft of the on-site construction areas.

4.9.1.3 Overview of the Existing Noise Environment

The primary existing noise sources in the project area are from vehicle traffic on project area roadways and from boating activities. Traffic on Pacific Coast Highway and Second Street contribute to area ambient noise levels.

4.9.2 REGULATORY SETTING

4.9.2.1 City of Long Beach General Plan Noise Element

The Noise Element of the General Plan contains noise standards for mobile noise sources. These standards address the impacts of noise from adjacent roadways and airports. The City specifies outdoor and indoor noise limits for residential uses, places of worship, educational facilities, hospitals, hotels/motels, and commercial and other land uses. The noise standard for exterior living areas is 65 dBA CNEL. The indoor noise standard is 45 dBA CNEL, which is consistent with the standard in the California Noise Insulation Standard.

4.9.2.2 City of Long Beach Municipal Code

The City has adopted a quantitative Noise Control Ordinance, No. C-5371, Long Beach 1977 (Municipal Code, Chapter 8.80). The ordinance establishes maximum permissible hourly noise levels (L_{50}) for different districts throughout the City. Tables 4.9.A and 4.9.B list exterior noise and interior noise limits for various land uses. For the purposes of analyzing the proposed project, the exterior noise standard of 70 dBA L_{max} has been applied to all of the sensitive land uses, the residences, the preschool, and the open space recreation areas located within the vicinity of the project construction areas.

Table 4.9.A: Exterior Noise Limits, L_N (dBA)

Receiving Land Use	Time Period	L_{50}	L_{25}	L_8	L_2	L_{max}
Residential (District One)	Night: 10:00 p.m.–7:00 a.m.	45	50	55	60	65
	Day: 7:00 a.m.–10:00 p.m.	50	55	60	65	70
Commercial (District Two)	Night: 10:00 p.m.–7:00 a.m.	55	60	65	70	75
	Day: 7:00 a.m.–10:00 p.m.	60	65	70	75	80
Industrial (District Three)	Anytime[1]	65	70	75	80	85
Industrial (District Four)	Anytime[1]	70	75	80	85	90

[1] For use at boundaries rather than for noise control within industrial districts.
dBA = A-weighted decibels
L_{max} = maximum sound level
L_N = percentile noise exceedance level
L_{50} = Noise level representing the median noise level; half the time the noise level exceeds this level and half the time it is less than this level
L_{25} = the noise level exceeded 25 percent of the time during a stated period
L_2 = the noise level exceeded 2 percent of the time during a stated period

Table 4.9.B: Maximum Interior Sound Levels, L_N (dBA)

Receiving Land Use	Time Interval	L_8	L_2	L_{max}
Residential	10:00 p.m.–7:00 a.m.	35	40	45
	7:00 a.m.–10:00 p.m.	45	50	55
School	7:00 a.m.–10:00 p.m. (while school is in session)	45	50	55
Hospital and other noise-sensitive zones	Anytime	40	45	50

dBA = A-weighted decibels
L_{max} = maximum sound level
L_N = percentile noise exceedance level
L_8 = the noise level exceeded 8 percent of the time during a stated period
L_2 = the noise level exceeded 2 percent of the time during a stated period

The City's Noise Control Ordinance (Section 8.80.202) governs the time of day that construction work can be performed. The Noise Ordinance prohibits construction, drilling, repair, remodeling, alteration, or demolition work between the hours of 7:00 p.m. and 7:00 a.m. on weekdays or federal holidays (considered a weekday) if the noise would create a disturbance across a residential or commercial property line or violate the quantitative provisions of the ordinance, except for emergency work authorized by the building official.

The Noise Ordinance prohibits construction, drilling, repair, remodeling, alteration, or demolition work between the hours of 7:00 p.m. on Friday and 9:00 a.m. on Saturday and after 6:00 p.m. on Saturday, except for emergency work authorized by the building official. No construction, drilling, repair, remodeling, alteration, or demolition work shall occur at anytime on Sundays, except for emergency work authorized by the building official.

4.9.3 METHODOLOGY

An evaluation of noise impacts associated with a proposed project typically includes the following:

- Determine the short-term construction noise impacts on on-site and off-site noise-sensitive uses with industry-recognized noise emission levels for construction equipment.
- Determine the long-term operational noise impacts, including vehicular traffic and aircraft activities, on on-site and off-site noise-sensitive uses.
- Determine the required mitigation measures to reduce short-term and long-term noise impacts from all sources.

4.9.4 THRESHOLDS OF SIGNIFICANCE

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, the following thresholds were used to assess the significance of potential noise impacts:

- Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The applicable noise standards governing the project site are the criteria in the City of Long Beach General Plan Noise Element and the City of Long Beach Municipal Code.

4.9.5 IMPACTS AND MITIGATION MEASURES

Implementation of the proposed project would result in short-term construction noise impacts. Once the project has been completed, the noise generated by on-site activities would

return to preexisting levels. The following focuses on the increase in noise associated with construction of the proposed project.

4.9.5.1 Less Than Significant Impacts

The following impacts that could result from implementation of the proposed project were evaluated and considered less than significant.

Long-Term Operational Noise Impacts. Rehabilitation of the Alamitos Bay Marina would reduce the number of boat slips from 1,967 to 1,646. Therefore, it is not expected that the proposed project would increase the number of vehicle trips on local roadways or boats using the docks. The proposed project would not result in any long-term noise impacts.

Airport Noise Impacts. The project site is located approximately 6 miles south of Long Beach Airport. The project will not create any new noise-sensitive land use or add any sensitive users. Construction workers will follow standard procedures regarding hearing protection to prevent exposure to excessive airplane noise, as necessary. Therefore, no impacts related to aircraft noise would occur as a result of the project.

Short-Term Construction-Related Vibration Impacts. The primary source of vibration during construction would be generated by the proposed pile driving. The closest pile-driving activities to a sensitive receptor would occur during Phase 12 at a distance of 100 ft from the nearest residence. Using Equation 9 and Table 17 from the Caltrans *Transportation and Construction-Induced Vibration Guidance Manual* (Jones & Stokes, June 2004), it was estimated that the vibration level at these residences would be 0.08 inches per second (in/sec). This construction vibration level would exceed the 0.02 in/sec threshold of perception. However, this level would be below the 0.1 in/sec annoyance threshold, below which there is virtually no risk of resulting in architectural damage to normal buildings. Therefore, the proposed project would not result in any significant vibration impacts.

Exposure of Sensitive Land Uses along the Haul Truck Routes. Land uses involving sensitive receptors located along the proposed haul truck routes such as residences, parks, and schools would be exposed to noise levels of up to 86 dBA L_{max} at a distance of 50 ft. Project construction during Phases 2 and 3 is expected to require 1,435 truck trips to remove dredge material from Basin 1 over a 12-month period, or an average of approximately three truck trips per hour. The trucks would depart from the staging areas on Marina Drive and be routed north on Marina Drive, east on 2nd Street, and north on Studebaker Road. This route traverses primarily commercial areas and does not affect any sensitive receptors.

Furthermore, the addition of three truck trips per hour to the local roadways would not result in a perceptible change in traffic noise.

Removal of excavated soils from the open space/habitat mitigation during Phase 1A is estimated to require 585 truck loads over 33 days, or an average of approximately 9 trucks trips per hour. Trucks from the open space/habitat mitigation site will be routed west on Eliot Street, west on Colorado Street, north on Park Avenue, and east on Seventh Street. There are residential uses along this haul route, and there will be short-term intermittent high noise levels associated with trucks passing by from the project site. However, the addition of nine truck trips per hour to the local roadways would not result in a perceptible change in traffic noise. Additionally, because the length of construction for each of these phases is limited, construction truck noise is a short-term impact and will cease once construction of each phase is completed. Therefore, the noise from haul trucks traveling along local roadways would be less than significant.

4.9.5.2 Potentially Significant Impacts

The following impacts that could result from implementation of the proposed project were evaluated and considered potentially significant.

Short-Term Construction-Related Noise Impacts. Two types of short-term noise impacts would occur during project construction. The first is the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from the project site. The pieces of heavy equipment for grading and construction will be moved to the site and remain as needed for the duration of each construction phase. The increase in traffic flow on the surrounding roads due to construction traffic is expected to be small. The associated increase in long-term traffic noise will not be perceptible. However, there will be short-term intermittent high noise levels associated with trucks passing by from the project site.

The second type of short-term noise impact is related to the noise generated by heavy equipment operating within the project area. The proposed Marina rehabilitation will be divided into 12 phases throughout Alamitos Bay. Each phase of construction will consist of multiple tasks. The activities that will occur during these tasks will include:

- Removal of the existing gangways
- Installation of new gangways
- Installation of temporary docks
- Dredging and pile removal

- Seawall and riprap repair
- Restroom replacement
- Parking lot pavement

The following construction equipment will be required to complete the above tasks:

- Backhoes
- Loaders
- Bobcats
- Paving equipment
- Heavy-duty trucks
- Gas skiffs
- Cranes
- Clam buckets
- Diesel tenders
- Pile drivers

Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 4.9.C lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor.

Pile driving will be the noisiest activity on site, generating up to 93 dBA L_{max} at a distance of 50 ft. Other construction equipment used on site, such as loaders and backhoes, would generate up to 86 dBA L_{max} at a distance of 50 ft.

Table 4.9.C: Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 ft)	Suggested Maximum Sound Levels for Analysis (dBA at 50 ft)
Pile drivers, 12,000 to 18,000 ft-lb/blow	81–96	93
Rock drills	83–99	96
Jackhammers	75–85	82
Pneumatic tools	78–88	85
Pumps	74–84	80
Scrapers	83–91	87
Haul trucks	83–94	88
Cranes	79–86	82
Portable generators	71–87	80
Rollers	75–82	80
Dozers	77–90	85
Tractors	77–82	80
Front-end loaders	77–90	86
Hydraulic backhoe	81–90	86
Hydraulic excavators	81–90	86
Graders	79–89	86
Air compressors	76–89	86
Trucks	81–87	86

Source: Noise Impact Analysis, May 2008.
dBA = A-weighted decibels
ft = feet
ft-lb/blow = foot-pounds per blow

The following land uses are located within the vicinity of the proposed construction activities:

- **Residential Development.** The nearest sensitive receptors, residential homes located around Alamitos Bay, are located at a distance of approximately 100 ft and may be subjected to short-term noise reaching 87 dBA L_{max} generated by construction activities. Homes located within 315 ft of the standard construction equipment and 706 ft of the pile driving would be exposed to noise levels in excess of the City's daytime exterior noise standard of 70 dBA L_{max}.
- **Open Space Recreation Uses.** Open space recreation uses such as Marina Park are located at a distance of approximately 250 ft from construction areas and may be

subjected to short-term noise reaching 79 dBA L_{max} generated by construction activities. Sensitive open space uses located within 315 ft of the standard construction equipment and 706 ft of the pile driving would be exposed to noise levels in excess of the City's daytime exterior noise standard of 70 dBA L_{max}.

Due to the distance between construction activities and the existing sensitive receptors, project construction activities would result in a significant noise impact; however, the noise impact would be intermittent and temporary. Construction-related, short-term noise levels would be higher than existing ambient noise levels in the project area but would no longer occur once construction of the project is completed. The City of Long Beach Municipal Code allows elevated construction-related noise levels as long as the construction activities are limited to the hours specified. Adherence to the City's noise regulations and implementation of Mitigation Measures 4.9-1 through 4.9-5 would reduce construction noise impacts to sensitive receptors; however, the construction noise impacts would remain significant and unavoidable due to intermittent high levels of noise and the disturbance that noise will have on nearby residents and the public using outdoor recreation open space.

4.9.6 MITIGATION MEASURES

All construction activities shall be carried out in accordance with the City's Noise Ordinance. The following mitigation measures are incorporated to offset potentially significant adverse construction-related noise impacts of the proposed project.

4.9-1 Prior to the issuance of any permit, the Marine Bureau Manager shall demonstrate that the following requirements are printed on all final project plans: Consistent with the City of Long Beach (City) Noise Ordinance, construction activity that produces loud or unusual noise that could impact a reasonable person of normal sensitivity shall be limited to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and federal holidays, and between 9:00 a.m. and 6:00 p.m. on Saturdays. No construction activities shall occur on Sundays.

4.9-2 Prior to the issuance of any permit, the Marine Bureau Manager shall demonstrate that the following requirement is printed on all final project plans: during construction and demolition, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.

4.9-3 Prior to the issuance of any permit, the Marine Bureau Manager shall demonstrate that the following requirement is printed on all final project plans: the project contractor shall place all stationary construction equipment

so that emitted noise is directed away from sensitive receptors nearest the project site.

4.9-4 Prior to the issuance of any permit, the Marine Bureau Manager shall demonstrate that the following requirement is printed on all final project plans: the construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

4.9-5 Prior to issuance of a grading permit, the Director of Parks, Recreation, and Marine shall hold a community preconstruction meeting in concert with the Construction Contractor to provide information regarding the construction schedule. The construction schedule information shall include the duration of each construction activity and the specific location, days, frequency, and duration of the pile driving that will occur during each phase of the project construction. Public notification of this meeting shall be undertaken in the same manner as the Notice of Availability mailings for this Draft Environmental Impact Report (EIR).

4.9.7 CUMULATIVE IMPACTS

The cumulative study area for construction noise impacts is localized to the immediate project site adjacent to construction activities. In general, only projects occurring adjacent to or very close to the project site are considered due to the localized effects of noise. Currently, the following projects that have been proposed or approved but are not yet fully constructed are within the cumulative study area for the proposed project:

- Colorado Lagoon Restoration Project, currently under construction
- Second+PCH Mixed Use Commercial/Hotel/Residential Project
- Proposed Home Depot Project at Loynes Drive and Studebaker Road
- Termino Drain Project, various segments terminating at the northern end of Marine Stadium

Because the proposed project is scheduled to begin in 2011 and be implemented over 6 years, it is possible that the construction activity for the proposed project and construction for one of the cumulative projects identified above may occur at the same time. However, noise from construction of the proposed project and the cumulative projects would be localized to each project site and would not combine to create a cumulative noise impact. In addition, pile

driving, which will be the noisiest activity on site, does not occur with any of the other cumulative projects.

Although there will be short-term intermittent high noise levels associated with trucks passing by from the project site, the increase in traffic flow on the surrounding roads due to construction traffic is expected to be small. Off-site construction vehicles would not contribute to a cumulative increase in traffic noise along roadways in the project area.

On-site construction and operations are point sources of noise and would not contribute to off-site cumulative noise impacts from construction or operation of other planned and future projects. In addition, construction noise is exempt in the City's Noise Ordinance, would be temporary, and would cease upon construction completion.

The proposed project would not increase the Marina or open space uses of the project site and is not anticipated to lead to an increase in the number of visitors or vehicles to the project area. Therefore, the long-term ambient noise levels associated with increased traffic are not anticipated to change as a result of the proposed project, and the proposed project would not contribute to off-site cumulative noise impacts from other planned and future projects. Therefore, impacts related to operational noise would be less than cumulatively significant.

4.9.8 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

Operational project impacts related to noise are less than significant. Implementation of Mitigation Measures 4.9-1 through 4.9-5 would reduce temporary and intermittent construction-related noise impacts; however, construction noise impacts to on-site sensitive receptors and to off-site residential uses would remain significant and unavoidable.