Camino Del Mar Bridge Replacement Project

Noise Study Report

Prepared For:

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SUMMARY

HELIX Environmental Planning, Inc. (HELIX) conducted a noise analysis to determine if changes in the roadway elevation associated with the proposed Camino Del Mar Bridge Replacement Project would adversely affect adjacent noise sensitive land uses. The analysis focuses on estimating noise levels from Project implementation and determining if noise attenuation features (i.e., barriers) would be necessary to attenuate noise from traffic along the improved Camino del Mar bridge.

The areas most susceptible to changes in traffic noise levels consist of single-family and multi-family residential uses on both sides of Camino del Mar along the southern portion of the Project alignment. Noise levels are calculated to exceed applicable California Department of Transportation (Caltrans) and City of Del Mar standards. Noise abatement would therefore be required to bring noise levels into compliance.

Construction of the proposed Project could affect nearby residences. However, implementation of standard best management practices would minimize construction noise.

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List of Abbreviated Terms

ADT	Average daily trips
CAD	Computer-aided design
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Del Mar
CNEL	Community Noise Equivalent Level
dB	decibels
dBA	A-weighted decibels
FHWA	Federal Highway Administration
Hz	Hertz
I-	Interstate
kHz	kilohertz
L_{DN}	Day-Night Level
L_{EQ}	Equivalent Sound Level
L_{EQ}(h)	Equivalent Sound Level over one hour
L_{MAX}	Maximum Sound Level
LOS	level of service
L_{XX}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
NAC	noise abatement criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
RCNM	Roadway Construction Noise Model
SPL	sound pressure level
STC	Sound Transmission Class

TeNS	Technical Noise Supplement (Caltrans)
TNM 2.5	FHWA Traffic Noise Model Version 2.5
TIA	Transportation Impact Analysis

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CHAPTER 1 INTRODUCTION

The proposed Camino Del Mar Bridge Replacement Project (Project) involves the replacement of the existing Camino del Mar Bridge No. 57C-0209 (bridge), which crosses the San Dieguito Lagoon (lagoon) in the City of Del Mar (Del Mar or City). The bridge was determined in 2010 to be eligible for rehabilitation funding under the Highway Bridge Program but was later determined to be structurally deficient upon preparation of a Final Rehabilitation Strategy Report in 2012. As a result, bridge replacement was recommended.

This Noise Study Report (NSR) assesses potential noise impacts which may result from construction and implementation of the proposed Project.

1.1 PURPOSE OF THE NOISE STUDY REPORT

The purpose of the NSR is to determine if changes in the roadway elevation associated with the proposed bridge replacement would adversely affect adjacent noise sensitive land uses. The analysis focuses on estimating changes in noise levels from Project implementation and determining if noise attenuation features (i.e., barriers) would be necessary to attenuate noise from traffic along the improved Camino del Mar bridge.

The California Department of Transportation (Caltrans) is the federal lead agency under the National Environmental Policy Act (NEPA) providing local assistance to the City. The Project is subject to environmental review pursuant to both NEPA and the California Environmental Quality Act (CEQA), with the City as lead agency under CEQA.

1.2 PROJECT PURPOSE AND NEED

Camino del Mar is a north-south roadway along the coast that spans the lagoon via the bridge, provides connections to coastal destinations in the area, and serves as a local bypass of Interstate (I-) 5 for motorists travelling along the coastline. The bridge was constructed in 1932, widened in 1953, and last updated in 2001 when a pedestrian overhang was replaced and safety rails were added.

As mentioned above, the bridge was previously determined to be structurally deficient, and a bridge replacement was therefore recommended. The proposed Project involves the replacement of the bridge to continue providing vehicle, pedestrian, and bicycle movement along Camino del Mar as it crosses the lagoon. The replacement bridge has been designed to accommodate a mid-range sea level rise scenario of 38 inches by the year 2100 during a 100-year flood event while maintaining safe roadway design and avoiding roadway conflicts with driveways and coastal access points.

CHAPTER 2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The bridge is located approximately one mile west of I-5, within Del Mar in western San Diego County (see Figure 1, *Regional Location*). The Project site includes the existing bridge along Camino del Mar over the lagoon and areas immediately surrounding the bridge in the northwestern part of the City (see Figure 2, *Project Location*). Regional access to the Project is provided from I-5, which runs parallel to the bridge about one mile to the east. The bridge serves as an important north-south connection for coastal residents and visitors in the vicinity and the greater San Diego region and is frequently used by motorists, bicyclists, hikers, and pedestrians. The bridge is situated between the State Fairgrounds and the Pacific Ocean near coastal destinations and provides access to local beaches, open space areas, hiking trails, the Del Mar Village (the City's central business district), and Torrey Pines State Beach (see Figure 3a, *General Project Setting,* and Figure 3b, *Focused Project Setting*). The Camino del Mar roadway becomes Highway 101 north of Via de la Valle within the City of Solana Beach, about one-quarter mile north of the bridge.

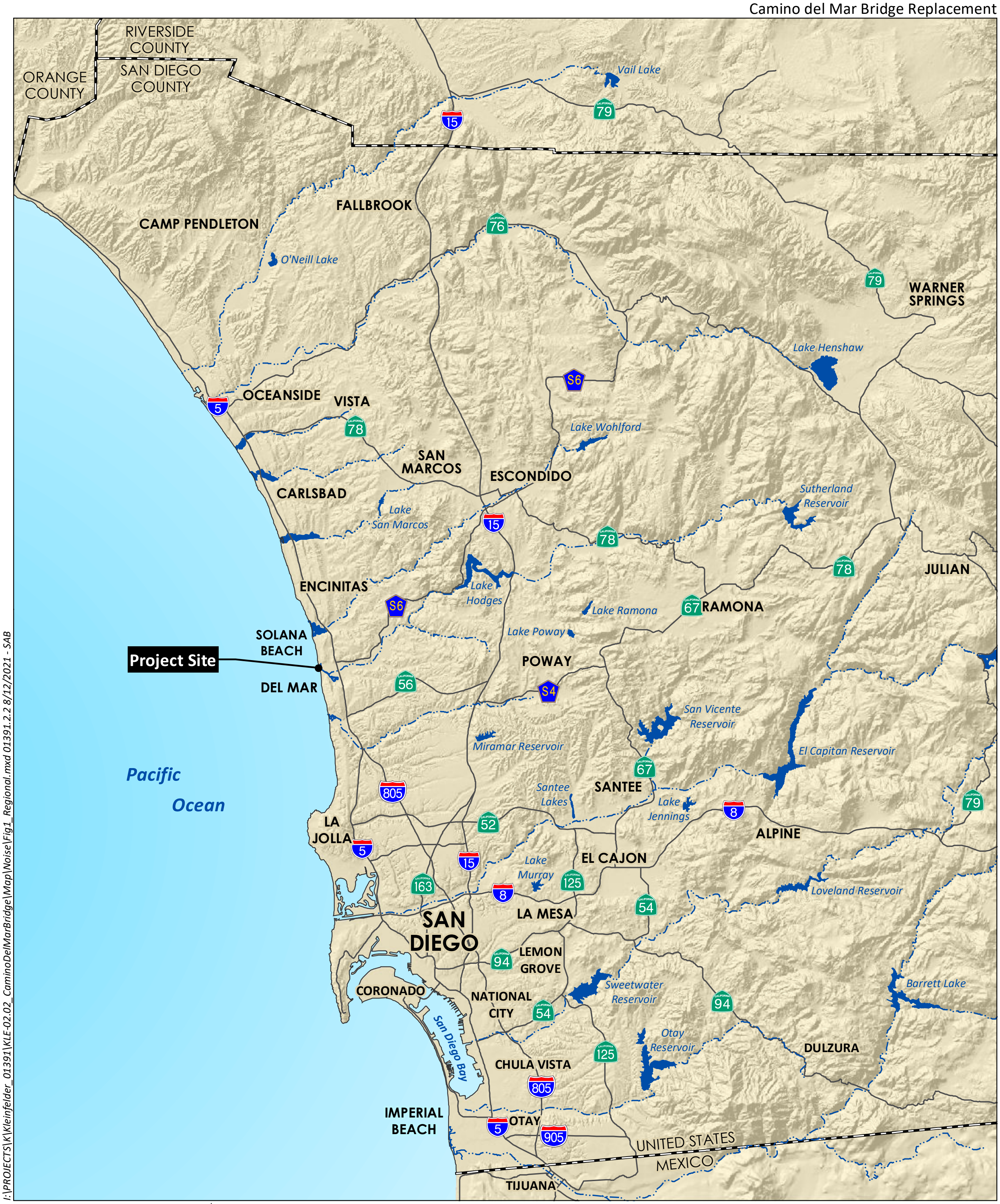
2.2 PROJECT DESCRIPTION

The proposed Project involves the replacement of the Camino del Mar bridge to continue providing vehicle, pedestrian, and bicycle movement along Camino del Mar as it crosses the lagoon. Coastal access to Del Mar Beach, including Dog Beach, would be maintained. The proposed bridge design consists of a five-span cast-in-place prestressed concrete box girder bridge with variable depth bridge with a length of 624 feet between abutments, a width of 68.5 feet, and an area of about 41,800 square feet (0.96 acre).

In comparison to the existing bridge, the replacement bridge would be located along the same horizontal alignment, would be slightly longer, wider, and higher, and would result in a reduction in the number of piers in the lagoon. The additional approximately 28 feet, 2 inches in bridge length and additional 7 feet, 8 inches in bridge height near the center of the bridge would accommodate a mid-range sea level rise scenario of 38 inches by the year 2100 during a 100-year flood event while maintaining safe roadway design and avoiding roadway conflicts with driveways and coastal access points. The additional bridge width of approximately 7 feet, 5 inches would accommodate two-way pedestrian and bicycle movement across the bridge. The roadway approach zones within Camino del Mar would also require modifications to accommodate the raised elevation of the bridge, including reconstructing the sidewalks to meet the proposed pedestrian sidewalks on both sides of the replacement bridge. There would be no change in vehicle capacity as the existing two-lane Camino del Mar roadway would continue to provide two vehicle traffic lanes.

The Project is estimated to be constructed over 27 months during 5 distinct construction stages: site preparation, demolition and replacement of east side, demolition and replacement of west side, bridge median improvements, and final improvements. With the exception of approximately 12 temporary short-term night closures (one to four nights per stage), the contractor would maintain continuous vehicular, pedestrian, and bicycle access along the Camino del Mar bridge throughout construction by shifting travel lanes from one side to another as the bridge is replaced. Bridge demolition and replacement would occur at one half of the bridge at a time, beginning with the east side (lagoon side) followed by the west side (ocean side). During the demolition and replacement of each side of the bridge, the opposite side would be used to re-route both lanes of traffic.

Due to limited on-site construction staging areas, the contractor is anticipated to need additional off-site staging areas for materials, equipment, and office. Several potential staging areas have been identified, including the Del Mar State Fairgrounds, located at 2260 Jimmy Durante Boulevard to the east of the Project site, and the City's Public Works Yard, located at 2240 Jimmy Durante Blvd to the southeast of the Project site. Ultimate staging areas would be selected by the construction contractor but are included within the area of impact evaluated herein for environmental clearance.



Source: Base Map Layers (SanGIS, 2016)

0 8 Miles

HELIX Environmental Planning

Regional Location

Figure 1

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Source: Aerial (SanGIS and Nearmap, 2019)

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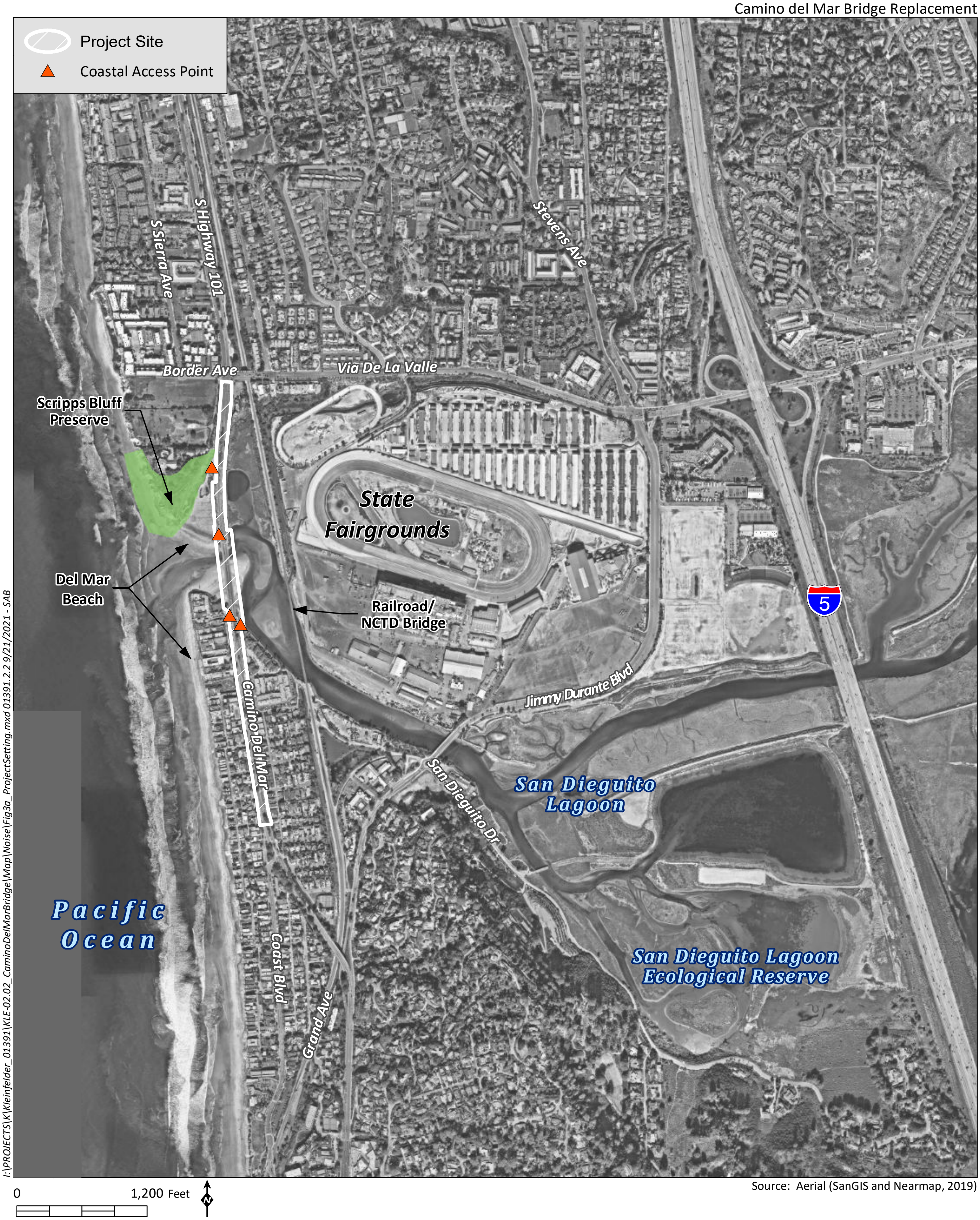
Project Location

Figure 2



Source: Aerial (SanGIS and Nearmap, 2019)

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General Project Setting

Figure 3a

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Source: Aerial (SanGIS and Nearmap, 2019)

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Focused Project Setting

Figure 3b

CHAPTER 3 FUNDAMENTALS OF TRAFFIC NOISE

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to Caltrans' Technical Noise Supplement (TeNS) (Caltrans 2013), a technical supplement to the Protocol that is available on Caltrans Web site (http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf).

3.1 SOUND, NOISE, AND ACOUSTICS

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

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

3.2 FREQUENCY

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

3.3 SOUND PRESSURE LEVELS AND DECIBELS

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this 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 decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

3.4 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 (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000 to 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 judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Table 3-1 describes typical A-weighted noise levels for various noise sources.

Table 3-1
TYPICAL A-WEIGHTED NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, at 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Caltrans (2013)

3.5 HUMAN RESPONSE TO CHANGES IN NOISE LEVELS

As discussed above, doubling 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 than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency ("pure-tone") signals in the midfrequency (1,000 Hz to 8,000 Hz) range. In typical noisy environments, changes in noise of

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

3.6 NOISE DESCRIPTORS

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- **Equivalent Sound Level (L_{EQ}):** L_{EQ} represents an average of the sound energy occurring over a specified period. In effect, L_{EQ} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{EQ}[h]) is the energy average of A-weighted sound levels occurring during a one-hour period and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.

- **Percentile-Exceeded Sound Level (L_{XX}):** L_{XX} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).

- **Maximum Sound Level (L_{MAX}):** L_{MAX} is the highest instantaneous sound level measured during a specified period.

- **Day-Night Level (L_{DN}):** L_{DN} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.

- **Community Noise Equivalent Level (CNEL):** Similar to 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 A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

3.7 SOUND PROPAGATION

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

3.7.1 Geometric Spreading

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

3.7.2 Ground Absorption

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance.

3.7.3 Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects.

3.7.4 Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor specifically to reduce noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receptor is rarely effective in reducing noise because it does not create a solid barrier.

CHAPTER 4 REGULATIONS AND POLICIES

4.1 CALIFORNIA DEPARTMENT OF TRANSPORTATION

4.1.1 Caltrans Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

This Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. Table 4-1 summarizes noise abatement criteria (NAC) used in the Protocol corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

Table 4-1
ACTIVITY CATEGORIES AND NOISE ABATEMENT CRITERIA

Activity Category	NAC, Hourly A-Weighted Noise Level (dBA-L_{EQ}[h])1	Description of Activities
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B2	67 Exterior	Residential.
C2	67 Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	N/A3	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	N/A	Undeveloped lands that are not permitted.

[1] The L_{EQ}(h) activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).
[2] Includes undeveloped lands permitted for this activity category.
[3] No standard specified.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category D) is used as the basis for determining a noise impact.

The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach a NAC level when the sound level is within 1 dB of the NAC identified in 23 Code of Federal Regulations (CFR) 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The TeNS to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2 CITY OF DEL MAR

4.2.1 City of Del Mar Community Plan Noise Element

The City's goals for transportation noise sources are published in the Community Plan (i.e., General Plan) Transportation Element, Noise Section (March 1976, incl. 1986 amendments). This section of the Community Plan identifies 65 CNEL as the maximum noise level compatible with residential land uses.

4.2.2 City of Del Mar Noise Ordinance

The City's Municipal Code regulates noise produced by construction activities. The City regulates noise produced on any property that may affect occupants of nearby properties. Section 9.20.050 of the City's Municipal Code identifies construction noise level limits and states that:

Any person who operates powered construction or landscape equipment and/or who erects, constructs, demolishes, excavates for, alters or repairs any building or structure within the City of Del Mar in such a manner as to cause noise to be received beyond the boundaries of the property on which the construction work is occurring shall comply with the following:

A. No construction work shall be performed on Sundays or City holidays.

B. No construction work shall be performed before 9:00 a.m. or after 7:00 p.m. on Saturday.

C. No construction work shall be performed before 7:00 a.m. or after 7:00 p.m. on Monday through Friday.

D. Construction activity shall not cause an hourly average sound level greater than 75 decibels on property zoned or used for residential purposes. Exception: A person may perform construction work on the person's own property, provided such construction activity is not carried on for profit or livelihood, between the hours of 10:00 a.m. and 5:00 p.m. on Sundays and City holidays.

CHAPTER 5 STUDY METHODS AND PROCEDURES

The noise analysis for the Project was conducted in a manner consistent with the Protocol (Caltrans 2020) and associated TeNS (Caltrans 2013). The purpose of the Protocol is to present Caltrans policies and procedures for applying the federal Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772) in California. The Protocol is supplemented by the TeNS, and contains Caltrans noise analysis procedures, practices, and other useful technical background information related to the analysis of highway noise impacts and abatement.

5.1 METHODS FOR IDENTIFYING LAND USES AND SELECTING NOISE MEASUREMENT AND MODELING RECEIVER LOCATIONS

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed Project, and that involve frequent human use. As stated in the Protocol, noise abatement is only considered where frequent human use occurs and where a lowered noise level would be of benefit. Noise-sensitive land uses with frequent human use that would be affected by the Project consist of single-family and multi-family residential uses on both sides of Camino del Mar along the southern portion of the Project alignment. Three measurement locations, one on the west side of the roadway and two on the east side of the roadway, were chosen to determine noise levels representative of the general area of these residences (see Figure 4, *Noise Measurement Locations*). Two measurements (ST-1 and ST-2) were short-term measurements, and one measurement (LT-1) was a long-term measurement.

5.2 FIELD MEASUREMENT PROCEDURES

A field noise study was conducted in accordance with recommended procedures in TeNS. The following is a summary of the procedures used to collect short-term and long-term noise level data.

5.2.1 Short-term Measurements

Short-term monitoring was conducted at two locations (ST-1 and ST-2; see Figure 4 and Appendix A) on August 24, 2021, using a Larson Davis Model 831 Class 1 Sound Level Meter. The meter was calibrated prior to the measurements using a Larson Davis Model CAL250 calibrator. The measurements were taken over a 15-minute period at each location.

Field staff attended the meters during the short-term measurements to document conditions in the measurement location area. The recorded temperature during the measurements was 75 degrees Fahrenheit, wind speeds ranged between 0 and 1 mile per hour, and relatively humidity was 50 percent. Traffic along Camino del Mar was also classified and counted during the measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An automobile is defined as a vehicle with two axles and four tires that is designed primarily to carry passengers. Small vans and light trucks are included in this category. Medium-duty trucks include cargo vehicles with two axles and six tires. Heavy-duty trucks include vehicles with three or more axles. The posted speed along this portion of Camino del Mar is 30 mph.

5.2.2 Long-term Measurements

Long-term monitoring was conducted at one location (LT-1; see Figure 4) using a Larson Davis Spark 703 Noise Dosimeter. The purpose of this measurement was to identify variations in sound levels throughout the day. The long-term noise level data was collected over one 25-hour period beginning at 3:00 p.m. on August 24, 2021, and ending at 4:00 p.m. on August 25, 2021.

5.3 TRAFFIC NOISE LEVELS PREDICTION METHODS

Traffic noise levels were predicted using the Computer-Aided Noise Abatement (CadnaA) implementation of the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). Key inputs to the traffic noise model were the locations of roadways, shielding features (e.g., topography and buildings), existing noise barriers, ground type, and receivers. Three-dimensional representations of these inputs were developed using computer-aided design (CAD) drawings, aerial photographs, and topographic contours.

The loudest hour traffic noise typically occurs when traffic is free-flowing at full speed; this condition typically occurs at Level of Service (LOS) C. Under LOS C conditions, traffic is heavy, but remains free-flowing. The SANTEC/ITE *Guidelines for Traffic Impact Study in the San Diego Region* (2000) provides traffic levels based on roadway capacities at different LOS for collector roadways. The segment of Camino del Mar included in the Project is classified as a 2-lane collector with a traffic capacity at LOS C of 10,000 average daily trips (ADT) (STC Traffic, Inc. 2018). The LOS C ADT, existing ADT, and year 2040 ADT for this segment of Camino del Mar are presented in Table 5-1.

Table 5-1
EXISTING AND FUTURE ROADWAY VOLUMES (ADT)

Roadway Segment	Existing	2040	LOS C
Camino del Mar			
Via de la Valle to Coast Boulevard	12,540	13,800	10,000

Source: STC Traffic, Inc. 2018

For the noise analysis, it was assumed that the loudest hour traffic represents 10 percent of the LOS C daily traffic capacity, in accordance with Caltrans standards (Caltrans 2013). Traffic speed at LOS C is assumed to be 45 miles per hour, which is the design speed for the bridge portion of Camino del Mar.

The model-calculated one-hour L_{EQ} noise output, with the use of 8 to 10 percent of the average daily traffic occurring during a peak hour, is the equivalent of the CNEL (Caltrans 2013).

Vehicle classification percentages used for modeling were based on standard assumptions and observations at the Project site. It was assumed that 96 percent of traffic are automobiles (light duty vehicles), 3 percent are medium-duty trucks, and 1 percent are heavy-duty trucks.

CHAPTER 6 EXISTING NOISE ENVIRONMENT

6.1 EXISTING LAND USES

Noise-sensitive land uses that would have the potential to be affected by changed traffic noise levels from the proposed bridge elevation consist of single-family and multi-family residential uses on both sides of Camino del Mar along the southern portion of the proposed bridge alignment (see Figure 3b). Multi-family residential uses are located on the eastern side of the roadway; the closest residential structure is approximately 30 feet from the edge of the roadway. Two outdoor use areas associated with these multi-family residences, a patio and a pool area, are also located approximately 30 feet from the edge of the roadway. The multi-family residential building and outdoor use areas are at a slightly higher elevation than the roadway (approximately five feet). A vertical slat fence is located between the residential properties and the roadway; however, this type of fence does not provide noise attenuation.

Single-family residential uses are located on the western side of the roadway along the southern portion of the proposed bridge alignment. While the residential property boundaries are located approximately 50 feet from the edge of the roadway, most of the residences themselves are set back from the roadway at a distance of approximately 175 feet, with the exception of two residences slightly to the north that

Source: Aerial (NearMap, 2019)

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Noise Measurement Locations

Figure 4

are located approximately 60 feet from the edge of the roadway. These residences on the western side of the roadway are generally at the same elevation as the roadway. A 6-foot-tall concrete wall is located between the residential properties and the roadway, which currently provides attenuation from traffic noise based on the existing roadway elevation.

Heading north along Camino del Mar, the residential properties end at the start of the existing bridge. Beach and lagoon are present on either side of the existing bridge, which has a midpoint height of approximately 17 feet. North of the existing bridge and along the northern portion of the proposed bridge alignment, beach area is located to the west at a slightly lower elevation than the roadway.

Specific topography for the roadways and the surrounding residential development was incorporated into the noise model.

6.2 NOISE MONITORING RESULTS

The existing noise environment in the Project area is characterized below based on short-term and long-term noise monitoring that was conducted.

6.2.1 Short-term Monitoring

Table 6-1 summarizes the results of the short-term noise monitoring conducted in the Project area.

Table 6-1
SUMMARY OF SHORT-TERM MEASUREMENTS

Measurement	Location[1]	Land Use	Time	dBA L_{EQ}	Autos	Medium Trucks	Heavy Trucks
ST-1	West side road	Residential	11:46 a.m. – 12:01 p.m.	63.2	205	3	0
ST-2	East side of road	Residential	12:08 p.m. – 12:23 p.m.	63.7	220	8	0

[1] Refer to Figure 4 for specific noise measurement locations.

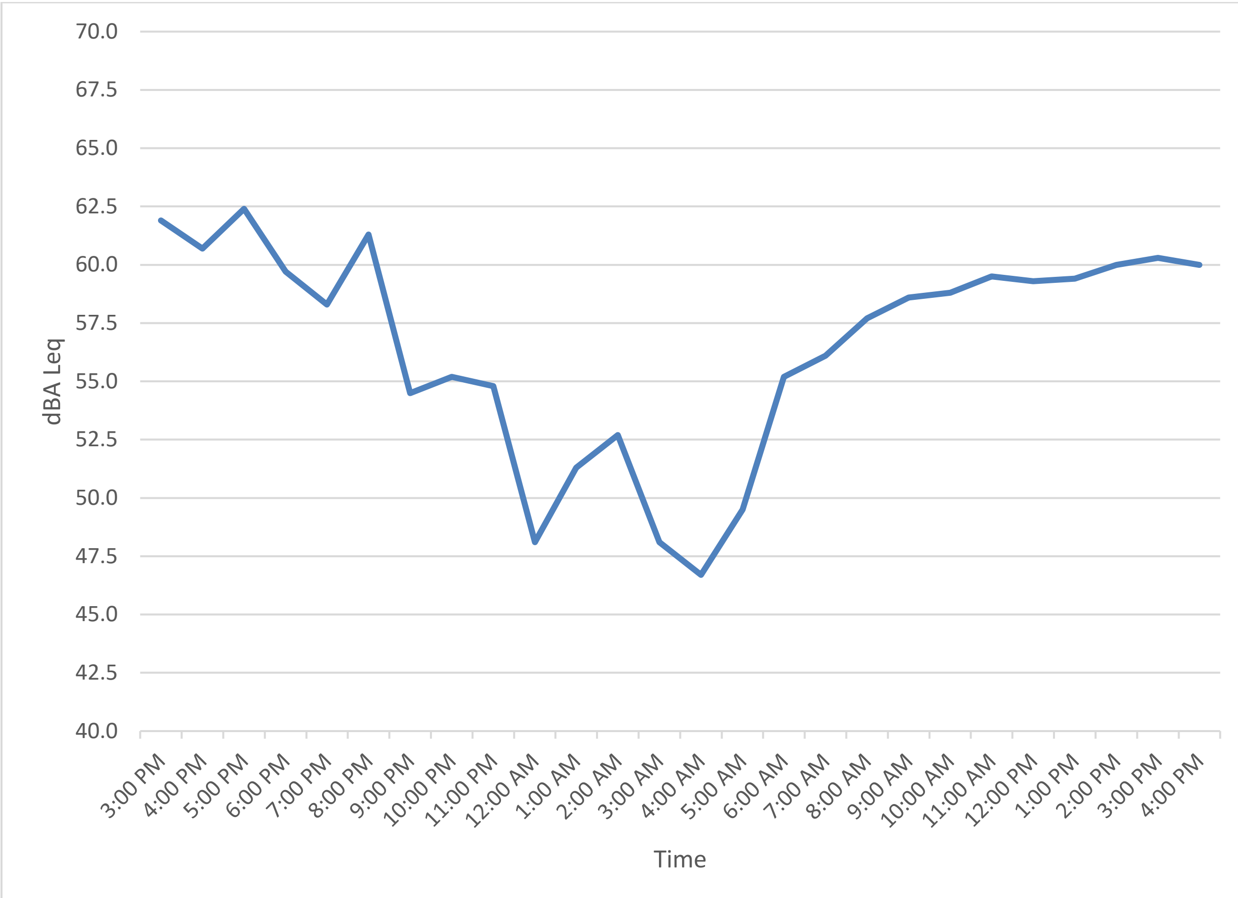
6.2.2 Long-term Monitoring

Table 6-2 and Figure 5, *Long-term Noise Monitoring Results,* provide the collected long-term measurement data from measurement LT-1. The average loudest-hour noise level measured was 62.4 dBA L_{EQ} (1-hour) at 5:00 p.m. on August 24, 2021.

Table 6-2 SUMMARY OF LONG-TERM MEASUREMENT		
Time	**dBA L_{EQ}**	**Difference from Loudest Hour (dB)**
3:00 p.m.	61.9	-0.5
4:00 p.m.	60.7	-1.7
5:00 p.m.	62.4	0.0
6:00 p.m.	59.7	-2.7
7:00 p.m.	58.3	-4.1
8:00 p.m.	61.3	-1.1
9:00 p.m.	54.5	-7.9
10:00 p.m.	55.2	-7.2
11:00 p.m.	54.8	-7.6
12:00 a.m.	48.1	-14.3
1:00 a.m.	51.3	-11.1
2:00 a.m.	52.7	-9.7
3:00 a.m.	48.1	-14.3
4:00 a.m.	46.7	-15.7
5:00 a.m.	49.5	-12.9
6:00 a.m.	55.2	-7.2
7:00 a.m.	56.1	-6.3
8:00 a.m.	57.7	-4.7
9:00 a.m.	58.6	-3.8
10:00 a.m.	58.8	-3.6
11:00 a.m.	59.5	-2.9
12:00 p.m.	59.3	-3.1
1:00 p.m.	59.4	-3.0
2:00 p.m.	60.0	-2.4
3:00 p.m.	60.3	-2.1
4:00 p.m.	60.0	-2.4

[1] Caltrans NAC for exterior noise levels in residential areas.

Figure 5. Long-term Noise Monitoring Results



6.2.3 Comparison of Measured Noise to TNM Model

TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at short-term field measurement locations. Table 6-3 compares the measured and modeled noise levels at the two short-term measurement locations (see Figure 5). The modeled noise levels are within 2 dB of the measured noise levels and are therefore considered to be in reasonable agreement with the measured noise levels. As such, no adjustments to the model were necessary.

Table 6-3
COMPARISON OF MEASURED AND MODELED NOISE LEVELS

Measurement	Measured Noise Level (dBA L_{EQ})	Modeled Noise Level (dBA L_{EQ})	Difference
ST-1	63.2	61.5	-1.7
ST-2	63.7	62.5	-1.2

CHAPTER 7 FUTURE NOISE ENVIRONMENT, IMPACTS, AND CONSIDERED ABATEMENT

7.1 PREDICTED NOISE ENVIRONMENT AND IMPACTS

This section discusses the predicted traffic noise levels for conditions with and without the Project under Caltrans and City criteria. As mentioned previously, the Project would not result in increased traffic levels. Rather, this analysis considers the traffic noise levels at nearby receptors from the raised elevation of the bridge. The proposed bridge would begin its ascent from the south in a location adjacent to the northernmost multi-family residential structure located on the eastern side of Camino del Mar and end in a location to the north that is adjacent to Del Mar Beach and the North Bluff/Scripps Bluff Preserve. Six receptors were evaluated, including four at single-family residential properties to the west of Camino del Mar (R-1 to R-4) and two at exterior use areas associated with multi-family residences to the east of Camino del Mar (R-5 and R-6). The receptor locations are shown on Figure 6, *Modeled Receptor Locations*. Noise levels are based on estimated traffic levels provided by the Transportation Impact Analysis Report (TIA; STC Traffic, Inc. 2018).

To assess Project impacts using Caltrans criteria, traffic noise levels with and without the Project were calculated using traffic volumes that would be expected under LOS C conditions (which are considered to be the highest volume of traffic that a roadway can support under free-flowing conditions). To assess Project impacts using City criteria, project-induced increases in noise levels over existing and future (year 2040) without Project conditions were calculated using traffic volumes provided in the Project TIA.

The noise is modeled as 10 percent of the traffic volume, which provides for both a conservative hourly average noise level (for use under the Caltrans criteria) and a direct equivalent to CNEL (for use under the City's criteria).

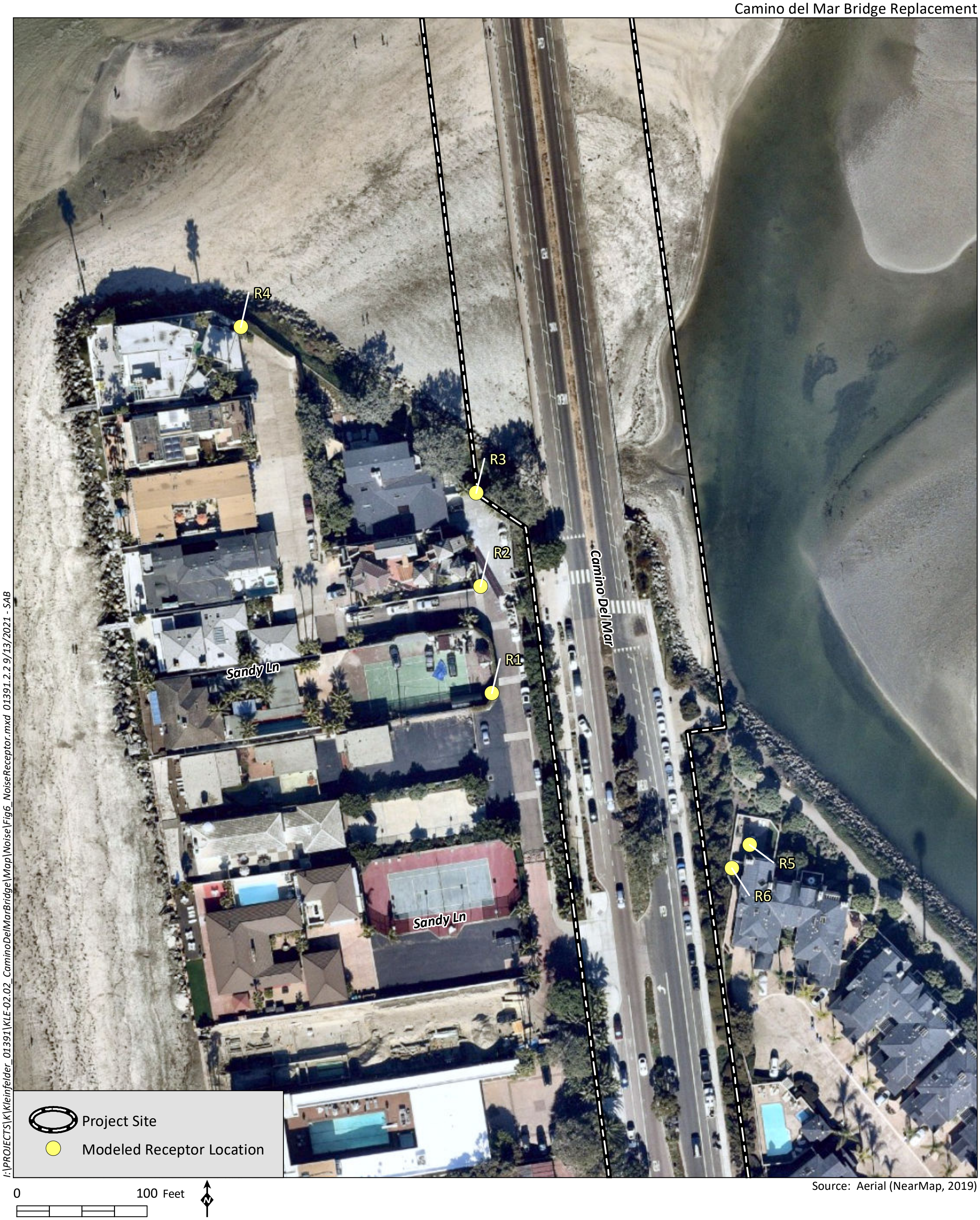
7.1.1 Caltrans

Estimated peak hour traffic noise levels under LOS C conditions without and with the Project are provided in Table 7-1 for comparison with Caltrans criteria. As shown in Table 7-1, at LOS C with the Project, the noise levels in adjacent residential areas would range from 58 to 66 dBA L_{EQ} and would approach the Caltrans NAC for residential areas of 67 dBA L_{EQ} at receivers R-5 and R-6. Noise abatement would be required for the Project to be in compliance with the NAC.

Table 7-1
LOS C PEAK HOUR NOISE LEVELS

Receiver Number	Without Project Noise Level (dBA L_{EQ})	With Project Noise Level (dBA L_{EQ})	Increase due to Project	Approach 67 dBA L_{EQ} NAC?[1]
R-1	60	61	1	No
R-2	61	61	0	No
R-3	64	64	0	No
R-4	58	58	0	No
R-5	66	66	0	Yes
R-6	66	66	0	Yes

[1] Caltrans NAC for exterior noise levels in residential areas.



Source: Aerial (NearMap, 2019)

HELIX
Environmental Planning

Modeled Receptor Locations

Figure 6

7.1.2 City of Del Mar

Estimated traffic noise levels both without and with the Project using existing traffic volumes are provided in Table 7-2. As shown in Table 7-2, under existing traffic volumes with the Project, noise levels in adjacent residential areas would range from 59 to 67 CNEL and would exceed the City's exterior noise standard of 65 CNEL at receivers R-5 and R-6. Noise abatement would be required for the Project to be in compliance with the City's standards.

Table 7-2
EXISTING AND EXISTING PLUS PROJECT NOISE LEVELS

Receiver Number	Existing No Project (CNEL)	Existing Plus Project (CNEL)	Increase due to Project	Exceed 65 CNEL Limit?[1]
R-1	61	62	1	No
R-2	62	63	1	No
R-3	65	65	0	No
R-4	59	59	0	No
R-5	67	67	0	Yes
R-6	67	67	0	Yes

[1] City threshold for exterior noise levels in residential areas.

Estimated traffic noise levels both without and with the Project using future (year 2040) traffic volumes are provided in Table 7-3. As shown in Table 7-3, under future traffic volumes with the Project, noise levels in adjacent residential areas would range from 59 to 67 CNEL and would exceed the City's exterior noise standard of 65 CNEL at receivers R-5 and R-6. Noise abatement would be required for the Project to be in compliance with the City's standards.

Table 7-3
FUTURE AND FUTURE PLUS PROJECT NOISE LEVELS

Receiver Number	Future No Project (CNEL)	Future Plus Project (CNEL)	Increase due to Project	Exceed 65 CNEL Limit?[1]
R-1	61	62	1	No
R-2	63	63	0	No
R-3	66	65	-1	No
R-4	60	59	-1	No
R-5	67	67	0	Yes
R-6	67	67	0	Yes

[1] City threshold for exterior noise levels in residential areas.

7.2 PRELIMINARY NOISE ABATEMENT ANALYSIS

7.2.1 Caltrans

In accordance with 23 CFR 772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a reduced noise level. Potential noise abatement measures identified in the Protocol include the following:

- Avoiding the impact by using design alternatives, such as altering the horizontal and vertical alignment of the project;

- Constructing noise barriers;
- Acquiring property to serve as a buffer zone;
- Using traffic management measures to regulate types of vehicles and speeds; and
- Acoustically insulating public-use or nonprofit institutional structures.

All of these abatement options have been considered. Because the Project is primarily limited to raising the bridge height, abatement in the form of noise barriers is the only abatement that is considered feasible.

Noise barriers have been evaluated for feasibility based on achievable noise reduction. A reasonable cost allowance for each barrier determined to be acoustically feasible was calculated. Worksheets provided in Appendix A summarize the reasonable cost allowance calculations at the critical design receiver based on the allowance calculation procedure identified in the Protocol. Appendix B summarizes results at receiver locations for two noise barriers (Barriers NB-1 and NB-2) that have been evaluated in detail for this Project.

For a noise barrier to be considered reasonable from a cost perspective, the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, and retaining walls. Construction cost estimates are not provided in this NSR but will be presented in the Noise Abatement Decision Report (NADR). The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document. The NADR is prepared by the project engineer after completion of the NSR. The NADR includes noise abatement construction cost estimates that have been prepared and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which wall configurations are reasonable from a cost perspective.

The design of noise barriers presented in this report is preliminary and is not for final design of the Project. Preliminary information on the physical location, length, and height of noise barriers is provided in this report. If pertinent parameters change substantially during the final Project design, preliminary noise barrier designs may be modified or eliminated from the final Project. A final decision on the construction of the noise abatement will be made upon completion of the Project design.

The following is a discussion of noise abatement considered for the subject residence outdoor use areas, the only evaluation areas where traffic noise impacts are predicted. The traffic noise modeling results in Table 7-1 indicate that traffic noise levels at the outdoor use areas (receptors R-5 and R-6) are predicted to be 66 dBA L_{EQ}(h) under LOS C traffic conditions. Because the predicted noise level under LOS C approaches Caltrans' 67-dBA L_{EQ}(h) exterior NAC for residential uses, traffic noise impacts are predicted at these areas, and noise abatement must be considered.

7.2.1.1 Preliminary Analysis of Noise Control Barrer NB-1

Detailed modeling analysis was conducted for a barrier (NB-1) with a length of approximately 87 feet along the western and northern periphery of the affected outdoor use areas between the use areas and the roadway, which would provide attenuation for receptors R-5 and R-6. Barrier heights of five feet and six feet were evaluated. A five-foot tall nose barrier is modeled to provide a 5-dB reduction; however, 23 CFR 722 requires that an acoustical design goal be applied to noise abatement. Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction. Because the five-foot-tall barrier would not provide a 7-dB reduction, a six-foot-tall barrier was analyzed.

A reasonable allowance calculation sheet for this six-foot-tall barrier is provided in Appendix B. Table 7-4 summarizes the calculated noise reductions and reasonable allowances for the barrier.

Table 7-4
SUMMARY OF REASONABLENESS DETERMINATION DATA—BARRIER NB-1[a]

Barrier I.D.: NB-1	
Receiver: R-5/R-6	
LOS C Noise Level without Barrier: 66 dBA L_{EQ}(h)	
LOS C Noise Level Minus Existing Noise Level: 0 dBA L_{EQ}(h)	
Feature	**6-Foot Barrier**
Barrier Noise Reduction, dB	9
Number of Benefited Residence	1
New Highway or More than 50% of Residences Predate 1978[b]	No
Reasonable Allowance Per Benefited Residence	$113,000
Total Reasonable Allowance	$113,000

[a] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

7.2.1.2 Preliminary Analysis of Noise Control Barrer NB-2

Detailed modeling analysis was conducted for a barrier (NB-2) with a length of approximately 59 feet along the western periphery of the affected outdoor use areas between the use areas and the roadway, which would provide attenuation for receptors R-5 and R-6. A barrier height of seven feet was evaluated.

A reasonable allowance calculation sheet for this seven-foot-tall barrier is provided in Appendix B. Table 7-5 summarizes the calculated noise reductions and reasonable allowances for the barrier.

Table 7-5
SUMMARY OF REASONABLENESS DETERMINATION DATA—BARRIER NB-2[a]

Barrier I.D.: NB-2	
Receiver: R-5/R-6	
LOS C Noise Level without Barrier: 66 dBA L_{EQ}(h)	
LOS C Noise Level Minus Existing Noise Level: 0 dBA L_{EQ}(h)	
Feature	**7-Foot Barrier**
Barrier Noise Reduction, dB	7
Number of Benefited Residence	1
New Highway or More than 50% of Residences Predate 1978[b]	No
Reasonable Allowance Per Benefited Residence	$111,000
Total Reasonable Allowance	$111,000

[a] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

[b] This adjustment increases the abatement allowance by $10,000 if the project is new construction or if most of the benefited residences (more than 50%) existed before January 1, 1978.

7.2.2 City of Del Mar

The traffic noise modeling results in Tables 7-2 and 7-3 indicate that traffic noise levels at receptors R5 and R6 are predicted to be 67 CNEL under both the existing and future traffic scenarios. Because the predicted noise levels exceed the City's 65-CNEL exterior standard for residential uses, traffic noise impacts are predicted at these areas, and noise abatement is considered. The six-foot-tall barrier (NB-1) described above in Section 7.2.1.1 would provide a noise reduction of 9 dB, resulting in a noise level of 58 CNEL, which would be below the City's 65-CNEL standard. The seven-foot-tall barrier (NB-2) described above in Section 7.2.1.2 would provide a noise reduction of 7 dB, resulting in a noise level of 60 dB, which would be below the City's 65-CNEL standard.

CHAPTER 8 CONSTRUCTION NOISE

Both Caltrans and the City have established standards for construction noise. Section 14-8.02 (Noise Control) of Caltrans standard specifications provides information that can be considered in determining whether construction would result in adverse noise impacts. The specification states:

- Do not exceed maximum noise levels (L_{MAX}) of 86 dBA at 50 feet from the construction site from 9:00 p.m. to 6:00 a.m.; and

- Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.

Additionally, the City has established standards for construction noise at residentially zoned properties. Construction noise would be considered adverse if it would exceed 75 dBA averaged over a one-hour period. No construction is allowed on Sundays or City holidays, before 9:00 a.m. or after 7:00 p.m. on Saturday, or before 7:00 a.m. or after 7:00 p.m. on Monday through Friday.

The Project is estimated to be constructed over 27 months with five distinct construction stages: site preparation, demolition and replacement of east side of the bridge, demolition and replacement of west side of the bridge, bridge median improvements, and final improvements. A variety of standard construction equipment would be used, including, but not limited to, backhoes/loaders, excavators, tractors, dozers, concrete breakers, concrete saws, pile installation equipment, and miscellaneous trucks. Hourly average noise levels from construction at the Project site were determined using the Roadway Construction Noise Model (RCNM) (FHWA 2008). Individually, these pieces of construction equipment generate noise levels ranging from approximately 77 to 100 dBA L_{MAX} and from approximately 73 to 94 dBA L_{EQ} at a distance of 50 feet. Noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance. It is likely that multiple pieces of equipment would be operating simultaneously near each other, thus having the potential to combine to generate hourly average noise levels exceeding the Caltrans construction noise standard of 86 dBA L_{MAX} at 50 feet during nighttime or early morning hours (before 6:00 a.m. or after 9:00 p.m.).

Noise levels would also potentially exceed the City construction noise standard of 75 dBA L_{EQ} (1-hour) at nearby residences. The nearest residences to the Project construction area are along Camino del Mar south of the existing bridge and are located within 50 feet of the construction work areas. The existing concrete walls between Camino del Mar and the residences on the western side of the roadway would partially reduce construction noise levels experienced at these residences; however, because the equipment that would be used would generally be taller than the wall, noise levels would still likely exceed the 75 dBA L_{EQ} (1-hour) standard. Further, there is no noise wall to provide attenuation for the residences on the eastern side of the roadway. In order to reduce noise levels at the nearby residents, Project construction would be required to comply with the standard construction best management practices listed below.

1. The construction contractor shall be required to work in such a manner so as not to exceed a 1-hour average sound level of 75 dBA at any noise-sensitive land use (residential). Sound levels may be limited by sound control devices, limited the number of equipment operating at once, or installation of temporary noise barriers between the construction site and sensitive receptors.

2. Construction equipment shall be properly outfitted and maintained with manufacturer recommended noise-reduction devices to minimize construction-generated noise.

3. Stationary construction noise sources such as generators or pumps shall be located at least 100 feet from noise-sensitive land uses as feasible.

4. Laydown and construction vehicle staging areas shall be located as far from noise-sensitive land uses as feasible.

With implementation of the above measures, construction noise levels would be less than significant under standards established by both the City and Caltrans.

CHAPTER 9 REFERENCES

California Department of Transportation (Caltrans)

2020 Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects. Sacramento, CA. August.

2013 Technical Noise Supplement for the Traffic Noise Protocol. September.

Federal Highway Administration (FHWA)

2008 Roadway Construction Noise Model.

2004 FHWA Traffic Noise Model, Version 2.5. February. FHWA-PD-96-010. Washington D.C.

STC Traffic, Inc.

2018 Transportation Impact Analysis Report for the Camino Del Mar Bridge Project. July.

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Appendix A

<u>Short-term Noise Measurement Field Sheets</u>

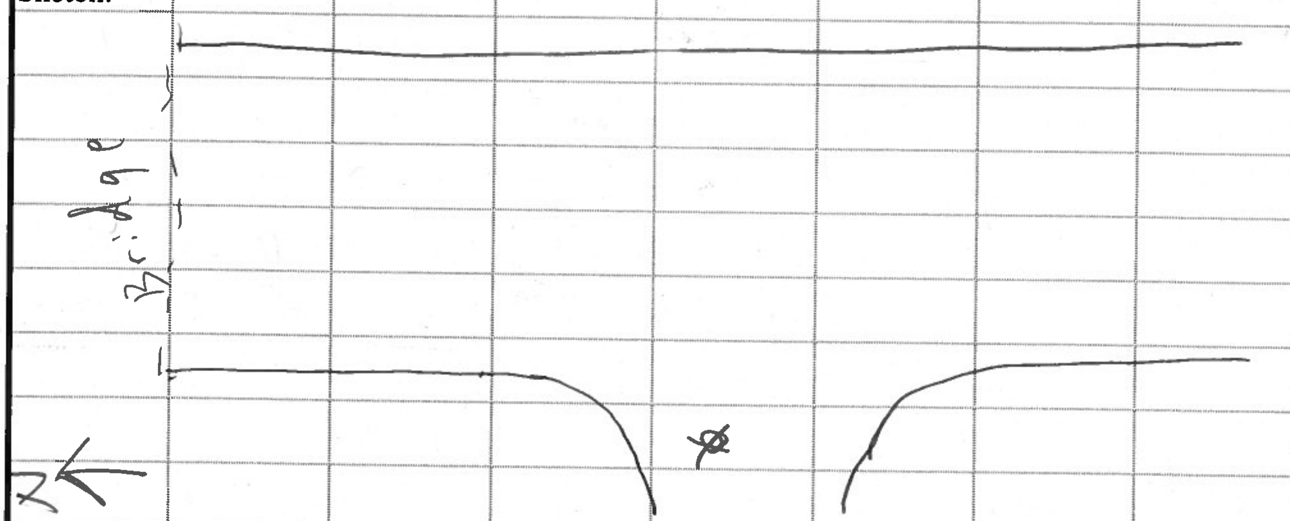
Site Survey

Project #	KLE 02.02	Project Name:	Camino Del Mar Ridge
Date: 8/10/21	Site #: 1	Engineer:	~~Brendan Sullivan~~ Charles Terry
Address:	Sandy Lane		

Meter:	LD 831	Serial #:	1741	Calibrator:	CA250	Serial #:	~~2621~~ 2530

Notes:

Sketch:



Temp: 75	Wind Spd: 0-1 mph	Humidity: 50 %
Start of Measurement: 11:46	End of Measurement: 12:01	63.2 dBA L_{EQ}

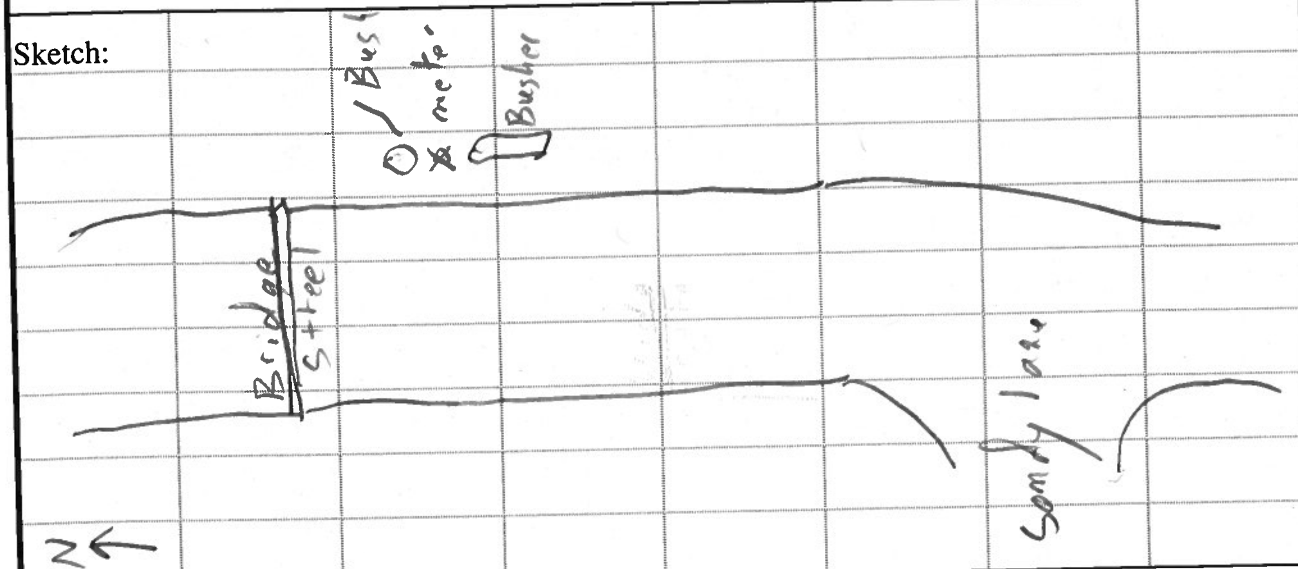
Cars (tally per 5 cars) 205	Medium Trucks (MT)	Heavy Trucks (HT)
~~IIII IIII IIII IIII~~	3	0
IIII IIII IIII IIII	III	
I 41x5 = 205		
Noise Measurement for Information Only		
No Through Roadways		
No Calibration Analysis Will Be Provided		

Site Survey

Project #:	KLE02.02			Project Name:	Camino Del Mar Bridge		
Date:		Site #:	2	Engineer:	Brendan Sullivan		
Address:	East side of street 100 ft S of Bridge						
Meter:	LD 831	Serial #:	1741	Calibrator:	CA250	Serial #:	2621

Notes:

Sketch:



Temp:	75	Wind Spd:	01 mph	Humidity:	50 %
Start of Measurement:	12:08	End of Measurement:	12:23	63.7	dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
~~HHH HHH HHH HHH~~	8	0
~~HHH HHH HHH~~	HHH III	
HHH IIII 44 x 5 = 220		
Noise Measurement for Information Only		
No Through Roadways		
No Calibration Analysis Will Be Provided		

Appendix B
Noise Barrier Reasonableness Analysis Worksheets

Worksheet A

Reasonable Allowance Calculation for Noise Abatement based on Critical Design Receiver

County: San Diego
Route: Camino Del Mar

Base Allowance				
Base Year	2019			$107,000
1) Absolute Noise Levels			Check One	
69 dBA or less:	Add:	$2,000	√	$2,000
70-74 dBA:	Add:	$4,000	☐	$0
75-78 dBA:	Add:	$6,000	☐	$0
More than 78 dBA:	Add:	$8,000	☐	$0
2) Build vs. Existing Noise Levels			Check One	
Less than 3 dBA:	Add:	$0	√	$0
3-7 dBA:	Add:	$2,000	☐	$0
8-11 dBA:	Add:	$4,000	☐	$0
12 dBA or more:	Add:	$6,000	☐	$0
3) Achievable Noise Reduction			Check One	
Less than 6 dBA:	Add:	$0	☐	$0
6-8 dBA:	Add:	$2,000	☐	$0
9-11 dBA:	Add:	$4,000	√	$4,000
12 dBA or more:	Add:	$6,000	☐	$0
4) New Construction Or Pre 1978 residences? (Choose Yes or No)				
YES on either one:	Add:	$10,000	☐	$0
NO on both:	Add:	$0	√	$0
Reasonable Allowance Per Residence				$113,000
Unmodified Barrier Allowance				$113,000
Adjusted reasonable allowance for Benefitted Residence				
Adjusted Unmodified Barrier Allowance				

Barrier Name or ID	NB-1
Barrier Height (Feet)	6
Critical Design Receiver	R5/R6
Number of benefitted Residences (equivalent)	1
New Hwy Construction	No
Pre 1978 residences	No
Existing Noise Levels	66 dBA
Future Noise Levels	66 dBA
Changes in Noise Level	0 dBA increase
Noise Level with Abatement	57 dBA
Barrier Insertion Loss	9 dBA

Continue to Worksheet B

Adjusted reasonable allowance for Residence and Barrier must be rounded up to the nearest $1,000

Worksheet B
Noise Barrier Reasonable Allowance Calculation

County: San Diego Route: Camino Del Mar
Construction Cost without abatement: TBD

From Worksheet A				Adjusted Barrier Allowance vs Construction Cost	Percentage of Total Barrier Allowance	Modified Barrier Allowance	Modified Allowance Benefitted Residence
Barrier ID	Adjusted Allowance for Critical Design Receiver	Number of Benefitted Residences	Adjusted Unmodified Barrier Allowance		(col 4: A/ΣA)	(A/ΣA x .5 x Const Cost)	(col 7/col 3)
NB-1	$113,000	1	$113,000	The total unmodified barrier allowance (column 4) is less than 50% of the construction cost without abatement, therefore no allowance modification is required.			
	Totals	1	$113,000				
1	2	1	4	5	6	7	8

Worksheet A

Reasonable Allowance Calculation for Noise Abatement based on Critical Design Receiver

County: San Diego
Route: Camino Del Mar

Base Allowance				
Base Year	2019			$107,000
1) Absolute Noise Levels			Check One	
69 dBA or less:	Add:	$2,000	√	$2,000
70-74 dBA:	Add:	$4,000	☐	$0
75-78 dBA:	Add:	$6,000	☐	$0
More than 78 dBA:	Add:	$8,000	☐	$0
2) Build vs. Existing Noise Levels			Check One	
Less than 3 dBA:	Add:	$0	√	$0
3-7 dBA:	Add:	$2,000	☐	$0
8-11 dBA:	Add:	$4,000	☐	$0
12 dBA or more:	Add:	$6,000	☐	$0
3) Achievable Noise Reduction			Check One	
Less than 6 dBA:	Add:	$0	☐	$0
6-8 dBA:	Add:	$2,000	√	$2,000
9-11 dBA:	Add:	$4,000	☐	$0
12 dBA or more:	Add:	$6,000	☐	$0
4) New Construction Or Pre 1978 residences? (Choose Yes or No)				
YES on either one:	Add:	$10,000	☐	$0
NO on both:	Add:	$0	√	$0
Reasonable Allowance Per Residence				$111,000
Unmodified Barrier Allowance				$111,000
Adjusted reasonable allowance for Benefitted Residence				
Adjusted Unmodified Barrier Allowance				

Barrier Name or ID	NB-2
Barrier Height (Feet)	7
Critical Design Receiver	R5/R6
Number of benefitted Residences (equivalent)	1
New Hwy Construction	No
Pre 1978 residences	No
Existing Noise Levels	66 dBA
Future Noise Levels	66 dBA
Changes in Noise Level	0 dBA increase
Noise Level with Abatement	59 dBA
Barrier Insertion Loss	7 dBA

Continue to Worksheet B

Adjusted reasonable allowance for Residence and Barrier must be rounded up to the nearest $1,000

Worksheet B

Noise Barrier Reasonable Allowance Calculation

County: San Diego Route: Camino Del Mar

Construction Cost without abatement: TBD

From Worksheet A				Adjusted Barrier Allowance vs Construction Cost	Percentage of Total Barrier Allowance	Modified Barrier Allowance	Modified Allowance Benefitted Residence
Barrier ID	Adjusted Allowance for Critical Design Receiver	Number of Benefitted Residences	Adjusted Unmodified Barrier Allowance		(col 4: A/ΣA)	(A/ΣA x .5 x Const Cost)	(col 7/col 3)
NB-2	$111,000	1	$111,000	The total unmodified barrier allowance (column 4) is less than 50% of the construction cost without abatement, therefore no allowance modification is required.			
	Totals	1	$111,000				
1	2	1	4	5	6	7	8