Noise and Vibration Impact Assessment

Church of the Woods

Irvine, California
July 2018

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Acronyms and Abbreviations

µPa	micropascals
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Authority
HVAC	heating, ventilation, and air conditioning
L_{dn}	day-night sound level
L_{eq}	time averaged equivalent sound pressure level
$L_{eq(Day)}$	time averaged daytime (7:00 a.m. to 10:00 p.m.) L_{eq}
$L_{eq(Night)}$	time averaged nighttime (10:00 p.m. to 7:00 a.m.) L_{eq}
L_{max}	maximum sound level
PPV	peak particle velocity
RMS	root mean square
STC	sound transmission class
VdB	velocity level in decibels

Executive Summary

A noise and vibration study was completed for the Church of the Woods project (project) to identify potential impacts to on-site and nearby sensitive land uses. Project construction and operational noise and vibration were calculated and compared to applicable laws, guidelines, and/or regulations. Construction noise from the project is predicted to result in a significant impact at nearby noise sensitive receptors. Construction noise would be restricted to daytime hours (7:00 a.m. to 7:00 p.m. Monday through Saturday). Vibration from project construction would attenuate quickly with distance from the source and is not predicted to result in perceptible levels at nearby sensitive receptors.

Operational noise is not predicted to result in an increase in received noise levels at nearby noise sensitive receptors. On-site sensitive receptors/land uses would not be exposed to traffic noise levels that would exceed the exterior noise level standards set by the County.

1 Project Description

The proposed site of the Church of the Woods is located on an approximately 27.1-acre property located in the Rimforest community, an unincorporated portion of San Bernardino County located in the San Bernardino Mountains. As shown in Figure 1-1, *Regional Map*, the Project site is located immediately north of State Route 18 (SR 18), approximately 0.5 mile south of State Route 189 (SR 189), and approximately 1.2 miles west of State Route 173 (SR 173). The City of San Bernardino is located approximately 4.5 miles to the south of the Project site. The Project site is located approximately 1.5 miles to the southwest of the Lake Arrowhead reservoir.

1.1 Local Setting and Location

As depicted on Figure 1-2, *Vicinity Map*, the Project site is located in the northeast portion of the unincorporated community of Rimforest in the western portion of unincorporated San Bernardino County, California. The Project site is located within the San Bernardino National Forest, a United States National Forest that encompasses about 823,816 acres of portions of the San Bernardino Mountains, San Jacinto Mountains, and Santa Rosa Mountains. Approximately 82 percent of the San Bernardino National Forest is federally-owned. The Project site is privately-owned and is located in the San Bernardino Mountains portion of the San Bernardino National Forest, situated immediately north of SR 18, east of Bear Springs Road, and west of Daley Canyon Road. The Project site lies within Section 29, Township 2 North, Range 3 West, Harrison Mountain Quadrangle. The Project site encompasses the Assessor's Parcel Number (APN) 336-101-06.

1.2 Surrounding Land Uses and Developments

Land uses surrounding the Project site are described below:

<u>North</u>: The Project site is bordered to the north by undeveloped mountainous terrain, with a Caltrans maintenance facility and single-family residences located approximately 0.5 mile and 0.2 mile farther north, respectively.

<u>East</u>: The Project site is bordered on the east by Daley Canyon Road. The Dogwood Campground (a public campground within the San Bernardino National Forest) and Rim of the World High School (within the Rim of the World Unified School District) are located to the east of Daley Canyon Road approximately 0.1 mile and 0.2 mile to the east of the Project site, respectively.

<u>South</u>: The Project site is bordered on the south by SR 18 with steeply sloped undeveloped mountainous terrain located beyond SR 18. Commercial and residential developments are located to the southwest of the Project site, south of SR 18.

<u>West</u>: The Project site is bordered on the west by single-family residences associated with the Rimforest community.

Figure 1-1. Regional Map

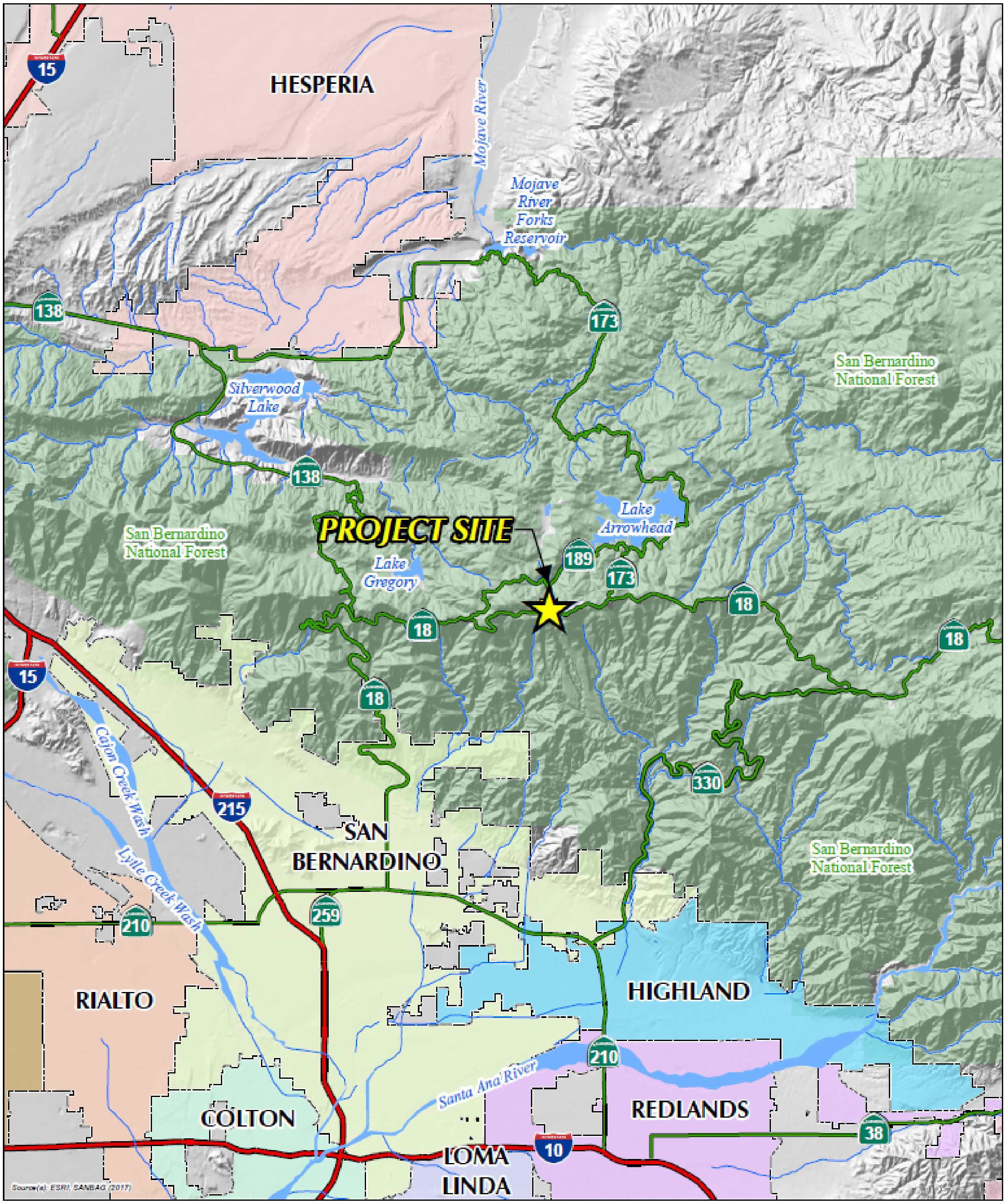
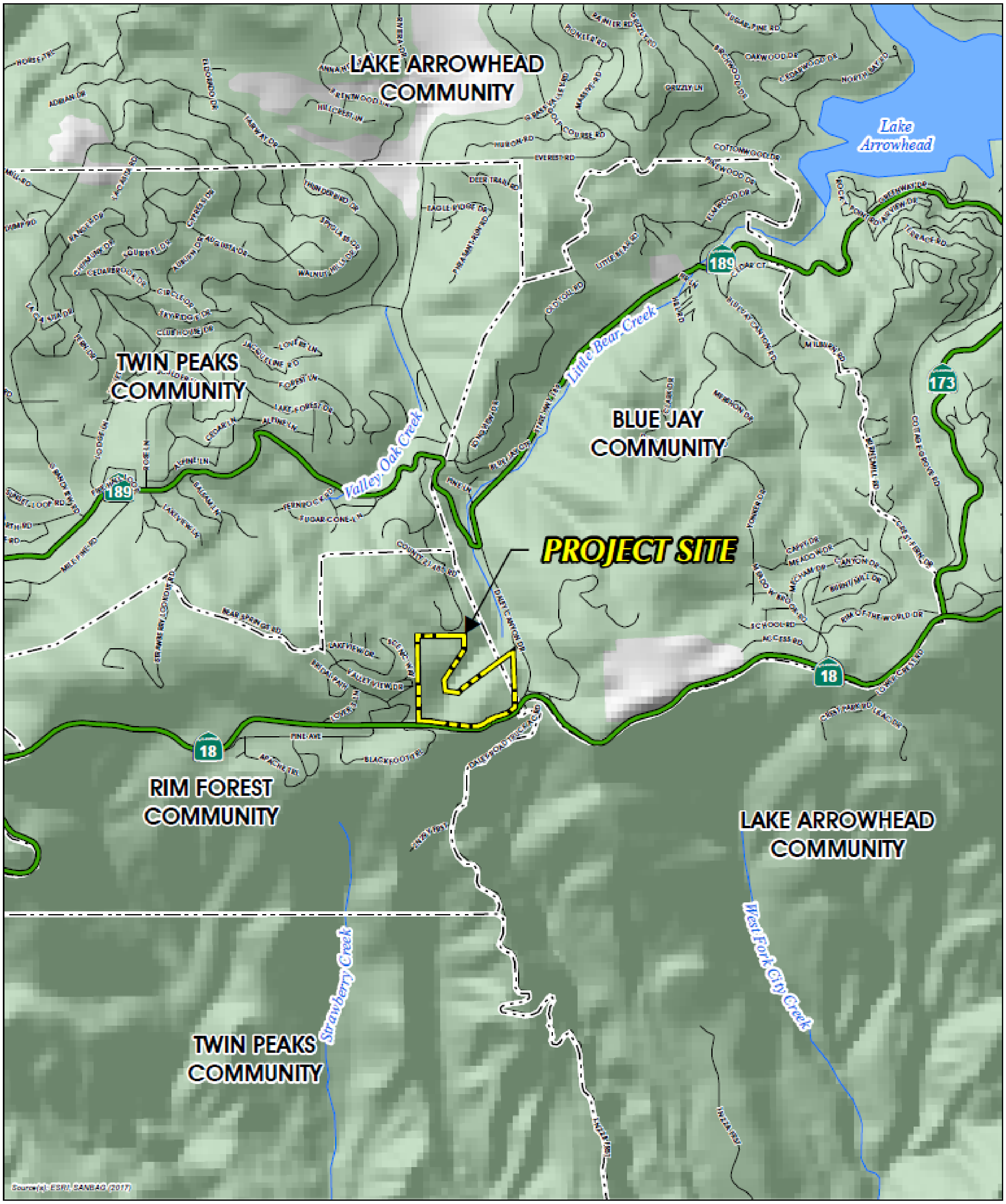


Figure 1-2. Vicinity Map



1.3 Existing Physical Site Conditions

The Project site is undeveloped and is characterized by gently rolling hills to steep mountain terrain that is largely covered by montane coniferous forest. The Project site includes a northeasterly trending valley that runs along the center of the Project site and falls to the northeast. Elevations across the Project site range from approximately 5,400 feet above mean sea level (amsl) at the northeast corner of the Project site to 5,740 feet amsl on the western edge of the Project site. A natural drainage course traverses the south-central portion of the Project site that is planned to be controlled in a pipe in the future as part of the County of San Bernardino Department of Public Works' Rimforest Storm Drain Project. In the existing condition, an 8-inch subsurface sewer line traverses the Project site parallel to the existing drainage course. An abandoned groundwater well also exists on the southwest portion of the Project site.

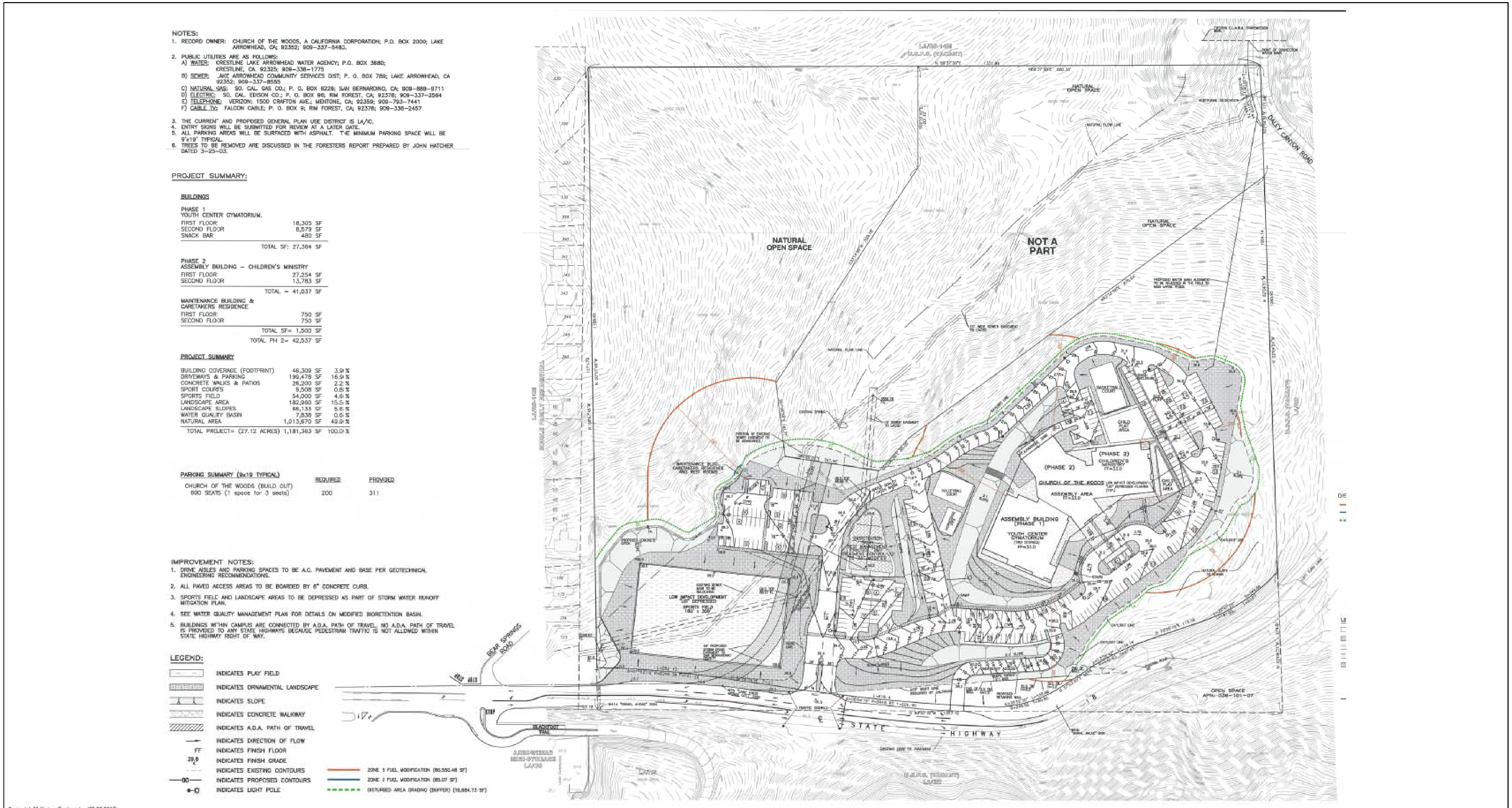
1.4 Overall Project Characteristics

The Project proposes to develop a portion of the Project site with the Church of the Woods campus development that would include a two-story building consisting of a 27,364 square foot (sf) gymnatorium and a 41,037 sf assembly building/children's ministry on the southeast portion of the Project site. Additionally, a 1,500sf two-story building that would serve as a maintenance building, caretaker residence, and lavatory facilities would be developed on the southwest portion of the Project site. The Project would also include an ancillary 54,000 sf sports field, sports courts, and a 7,838 sf water quality bioretention basin. Additionally, associated on-site drainage facilities, utility connections, landscaped areas, pedestrian pathways, internal circulation roadways, driveways, and parking areas would be constructed. Approximately 588,937 sf of the Project site (approximately 50 percent) would remain as natural open space. Figure 1-3, *Proposed Site Plan*, shows the proposed on-site uses.

1.5 Circulation and Parking

The developed portion of the Project site would include several internal drive aisles and parking lot areas that would include a total of 311 parking stalls (200 required). Primary vehicular access onto the Project site would be provided by a driveway constructed in the central portion of the Project site's frontage along SR 18. The proposed project would widen the northern side of SR 18 to accommodate an eastbound left-turn lane and a westbound deceleration/acceleration lane. In addition, the Project would install a traffic signal at the proposed driveway (three-way intersection). A secondary emergency access (egress only) would occur at SR 18 approximately 325 feet to the east of the proposed access driveway. A total of 26,200 sf of pedestrian walkways and outdoor patios would be constructed on the Project site.

Figure 1-3. Proposed Site Plan



Source(s): McKeever Engineering (06-28-2017)

1.6 Open Space, Landscaped Areas, and Recreation Features

As depicted on Figure 1-3, *Proposed Site Plan*, the Project site would include a total of 182,960 sf of landscaped areas and 66,133 sf of landscaped manufactured slopes. Additionally, approximately 50 percent of the Project site (totaling 588,937 sf) would remain as natural open space.

The Project also proposes to develop a low-impact development (LID) 54,000 sf sports field on the southwest portion of the Project site. In addition, a total of 9,508 sf of sports courts are proposed at the Project site, which would include a horseshoe pit and volleyball court in the central portion of the church campus, and a basketball court and two child play areas on the east portion of the church campus.

1.7 Timing and Phasing of Construction

The Project is proposed to be constructed in two (2) phases, as follows:

- Phase 1 – Construction of a 27,364 sf assembly building housing a youth center/gymnatorium, 54,000 sf sports field, sports courts, child play areas, internal circulation roadways, pedestrian walkways, landscaped areas, parking; and
- Phase 2 – Construction of a 41,037 sf addition to the assembly building that would include an assembly area and children’s ministry, as well as a 1,500 sf maintenance building/caretaker residence.

This air quality analysis evaluates the worst-case conditions associated with the construction phases occurring concurrently.

2 Acoustic and Vibration Terminology

2.1 Acoustic Terminology

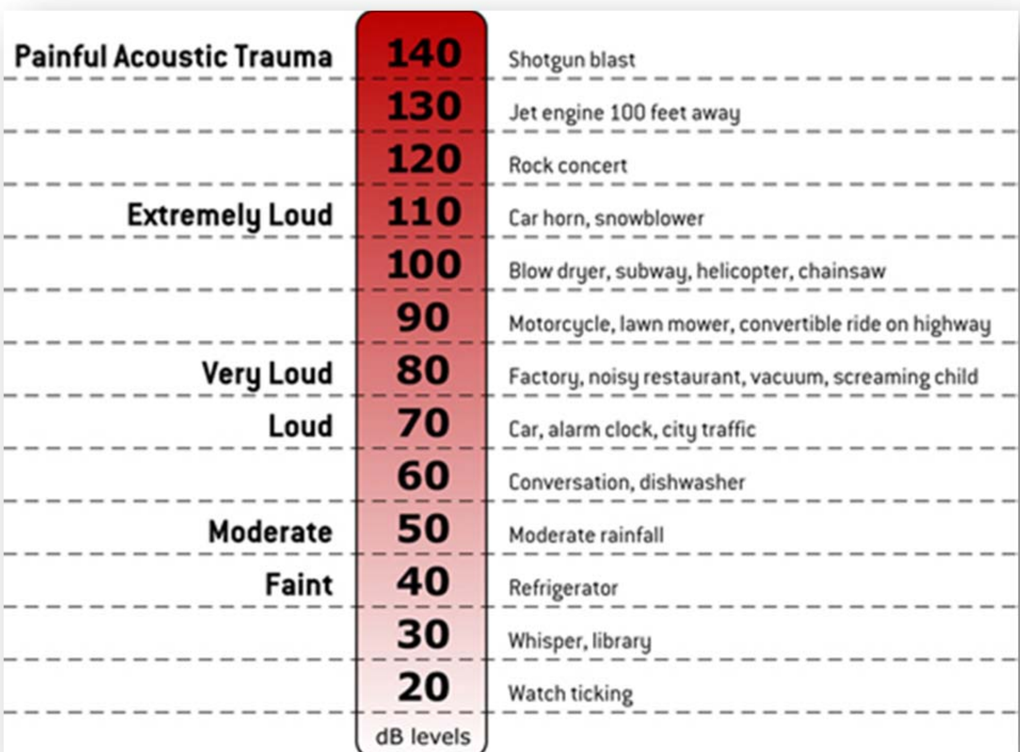
Noise levels are presented on a logarithmic scale to account for the large pressure response range of the human ear, and are expressed in units of decibels (dB). A decibel is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (μPa). Because the human ear does not perceive every frequency with equal loudness, sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system, known as dBA.

An inherent property of the logarithmic decibel scale is that the sound pressure levels of two separate sources are not directly additive. For example, if a sound of 50 dBA is added to another sound of 50 dBA in the proximity, the result is a 3-decibel increase (or 53 dBA), not an arithmetic doubling to 100 dBA. With respect to how the human ear perceives changes in sound pressure level relative to changes in “loudness,” scientific research demonstrates the following general relationships between sound level and human perception for two sound levels with the same or very similar frequency characteristics:

- One dBA is the practical limit of accuracy for sound measurement systems and corresponds to an approximate 10 percent variation in the sound pressure level. A 1 dBA increase or decrease is a non-perceptible change in sound.
- Three dBA increase or decrease is a doubling (or halving) of acoustic pressure level and it corresponds to the threshold of change in loudness perceptible in a laboratory environment. In practice, the average person is not able to distinguish a 3 dBA difference in environmental sound outdoors.
- Five dBA increase or decrease is described as a perceptible change in sound level and is a discernible change in an outdoor environment.
- Ten dBA increase or decrease is a tenfold increase or decrease in acoustic pressure level but is perceived as a doubling or halving in loudness (i.e., the average person will judge a 10 dBA change in sound level to be twice or half as loud).

Estimations of common noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Figure 2-1.

Figure 2-1. Relative Loudness



Noise levels can be measured, modeled and presented in various formats. The noise metrics that were employed in this analysis have the following definitions:

- ***L_{eq}:*** Conventionally expressed in dBA, the L_{eq} is the energy-averaged, A-weighted sound level over a specified time period. It is defined as the steady, continuous sound level over a specified time, which has the same acoustic energy as the actual varying sound levels over the specified period. It is a mean average sound level.
- ***L_{max}:*** The maximum A-weighted sound level as determined during a specified measurement period. It can also be described as the maximum instantaneous sound pressure level generated by a piece of equipment or during a construction activity.
- ***L_{dn}:*** The L_{dn} is the averaged hourly A-weighted L_{eq} for a 24-hour period with a 10 dB penalty added to sound levels occurring during the evening hours (7:00 p.m. to 10:00 p.m.) to account for individuals' increased sensitivity to noise levels during nighttime hours.
- ***CNEL:*** Community noise equivalent level is another average A-weighted L_{eq} sound level measured over a 24-hour period; however, this noise scale is adjusted to account for some individuals' increased sensitivity to noise levels during the evening and nighttime hours. A CNEL noise measurement is obtained after adding 5 dB to sound levels occurring during evening hours (7:00 p.m. to 10:00 p.m.) and 10 dB to noise levels occurring during nighttime hours (10:00 p.m. to 7:00 a.m.).

2.2 Vibration Terminology

According to the Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA, May 2006), construction activities can be a source of ground-borne vibration. Activities such as pile driving and operation of heavy equipment may cause ground-borne vibration while constructing the proposed project. Vibration is an oscillatory motion that can be described in terms of the displacement, velocity, or acceleration (FTA, 2006). Velocity or acceleration is typically used to describe vibration. Two descriptors are frequently used when discussing quantification of vibration, the peak particle velocity (PPV) and the root mean square (rms):

- ***Peak particle velocity (PPV):*** The maximum instantaneous positive or negative peak of the vibration signal (FTA, 2006). The potential for damage to buildings due to construction-related vibration is evaluated using PPV.
- ***Root mean square (rms):*** The square root of the average of the squared amplitude of the vibration signal, typically calculated over a one-second period (FTA, 2006). The potential to annoy humans due to construction-related vibration is evaluated using rms.

3 Existing Conditions

3.1 Sensitive land uses

Certain land uses are considered more sensitive to noise than others. Examples of these include residential areas, educational facilities, hospitals, childcare facilities, and senior housing. The proposed project site is located in a rural, wooded area. The closest off-site sensitive land uses to the project site are the rural residences located at a distance of 90 feet west of the proposed soccer field. The land uses and developments in the project area are shown in Figure 3-1.

3.2 Overview of the Existing Noise Environment

The primary existing noise sources in the project area are transportation facilities. Traffic on Rim of the World Highway (SR 18), Bear Springs Road, and Daley Canyon Road is the dominant source contributing to area ambient noise levels at the residences to the west. Noise from motor vehicles is generated by engine vibrations, the interaction between the tires and the road, and the exhaust system. Noise levels on and in the vicinity of the project site will change as a result of the proposed project. Potential noise impacts associated with the project include road noise due to increases in vehicular traffic, on-site noise from activities within the proposed play fields, and construction noise.

3.3 Ambient Noise Levels

Ambient noise levels were measured on-site by LSA Associates, Inc. (LSA) for a previous acoustical analysis that was prepared for the proposed project. Table 3-1 summarizes the results of the short-term monitoring and Table 3-2 summarizes the results of the long-term (24-hr) measurement. Figure 3-2 shows the locations of the noise monitoring within the project site. Although the noise levels were measured back in 2005, the project site, the surrounding area, and the existing traffic volumes have not substantially changed. Therefore, the noise levels are still applicable.

Figure 3-1. Surrounding Land Uses and Developments

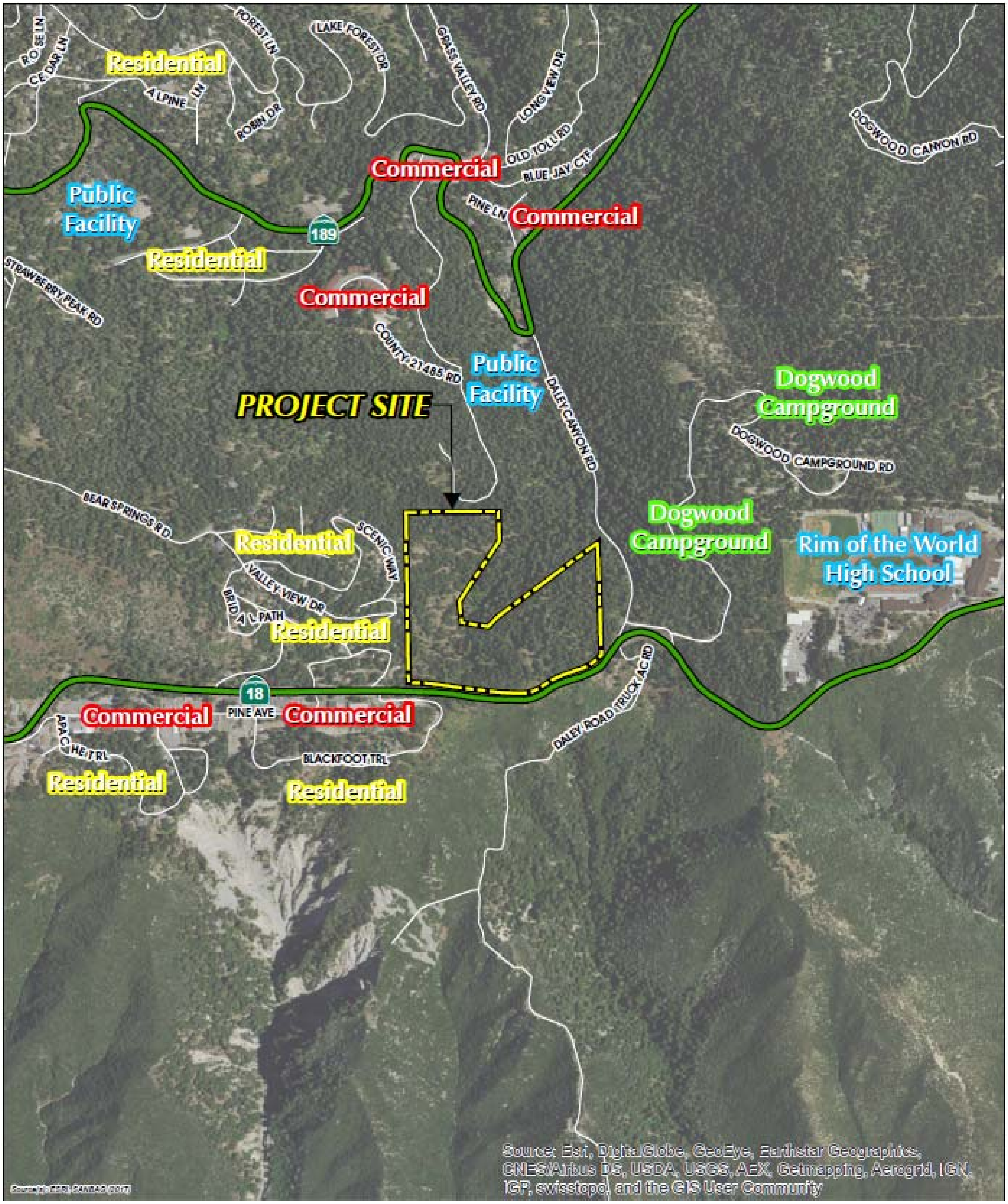


Table 3-1. Ambient Noise Monitoring Results

Site	Location	Date	Start Time	Duration (minutes)	L_{eq}	L_{max}
1	100 feet north of Highway 18 near the proposed soccer field location	9/15/05	9:53 a.m.	20	57.4	66.8
2	Approximately 750 feet from Highway 18 adjacent to existing residences	9/15/05	9:30 a.m.	20	40.1	63.6

Table 3-2. 24-Hour Noise Monitoring Results (dBA)

Hour/Day	L_{eq}	L_{max}	L_{min}
10:00 a.m., 9/15/05	41.1	55.6	33.9
11:00 a.m., 9/15/05	47.5	68.8	35.4
12:00 p.m., 9/15/05	41.7	54.6	35.9
1:00 p.m., 9/15/05	42.0	54.0	33.9
2:00 p.m., 9/15/05	42.5	54.7	37.6
3:00 p.m., 9/15/05	46.8	67.4	38.6
4:00 p.m., 9/15/05	44.9	61.6	39.3
5:00 p.m., 9/15/05	43.4	60.6	35.3
6:00 p.m., 9/15/05	41.9	57.7	35.1
7:00 p.m., 9/15/05	40.4	61.4	34.0
8:00 p.m., 9/15/05	41.3	54.2	35.6
9:00 p.m., 9/15/05	41.9	53.9	36.3
10:00 p.m., 9/15/05	38.1	49.9	32.7
11:00 p.m., 9/15/05	37.8	48.7	33.4
12:00 a.m., 9/16/05	36.4	43.8	32.3
1:00 a.m., 9/16/05	35.0	44.9	32.0
2:00 a.m., 9/16/05	35.2	43.8	32.0
3:00 a.m., 9/16/05	35.3	46.9	29.8
4:00 a.m., 9/16/05	35.5	48.2	29.7
5:00 a.m., 9/16/05	38.8	52.5	30.9
6:00 a.m., 9/16/05	43.7	54.7	34.7
7:00 a.m., 9/16/05	50.2	74.5	34.8
8:00 a.m., 9/16/05	45.5	65.3	34.3
9:00 a.m., 9/16/05	39.7	50.0	34.3
10:00 a.m., 9/16/05	41.6	52.4	37.3
CNEL		46.7	

Figure 3-2. Noise Monitoring Locations

3.4 Existing Traffic Noise Levels

The primary existing noise source in the project area is traffic on the local roadways. The Federal Highway Administration (FHWA) highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. Existing traffic volumes in the project's traffic study (Translutions, August 2017) were used to assess the existing traffic noise levels. A typical vehicle mix for Southern California was used. Table 3-3 provides the traffic noise levels along the roadways adjacent to the project site under the existing conditions. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between the traffic and the location where the noise contours are drawn. The specific assumptions used in developing these noise levels and model printouts are provided in Appendix A.

Table 3-3. Existing Traffic Volumes

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Bear Springs Rd. north of SR 18	600	<50	<50	<50	52.1
Daley Canyon Rd. between SR 189 and Daley Canyon Access	6,360	<50	<50	80.7	62.4
Daley Canyon Rd. between Daley Canyon Access and SR 18	4,150	<50	<50	60.7	60.5
SR 173 north of SR 18	4,200	<50	<50	61.2	60.6
SR 18 west of Lake Gregory Dr.	8,360	<50	67.9	146.3	66.2
SR 18 between Lake Gregory Dr. and Bear Springs Rd.	9,800	<50	75.5	162.7	66.9
SR 18 between Bear Springs Rd. and Project Access	9,760	<50	75.3	162.2	66.9
SR 18 between Project Access and Daley Canyon Rd.	9,750	<50	75.2	162.1	66.9
SR 18 between Daley Canyon Rd. and Daley Canyon Access	5,800	<50	53.2	114.7	64.7
SR 18 between Daley Canyon Access and SR 173	5,920	<50	54.0	116.2	64.7
SR 18 east of SR 173	3,940	<50	<50	88.6	63.0
SR 189 between Grass Valley Rd. and Daley Canyon Rd.	4,850	<50	<50	<50	57.7
SR 189 between Daley Canyon Rd. and North Bay Rd.	5,370	<50	<50	<50	58.2
SR 189 east of North Bay Rd.	4,050	<50	<50	<50	56.9

3.5 Topographic Effects

The proposed project is located in the mountainous region of San Bernardino County. Therefore, there is the potential for noise levels generated within the proposed development to be augmented by canyon effects. Occasionally, canyon effects occur when the surrounding topography creates a channel off of which noise reflects. Studies of highway noise have shown that canyon effects can result in noise increases of up to 3 dBA; however, unless the slopes adjacent to the noise source are vertical, the buildup of noise will be limited. The slopes within the vicinity of the proposed project are covered in soft, noise-absorbing vegetation and are not vertical. Therefore, the potential canyon effects are anticipated to be negligible.

4 Regulatory Setting

This section provides an overview of state and local regulations related to noise issues applicable to the proposed project.

4.1 State

4.1.1 California Department of Health Services

4.1.1.1 Noise Guidelines

In 1987, the California Department of Health Services published guidelines for the noise element of local general plans (Office of Planning and Research, 2003). These guidelines include a noise level/land use compatibility chart that categorizes various outdoor Ldn ranges up to four compatibility categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable), depending on land use. For many land uses, the chart shows exterior Ldn ranges for two or more compatibility categories. The noise element guidelines chart identifies the normally acceptable range for low-density residential uses as less than 60 dBA, while the conditionally acceptable range is 60-70 dBA. The normally acceptable range for high-density residential uses is identified as Ldn values below 65 dBA, while the conditionally acceptable range is identified as 65-70 dBA. For educational and medical facilities, Ldn values below 60 dB are considered normally acceptable, while Ldn values of 60-70 dBA are considered conditionally acceptable. For office and commercial land uses, Ldn values below 67.5 dBA are considered normally acceptable, while Ldn values of 67.5-77.5 dBA are categorized as conditionally acceptable.

These normally and conditionally acceptable Ldn ranges are intended to indicate that local conditions (existing noise levels and community attitudes toward dominant noise sources) should be considered in evaluating land use compatibility at specific locations. These guidelines are used by many agencies, environmental planners, and acoustical specialists as a starting point to evaluate the potential for noise impact on and by a project. The guidelines are also employed to evaluate methods for achieving noise compatibility with respect to nearby existing uses. Table 4-1 summarizes these guidelines for the normally and conditionally acceptable Ldn exposures.

4.1.2 California Department of Housing and Community Development

4.1.2.1 Noise Insulation Performance Standards

The California Department of Housing and Community Development adopted noise insulation performance standards for new hotels, motels, and dwellings other than detached single-family structures (24 CCR T25-28). These standards require that “interior CNEL with windows closed, attributable to exterior sources, shall not exceed an annual CNEL of 45 dB in any habitable room.”

Table 4-1. California Department of Health Services Noise Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA) Normally Acceptable	Conditionally Acceptable
Residential – Low Density	50 - 60	60 - 70
Residential – High Density	50 - 65	65 - 70
Transient Lodging – Motels, Hotels	50 - 65	65 – 70
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 – 60	60 - 65
Auditoriums, Concert Halls, Amphitheaters	NA	50 - 70
Sports Arenas, Outdoor Spectator Sports	NA	50 - 75
Playgrounds, Neighborhood Parks	50 – 67.5	NA
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 70	NA
Office Buildings, Business Commercial and Professional	50 – 67.5	67.5 – 77.5
Industrial, Manufacturing, Utilities, Agriculture	50 - 70	70 - 80

4.1.3 California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and that such impacts be eliminated or mitigated to the extent feasible. Appendix G of the CEQA Statutes and Guidelines (State Clearing House, Office of Planning and Research and the Natural Resources Agency, 2016) sets forth a series of suggested thresholds for determining a potentially significant impact. Under the thresholds suggested in Appendix G, the proposed project could be considered to have significant noise and vibration impacts if it results in one or more of the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels.
- For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels.

4.2 County of San Bernardino Noise Standards

The County has adopted a Noise Element (2007) in its General Plan. One of the general goals of the County Noise Element is to develop and adopt specific policies and an effective implementation program to abate and avoid excessive noise exposures in the County by requiring that effective noise-mitigation measures be incorporated into the design of new noise-generating and new noise-sensitive land uses. Specific policies have been adopted by the County to accomplish the goals of the Noise Element, including the following:

- The County will abate and avoid excessive noise exposure through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits (Goal N1). The County's noise standards for land uses located adjacent to mobile noise sources are listed in Table 4-2.
- When industrial, commercial, or other land uses, including locally regulated noise sources, are proposed for areas containing noise-sensitive land uses, noise levels generated by the proposed use will not exceed the performance standards of Table 4-3 within outdoor activity areas. If outdoor activity areas have not yet been determined, noise levels shall not exceed the performance standards listed in Chapter 83.01 of the County's Development Code at the boundary of areas planned or zoned for residential or other noise-sensitive land uses (Goal N1.3). The L_{max} standards listed in Table 4-3 were established based on the noise limit categories included in Section 83.01.080 (c)(2) of the County's Development Code.

Construction, repair, or demolition activities are limited to between the hours of 7:00 a.m. and 7:00 p.m. of any working day, Monday through Saturday. These activities are prohibited on Sundays and federal holidays.

Table 4-2. Noise Standards for Adjacent Mobile Noise Sources (dBA CNEL)

Categories	Land Use	Interior Standard[1]	Exterior Standard[2]
Residential	Single and multifamily, duplex, mobile homes	45	60[3]
Commercial	Hotel, motel, lodging, commercial retail	45	60[3]
	Commercial retail, bank	50	NA
	Office building	45	65
	Concert hall, auditorium	45	NA
Institutional	Hospital, school, church	45	65
Open Space	Park	NA	65

Source: County of San Bernardino Noise Element, 2007.

Notes:
[1] The indoor environment shall exclude bathrooms, kitchens, toilets, closets, and corridors.
[2] The outdoor environment shall be limited to:

- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

[3] An exterior noise level of up to 65 dBA CNEL shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology and interior noise exposure does not exceed 45 dBA CNEL with windows and doors closed. Requiring the windows and doors to remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

Table 4-3. Hourly Noise Level Performance Standards—Locally Regulated Sources (dBA)

Land Use Category	7:00 a.m. to 10:00 p.m.		10:00 p.m. to 7:00 a.m.	
	L_{eq}	L_{max}	L_{eq}	L_{max}
Residential	55	75	45	65
Professional Services	55	75	55	75
Other Commercial	60	80	60	80
Industrial	70	90	70	90

Source: County of San Bernardino Development Code, 2007.

4.3 Vibration

4.3.1 Vibration Annoyance

Ground-borne noise is the vibration of floors and walls that may cause rattling of items such as windows or dishes on shelves, or a rumbling noise. The rumbling is created by the motion of the room surfaces, which act like a giant loudspeaker. The FTA provides criteria for acceptable levels of ground-borne vibration based on the relative perception of a vibration event for vibration-sensitive land uses (Table 4-4).

Table 4-4. Groundborne Vibration and Noise Impact Criteria – Human Annoyance

Land Use Category	Max Lv (VdB)[1]	Description
Workshop	90	Distinctly felt vibration. Appropriate to workshops and nonsensitive areas.
Office	84	Felt vibration. Appropriate to offices and nonsensitive areas.
Residential – Daytime	78	Barely felt vibration. Adequate for computer equipment.
Residential – Nighttime	72	Vibration not felt, but ground-borne noise may be audible inside quiet rooms.

Notes:
1. As measured in 1/3-octave bands of frequency over the frequency ranges of 8 to 80 Hz

4.3.2 Vibration-Related Structural Damage

The level at which ground-borne vibration is strong enough to cause structural damage has not been determined conclusively. The most conservative estimates are reflected in the FTA standards, shown in Table 4-5. Vibration-related problems generally occur due to resonances in the structural components of a building. The maximum vibration amplitudes of the floors and walls of a building will often be at the resonance frequencies of various components of the building. That is, structures amplify ground-borne vibration. Wood-frame buildings, such as typical residential structures, are more easily excited by ground vibration than heavier buildings. According to the Caltrans's "Transportation Related Earthborne Vibration" (2002), extreme care must be taken when sustained pile driving occurs within 25 feet of any building; the threshold at which there is a risk of architectural damage to normal houses with plastered walls and ceilings is 0.2 in/sec.

Table 4-5. Groundborne Vibration and Noise Impact Criteria – Structural Damage

Building Category	PPV (in/sec)[1]	VdB
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Nonengineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Notes:
1. RMS velocity calculated from vibration level (VdB) using the reference of one microinch/second

4.4 Screening Criteria

The noise significance thresholds presented below are based on industry standards and standards provided by the County of San Bernardino. Most people can detect changes in sound levels of approximately 3 dBA under normal, quiet conditions. Changes of 1 to 3 dBA are detectable under quiet, controlled conditions, and changes of less than 1 dBA are usually indiscernible. A change of 5 dBA is readily discernable to most people in an exterior environment. Based on these factors and the County's noise policies and standards (listed below), noise impacts are considered significant if any of the following conditions are met.

- The project's operational noise sources increase ambient levels at the nearest receptor above the maximum allowable noise level, based on the land use classification
- The project's mobile sources of noise increase the ambient CNEL more than 5 dBA at the nearest sensitive receptors for areas within San Bernardino County that are not designated as "noise impacted"
- The project's mobile sources of noise increase the ambient CNEL more than 3 dBA at the nearest sensitive receptors for areas within San Bernardino County that are designated as "noise impacted"
- The project's operational stationary sources of noise increase the ambient L_{eq} more than 5 dBA at the nearest sensitive receptors for areas within San Bernardino County that are not designated as "noise impacted"
- The project's operational stationary sources of noise increase the ambient L_{eq} more than 3 dBA at the nearest sensitive receptors for areas within San Bernardino County that are designated as "noise impacted"

A cumulative impact is considered significant if any of the following conditions are met:

- The cumulative noise levels from the project and related projects increase the ambient levels by more than 5 dBA for areas within San Bernardino County that are not designated as "noise impacted"

- The cumulative noise levels from the project and related projects increase the ambient levels by more than 3 dBA for areas within San Bernardino County that are designated as "noise impacted"

4.4.1 Significant Impact Criteria

The ambient noise levels measured within the project area are similar to or lower than the County's stationary noise source thresholds. Therefore, the thresholds listed in Table 4-6, based on the existing ambient noise levels, were used for determining significance. As on-site events would not occur during nighttime hours (10:00 p.m. to 7:00 a.m.), no nighttime noise thresholds were established. For areas currently experiencing noise levels exceeding the County's hourly performance standards, such as the hourly L_{eq} within the vicinity of SR-18, a significant noise impact would occur if a project increases the ambient noise level by 3 dBA or more. For locations where the existing ambient noise level is less than the County's hourly performance standards, a significant noise impact would occur if a project increases the ambient noise level by 5 dBA or more.

Table 4-6. Stationary Source Noise Level Performance Standards (dBA)

Land Use Category	Ambient Noise Level		Impact Level	
	L_{eq}	L_{max}	L_{eq}	L_{max}
Residences located within 200 ft of SR-18	57[1]	66	60	71
Residences located within 500 ft of SR-18	50	64	55	69
Residences located within 800 ft of SR-18	43	62	48	67

Notes:

1. Ambient noise level exceeded the County's noise threshold. Therefore, exceeding the ambient noise level by 3 dBA would result in a significant noise impact.

5 Noise and Vibration Impact Analysis

Noise generated by the proposed project will consist of: (1) short duration noise resulting from construction activities and (2) long-term noise from on-site stationary sources and off-site traffic noise from vehicles operated by residents living in the proposed church campus. Vibration from the proposed project would only result during construction. Construction activities would take place only during daytime hours. An evaluation was performed of expected noise and vibration and compared to regulatory requirements.

Airborne noise dissipates with increasing distance from the noise source. The distances involved depend primarily on the intensity of the noise generated by the source, terrain and ground cover between source and receiver, and partly on weather conditions such as wind speed and direction, the height and strength of temperature inversions, and the height of cloud cover. Temperature inversions and cloud cover can reflect or refract sound that is radiated upwards; this effect can increase noise levels at locations that receive the reflected or refracted sound. Such reflection and refraction effects are important primarily for high intensity sounds and for the calculation of sound propagation over large distances. For noise sources such as construction activity and vehicle traffic, the region of influence is typically less than 0.5 mile from the noise source. Temperature inversions and cloud cover are not accounted for in this analysis.

The region of interest for noise and vibration issues is typically localized. Ground-borne vibrations generally attenuate rapidly with increasing distance from the vibration source. The distances involved depend primarily on the intensity of the vibrations generated by the source, and partly on soil and geologic conditions. Detectable vibrations will travel the greatest distance through solid rock and the least distance through loose, unconsolidated soils or saturated soils. For vibration sources such as construction activity and vehicle traffic, the region of influence is typically less than 1,000 feet from the vibration source.

5.1 Construction

5.1.1 Noise

Construction noise, although temporary, can potentially affect nearby sensitive receptors, such as residences. Construction of the proposed project will require the use of heavy equipment that may be periodically audible at off-site locations. Received noise levels will fluctuate, depending on the construction activity, equipment type, and distance between noise source and receiver. Additionally, noise from construction equipment will vary dependent on the construction phase and the number and type of equipment at a location at any given time. There would be six phases of construction for the proposed project:

1. Site Preparation
2. Curb Grading
3. Fine Grading

4. Building construction
5. Paving
6. Architectural coating

The variation in power and usage of the various construction equipment types creates complexity in characterizing construction noise levels. Expected equipment types for each phase of construction are presented in Table 5-1 and were used to screen for potential construction noise impacts. Each phase identified will require different types of construction equipment. The estimated composite site noise level is based on the assumption that all equipment would operate at a given usage load factor, for a given hour (i.e., front end loaders are assumed to be used for up to 40 percent of 1 hour, or 24 minutes), to calculate the composite average daytime hourly L_{eq}. The load factor accounts for the fraction of time that the equipment is in use over the specified time period. The composite noise level from several pieces of equipment operating during the same phase is obtained from decibel addition of the L_{eq} of each individual unit. Although it is not possible for all the construction equipment to operate at one point simultaneously, the screening level analysis represented in Table 5-1 conservatively assumes concurrent operation of equipment in the same location.

The nearest sensitive receptors to the project site are the existing homes to the west along Bear Springs Road. At its closest point, the construction activity would be located within 50 feet of these land uses. The average distance from the construction activities on the project site to these sensitive land uses on a daily basis is approximately 300 feet. Once the soccer field has been constructed the average and minimum distances will be much greater. Construction noise will attenuate with increased distance from the noise sources. Maximum noise levels at 50 feet and composite L_{eq} noise levels at 300 feet given in Table 5-1 were evaluated assuming spherical free-field spreading. As a general construction practice, functional mufflers will be maintained on all equipment to attenuate noise levels as low as reasonably achievable. As shown in Table 5-1, during the loudest construction phase the maximum noise level is projected to be 85 dBA L_{max} and the average level is projected to be 71 dBA L_{eq}. Therefore, the construction noise levels reaching the residence to the west would exceed the 71 dBA L_{max} and 60 dBA L_{eq} exterior noise standards listed in Table 4-6. Mitigation measures would be required.

Traffic noise associated with construction of the proposed project is not anticipated to be a significant source of noise. Traffic noise is not greatly influenced by lower levels of traffic, such as those associated with the proposed project’s construction effort. For example, traffic levels would have to double in order for traffic noise on area roadways to increase by 3 dBA. The proposed project’s construction traffic on area roadways would increase hourly traffic volumes by much less than a factor of two; therefore, the increase in construction related traffic noise would be less than 3 dBA and is not significant.

Table 5-1. Project Construction Noise Levels by Phase

Phase	Equipment[1]			Composite Sound Level[3]	
	Type	Quantity	L_{max} at 50 feet	L_{max} at 50 feet	L_{eq} at 300 feet
Site Preparation	Tractor	1	84.0	84.0	71.3
	Excavator	1	80.7		
	Dozer	2	81.7		
	Scraper	2	83.6		
	Loader	1	79.1		
Curb Grading	Excavator	2	80.7	85.0	69.8
	Grader	1	85.0		
	Loader	1	79.1		
	Tractor	1	84.0		
Fine Grading	Excavator	1	80.7	85.0	69.4
	Grader	1	85.0		
	Roller	1	84.0		
	Skid Steer	1	77.6		
	Tractor	1	84.0		
Building Construction	Crane	1	80.6	80.6	69.7
	Forklift	3	74.7		
	Generator	1	80.6		
	Loader	3	79.1		
	Welder	1	74.0		
Paving	Paver	2	77.2	80.0	66.1
	Paving Equipment	2	77.2		
	Roller	2	80.0		
Architectural Coating	Compressor	1	77.7	77.7	58.1

1. Equipment mix obtained from the CalEEMod emission calculations prepared for the Air Quality Assessment, April 2018.
2. Measured Lmax at given reference distance obtained from the FHWA Roadway Construction Noise Model, FHWA 2006.
3. Distance factor determined by the inverse square law defined as 6 dBA per doubling of distance as sound travels away from an idealized point.

5.1.2 Vibration

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration-related problems generally occur due to resonances in the structural components of a building because structures amplify ground-borne vibration.

Table 5-2 lists the vibration source amplitudes for construction equipment. As pile driving is not required, the highest reference PPV for the proposed project would be 0.210 inches per second (in/sec) associated with on-site vibration rollers.

Table 5-2. Vibration Source Amplitudes for Construction Equipment

Equipment	PPV at 25 feet (in/sec)	Approximate Lv[1] at 25 feet (VdB)
Pile Driver (impact) – upper range	1.518	112
Pile Driver (impact) – typical	0.644	104
Pile Drive (sonic) – upper range	0.734	105
Pile Drive (sonic) – typical	0.170	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill (slurry wall) – in soil	0.008	66
Hydromill (slurry wall) – in rock	0.017	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Guidelines, May 2006. Table 12-2

Notes:

1. RMS velocity in decibels (VdB) re 1 micro-inch/second

The closest sensitive receptors to the project site, the residential uses to the west along Bear Springs Road, are located within 90 feet of the project construction areas that would require the use of rollers. The FTA vibration guidance provides the following equation to calculate PPV at sensitive receptors:

$$PPV_{equipment} = PPV_{Ref} \ (25/D)^{n} \ (in/sec)$$

Where:

PPVRef = reference PPV at 25 feet

D = distance from equipment to the receiver in feet

n = 1.5 is a value related to the vibration attenuation rate through ground

Distance attenuation would reduce the construction vibration levels from the proposed project to 0.031 in/sec. This level is much lower than the 0.12 in/sec threshold listed in Table 4-5 for buildings extremely susceptible to vibration damage.

For consideration of annoyance or interference with vibration-sensitive activities, the vibration level at any distance is calculated using the following formula:

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

Where:

Lv(D) = Vibration level at distance D

D = distance from equipment to the receiver in feet

Lv(25 ft) = reference vibration level at 25 feet from source

At 900 feet the roller vibration level would be reduced from 94 to 77 VdB. This level would exceed FTA's nighttime annoyance threshold of 72 VdB listed in Table 4-4. However, as this level is less than FTA's daytime annoyance threshold of 78 VdB, implementing the mitigation measures listed in Section 0 would reduce the short-term construction vibration impacts to below a level of significance.

5.2 Operation

5.2.1 Stationary Sources

5.2.1.1 Soccer Field

The proposed project is located within a rural area. Therefore, the noise impacts from the proposed soccer field were calculated using a soft-site 7.5 dBA reduction per doubling of distance for point sources.

As there are no grandstands for the soccer field, the majority of the noise will be generated by the activities on the field. Based on the average A-weighted sound level of speech for different vocal efforts under quiet conditions at a distance of 1 meter (m) (3 ft) in a free field (quoted by Harry Levitt and John C. Webster in *Handbook of Acoustical Measurements and Noise Control,* Third Edition, edited by Cyril M Harris, 1991), male shouting would result in 88 dBA, while female shouting is 82 dBA. Likewise, loud voice for male is 75 dBA and 71 dBA for female, and raised voice is 65 dBA for male and 62 dBA for female. These are all maximum sound pressure levels (L_{max}) measured at 1 m (3.28 ft) from the person. In acoustics, every doubling of an equal sound energy would result in a 3 dBA increase in combined noise level. Therefore, two males shouting at the same time would result in 91 dBA at 1 m (3 ft), and two females shouting would result in 85 dBA. The distance from the center of the soccer field to the residential property line to the west is approximately 240 ft. Assuming a total 60 people (the size of two teams, coaches, and several spectators) with an even mix of men and women and a combination of 10 minutes of shouting, 20 minutes of loud voices, and 30 minutes of raised voices, the noise would be approximately 50 dBA L_{eq} (1 hour) at 240 ft.

The maximum noise level from the play field activities would occur when there are multiple individuals yelling along the western edge of the play fields. Ten men yelling at one time along the western edge would generate a noise level of 98 dBA L_{max} at a distance of 1 m. At 90 ft, this noise level would be reduced to 62 dBA L_{max}.

Table 5-3 lists the average and maximum soccer field noise levels at the existing sensitive land uses west of the project site. Table 5-3 also includes the impact thresholds from Table 4-6. As shown, the noise levels would not exceed the noise thresholds. Therefore, the soccer field would not result in any long-term stationary noise impacts.

Table 5-3. Soccer Field Noise Levels

Land Use Category	Soccer Field Noise		Thresholds	
	L_{eq}	L_{max}	L_{eq}	L_{max}
Residences located within 200 ft of SR-18	50	62	60	71
Residences located within 500 ft of SR-18	45	57	55	69
Residences located within 800 ft of SR-18	39	51	48	67

5.2.1.2 Miscellaneous Noise Sources

Other on-site activities, such as parking lots, basketball courts, horseshoe pits, and volleyball courts would be located more than 700 ft from the nearest off-site sensitive residence to the west. Activities within these uses would potentially generate noise levels of up to 75 dBA L_{max} at a distance of 50 ft. Distance attenuation would reduce these noise levels to 46 dBA L_{max} or less. Activities within these on-site uses would not result in an exceedance of the noise standards listed in Table 4-6.

5.2.2 Long Term Traffic Noise Impacts

Project-related long-term vehicular trip increases are anticipated to be small when distributed to adjacent street segments. The proposed on-site residential land uses would be potentially exposed to traffic noise levels exceeding the exterior noise standard of 65 dBA CNEL; and/or would potentially exceed the interior noise standard of 45 dBA CNEL from exterior noise sources. The FHWA highway traffic noise prediction model

(FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. The typical vehicle mix for Southern California was used.

As discussed in Section 2, a 3 dBA increase or decrease is a doubling (or halving) of sound pressure level and it corresponds to the threshold of change in loudness perceptible in a laboratory environment. In practice, the average person is not able to distinguish a 3 dBA difference in environmental sound outdoors. An increase of 3 dBA is considered to be a significant off-site traffic noise impact requiring mitigation. The County also sets a noise standard for various land uses. For institutional uses, such as churches, a significant on-site traffic noise impact would occur if noise exceeds the exterior noise standard of 65 dBA CNEL or the interior noise standard of 45 dBA CNEL.

5.2.2.1 Existing Year Conditions

The proposed on-site uses would be along SR 18. Table 3-3 provides the existing year traffic noise levels in the area around the project site. Table 5-4 provides the existing traffic noise level with project conditions on the roadways in the project area.

As shown in Table 5-4, the project-related traffic noise level increase would be 2.2 dBA or less for all analyzed roadway segments. Therefore, no significant off-site traffic noise impacts would occur under existing year conditions. No mitigation measures would be required for off-site land uses.

5.2.2.2 Cumulative (2040) Conditions

Table 5-5 provides the traffic noise levels along the roadways adjacent to the project site under the cumulative (2040) without project traffic conditions.

Table 5-6 provides the cumulative (2040) traffic noise level with project conditions on the roadways adjacent to the project site.

As shown in Table 5-6, the project-related traffic noise level increase would be 1.9 dBA or less for all analyzed roadway segments. Therefore, no significant off-site traffic noise impacts would occur under cumulative (2040) conditions. No mitigation measures would be required for off-site land uses.

The closest on-site church structure to SR-18, the assembly building, would be located at a distance of approximately 200 ft from the roadway centerline. The on-site caretaker's residence is located approximately 420 ft from the roadway centerline. Distance attenuation would reduce the traffic noise level at these locations to 61 dBA and 56 CNEL, respectively. These levels are below the County's 65 dBA CNEL exterior noise standard. Therefore, no exterior mitigation measures are required.

Table 5-4. Existing With Project Traffic Volumes

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Project Related Increase CNEL (dBA)
Bear Springs Rd. north of SR 18	1,000	<50	<50	<50	54.3	2.2
Daley Canyon Rd. between SR 189 and Daley Canyon Access	7,940	<50	<50	93.5	63.3	1.0
Daley Canyon Rd. between Daley Canyon Access and SR 18	5,730	<50	<50	75.2	61.9	1.4
SR 173 north of SR 18	4,790	<50	<50	66.8	61.1	0.6
SR 18 west of Lake Gregory Dr.	8,760	<50	70.1	150.9	66.4	0.2
SR 18 between Lake Gregory Dr. and Bear Springs Rd.	10,790	<50	80.5	173.4	67.4	0.4
SR 18 between Bear Springs Rd. and Project Access	11,140	<50	82.2	177.2	67.5	0.6
SR 18 between Project Access and Daley Canyon Rd.	12,320	<50	87.9	189.5	67.9	1.0
SR 18 between Daley Canyon Rd. and Daley Canyon Access	6,790	<50	59.1	127.4	65.3	0.7
SR 18 between Daley Canyon Access and SR 173	6,710	<50	58.7	126.4	65.3	0.5
SR 18 east of SR 173	4,140	<50	<50	91.6	63.2	0.2
SR 189 between Grass Valley Rd. and Daley Canyon Rd.	5,440	<50	<50	<50	58.2	0.5
SR 189 between Daley Canyon Rd. and North Bay Rd.	6,360	<50	<50	<50	58.9	0.7
SR 189 east of North Bay Rd.	4,640	<50	<50	<50	57.5	0.6

Table 5-5. 2040 Without Project Traffic Volumes

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Bear Springs Rd. north of SR 18	750	<50	<50	<50	53.1
Daley Canyon Rd. between SR 189 and Daley Canyon Access	7,620	<50	<50	91.0	63.2
Daley Canyon Rd. between Daley Canyon Access and SR 18	5,210	<50	<50	70.6	61.5
SR 173 north of SR 18	5,710	<50	<50	75.1	61.9
SR 18 west of Lake Gregory Dr.	10,960	<50	81.3	175.3	67.4
SR 18 between Lake Gregory Dr. and Bear Springs Rd.	12,400	<50	88.3	190.3	68.0
SR 18 between Bear Springs Rd. and Project Access	12,330	<50	88.0	189.6	67.9
SR 18 between Project Access and Daley Canyon Rd.	12,340	<50	88.0	189.7	67.9
SR 18 between Daley Canyon Rd. and Daley Canyon Access	7,600	<50	63.7	137.3	65.8
SR 18 between Daley Canyon Access and SR 173	8,260	<50	67.4	145.1	66.2
SR 18 east of SR 173	5,670	<50	52.4	112.9	64.6
SR 189 between Grass Valley Rd. and Daley Canyon Rd.	5,490	<50	<50	<50	58.3
SR 189 between Daley Canyon Rd. and North Bay Rd.	6,080	<50	<50	<50	58.7
SR 189 east of North Bay Rd.	4,440	<50	<50	<50	57.3

Table 5-6. 2040 With Project Traffic Volumes

Roadway Segment	ADT	Centerline to 70 CNEL (ft)	Centerline to 65 CNEL (ft)	Centerline to 60 CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Project Related Increase CNEL (dBA)
Bear Springs Rd. north of SR 18	1,150	<50	<50	<50	54.9	1.9
Daley Canyon Rd. between SR 189 and Daley Canyon Access	9,200	<50	<50	103.2	64.0	0.8
Daley Canyon Rd. between Daley Canyon Access and SR 18	6,790	<50	<50	84.3	62.7	1.2
SR 173 north of SR 18	6,300	<50	<50	80.2	62.3	0.4
SR 18 west of Lake Gregory Dr.	11,360	<50	83.3	179.5	67.6	0.2
SR 18 between Lake Gregory Dr. and Bear Springs Rd.	13,390	<50	93.0	200.3	68.3	0.3
SR 18 between Bear Springs Rd. and Project Access	13,710	<50	94.4	203.5	68.4	0.5
SR 18 between Project Access and Daley Canyon Rd.	14,910	<50	99.9	215.2	68.8	0.8
SR 18 between Daley Canyon Rd. and Daley Canyon Access	8,590	<50	69.2	149.0	66.4	0.5
SR 18 between Daley Canyon Access and SR 173	9,050	<50	71.6	154.3	66.6	0.4
SR 18 east of SR 173	5,870	<50	53.6	115.6	64.7	0.2
SR 189 between Grass Valley Rd. and Daley Canyon Rd.	6,080	<50	<50	<50	58.7	0.4
SR 189 between Daley Canyon Rd. and North Bay Rd.	7,070	<50	<50	50.8	59.4	0.7
SR 189 east of North Bay Rd.	5,030	<50	<50	<50	57.9	0.5

Standard building construction in warm climates provides 24 dBA of exterior to interior noise attenuation when windows are closed and 12 dBA of exterior to interior noise attenuation when windows are open (Protective Noise Levels, Environmental Protection Agency [EPA] 550/9-79-100, November 1978). All new construction requires some form of mechanical ventilation to ensure that proper indoor air quality is maintained even with all windows and doors closed. Therefore, with windows and doors closed, interior noise levels would be below the 45 dBA CNEL standard (i.e., 61 dBA - 24 dBA = 37 dBA). The interior noise level within the caretaker's residence would be below the County's interior noise standard of 45 dBA CNEL when windows are open (56 dBA - 12 dBA = 44 dBA).

5.2.3 Airport Noise Impacts

The proposed project site is located approximately 9 miles north of the Rialto Municipal Airport and 25 miles northeast of the Ontario International Airport. Due to the project's distance from the airports, no significant noise impact in terms of 24-hour averaged noise level, such as CNEL, are expected to affect the project site. Therefore, aircraft noise levels will be below a level of significance.

6 Mitigation Measures

6.1 Construction Noise

Construction will be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday, in accordance with County standards. No construction activities are permitted outside of these hours or on Sundays and federal holidays.

The following measures will be implemented to reduce potential construction noise impacts on nearby sensitive receptors.

1. During all site excavation and grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.
2. The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
3. The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
4. Heavy construction activities within 300 ft of the western property line shall be restricted to the hours of 10:00 a.m. to 4:00 p.m.

These mitigation measures are designed to limit the exposure of the sensitive land uses in the project area to the construction activities. However, the measures would not reduce the peak construction noise levels. Therefore, the impact would remain significant and unavoidable.

7 References

Bolt, Beranek & Newman, 1987, Noise Control for Buildings and Manufacturing Plants.

San Bernardino County Code.

County of San Bernardino, 1989, Noise Element of the General Plan.

Federal Highway Administration. 1977. Highway Traffic Noise Prediction Model, FHWA RD-77-108.

United States Environmental Protection Agency. 1978. Protective Noise Levels: Condensed Version of EPA Levels Document.

Translutions, Church of the Woods Traffic Impact Analysis, August 2017.

Appendix A. Traffic Noise Modeling

FHWA Noise Model

Project Name: Church of the Woods
Year: Existing

Roadway Link	ADT	AHW	Speed	Hard or Soft Site? (H or S)	CNEL at 50ft from Centerline of Outside Lane	CNEL 50 feet from Centerline	Centerline to 70 dBA CNEL Countour	Centerline to 65 dBA CNEL Countour	Centerline to 60 dBA CNEL Countour
Bear Springs Rd. north of SR-18	600	6	35	S	52.1	52.9	<50	<50	<50
Daley Canyon Rd. between SR-189 and Daley Canyon Access	6,360	6	35	S	62.4	63.1	<50	<50	80.7
Daley Canyon Rd. between Daley Canyon Access and SR-18	4,150	6	35	S	60.5	61.3	<50	<50	60.7
SR-173 north of SR-18	4,200	6	35	S	60.6	61.3	<50	<50	61.2
SR-18 west of Lake Gregory Dr.	8,360	6	45	S	66.2	67.0	<50	67.9	146.3
SR-18 between Lake Gregory Dr. and Bear Springs Rd.	9,800	6	45	S	66.9	67.7	<50	75.5	162.7
SR-18 between Bear Springs Rd. and Project Access	9,760	6	45	S	66.9	67.7	<50	75.3	162.2
SR-18 between Project Acess and Daley Canyon Rd.	9,750	6	45	S	66.9	67.7	<50	75.2	162.1
SR-18 between Daley Canyon Rd. and Daley Canyon Access	5,800	6	45	S	64.7	65.4	<50	53.2	114.7
SR-18 between Daley Canyon Access and SR-173	5,920	6	45	S	64.7	65.5	<50	54.0	116.2
SR-18 east of SR-173	3,940	6	45	S	63.0	63.7	<50	<50	88.6
SR-189 between Grass Valley Rd. and Daley Canyon Rd.	4,850	6	25	S	57.7	58.5	<50	<50	<50
SR-189 between Daley Canyon Rd. and North Bay Rd.	5,370	6	25	S	58.2	58.9	<50	<50	<50
SR-189 east of North Bay Rd.	4,050	6	25	S	56.9	57.7	<50	<50	<50

FHWA Noise Model

Project Name: Church of the Woods
Year: Existing plus Project

Roadway Link	ADT	AHW	Speed	Hard or Soft Site? (H or S)	CNEL at 50ft from Centerline of Outside Lane	CNEL 50 feet from Centerline	Centerline to 70 dBA CNEL Countour	Centerline to 65 dBA CNEL Countour	Centerline to 60 dBA CNEL Countour	Increase from No Build
Bear Springs Rd. north of SR-18	1,000	6	35	S	54.3	55.1	<50	<50	<50	2.2
Daley Canyon Rd. between SR-189 and Daley	7,940	6	35	S	63.3	64.1	<50	<50	93.5	1.0
Daley Canyon Rd. between Daley Canyon Acc	5,730	6	35	S	61.9	62.7	<50	<50	75.2	1.4
SR-173 north of SR-18	4,790	6	35	S	61.1	61.9	<50	<50	66.8	0.6
SR-18 west of Lake Gregory Dr.	8,760	6	45	S	66.4	67.2	<50	70.1	150.9	0.2
SR-18 between Lake Gregory Dr. and Bear Spr	10,790	6	45	S	67.4	68.1	<50	80.5	173.4	0.4
SR-18 between Bear Springs Rd. and Project A	11,140	6	45	S	67.5	68.2	<50	82.2	177.2	0.6
SR-18 between Project Acess and Daley Cany	12,320	6	45	S	67.9	68.7	<50	87.9	189.5	1.0
SR-18 between Daley Canyon Rd. and Daley C	6,790	6	45	S	65.3	66.1	<50	59.1	127.4	0.7
SR-18 between Daley Canyon Access and SR-1	6,710	6	45	S	65.3	66.0	<50	58.7	126.4	0.5
SR-18 east of SR-173	4,140	6	45	S	63.2	63.9	<50	<50	91.6	0.2
SR-189 between Grass Valley Rd. and Daley C	5,440	6	25	S	58.2	59.0	<50	<50	<50	0.5
SR-189 between Daley Canyon Rd. and North	6,360	6	25	S	58.9	59.6	<50	<50	<50	0.7
SR-189 east of North Bay Rd.	4,640	6	25	S	57.5	58.3	<50	<50	<50	0.6

FHWA Noise Model

Project Name: Church of the Woods
Year: 2040 No Build

Roadway Link	ADT	AHW	Speed	Hard or Soft Site? (H or S)	CNEL at 50ft from Centerline of Outside Lane	CNEL 50 feet from Centerline	Centerline to 70 dBA CNEL Countour	Centerline to 65 dBA CNEL Countour	Centerline to 60 dBA CNEL Countour
Bear Springs Rd. north of SR-18	750	6	35	S	53.1	53.8	<50	<50	<50
Daley Canyon Rd. between SR-189 and Daley Canyon Access	7,620	6	35	S	63.2	63.9	<50	<50	91.0
Daley Canyon Rd. between Daley Canyon Access and SR-18	5,210	6	35	S	61.5	62.2	<50	<50	70.6
SR-173 north of SR-18	5,710	6	35	S	61.9	62.6	<50	<50	75.1
SR-18 west of Lake Gregory Dr.	10,960	6	45	S	67.4	68.2	<50	81.3	175.3
SR-18 between Lake Gregory Dr. and Bear Springs Rd.	12,400	6	45	S	68.0	68.7	<50	88.3	190.3
SR-18 between Bear Springs Rd. and Project Access	12,330	6	45	S	67.9	68.7	<50	88.0	189.6
SR-18 between Project Acess and Daley Canyon Rd.	12,340	6	45	S	67.9	68.7	<50	88.0	189.7
SR-18 between Daley Canyon Rd. and Daley Canyon Access	7,600	6	45	S	65.8	66.6	<50	63.7	137.3
SR-18 between Daley Canyon Access and SR-173	8,260	6	45	S	66.2	66.9	<50	67.4	145.1
SR-18 east of SR-173	5,670	6	45	S	64.6	65.3	<50	52.4	112.9
SR-189 between Grass Valley Rd. and Daley Canyon Rd.	5,490	6	25	S	58.3	59.0	<50	<50	<50
SR-189 between Daley Canyon Rd. and North Bay Rd.	6,080	6	25	S	58.7	59.5	<50	<50	<50
SR-189 east of North Bay Rd.	4,440	6	25	S	57.3	58.1	<50	<50	<50

FHWA Noise Model

Project Name: Church of the Woods
Year: 2040 plus Project

Roadway Link	ADT	AHW	Speed	Hard or Soft Site? (H or S)	CNEL at 50ft from Centerline of Outside Lane	CNEL 50 feet from Centerline	Centerline to 70 dBA CNEL Countour	Centerline to 65 dBA CNEL Countour	Centerline to 60 dBA CNEL Countour	Increase from No Build
Bear Springs Rd. north of SR-18	1,150	6	35	S	54.9	55.7	<50	<50	<50	1.9
Daley Canyon Rd. between SR-189 and Daley Canyon Access	9,200	6	35	S	64.0	64.7	<50	<50	103.2	0.8
Daley Canyon Rd. between Daley Canyon Access and SR-18	6,790	6	35	S	62.7	63.4	<50	<50	84.3	1.2
SR-173 north of SR-18	6,300	6	35	S	62.3	63.1	<50	<50	80.2	0.4
SR-18 west of Lake Gregory Dr.	11,360	6	45	S	67.6	68.3	<50	83.3	179.5	0.2
SR-18 between Lake Gregory Dr. and Bear Springs Rd.	13,390	6	45	S	68.3	69.0	<50	93.0	200.3	0.3
SR-18 between Bear Springs Rd. and Project Access	13,710	6	45	S	68.4	69.1	<50	94.4	203.5	0.5
SR-18 between Project Acess and Daley Canyon Rd.	14,910	6	45	S	68.8	69.5	<50	99.9	215.2	0.8
SR-18 between Daley Canyon Rd. and Daley Canyon Access	8,590	6	45	S	66.4	67.1	<50	69.2	149.0	0.5
SR-18 between Daley Canyon Access and SR-173	9,050	6	45	S	66.6	67.3	<50	71.6	154.3	0.4
SR-18 east of SR-173	5,870	6	45	S	64.7	65.5	<50	53.6	115.6	0.2
SR-189 between Grass Valley Rd. and Daley Canyon Rd.	6,080	6	25	S	58.7	59.5	<50	<50	<50	0.4
SR-189 between Daley Canyon Rd. and North Bay Rd.	7,070	6	25	S	59.4	60.1	<50	<50	50.8	0.7
SR-189 east of North Bay Rd.	5,030	6	25	S	57.9	58.6	<50	<50	<50	0.5

Appendix B. Construction Noise Modeling

Site Prep.txt

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018
Case Description: Site Preparation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84.0		300.0	0.0
Excavator	No	40		80.7	300.0	0.0
Dozer	No	40		81.7	300.0	0.0
Dozer	No	40		81.7	300.0	0.0
Scraper	No	40		83.6	300.0	0.0
Scraper	No	40		83.6	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor	68.4	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	65.1	61.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	66.1	62.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	66.1	62.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	68.0	64.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	68.0	64.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	63.5	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	68.4	71.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night

residence 2	Residential	57.5	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84.0		50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Dozer	No	40		81.7	50.0	0.0
Scraper	No	40		83.6	50.0	0.0
Scraper	No	40		83.6	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	81.7	77.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	83.6	79.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper	83.6	79.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	79.1	75.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	84.0	86.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
		0.0	0.0	0.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)

Tractor	No	40	84.0		0.0	0.0
Excavator	No	40		80.7	0.0	0.0
Dozer	No	40		81.7	0.0	0.0
Dozer	No	40		81.7	0.0	0.0
Scraper	No	40		83.6	0.0	0.0
Scraper	No	40		83.6	0.0	0.0
Front End Loader	No	40		79.1	0.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	0.0	4.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

curb grad.txt
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018
Case Description: Curb Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	300.0	0.0
Excavator	No	40		80.7	300.0	0.0
Grader	No	40	85.0		300.0	0.0
Roller	No	20		80.0	300.0	0.0
Tractor	No	40	84.0		300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	65.1	61.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	65.1	61.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	69.4	65.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	68.4	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	69.4	69.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence 2	Residential	57.5	47.0	42.0

Equipment

Spec Actual Receptor Estimated

Description	Impact Device	Usage (%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Excavator	No	40		80.7	50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Grader	No	40	85.0		50.0	0.0
Roller	No	20		80.0	50.0	0.0
Tractor	No	40	84.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	85.0	85.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
		0.0	0.0	0.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	0.0	0.0
Excavator	No	40		80.7	0.0	0.0
Grader	No	40	85.0		0.0	0.0
Roller	No	20		80.0	0.0	0.0
Tractor	No	40	84.0		0.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Lmax	Calculated (dBA) Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Excavator		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	0.0	2.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Fine Grad.txt

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018

Case Description: Fine Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	300.0	0.0
Backhoe	No	40		77.6	300.0	0.0
Grader	No	40	85.0		300.0	0.0
Roller	No	20		80.0	300.0	0.0
Tractor	No	40	84.0		300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	65.1	61.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	62.0	58.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	69.4	65.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	68.4	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	69.4	69.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence 2	Residential	57.5	47.0	42.0

Equipment

Spec Actual Receptor Estimated

Description	Impact Device	Usage (%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Excavator	No	40		80.7	50.0	0.0
Backhoe	No	40		77.6	50.0	0.0
Grader	No	40	85.0		50.0	0.0
Roller	No	20		80.0	50.0	0.0
Tractor	No	40	84.0		50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	80.7	76.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	77.6	73.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader	85.0	81.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	84.0	80.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	85.0	85.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
		0.0	0.0	0.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	0.0	0.0
Backhoe	No	40		77.6	0.0	0.0
Grader	No	40	85.0		0.0	0.0
Roller	No	20		80.0	0.0	0.0
Tractor	No	40	84.0		0.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

	Calculated (dBA)		Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	0.0	2.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018
Case Description: Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	300.0	0.0
Crane	No	16		80.6	300.0	0.0
Man Lift	No	20		74.7	300.0	0.0
Man Lift	No	20		74.7	300.0	0.0
Man Lift	No	20		74.7	300.0	0.0
Generator	No	50		80.6	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0
Welder / Torch	No	40		74.0	300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	65.0	57.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	65.0	57.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	59.1	52.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	59.1	52.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	59.1	52.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	65.1	62.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	63.5	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	63.5	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	63.5	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Equipment	Calculated Lmax	Calculated Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Welder / Torch	58.4	54.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	65.1	67.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence 2	Residential	57.5	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50.0	0.0
Crane	No	16		80.6	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Generator	No	50		80.6	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Welder / Torch	No	40		74.0	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	80.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	80.6	72.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	74.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	74.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	74.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	80.6	77.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	79.1	75.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	79.1	75.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	79.1	75.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Welder / Torch	74.0	70.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	80.6	83.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
		0.0	0.0	0.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	0.0	0.0
Crane	No	16		80.6	0.0	0.0
Man Lift	No	20		74.7	0.0	0.0
Man Lift	No	20		74.7	0.0	0.0
Man Lift	No	20		74.7	0.0	0.0
Generator	No	50		80.6	0.0	0.0
Front End Loader	No	40		79.1	0.0	0.0
Front End Loader	No	40		79.1	0.0	0.0
Front End Loader	No	40		79.1	0.0	0.0
Welder / Torch	No	40		74.0	0.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		-8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane		-8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator		-3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Welder / Torch		-4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			N/A	N/A	N/A						
Total	0.0	4.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			N/A	N/A	N/A						

Pave.txt

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018

Case Description: Paving

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	300.0	0.0
Paver	No	50		77.2	300.0	0.0
Paver	No	50		77.2	300.0	0.0
Paver	No	50		77.2	300.0	0.0
Roller	No	20		80.0	300.0	0.0
Roller	No	20		80.0	300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	61.7	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	61.7	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	61.7	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	61.7	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	64.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	64.4	66.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
residence 2	Residential	57.5	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	50.0	0.0
Paver	No	50		77.2	50.0	0.0
Paver	No	50		77.2	50.0	0.0
Paver	No	50		77.2	50.0	0.0
Roller	No	20		80.0	50.0	0.0
Roller	No	20		80.0	50.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	77.2	74.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	80.0	73.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	80.0	81.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
		0.0	0.0	0.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	0.0	0.0
Paver	No	50		77.2	0.0	0.0
Paver	No	50		77.2	0.0	0.0
Paver	No	50		77.2	0.0	0.0
Roller	No	20		80.0	0.0	0.0
Roller	No	20		80.0	0.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Paver		-3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		-3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		-3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		-3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		-7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	0.0	3.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 04/30/2018
Case Description: achitectural coating

**** Receptor #1 ****

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
residence	Residential	57.0	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	300.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	62.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	62.1	58.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
residence 2	Residential	57.5	47.0	42.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50.0	0.0

Results

Noise Limits (dBA)

Noise Limit Exceedance (dBA)

```
---------------------------------------------
                        Calculated (dBA)        Day           Evening
Night              Day           Evening         Night
                        ----------------   --------------   -------------
--------------    --------------  --------------  --------------
Equipment                  Lmax    Leq        Lmax    Leq      Lmax    Leq      Lmax
 Leq       Lmax    Leq      Lmax    Leq     Lmax    Leq
----------------------  ------  ------     ------  ------  ------  ------  ------
------   ------  ------  ------  ------  ------  ------
Compressor (air)          77.7    73.7        N/A     N/A     N/A     N/A     N/A
 N/A       N/A     N/A     N/A     N/A     N/A     N/A
               Total      77.7    73.7        N/A     N/A     N/A     N/A     N/A
 N/A       N/A     N/A     N/A     N/A     N/A     N/A

                          **** Receptor #3 ****

                                            Baselines (dBA)
Description    Land Use        Daytime    Evening    Night
-----------    --------        -------    -------    -----
                                   0.0        0.0      0.0

                                     Equipment
                                     ---------
                                     Spec    Actual    Receptor    Estimated
                    Impact  Usage    Lmax    Lmax      Distance    Shielding
Description         Device   (%)     (dBA)   (dBA)      (feet)       (dBA)
-----------         ------  -----    -----   -----     --------    ---------
Compressor (air)        No     40             77.7          0.0          0.0


                                     Results
                                     -------
                                                          Noise Limits (dBA)
                   Noise Limit Exceedance (dBA)

---------------------------------------------
---------------------------------------------
                        Calculated (dBA)        Day           Evening
Night              Day           Evening         Night
                        ----------------   --------------   -------------
--------------    --------------  --------------  --------------
Equipment                  Lmax    Leq        Lmax    Leq      Lmax    Leq      Lmax
 Leq       Lmax    Leq      Lmax    Leq     Lmax    Leq
----------------------  ------  ------     ------  ------  ------  ------  ------
------   ------  ------  ------  ------  ------  ------
Compressor (air)                  -4.0        N/A     N/A     N/A     N/A     N/A
 N/A       N/A     N/A     N/A     N/A     N/A     N/A
               Total       0.0    -4.0        N/A     N/A     N/A     N/A     N/A
 N/A       N/A     N/A     N/A     N/A     N/A     N/A
```