

APPENDIX D
NOISE TECHNICAL REPORT



Noise Technical Report

Pediatric Mental and Behavioral Health Campus Project

October 7, 2022



Noise Technical Report

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Project Name: Pediatric Mental and Behavioral Health Campus Project

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Acronyms and Abbreviations

Terms	Definitions
CFR	Code of Federal Regulations
City	City of San Diego
CNEL	Community Noise Equivalent Level
County	County of San Diego
dB	decibels
dBA	A-weighted decibel
DHS	California Department of Health Services
EPA	U.S. Environmental Protection Agency
EPS	Emergency Power Supply
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
Hz	hertz
I-	Interstate
in	inches
JJC	San Diego Juvenile Justice Campus
kVA	kilovolt-ampere
kW	Kilowatt
L_{dn}	The average A-weighted noise level during a 24-hour day.
L_{eq}	Equivalent sound level over a specified period of time, typically, 1 hour.
L_{max}	The maximum, instantaneous noise level experienced during a given period of time
L_{min}	The minimum, instantaneous noise level experienced during a given period of time.
L_x	The noise level exceeded a percentage of a specified time period.
MBH	Pediatric Mental and Behavioral Health Campus
MHPA	multi-habitat planning area

Noise Technical Report

Terms	Definitions
NSLU	noise sensitive land uses
PPV	peak particle velocity
Project	Pediatric Mental and Behavioral Health Campus Project
RCHSD	Rady Children's Hospital-San Diego
ROW	right-of-way
SEL	sound exposure level
SF	square feet
SR-	State Route
V	Volt
YTC	Youth Transition Campus

1 Introduction

This noise technical study analyzes the proposed Pediatric Mental and Behavioral Health Campus (MBH) Project (Project). The Project site is located on County of San Diego (County) -owned land within the City of San Diego (City), south of the Interstate (I-) 805 and State Route (SR-) 163 interchange in the Serra Mesa Community (Figure 1). The 4.35-acre Project site is located along Birmingham Way on the former San Diego Juvenile Justice Campus (JJC), now known as the Youth Transition Campus (YTC), and is adjacent to the Rady Children's Hospital-San Diego (RCHSD) and Sharp Memorial Hospital campuses.

This noise technical study was prepared to support the County of San Diego environmental review process. This report includes a description of noise fundamentals and the existing noise setting, a summary of the regulations related to noise, and an evaluation of the proposed Project's potential noise effects.

1.1 Project Description

The proposed Project is Ground Lease and Operating Agreement enabling the construction and operation of a Pediatric MBH, a joint initiative between the County of San Diego and RCHSD. The Project site consists of a paved surface parking lot located on the YTC (Figure 2).

1.1.1 Project Background

The Pediatric MBH Project site is included in the site boundary for the YTC Redevelopment Project. The YTC Redevelopment Project consists of the redevelopment and reorganization of the YTC on a 31.5-acre site, including the Pediatric MBH Project site. The YTC Redevelopment Project was proposed in multiple phases; Phase 3 includes demolition of the existing Juvenile Probation Center and construction of a new Juvenile Probation Center adjacent to the west side of the Pediatric MBH Project site boundary. That activity has not yet occurred. The Pediatric MBH Project was not identified as a component of the YTC Redevelopment Project.

1.1.2 Project Components

The Pediatric MBH would provide child and adolescent mental and behavioral health services. The Project would result in the expansion of the existing County and RCHSD child and adolescent psychiatric inpatient services and outpatient programs. The Pediatric MBH would offer the complete spectrum of care that includes an acute psychiatric hospital, a crisis stabilization unit, and outpatient transitional services.

The Project consists of the following components (Figure 3):

- Two new patient care buildings
- One new parking structure
- Two new driveways on Birmingham Way
- Reconfiguration of the existing southern driveway on Meadow Lark Drive
- Service Access, Service Yard, and Fire Lanes
- Roadway improvements along Birmingham Way
- Utility improvements to connection points within Birmingham Way

The key Project components are described in more detail below.

1.1.2.1 Buildings

The Project includes construction of two new patient care buildings totaling approximately 93,000 square feet (SF). These are the Outpatient Psychiatric Clinic and the Inpatient Acute Psychiatric Hospital. The approximately 11,000-SF Outpatient Psychiatric Clinic would provide outpatient services, administration and academic services, clinical ancillary services, and facility support services. The facility would be constructed on the north-central area of the Project site and would be a one-story building.

The approximately 82,000-SF Inpatient Acute Psychiatric Hospital would include the Acute Psychiatric Unit and the Crisis Stabilization Unit with a combined total of 84 beds. It would have a secure vehicular sallyport to provide a secure entry for patients arriving by ambulance or law enforcement and a separate pedestrian sallyport for patients arriving with their parents or a guardian. This building would be constructed on the eastern portion of the Project site and would be a four-story building.

1.1.2.2 Parking Structure

A new up to approximately 369,000-SF, eleven-level including a partial height basement level, open-air parking structure would be constructed at the southwestern corner of the Project site. The parking structure would have up to approximately 900 parking spaces. The new parking structure would have three entrance/exits located in the southeastern, northeastern, and southwestern corners of the parking structure and would not exceed 117 feet in height. The parking structure would serve both the proposed Pediatric MBH Program and the existing County's Juvenile Court and Juvenile Probation Center.

1.1.2.3 Site Access Driveways

Current vehicle access to the existing surface parking lot is from Meadow Lark Drive on the west via two driveways, one located on each side of the County's Juvenile Probation Building. The Project would not include the northern driveway. The southern driveway on Meadow Lark Drive would be reconfigured within the existing curb cut. Two new driveways would be constructed on Birmingham Way for site access, one on the northwestern corner of the Project site and the other located at the northeast end of the Project site.

1.1.2.4 Birmingham Way Roadway Improvements

The following off-site circulation improvements are proposed along Birmingham Way on the north side of the Project site within the City of San Diego-owned right-of-way (ROW):

- Provision of dedicated right-turn lanes into each of the two new Project driveways along Birmingham Way (i.e., the northwestern and eastern driveways)
- Provision of a dedicated left-turn lane into the northwestern driveway, opposite Birmingham Drive
- Construction of new curb, sidewalk, and patient drop-off area along Birmingham Way between the two driveways

These improvements may include removal of existing pavement and new sidewalks and landscaping along Birmingham Way, as well as restriping.

1.1.2.5 Construction Activities

The pavement of the portion of the existing surface parking lot within the Project site boundary (approximately 116,000 SF) would be removed to allow for the construction of the Project components described above. An existing retaining wall along the east side of the parking lot would remain.

Other site preparation and demolition activities would include:

1. Soil removal as required for construction of basement-level parking and retaining walls along the light wells around the Parking Structure
2. Removal of existing trees and vegetation (landscaped areas)
3. Relocation of existing underground domestic water, fire water, stormwater, and sanitary sewer connections that serve existing buildings on the YTC site and that would conflict with the construction of the Pediatric MBH site
4. Trenching (approximately 600 linear feet) would be required in Birmingham Way and Children's Way to install the offsite sewer line connection, and approximately 300 linear feet of trenching may also be required to install electrical conduit within Birmingham Way.

Construction of the Project is expected to take 24 to 30 months. Construction would begin with demolition of the surface parking lot and is expected to start in 2024.

1.1.3 Operations

The Pediatric MBH is expected to have a total of approximately 80 to 90 staff. The Outpatient Psychiatric Clinic is expected to serve approximately 72 patients per day split approximately evenly between morning and afternoon patient blocks. The Inpatient Acute Psychiatric Hospital would accommodate overnight patients not to exceed the total of its 84 overnight bed capacity. Up to approximately 168 visitors are expected daily during visiting hours between 6 to 8 p.m.

Emergency power for the Pediatric MBH Project would be provided by a new generator that would be installed on the Project site. The generator would be installed in an exterior, sound-attenuated fashion to provide additional sound attenuation beyond that provided by a standard enclosure.

Figure 1: Regional Map

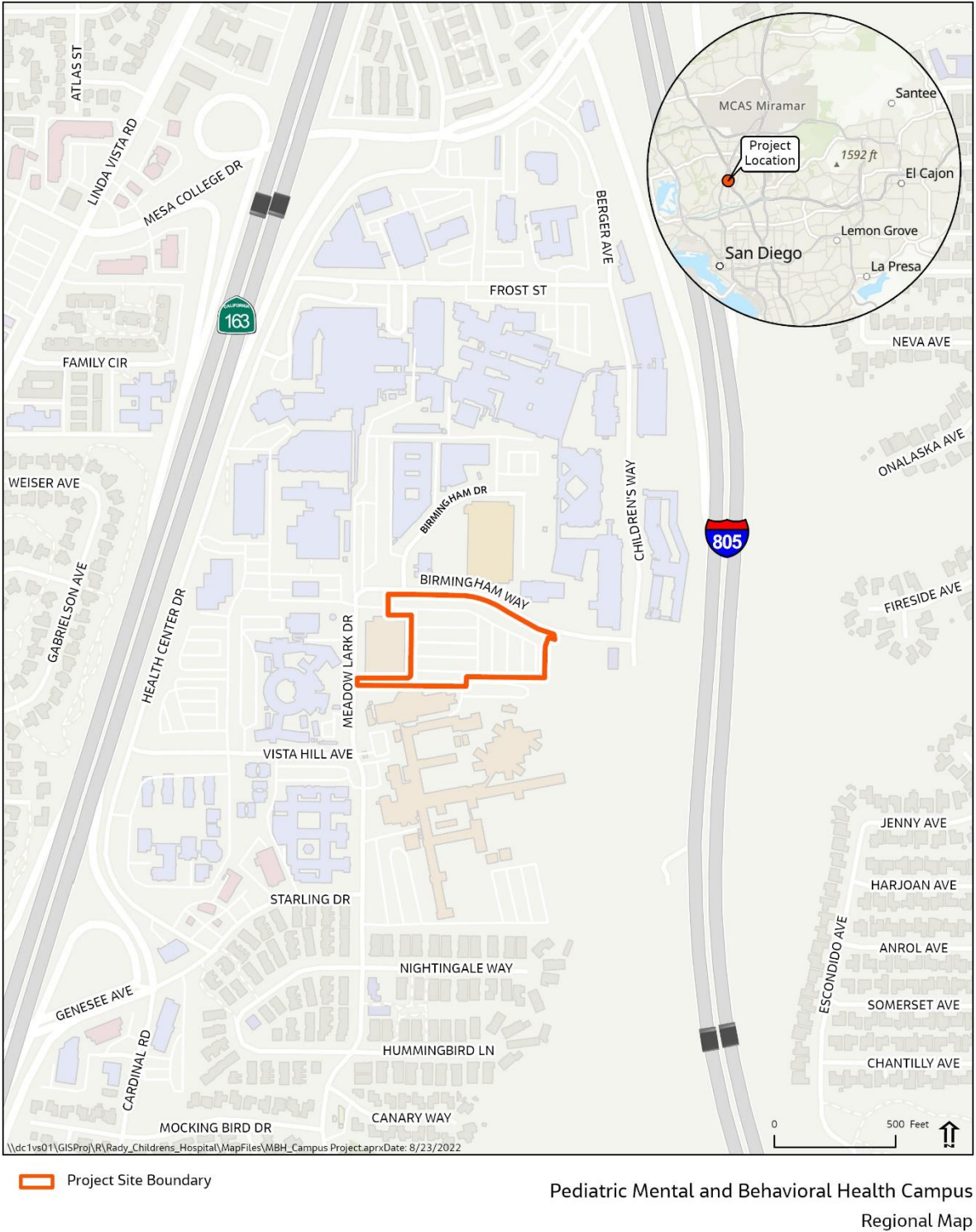


Figure 2: Existing Conditions Map

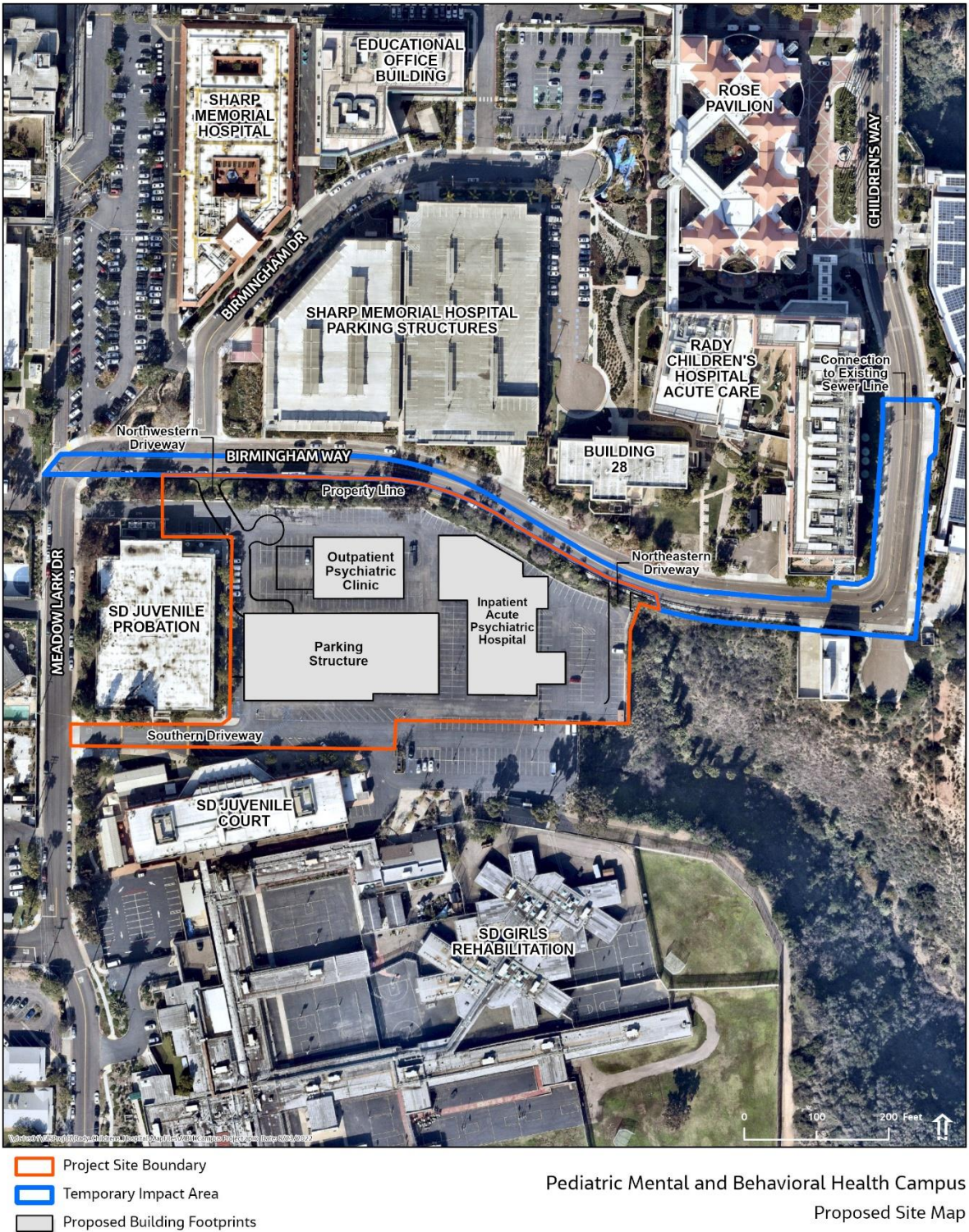


Project Site Boundary

Pediatric Mental and Behavioral Health Campus
Existing Conditions Map

Imagery Source:
San Diego Association Of Governments (Sandag) 2020

Figure 3: Site Map



2 Fundamentals of Noise

2.1 Noise Principles and Descriptors

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). Noise is generally defined as unwanted (i.e., loud, unexpected, or annoying) sound. Acoustics is defined as the physics of sound and addresses its propagation and control (Caltrans 2013). In acoustics, the fundamental scientific 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.

Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) that is measured in decibels (dB), which is the standard unit of sound amplitude measurement. The dB scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound, with 0 dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound (Caltrans 2013).

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude. When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum (Caltrans 2013).

The typical human ear is not equally sensitive to the frequency range from 20 to 20,000 Hz. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to these extremely low and extremely high frequencies. This method of frequency filtering or weighting is referred to as A-weighting, expressed in units of A-weighted decibels (dBA), which is typically applied to community noise measurements (Caltrans 2013). Some representative common outdoor and indoor noise sources and their corresponding A-weighted noise levels are shown in Table 1.

Table 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 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office

Table 1. Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime	— 30 —	Library
Quiet rural nighttime	— 20 —	Bedroom at night, concert hall (background)
	— 10 —	Broadcast/recording studio
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013.

2.2 Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time; a noise level is a measure of noise at a given instant in time, as presented in Table 2. However, noise levels rarely persist at that level over a long period of time. Rather, community noise varies continuously over a period of time with respect to the sound sources contributing to the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with many unidentifiable individual contributors. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources, such as changes in traffic volume. What makes community noise variable throughout a day, besides the slowly changing background noise, is the addition of short-duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual (Caltrans 2013).

These successive additions of sound to the community noise environment change the community noise level from instant to instant, requiring the noise exposure to be measured over periods of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. The following noise descriptors which are used to characterize environmental noise levels over time, are applicable to the proposed Project (Caltrans 2013).

- L_{eq}:** The equivalent sound level over a specified period of time, typically, 1 hour (L_{eq}). The L_{eq} may also be referred to as the average sound level.
- L_{max}:** The maximum, instantaneous noise level experienced during a given period of time.
- L_{min}:** The minimum, instantaneous noise level experienced during a given period of time.
- L_x:** The noise level exceeded a percentage of a specified time period. For instance, L₅₀ and L₉₀ represent the noise levels that are exceeded 50 percent and 90 percent of the time, respectively.
- L_{dn}:** The average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dB to measured noise levels between the hours of 10:00 p.m. to 7:00 a.m. to account for nighttime noise sensitivity. The L_{dn} is also termed the day-night average noise level (DNL).
- CNEL:** The Community Noise Equivalent Level (CNEL) is the average A-weighted noise level during a 24-hour day that includes an addition of 5 dB to measured noise levels between the hours of 7:00 a.m. to 10:00 p.m. and an addition of 10 dB to noise levels between the

hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime.

2.3 Effects of Noise on People

Noise is generally loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity that is a nuisance or disruptive. The effects of noise on people can be placed into four general categories:

- Subjective effects (e.g., dissatisfaction, annoyance)
- Interference effects (e.g., communication, sleep, and learning interference)
- Physiological effects (e.g., startle response)
- Physical effects (e.g., hearing loss)

Although exposure to high noise levels has been demonstrated to cause physical and physiological effects, the principal human responses to typical environmental noise exposure are related to subjective effects and interference with activities. Interference effects interrupt daily activities and include interference with human communication activities, such as normal conversations, watching television, telephone conversations, and interference with sleep. Sleep interference effects can include both awakening and arousal to a lesser state of sleep (Caltrans 2013).

With regard to the subjective effects, the responses of individuals to similar noise events are diverse and influenced by many factors, including the type of noise, the perceived importance of the noise, the appropriateness of the noise to the setting, the duration of the noise, the time of day and the type of activity during which the noise occurs, and individual noise sensitivity. Overall, there is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction on people. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise. Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted (i.e., comparison to the ambient noise environment). In general, the more a new noise level exceeds the previously existing ambient noise level, the less acceptable the new noise level will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships generally occur (Caltrans 2013):

- Except in carefully controlled laboratory experiments, a change of 1 dBA in ambient noise levels cannot be perceived.
- Outside the laboratory, a 3-dBA change in ambient noise levels is considered to be a barely perceivable difference.
- A change in ambient noise levels of 5 dBA is considered to be a readily perceivable difference.
- A change in ambient noise levels of 10 dBA is subjectively heard as doubling of the perceived loudness.

These relationships occur in part because of the logarithmic nature of sound and the decibel scale. The human ear perceives sound in a non-linear fashion; therefore, the dBA scale was developed. Because the dBA scale is based on logarithms, two noise sources do not combine in a simple additive fashion, but rather logarithmically. Under the dBA scale, a doubling of sound energy corresponds to a 3-dBA increase. In other words, when two sources are each producing sound of the same loudness, the resulting sound level at a given distance would be approximately 3 dBA higher than one of the sources under the same conditions. For example, if two identical noise

sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA. Under the dB scale, three sources of equal loudness together produce a sound level of approximately 5 dBA louder than one source, and 10 sources of equal loudness together produce a sound level of approximately 10 dBA louder than the single source (Caltrans 2013).

2.4 Noise Attenuation

When noise propagates over a distance, the noise level reduces with distance depending on the type of noise source and the propagation path. Noise from a localized source (i.e., point source) propagates uniformly outward in a spherical pattern, referred to as “spherical spreading.” Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (i.e., reduce) at a rate between 6 dBA for acoustically “hard” sites and 7.5 dBA for “soft” sites for each doubling of distance from the reference measurement, as their energy is continuously spread out over a spherical surface (e.g., for hard surfaces, 80 dBA at 50 feet attenuates to 74 dBA at 100 feet, 68 dBA at 200 feet). Hard sites are those with a reflective surface between the source and the receiver, such as asphalt or concrete surfaces or smooth bodies of water. No excess ground attenuation is assumed for hard sites, and the reduction in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, which in addition to geometric spreading, provides an excess ground attenuation value of 1.5 dBA (per doubling distance) (Caltrans 2013).

Roadways and highways consist of several localized noise sources on a defined path and hence are treated as “line” sources, which approximate the effect of several point sources. Noise from a line source propagates over a cylindrical surface, often referred to as “cylindrical spreading.” Line sources (e.g., traffic noise from vehicles) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement (Caltrans 2013). Therefore, noise due to a line source attenuates less with distance than that of a point source with increased distance.

Additionally, receptors located downwind from a noise source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Atmospheric temperature inversion (i.e., increasing temperature with elevation) can increase sound levels at long distances (e.g., more than 500 feet). Other factors such as air temperature, humidity, and turbulence can also have significant effects on noise levels (Caltrans 2013).

2.5 Fundamentals of Vibration

Vibration can be interpreted as energy transmitted in waves through the ground or man-made structures, which generally dissipate with distance from the vibration source. Because energy is lost during the transfer of energy from one particle to another, vibration becomes less perceptible with increasing distance from the source.

As discussed in the Caltrans’ Transportation and Construction Vibration Guidance Manual, operation of construction equipment generates ground vibration. Maintenance operations and traffic traveling on roadways can also be a source of such vibration. If amplitudes are high enough, ground vibration has the potential to damage structures, cause cosmetic damage, or disrupt the operation of vibration-sensitive equipment such as electron microscopes and advanced technology production and research equipment. Ground vibration and groundborne noise can also be a source of annoyance to individuals who live or work close to vibration-generating activities (Caltrans 2020).

In describing vibration in the ground and in structures, the motion of a particle (i.e., a point in or on the ground or structure) is used. The concepts of particle displacement, velocity, and acceleration are used to describe how the ground or structure responds to excitation. Although displacement is generally easier to understand than velocity or acceleration, it is rarely used to

describe ground- and structure-borne vibration because most transducers used to measure vibration directly measure velocity or acceleration, not displacement. Accordingly, vibratory motion is commonly described by identifying the peak particle velocity (PPV) (Caltrans 2020).

3 Environmental Setting

3.1 Existing Setting

The Project site is bordered by Birmingham Way on the north, open space that is part of the City of San Diego's multi-habitat planning area (MHPA) to the east, County Juvenile Court and Girls Rehabilitation Center to the south, and the existing County Juvenile Probation building to the west. Sharp Memorial Hospital parking structures and the RCHSD Specialty Clinic are located on the north side of Birmingham Way across from the site.

As previously stated, the Project site is located on land owned by San Diego County within the City of San Diego. According to the City of San Diego General Plan Noise Element, the most prevalent noise generators in the City are vehicles on interstate freeways. State highways, stationary industrial, commercial sources, and construction also contribute to the noise environment. Local collector streets are not considered a significant source of noise since traffic volume and speed are generally much lower than for freeways and major roadways.

The Project site is located directly between SR-163 and I-805, south of Birmingham Way and Meadow Lark Drive. Environmental noise at the Project site is due primarily to traffic on Birmingham Way and Meadow Lark Drive that border the Project site to the north and west, respectively. The Project site is approximately 800 feet to the east of SR-163 and approximately 600 feet from I-805. The faint sound of the freeways can be discerned from the Project site.

3.1.1 Noise-Sensitive Receptor Locations

Some land uses are considered more sensitive to noise than others due to the amount of noise exposure and the types of activities typically involved at the receptor location. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, nursing homes, and parks are generally more sensitive to noise than commercial and industrial land uses. Existing noise sensitive uses within 500 feet of the Project area include the following:

- San Diego Girls Rehabilitation Center, located approximately 110 feet south of the Project site, to the east of Meadow Lark Drive.
- Sharp Memorial Hospital, located approximately 260 feet north of the Project site, north of Birmingham Drive.
- Rady Children's Hospital Acute Care Pavilion, located approximately 270 feet northeast of the Project site, north of Birmingham Way.
- Shore Post-Acute nursing home, located approximately 420 feet south of the Project site, on Meadow Lark Drive.

All other noise-sensitive uses are located at greater distances and/or shielded from construction and operation activity by buildings immediately surrounding the Project area and would experience lower noise levels associated with the Project. Therefore, additional sensitive receptors beyond those identified above are not evaluated.

3.1.2 Ambient Noise Levels

Environmental noise at the Project site is due primarily to traffic on Birmingham Way and Meadow Lark Drive that border the Project site to the north and east, respectively. The Project site is located directly between SR-163 and I-805, south of Birmingham Way and Meadow Lark Drive. The Project site is approximately 800 feet to the east of SR-163 and approximately 600 feet from I-805. The faint sound of the freeways can be discerned from the Project site.

The ambient noise level is the all-encompassing noise associated with a given environment at a specified time. It is the composite of sound from many sources in all directions, near and far, with no particular sound being dominant (Harris 1991). Typical ambient levels range from 35 to 50 CNEL in rural and agricultural areas, 50 to 65 CNEL in suburban to urban areas, and 65 to 75 CNEL in downtown urban areas (EPA 1974). The Project area can be categorized as a downtown urban area; therefore, ambient sound levels range from 65 to 75 dBA.

3.2 Regulatory Framework

The following State and federal regulations provide an overall context for the consideration of site-specific issues at the Project site. When provisions are requirements (e.g., law, code, regulation, or ordinance), it is assumed these regulatory requirements would be adhered to with Project implementation, both as they apply to development of the proposed Project and related Project activities.

3.2.1 Federal

Under the authority of the Noise Control Act of 1972, the U.S. Environmental Protection Agency (EPA) established noise emission criteria and published testing methods in 40 Code of Federal Regulations (CFR) Parts 201 through 205 that apply to some transportation equipment (e.g., interstate rail carriers, medium trucks, and heavy trucks) and construction equipment (EPA 1972). In 1974, the EPA issued guidance levels for the protection of public health and welfare in residential areas of an outdoor L_{dn} of 55 dBA and an indoor L_{dn} of 45 dBA (EPA 1974). These guidance levels are not considered as standards or regulations and were developed without consideration of technical or economic feasibility. As a result, there are no federal noise standards that directly regulate construction or operational noise of the proposed Project.

3.2.2 State

3.2.2.1 California Department of Health Services

The State of California does not have statewide standards for environmental noise, but the California Department of Health Services (DHS) has established guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The purpose of these guidelines is to maintain acceptable noise levels in a community setting for different land use types. Noise compatibility by different land use types is categorized into four general levels: "normally acceptable," "conditionally acceptable," "normally unacceptable," and "clearly unacceptable." For instance, a noise environment ranging from 50 dBA CNEL to 65 dBA CNEL is considered to be "normally acceptable" for multi-family residential uses, while a noise environment of 75 dBA CNEL or above for multi-family residential uses is considered to be "clearly unacceptable." In addition, California Government Code Section 65302(f) requires each county and city in the state to prepare and adopt a comprehensive long-range General Plan for its physical development, with Section 65302(g) requiring a Noise Element to be included in the General Plan. The Noise Element must: (1) identify and appraise noise problems in the community, (2) recognize Office of Noise Control guidelines, and (3) analyze and quantify current and projected noise levels.

3.2.2.2 Caltrans Construction Vibration Criteria

Caltrans provides vibration design criteria for construction damage (Caltrans 2020). Transient vibrations are classified as brief impulsive events that are short in duration (e.g., debris falling). Continuous vibrations are more sustained vibration events over longer periods of time (e.g.,

jackhammering, drilling). Thresholds for continuous vibrations are lower than those for transient vibrations and are therefore more conservative. Tables 2 and 3 present the thresholds applied to the proposed Project.

Table 2: Guideline Vibration Damage Potential Threshold Criteria

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

Source: Caltrans 2020

Table 3: Guideline Vibration Annoyance Potential Threshold Criteria

Structure and Condition	Maximum PPV	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible (begin to annoy people)	0.9	0.10
Severe	2.0	0.4
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04

Source: Caltrans 2020


3.2.3 Regional


3.2.3.1 San Diego County General Plan Noise Element


The Noise Element of the County General Plan includes guidelines for noise compatibility and establishes limitations on sound levels to be received by noise sensitive land uses (NSLU) (Tables N-1 and N-2 from the County General Plan), as detailed below in Table 4, and noise standards, as detailed in Table 5. New development may cause an existing NSLU to be affected by noise caused by the new development, or it may locate a sensitive land use in such a place that it is affected by noise.

Table 4: Noise Compatibility Guidelines

Land Use Category		Exterior Noise Level (CNEL)					
		55	60	65	70	75	80
A	Residential—single family residences, mobile homes, senior housing, convalescent homes						
B	Residential—multi-family residences, mixed-use (commercial/residential)						
C	Transient lodging—motels, hotels, resorts						
D*	Schools, churches, hospitals, nursing homes, child care facilities						
E*	Passive recreational parks, nature preserves, contemplative spaces, cemeteries						
F*	Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation						
G*	Office\professional, government, medical\dental, commercial, retail, laboratories						
H*	Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair						

 **ACCEPTABLE**—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements

 **CONDITIONALLY ACCEPTABLE**—New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table N-2, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate county decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist.

 **UNACCEPTABLE**—New construction or development shall not be undertaken.

* Denotes facilities used for part of the day; therefore, an hourly standard would be used rather than CNEL (Refer to Table N-2 in the San Diego County General Plan, Noise Element).

Source: County of San Diego 2011

Table 5: Noise Standards

1. The exterior noise level (as defined in Item 3) standard for Category A shall be 60 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
2. The exterior noise level standard for Categories B and C shall be 65 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
3. The exterior noise level standard for Categories D and G shall be 65 CNEL and the interior noise level standard shall be 50 dBA Leq (one hour average).
4. For single-family detached dwelling units, "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: (i) for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, (ii) for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; (iii) for lots over 10 acres in area, the exterior area shall include 1 acre.
5. For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas which are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.
6. For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.
7. For noise sensitive land uses where people normally do not sleep at night, the exterior and interior noise standard may be measured using either CNEL or the one-hour average noise level determined at the loudest hour during the period when the facility is normally occupied.
8. The exterior noise standard does not apply for land uses where no exterior use area is proposed or necessary, such as a library.
9. For Categories E and F the exterior noise level standard shall not exceed the limit defined as "Acceptable" in Table N-1 (Table 4 above) or an equivalent one-hour noise standard.

Source: County of San Diego 2011

Note: Exterior Noise Level compatibility guidelines for Land Use Categories A-H are identified in Table N-1 in the San Diego County Noise Element (Table 4 above).

3.2.3.2 San Diego County Code of Regulatory Ordinances

Chapter 4 of the County of San Diego Code of Regulatory Ordinances discuss further County noise requirements. The purpose of the Noise Ordinance is to regulate noise in the unincorporated area of the County to promote the public health, safety, comfort, and convenience of the County's inhabitants and its visitors.

Section 36.404, General Sound Level Limits

The noise ordinance sets limits pertaining to the generation of exterior noise as follows:

- (a) It shall be unlawful for any person to cause or allow the creation of any noise which exceeds the one-hour average sound level limits in Table 6 when the one-hour average sound level is measured at the property line of the property on which the noise is produced or at any location on a property that is receiving the noise.

Table 6: County of San Diego Noise Ordinance Exterior Sound Level Limits

Zone	Time	One-Hour Average Sound Level Limits (dBA)
(1) R-S, R-D, R-R, R-MH, A-70, A-72, S-80, S-81, S-87, S-90, S-92 and R-V and R-U with a density of less than 11 dwelling units per acre.	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
(2) RRO, RC, RM, S86, FB-V5, RV and RU with a General Plan Land Use Designation density of 10.9 or more dwelling units per acre.	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
(3) S94, FB-V4, AL-V2, AL-V1, AL-CD, RM-V5, RM-V4, RM-V3, RM-CD and all commercial zones.	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
(4) FB-V1, FB-V2, RM-V1, RM-V2	7 a.m. to 7 p.m.	60
	7 p.m. to 10 p.m.	55
FB-V1, RM-V2	10 p.m. to 7 a.m.	55
FB-V2, RM-V1	10 p.m. to 7 a.m.	50
FB-V3	7 a.m. to 10 p.m.	70
	10 p.m. to 7 a.m.	65
(5) M50, M52, and M54	Anytime	70
(6) S82, M56, and M58.	Anytime	75
(7) S88 (see subsection (c) below)	--	--

Source: San Diego County Code of Regulatory Ordinances Section 36.404.

NOTES:

Zoning Code Definitions: R-S = Single-Family Residential; R-D = Duplex Residential; R-R = Rural Residential; R-MH = Mobile Home Residential; A-70 = Limited Agriculture; A-72 = General Agriculture; S-80 = Open Space; S-90 = Holding Area; S-92 = General Rural; S-94 = Transportation and Utility Corridor; R-V = Variable-Family Residential; R-RO = Residential-Recreation Oriented; R-C = Residential-Commercial; R-M = Multi-Family Residential; S-86 = Parking; R-U = Urban Residential; V1, V2, V3, V4, and V5 = Village Designations; M-50 = Basic Industrial; M-52 = Limited Industrial; M-54 = General Impact Industrial; S-82 = Extractive Use; M-56 = Mixed Industrial; M-58 = High-Impact Industrial; S-88 = Specific Plan

- (b) Where a noise study has been conducted and the noise mitigation measures recommended by that study have been made conditions of approval of a Major Use Permit, which authorizes the noise-generating use or activity and the decision-making body approving the Major Use Permit determined that those mitigation measures reduce potential noise impacts to a level below significance, implementation and compliance with those noise mitigation measures shall constitute compliance with subsection (a) above.

- (c) S-88 zones are Specific Planning Areas which allow different uses. The sound level limits in Table 6 above that apply in an S-88 zone depend on the use being made of the property. The limits in Table 6, subsection (1) apply to property with a residential, agricultural, or civic use. The limits in subsection (3) apply to property with a commercial use. The limits in subsection (5) apply to property with an industrial use that would only be allowed in an M-50, M-52, or M-54 zone. The limits in subsection (6) apply to all property with an extractive use or a use that would only be allowed in an M-56 or M-58 zone.
- (d) If the measured ambient noise level exceeds the applicable limit in Table 6, the allowable one-hour average sound level shall be the one-hour average ambient noise level, plus 3 decibels. The ambient noise level shall be measured when the alleged noise violation source is not operating.
- (e) The sound level limit at a location on a boundary between two zones is the arithmetic mean of the respective limits for the two zones. The one-hour average sound level limit applicable to extractive industries, however, including but not limited to borrow pits and mines, shall be 75 decibels at the property line regardless of the zone in which the extractive industry is located.
- (f) A fixed-location public utility distribution or transmission facility located on or adjacent to a property line shall be subject to the sound level limits of this section measured at or beyond 6 feet from the boundary of the easement upon which the facility is located.

Section 36.408, Hours of Operation of Construction Equipment

Except for emergency work, it shall be unlawful for any person to operate or cause to be operated, construction equipment:

- (a) Between the hours of 7 p.m. and 7 a.m.
- (b) On a Sunday or a holiday. For purposes of this section, a holiday means January 1st, the last Monday in May, July 4th, the first Monday in September, the fourth Thursday in November, and December 25th. A person may, however, operate construction equipment on a Sunday or holiday between the hours of 10 a.m. and 5 p.m. at the person's residence or for the purpose of constructing a residence for himself or herself, provided that the operation of construction equipment is not carried out for financial consideration or other consideration of any kind and does not violate the limitations in sections 36.409 and 36.410.

Section 36.409, Construction Noise

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 decibels for an eight-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

Section 36.410, Impulsive Noise

Section 36.410 provides additional limitation on construction equipment beyond Section 36.404 pertaining to impulsive noise. Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 7, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period.

Table 7: County of San Diego Maximum Sound Levels (Impulsive)

Occupied Property Use	Decibels (dBA)
Residential, village zoning or civic use	82
Agricultural, commercial or industrial use	85

Source: San Diego County Municipal Code Section 36.410

Notes:

dBA = A-weighted decibel; LMAX = maximum noise level

The minimum measurement period for any measurements is one hour. During the measurement period, a measurement must be conducted every minute from a fixed location on an occupied property. The measurements must measure the maximum sound level during each minute of the measurement period. If the sound level caused by construction equipment or the producer of the impulsive noise exceeds the maximum sound level for any portion of any minute, it will be deemed that the maximum sound level was exceeded during that minute.

3.3 City of San Diego General Plan

The City of San Diego's Noise Element of the General Plan specifies compatibility standards for different land use categories, see Table 7. Multi-family residential uses are considered "compatible" with exterior noise levels up to 60 CNEL and "conditionally compatible" with exterior noise levels up to 70 CNEL. The City's interior noise level standard for all residential uses is 45 CNEL.

Table 8: City of San Diego Noise Compatibility Guidelines

Land Use Category	Exterior Noise Exposure (dBA CNEL)			
	60	65	70	75
<i>Parks and Recreational</i>				
Parks, Active and Passive Recreation				
Outdoor Spectator Sports, Golf Courses; Water Recreational Facilities; Indoor Recreation Facilities				
<i>Agricultural</i>				
Crop Raising and Farming; Community Gardens, Aquaculture, Dairies; Horticulture Nurseries and Greenhouses; Animal Raising, Maintaining and Keeping; Commercial Stables				
<i>Residential</i>				
Single Dwelling Units; Mobile Homes		45		
Multiple Dwelling Units *For uses affected by aircraft noise, refer to Policies NE-D.2. & NE-D.3.		45	45	

Table 8: City of San Diego Noise Compatibility Guidelines

Land Use Category			Exterior Noise Exposure (dBA CNEL)			
			60	65	70	75
<i>Institutional</i>						
Hospitals; Nursing Facilities; Intermediate Care Facilities; Kindergarten through Grade 12 Educational Facilities; Libraries; Museums; Child Care Facilities				45		
Other Educational Facilities including Vocational/Trade Schools and Colleges and Universities				45	45	
Cemeteries						
<i>Retail Sales</i>						
Building Supplies/Equipment; Food, Beverage, and Groceries; Pets and Pet Supplies; Sundries, Pharmaceutical, and Convenience Sales; Wearing Apparel and Accessories					50	50
<i>Commercial Services</i>						
Building Services; Business Support; Eating and Drinking; Financial Institutions; Maintenance & Repair; Personal Services; Assembly and Entertainment (includes public and religious assembly); Radio and Television Studios; Golf Course Support					50	50
Visitor Accommodations				45	45	45
<i>Offices</i>						
Business & Professional; Government; Medical, Dental & Health Practitioner; Regional & Corporate Headquarters					50	50
<i>Vehicle and Vehicular Equipment Sales and Services Use</i>						
Commercial or Personal Vehicle Repair & Maintenance; Commercial or Personal Vehicle Sales & Rentals; Vehicle Equipment & Supplies Sales & Rentals; Vehicle Parking						
<i>Wholesale, Distribution, Storage Use Category</i>						
Equipment & Materials Storage Yards; Moving & Storage Facilities; Warehouse; Wholesale Distribution						
<i>Industrial</i>						
Heavy Manufacturing; Light Manufacturing; Marine Industry; Trucking & Transportation Terminals; Mining & Extractive Industries						
Research & Development					50	
	Compatible	Indoor Uses	Standard construction methods should attenuate exterior noise to an acceptable indoor noise level.			
		Outdoor Uses	Activities associated with the land use may be carried out.			
45, 50	Conditionally Compatible	Indoor Uses	Building structure must attenuate exterior noise to the indoor noise level indicated by the number for occupied areas.			

Table 8: City of San Diego Noise Compatibility Guidelines

Land Use Category			Exterior Noise Exposure (dBA CNEL)			
			60	65	70	75
		Outdoor Uses	Feasible noise mitigation techniques should be analyzed and incorporated to make the outdoor activities acceptable.			
	Incompatible	Indoor Uses	New construction should not be undertaken.			
		Outdoor Uses	Severe noise interference makes outdoor activities unacceptable.			

Source: City of San Diego 2008

3.4 City of San Diego Municipal Code

Section 59.5.0401 of the City's Noise Abatement and Control Ordinance states that:

- A. It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit.
- B. The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts.

The applicable noise limits of the City's Noise Abatement and Control Ordinance are summarized in Table 9.

Table 9: City of San Diego Applicable Noise Level Limits

Land Use	Time of Day	One-Hour Average Sound Level (dBA, L_{eq})
Single-family Residential	7:00 a.m. to 7:00 p.m.	50
	7:00 p.m. to 10:00 p.m.	45
	10:00 p.m. to 7:00 a.m.	40
Multi-family Residential (up to a maximum density of 1 unit/2,000 square feet)	7:00 a.m. to 7:00 p.m.	55
	7:00 p.m. to 10:00 p.m.	50
	10:00 p.m. to 7:00 a.m.	45
All other Residential	7:00 a.m. to 7:00 p.m.	60
	7:00 p.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
Commercial	7:00 a.m. to 7:00 p.m.	65
	7:00 p.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	60
Industrial or Agricultural	Anytime	75

Source: City of San Diego 2010a.

Notes:

dBA = A-weighted decibel

Under Section 59.5.0404, Construction Noise, construction activities are unlawful for any person, between the hours of 7 p.m. of any day and 7 a.m. of the following day, or on legal holidays, except for Columbus Day and Washington's Birthday, or on Sundays unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. Additionally, it is unlawful for any person to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7 a.m. to 7 p.m.

3.5 Thresholds of Significance

A significant impact would occur to noise and vibration if the proposed Project would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies
- Generation of excessive groundborne vibration or groundborne noise levels
- For a project located within the vicinity of a private airstrip or an airport land use plan, would the project expose people residing or working in the project area to excessive noise levels

The proposed Project is located on County-owned land; however, the land is within the City of San Diego. Therefore, City of San Diego regulations are used, where applicable, for land uses located within the jurisdiction of the City to determine potential impacts generated by the construction and operation of the Project (City of San Diego 2020). For noise sensitive receivers located on County-owned land, San Diego County regulations are used.

4 Project Impact Analysis

4.1 Construction Impacts

4.1.1 Construction Equipment Noise Levels

Construction of all proposed Project components would require the use of heavy equipment during site preparation, grading, trenching, excavation, and building activities at the Project site. Development activities would also involve the use of smaller power tools, generators, and other sources of noise. Each stage of development would utilize a different mix of equipment. As such, construction activity noise levels at and near the Project site would fluctuate depending on the particular type, number, and duration of use of the various pieces of construction equipment. Construction of the Project is expected to take 24 to 30 months. Construction would begin with demolition of the surface parking lot and is expected to start in 2024. Construction-related material haul trips would increase noise levels along haul routes depending on the number of haul trips made and types of vehicles used.

Table 10 shows the anticipated noise levels (L_{max}) produced by some of the various types of construction equipment that would be used at the Project site based on a distance of 50 feet between the equipment and the noise receptor.

Table 10. Construction Noise Levels from a Distance of 50 feet

Type of Equipment	L_{max} , dBA (50 feet)	L_{max} , dBA (100 feet) ^a	L_{max} , dBA (200 feet) ^a
Air Compressor	78	72	66
Backhoe	78	72	66
Bore/Drill Rig	79	73	67
Cement/Mortar Mixer	79	73	67
Cranes	81	75	69
Dozers	82	76	70
Dump/Haul Trucks	76	70	64
Excavator	81	75	69
Forklift	75	69	63
Front End Loader	79	73	67
Generator Sets	81	75	69
Graders	85	79	73
Paving Equipment	85	79	73
Pickup Truck	75	69	63
Pumps	81	75	69
Scraper	84	78	72
Tractor/Loader/Backhoe	80	74	68
Vacuum Street Sweeper	82	76	70
Water Trucks	80	74	68
Welders	74	68	62

Source: FHWA 2006

Notes

- a) Noise levels calculated by accounting for distance attenuation of 6 dBA per doubling of distance.

Construction activity would occur approximately 100 feet from the Girls Rehabilitation Center. According to Table 10, maximum exterior noise levels experienced at the Rehabilitation Center will not exceed 79 dBA; and, in accounting for distance attenuation of 6 dBA per doubling of distance, maximum exterior noise levels experienced at the Girls Rehabilitation Center would be less than 85 dBA, which is the San Diego County maximum noise level limits. Construction activities will not exceed an average sound level of 75 dB for an eight-hour period, between 7 a.m. and 7 p.m. Sharp Memorial Hospital and Rady Children's Acute Center Pavilion are located over 200 feet from the proposed construction activities. According to Table 10, maximum exterior noise levels experienced at the Sharp Hospital and the Acute Center Pavilion will not exceed 75 dBA; maximum exterior noise levels would be less than 73 dBA, which is the City of San Diego maximum noise limit (City of San Diego 2010b). Additionally, construction equipment would be used intermittently throughout the day at different locations within the Project site. Furthermore, L_{max} noise levels associated with the construction equipment would be generated only when equipment is operated at full power. Typically, the operating cycle for a piece of construction equipment would involve 1 or 2 minutes of full power operation followed by 3 or 4 minutes at lower power settings. As such, the L_{max} noise levels shown in Table 10 would occur only occasionally throughout the construction day.

4.2 Operation Impacts

Operational noise sources associated with the proposed Project would include, but would not be limited to, mechanical equipment (e.g., heating, ventilation, and air conditioning [HVAC] units); generators; and sewer pumps and vehicles utilizing the parking structure.

4.2.1 Stationary Noise Sources

The operation of mechanical equipment typical for developments like the Project, such as air conditioners, fans, generators, and related equipment, generate noise levels which may be audible.

The HVAC system proposed for the Project has not been specified, and noise levels vary depending on the system size. However, it is assumed that one or more HVAC compressor units will be installed on the rooftops of the two new patient care buildings. HVAC noise levels can be expected to range from 60 to 70 dBA at 5 feet from the rooftop equipment and ventilation openings (Illingsworth & Rodkin 2011). Assuming HVAC units are installed at the center of each rooftop, a 70-dBA reference noise level would attenuate to 52 dBA at 40 feet from the source. HVAC noise would be less than the 60 dBA criteria at the Project property line, which is below the 60-dB CNEL threshold for the County of San Diego and the 60-dBA threshold for the City of San Diego (County of San Diego 2011; City of San Diego 2010b).

Emergency power source for the facility would consist of an Emergency Power Supply (EPS) coupled to an Emergency Power Supply System. The EPS would include a single diesel-operated engine generator set. The emergency power supply would include a new 750-kilowatt (kW) / 937.5-kilovolt-ampere (kVA), 480Y/277-volt (V), diesel-engine-driven essential power generator. Maximum noise levels for generators at 50 feet are 82 dBA (FHWA 2006). The essential power generator would be placed in an exterior, sound attenuated fashion. This shall provide sound attenuation to a minimum of 70 dB. The enclosure would limit noise from the generator, ensuring that noise levels would not exceed the 60-dB CNEL threshold for the County of San Diego and the 60-dBA threshold for the City of San Diego.

4.2.2 Parking Noise

Vehicle sources of noise associated with parking facilities typically include engines accelerating, doors slamming, car alarms, and people talking. Noise levels at these facilities would fluctuate throughout the day with the amount of vehicle and human activity. Noise levels would generally be the highest in the early morning and evening hours when the largest number of people would enter and exit the parking facility. The nearest noise-sensitive uses to the parking entrance would be the Girls Rehabilitation Center, located approximately 100 feet to the south.

For the purpose of providing a quantitative estimate of the noise levels that would be generated from the Project's parking area, the methodology recommended by the Federal Transit Administration (FTA) for the general assessment of stationary transit noise sources is used (FTA 2006). Using the methodology, the Project's peak hourly noise level that would be generated by the onsite parking levels was estimated using the following FTA equation for a parking lot:

$$L_{eq}(h) = SEL_{ref} + 10\log(NA/1000) - 35.6, \text{ where}$$

$$L_{eq}(h) = \text{hourly } L_{eq} \text{ noise level at 50 feet}$$

$$SEL_{ref} = \text{reference noise level for stationary noise source represented in sound exposure level (SEL) at 50 feet}$$

$$N_A = \text{number of automobiles per hour}$$

As a worst-case scenario, this analysis will assume that during peak hour the anticipated number of vehicles traveling to the parking structure will be approximately 450 vehicles (50 percent of the parking structure capacity). Using the FTA's reference noise level of 92 dBA SEL at 50 feet from the noise source for a parking lot (FTA 2006), it was determined that the Project's highest peak hour vehicle trips, would generate noise levels of approximately 53 dBA L_{eq} at 50 feet from the Project's parking entrance. Accounting for distance attenuation of 6 dBA per doubling of distance, noise levels would be approximately 47 dBA L_{eq} at 100 feet. These noise levels would not exceed the 60-dB CNEL threshold for the County of San Diego.

4.3 Vibration Impacts

Vibration-sensitive land uses include high-precision manufacturing facilities or research facilities with optical and electron microscopes. None of these occur in the Project area. Therefore, the significance threshold for "excessive groundborne vibration" depends on whether a nuisance, annoyance, or physical damage to any structure could occur.

4.3.1 Construction

Construction of the proposed Project may include activities such as the use of concrete saws, excavation and grading, and the use of rolling stock equipment (tracked vehicles, compactors, etc.), which may result in increased vibration levels. Typical construction vibration levels are listed in Table 11.

Table 11. Construction Equipment Vibration Levels

Equipment	PPV at 25 feet	PPV at 50 feet	PPV at 100 feet	PPV at 200 feet
Vibratory Roller	0.210	0.074	0.026	0.009
Hoe ram/Drill	0.089	0.031	0.011	0.004
Large bulldozer	0.089	0.031	0.011	0.004
Loaded trucks	0.076	0.027	0.010	0.003
Jackhammer	0.035	0.012	0.004	0.002
Small bulldozer	0.003	0.001	0.000	0.000

Source: Caltrans 2020

Notes

PPV = Peak Particle Velocity

The San Diego Juvenile Probation building is located approximately 25 feet from the construction activity for the proposed Project. Based on the distance of the nearest sensitive receptors and the anticipated vibration levels shown in Table 11, the operation of a vibratory roller would result in construction vibration levels of 0.210 inches per second peak particle velocity (in/sec PPV) at 25 feet. This vibration level would be below the vibration damage potential threshold for commercial buildings (2.0 in/sec PPV); and with commercial buildings located 25 feet away would be on the order of 0.210 in/sec PPV (vibratory roller), which would be distinctly perceptible but not excessive.

4.3.2 Operation

Once construction activities have been completed, no substantial sources of vibration activities would be generated from the Project site. Operation of the proposed Project would include typical stationary mechanical and electrical equipment, such as HVAC units, sewage pumps, and generators, which would produce limited levels of vibration. In addition, the primary sources of transient vibration would include passenger vehicle circulation within the proposed parking areas, which also produces limited levels of vibration. These sources would generate substantially lower levels of vibration identified above for construction.

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