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MEMORANDUM

DATE: December 2, 2024

TO: Brian T. Diebolt, Design Concepts

FROM: Jason Lui, Associate/Senior Noise Specialist

SUBJECT: Noise and Vibration Impact Analysis for the Lighthouse Church and Coffee Project in Yucca Valley, San Bernardino County, California (LSA Project Number 20241938)

INTRODUCTION

This Noise and Vibration Impact Analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the Lighthouse Church and Coffee Project (project) in Yucca Valley, San Bernardino County, California. This memorandum is intended to satisfy the Town of Yucca Valley's (Town) requirements and California Environmental Quality Act requirements for a project-specific noise and vibration impact analysis by examining the impacts from the proposed uses on the project site and evaluating mitigation measures that the project requires. All references cited in this memorandum are included in Attachment A.

PROJECT LOCATION

The proposed project is located on Assessor's Parcel Number (APN) 0595-371-15 at 57155 Twentynine Palms Highway. The project site is on the southeast corner of State Route (SR) 62 (Twentynine Palms Highway) and Dumosa Avenue near SR-247 (Old Women Springs Road) in Yucca Valley, California. Figure 1 (all figures provided in Attachment B) shows the regional and project location. The project site currently includes a 12,259 square-foot (sf) Bank of America building that has two drive-through lanes with automatic teller machines (ATMs).

PROJECT DESCRIPTION

The proposed project would convert the Bank of America structure into a 10,773 sf church and 1,486 sf coffee shop with a drive-through window while keeping the ATM operational. The proposed tenant improvements consist of the following:

- Conversion of 2,617 sf of existing space to a main assembly area with nonfixed seating areas.
- Conversion of 1,470 sf of existing space to a coffee house with seating areas and a drive-through.

- Conversion of other existing spaces to ancillary uses to the main assembly area, including a nursery, nursing mother's room, entry foyers, restrooms, children's ministries, Sunday school classrooms, administration, janitorial, and a youth activities room.

- Replacement of existing windows with high-efficiency dual-pane windows.

On-site improvements would include restriping of existing parking areas to accommodate additional required standard parking spaces and Americans with Disabilities Act (ADA) accessible parking spaces. Figure 2 shows the site plan.

The hours of operation for the church would be from 9:00 a.m. to 5:00 p.m., Monday through Saturday, with expanded hours on Wednesday for Bible study from 6:00 p.m. to 9:00 p.m., and from 7:00 a.m. to 9:00 p.m. on Sunday for the main service. The hours of operation for the coffee shop would be from 6:00 a.m. to 9:00 p.m., Monday through Saturday. The church would have two staff members, and the coffee shop would have four staff members.

Construction would consist primarily of remodeling the interior of the existing building and refurbishment of the parking lot. A patio cover will be added for the coffee shop outdoor dining area. Construction would begin in late 2024 and last approximately 5 months.

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale, which is a scale based on powers of 10.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as

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

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

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

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. L_{max} is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in

laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

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

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 vibration velocity decibels (VdB) or less. This is an order of magnitude below the damage threshold for normal buildings. Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (see the Federal Transit Administration's [FTA] 2018 *Transit Noise and Vibration Impact Assessment Manual*). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, both construction of a project and freight train operations on railroad tracks could result in ground-borne vibration that may be perceptible and annoying.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter deemphasizes the very low- and very high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted, unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 PM to 10:00 PM and after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time; usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near-Freeway Auto Traffic	70	Moderately Loud	Reference Level
Average Office	60	Quiet	½ as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	¼ as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	⅛ as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2004).

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise. Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause cosmetic building damage, it is not uncommon for heavy duty construction processes (e.g., blasting and pile driving) to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the VdB, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches per second (in/sec) used in the United States.

REGULATORY SETTING

Federal Guidelines

Federal Transit Administration

Noise. The construction noise criteria included in the FTA's *Transit Noise and Vibration Impact Assessment Manual* (2018) was used to evaluated potential construction noise impacts because Section 9.34.080(F)(3) of the Town's Municipal Code does not have daytime construction noise level limits for activities that occur within the specified hours. Table C shows the FTA's Detailed Assessment Daytime Construction Noise Criteria based on the composite noise levels for each construction phase.

Table C: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Vibration. Vibration standards included in the FTA *Transit Noise and Vibration Impact Assessment Manual* (2018) were used to evaluate construction vibration impacts even though the Town exempts vibration levels generated from construction between the hours of 7:00 a.m. and 10:00 p.m. based on Section 9.34.090(C) of the Town's Municipal Code. Table D lists the potential vibration building damage criteria associated with construction activities.

Table D: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
Reinforced concrete, steel, or timber (no plaster)	0.50
Engineered concrete and masonry (no plaster)	0.30
Nonengineered-timber and masonry buildings	0.20
Buildings extremely susceptible to vibration damage	0.12

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
FTA = Federal Transit Administration
in/sec = inches per second
PPV = peak particle velocity

Local Regulations

Town of Yucca Valley

General Plan. The Town's General Plan Noise Element (Town of Yucca Valley 2014) has established policies to meet the Town's noise-related goal. The applicable policies for the proposed project are listed below.

> **Goal N1:** A noise environment where excessive noise from stationary, transportation-related, and temporary sources of noise are appropriately managed.
>
> **Policy N 1-3:** Require daytime only truck deliveries to commercial and industrial uses adjacent to residential uses and other sensitive receptors unless there is no feasible alternative.
>
> **Policy N 1-13:** Enforce Town noise standards and monitor compliance with noise standards.
>
> **Policy N 1-18:** Enforce standards on the hours of operation for nonemergency construction.

Municipal Code. Section 9.34.080(B) of the Town's Municipal Code establishes noise standards for stationary and mobile noise sources affecting adjacent properties. Table E shows the exterior noise standards for stationary noise sources, and Table F shows the exterior and interior noise standards for mobile noise sources.

Section 9.34.080(F)(3) of the Town's Municipal Code exempts noise from temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 10:00 p.m., except Sundays and federal holidays.

Section 9.34.090(C) of the Town's Municipal Code limits ground vibration that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to 0.2 inch per second measured at or beyond the lot line. Also, vibration from motor vehicles not under the control of the subject use and temporary construction maintenance or demolition activities between 7:00 a.m. and 10:00 p.m. are exempt.

Table E: Noise Standards for Stationary Noise Sources

Affected Land Uses	Time Period	Noise Level (dBA)				
		L_{50}	L_{25}	L_8	L_2	L_{max}
Residential	7:00 a.m. to 10:00 p.m.	55	60	65	70	75
	10:00 p.m. to 7:00 a.m.	45	50	55	60	70
Professional Services	Anytime	55	60	65	70	75
Other Commercial	Anytime	60	65	70	75	80
Industrial	Anytime	70	75	80	85	90

Source: Town of Yucca Valley Municipal Code, Section 9.34.080(C) (Town of Yucca Valley 2024).
Note: No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

L_{50} = The noise standard for a cumulative period of more than 30 minutes in any hour.
L_{25} = The noise standard plus 5 dBA for a cumulative period of more than 15 minutes in any hour.
L_8 = The noise standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour.
L_2 = The noise standard plus 15 dBA for a cumulative period of more than 1 minute in any hour.
L_{max} = The noise standard plus 20 dBA for any period of time.

dBA = A-weighted decibel

Table F: Noise Standards for Mobile Noise Sources

Categories	Uses	Noise Standard (dBA L_{dn} or CNEL)	
		Interior[1]	Exterior[2,3]
Residential	Single-family, multi-family, duplex, mobile homes	45	60
Commercial	Amphitheater, concert hall, auditorium, movie theater	45	N/A
	Commercial retail, bank, restaurant	50	N/A
	Hotel, motel, transient housing	45	60
	Office building, research and development, professional offices	45	65
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Source: Town of Yucca Valley Municipal Code, Section 9.34.080(C) (Town of Yucca Valley 2024).

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, and 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 that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = Community Noise Equivalent Level
L_{dn} = day-night average noise level
dBA = A-weighted decibel
N/A = not applicable

THRESHOLDS OF SIGNIFICANCE

Based on the *Guidelines for the Implementation of the California Environmental Quality Act* (*State CEQA Guidelines*), Appendix G, Public Resources Code, Sections 15000–15387, a project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and the goals of the community in which it is located. The following are the thresholds for potential noise impacts.

The *State CEQA Guidelines* indicate that a project would have a significant impact on noise if it 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 ground-borne vibration or ground-borne noise levels; or
- For a project located within the vicinity of a private airstrip or 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, expose people residing or working in the project area to excessive noise levels.

EXISTING SETTING

Overview of the Existing Noise Environment

The primary existing noise sources in the project area are transportation facilities. Traffic on SR-62 (Twentynine Palms Highway), Yucca Trail, Dumosa Avenue, and other roadways within the project area contributes to the ambient noise levels in the project vicinity. Also, commercial and retail activities that surround the project site contribute to the noise environment in the project area.

Land Uses in the Project Vicinity

Existing land uses within the project area include residences, vacant land, and commercial uses. Multifamily residences (Dumosa Senior Village) are located to the northwest approximately 215 ft from the project boundary. Vacant land is located immediately south of the project site. Commercial uses are located to the north, east, southeast, southwest, and west.

Ambient Noise Measurements

Two long-term (24-hour) noise level measurements were conducted from August 20 to August 21, 2024, using Larson Davis Spark 706RC dosimeters to document the existing noise environment within the project area. Table G summarizes the results of the long-term noise level measurements along with a description of the measurement locations and noise sources that occurred during the measurements. As shown in Table G, daytime noise levels ranged from 61.0 to 68.0 dBA L_{eq} and nighttime noise levels ranged from 50.0 to 65.0 dBA L_{eq}. Also, the calculated CNEL levels at LT-1 and LT-2 were 68.0 and 67.4 dBA, respectively. The long-term noise level measurement survey sheets along with the hourly L_{eq} results are provided in Attachment C. Figure 3 shows the long-term monitoring locations.

Existing Aircraft Noise

The closest public airport to the project site is the Yucca Valley Airport, which is 0.4 miles northeast of the project site. Based on the *Airport Comprehensive Land Use Plan for Yucca Valley Airport* (San Bernardino County 1992), the project site is beyond the 60 dBA CNEL noise contour. Also, there are no private airstrips within 2 miles of the project site. Therefore, the project would not expose

Table G: Long-Term Ambient Noise Monitoring Results

Monitor No.	Location Description	Noise Levels (dBA)		
		L_{eq}		CNEL
		Daytime[1]	Nighttime[2]	
LT-1	57155 Twentynine Palms Highway. On a light pole on the north end of the parking lot approximately 110 ft from SR-62 (Twentynine Palms Highway) centerline.	61.0–66.0	54.5–64.4	68.0
LT-2	57075 Twentynine Palms Highway. On a tree south of the Stater Brothers grocery store and approximately 42 ft from Yucca Trail centerline.	61.7–68.0	50.0–65.0	67.4

Source: Compiled by LSA (2024).
Note: The long-term noise level measurements were conducted from August 20 to August 21, 2024.
[1] Daytime = Hours between 7:00 a.m. and 10:00 p.m.
[2] Nighttime = Hours between 10:00 p.m. and 7:00 a.m.
CNEL = Community Noise Equivalent Level ft = foot/feet
dBA = A-weighted decibels L_{eq} = equivalent continuous sound level

people working in the project vicinity to aviation-related excessive noise levels, and this topic is not further discussed.

IMPACTS

Short-Term Construction Noise Impacts

Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on roadways leading to the site. The pieces of construction equipment for construction activities would move on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 84 dBA), the effect on longer-term ambient noise levels would be small because the number of daily construction-related vehicle trips is small compared to existing daily traffic volume on SR-62 (Twentynine Palms Highway), Yucca Trail, and Dumisa. The building construction phase would generate the most trips out of all of the construction phases, at 28 trips per day based on the California Emissions Estimator Model (CalEEMod) (Version 2022.1) results contained in Attachment B of the *Air Quality, Energy, and Greenhouse Gas Technical Memorandum for the Lighthouse Church and Coffee Project* (LSA 2024a). Roadways that would be used to access the project site are SR-62 (Twentynine Palms Highway), Yucca Trail, and Dumosa Avenue. The existing average daily traffic (ADT) volume on SR-62 (Twentynine Palms Highway) ranges between 24,000 and 32,000 based on the 2022 California Department of Transportation (Caltrans) Annual Average Daily Truck Traffic for Truck Traffic on California State Highways (Caltrans 2022). Also, the existing ADT volumes on Yucca Trail and Sage Avenue are 6,923 and 4,341, respectively, based on the *Yucca Valley General Plan Update Environmental Impact Report* (Town of Yucca Valley 2013). Dumosa Avenue is a two-lane road similar to Sage Avenue and would have a similar ADT volume as Sage Avenue. Based on the information above, construction-related traffic would increase noise levels by up to 0.03 dBA. A noise level increase of less than 1 dBA would not be perceptible to the human ear. Therefore, short-term

construction-related noise impacts associated with worker commute and equipment transport to the project site would be less than significant. No mitigation measures are required.

The second type of short-term noise impact is related noise generated from construction activities. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. The proposed project anticipates building construction, paving, and architectural coating phases of construction. These various sequential phases change the character of the noise generated on a project site. Therefore, the noise levels vary as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists the L_{max} noise level recommended for noise impact assessments for typical construction equipment included in the Federal Highway Administration (FHWA) *Highway Construction Noise Handbook* (2006), based on a distance of 50 ft between the equipment and a noise receptor.

Table H: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 ft[2]
Backhoes	40	80
Compactor (ground)	20	80
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Manlift (Forklift)	20	85
Front-end Loaders	40	80
Generator	50	82
Graders	40	85
Jackhammers	20	85
Pavement Scarifier	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Welder/Torch	40	73

Source: Table 1, *FHWA Roadway Construction Noise Model User's Guide* (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration L_{max} = maximum instantaneous sound level
ft = foot/feet

Table I lists the anticipated construction equipment for each construction phase based on the CalEEMod (Version 2022.1) results contained in Attachment B of the *Air Quality and Greenhouse Gas Impact Analysis for the Lighthouse Church and Coffee Shop Project* (LSA 2024a). Table I shows the combined noise level at 50 ft from all of the equipment in each phase and the L_{eq} noise level for each equipment at 50 ft based on the quantity, reference L_{max} noise level at 50 ft, and the acoustical usage factor. As shown in Table I, construction noise levels would reach up to 86.5 L_{eq} at a distance of 50 ft.

Table I: Summary of Construction Phase, Equipment, and Noise Levels

Construction Phase	Construction Equipment	Quantity	Reference Noise Level at 50 ft (dBA L_{max})	Acoustical Usage Factor[1] (%)	Noise Level at 50 ft (dBA L_{eq})	Combined Noise Level at 50 ft (dBA L_{eq})
Building Construction	Crane	1	85	16	85	84.1
	Forklifts	1	85	20	85	
	Generator	1	82	50	82	
	Front-End Loaders	1	80	40	80	
	Welders	3	73	40	73	
Paving	Paver	1	85	50	85	86.5
	Roller	1	85	20	85	
	Concrete Mixer Truck	1	85	40	85	
	Front-End Loaders	1	80	40	80	
	Pavement Scarafier	1	85	20	85	
Architectural Coating	Air Compressors	1	80	40	80	76.0

Source: Compiled by LSA (2024).

[1] The acoustical usage factor is the percentage of time during a construction noise operation that a piece of construction equipment operates at full power.

dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level
ft = foot/feet
L_{max} = maximum instantaneous noise level

The closest residential property line (Dumosa Senior Village) is approximately 360 ft from the center of the project site and may be subject to short-term construction noise reaching 69.4 dBA L_{eq} generated by construction activities in the project area. Construction noise is temporary and would stop once project construction is completed. Compliance with the Town's hours of construction pursuant to Section 9.34.080(F)(3) of the Town's Municipal Code listed below would ensure construction-related noise would not be generated during the more sensitive nighttime hours. Furthermore, construction related noise levels would be below the FTA noise level standard of 80 dBA L_{eq} for residential uses. Therefore, noise levels generated from project construction would be less than significant. No mitigation measures are required.

- The construction contractor shall limit construction activities to between the hours of 7:00 a.m. and 10:00 p.m. Monday through Saturday pursuant to Sections 9.34.080(F)(3) and 9.34.090(C) of the Town's Municipal Code (Town of Yucca Valley 2024). Construction is prohibited outside these hours and anytime on Sundays and federal holidays.

Short-Term Construction Vibration Impacts

Although vibration levels from construction-related activities between the hours of 7:00 a.m. and 10:00 p.m., Monday through Saturday, are exempt pursuant to Sections 9.34.080(F)(3) and 9.34.090(C) of the Town's Municipal Code (Town of Yucca Valley 2024), this construction vibration impact analysis assesses the potential for building damage using vibration levels in PPV (in/sec). Vibration levels calculated in PPV are best for characterizing damage potential.

Table J shows the reference vibration levels at a distance of 25 ft for each type of standard construction equipment from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Project construction is expected to require the use of loaded trucks to either deliver building materials onto the site or haul away construction and demolition waste, which would generate ground-borne vibration levels of up to 0.076 PPV (in/sec) when measured at 25 ft. Jackhammers, bulldozers, and other vibration-generating construction equipment would not be used because the proposed project primarily consists of tenant improvements as described above.

Table J: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV (in/sec) at 25 ft
Pile Driver (Impact), Typical	0.644
Pile Driver (Sonic), Typical	0.170
Vibratory Roller	0.210
Hoe Ram	0.089
Large Bulldozer	0.089
Caisson Drilling	0.089
Loaded Trucks[1]	**0.076**
Jackhammer	0.035
Small Bulldozer	0.003

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] The equipment shown in **bold** is expected to be used on site.
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inches per second
PPV = peak particle velocity

The greatest vibration levels are anticipated to occur during the site preparation and grading phase. All other phases are expected to result in lower vibration levels. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project boundary (assuming the construction equipment would be used at or near the project boundary) because vibration impacts normally occur within the buildings.

The formula for vibration transmission is provided below:

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Table K lists the projected vibration levels from loaded trucks operating on the project site to the nearest buildings in the project vicinity. As shown in Table K, the office building is approximately 70 ft from the area in which loaded trucks would operate on the project site and would experience a vibration level of up to 0.019 PPV (in/sec). This vibration level would not result in building damage

because this building would be constructed equivalent to or better than nonengineered timber and masonry and vibration levels would not exceed the FTA vibration damage threshold of 0.20 PPV (in/sec). Other building structures that surround the project site would experience lower vibration levels because they are farther away and would be constructed equivalent to or better than nonengineered timber and masonry. Also, compliance with the Town's hours of construction pursuant to Sections 9.34.080(F)(3) and 9.34.090(C) of the Town's Municipal Code (Town of Yucca Valley 2024) discussed above would ensure that vibration levels generated from construction-related activities would be exempt. Therefore, construction vibration impacts during project construction would be less than significant. No mitigation measures are required.

Table K: Potential Construction Vibration Damage

Land Use	Direction	Equipment/ Activity	Reference Vibration Level at 25 ft	Distance to Structure (ft)[1]	Vibration Level
			PPV (in/sec)		PPV (in/sec)
Residence (Dumosa Senior Village)	Northwest	Loaded trucks	0.076	215	0.004
Commercial (Restaurant)	North	Loaded trucks	0.076	195	0.004
Commercial (Animal Hospital)	East	Loaded trucks	0.076	160	0.005
Commercial (Frontier Communications)	Southeast	Loaded trucks	0.076	125	0.008
Commercial (Various)	Southwest	Loaded trucks	0.076	70	0.019
Commercial (Wells Fargo Bank)	West	Loaded trucks	0.076	85	0.014

Source: Compiled by LSA (2024).
Note: The FTA-recommended building damage threshold is 0.20 PPV (in/sec) at the receiving nonengineered timber and masonry building.
[1] Distance from the area which loading trucks would operate on the project site.
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inches per second
PPV = peak particle velocity

Long-Term Traffic Noise Impacts

The proposed project would reduce daily trips by 255 compared to the existing bank use based on the *Lighthouse Church and Coffee Project Trip Generation Comparison Analysis Memorandum* (LSA 2024b). A reduction in daily trips would result in a traffic noise reduction. Therefore, no traffic noise impacts from project-related traffic on off-site sensitive receptors would occur. No mitigation measures are required.

Long-Term Stationary Source Noise Impacts

Operation of the proposed project would include parking activities and heating, ventilation, and air conditioning (HVAC) equipment that would result in stationary noise impacts as described below.

Parking Activities

The proposed project would restripe and improve circulation to provide two-way travel at the main parking areas. The number of parking spaces would remain relatively the same while parking activities would either remain the same or lower because the proposed project would have a reduction in daily trips by 255 compared to the existing bank based on the *Lighthouse Church and*

Coffee Project Trip Generation Comparison Analysis Memorandum (LSA 2024b). Noise generated from parking lot activities would be the same or lower compared to the existing bank. Therefore, noise generated from parking activities would be less than significant. No mitigation measures are required.

Drive-Thru ATM

The drive-thru ATM would remain operational as part of the proposed project. Noise generated from the drive-thru ATM would consist of vehicles approaching the ATM machine at slow speeds and vehicles idling at the ATM machine and would be the same or lower compared to the existing bank. Therefore, noise generated from the existing drive-thru ATM would be less than significant. No mitigation measures are required.

Heating, Ventilation, and Air Conditioning

Noise generated from HVAC equipment is expected to remain the same because the proposed project would either utilize the existing HVAC equipment or replace it with one that is similar to the existing HVAC equipment and similar noise levels. Therefore, noise generated from HVAC equipment would be less than significant. No mitigation measures are required.

Speakerphone

The proposed project would include a speakerphone for the drive-through. The speakerphone equipment would operate during daytime hours with the daily hours of operation from 6:00 a.m. to 9:00 p.m., which corresponds with the hours of operation for the coffee shop. The specifications of the speakerphone, including the reference noise level, are provided in Appendix D. The speakerphone would generate a noise level of 84 dBA L_{eq} at a distance of 1 ft. At a distance of 50 ft, the noise level from the speakerphone is 50.0 dBA.

Table L show the noise levels generated from the drive-through speakerphone at each of the adjacent uses surrounding the project site along with the reference noise level at 50 ft and distance from the speakerphone to the property line of the adjacent use. As shown in Table L, noise levels generated from the speakerphone at the closest residential and commercial property line would reach up to 31.5 and 50.0 dBA L_{eq}, respectively. Noise levels at the closest residential property line would not exceed the Town's daytime and nighttime 30-minute noise standards of 55 and 45 dBA, respectively. Also, noise levels at the commercial property lines that surround the project site would not exceed the Town's 30-minute noise standard of 60 dBA. Therefore, noise generated from the drive-through speakerphone would be less than significant. No mitigation measures are required.

Table L: Speakerphone Noise Levels

Land Use	Direction	Reference Noise Level at 50 ft (dBA L_{eq})	Distance[1] (ft)	Distance Attenuation (dBA)	Noise Level (dBA L_{eq})
Residence (Dumosa Senior Village)	Northwest	50.0	420	18.5	31.5
Commercial (Restaurant)	North	50.0	335	16.5	33.5
Commercial (Animal Hospital)	East	50.0	50	0.0	50.0
Commercial (Frontier Communications)	Southeast	50.0	105	6.4	43.6
Commercial (Various)	Southwest	50.0	180	11.1	38.9
Commercial (Wells Fargo Bank)	West	50.0	250	14.0	36.0

Source: Compiled by LSA (2024).

[1] Distance from the speakerphone to the property line of adjacent land use.

Long-Term Vibration Impacts

The proposed project would not generate vibration. In addition, vibration levels generated from project-related traffic on the roadways (SR-62 [Twentynine Palms Highway], Dumosa Avenue, Yucca Trail, and other roadways in the project area) leading to the project site are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Vibration generated from operations of the project would be minimal to negligible and would not exceed the Town's vibration standard of 0.2 in/sec (particle velocity). Therefore, vibration impacts from project-related operations would be less than significant. No mitigation measures are required.

REGULATORY COMPLIANCE MEASURES

Compliance with the following measure would ensure that construction noise would be generated only during allowable times:

- The construction contractor shall limit construction activities to between the hours of 7:00 a.m. and 10:00 p.m., Monday through Saturday, pursuant to Sections 9.34.080(F)(3) and 9.34.090(C) of the Town's Municipal Code (Town of Yucca Valley 2024). Construction is prohibited outside these hours and anytime on Sundays and federal holidays.

Attachments: A: References
B: Figures
C: Noise Survey Sheets
D: Speakerphone Specifications

ATTACHMENT A

REFERENCES

California Department of Transportation (Caltrans). 2022. Caltrans Annual Average Daily Truck Traffic for Truck Traffic on California State Highways. Website: https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/census/2022/2022-truck-aadt.xlsx (accessed December 2024).

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Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. FTA Report No. 0123. September. Website: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf (accessed December 2024).

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LSA Associates, Inc. (LSA). 2024a. Air Quality and Greenhouse Gas Impact Analysis Memorandum for the Lighthouse Church and Coffee Shop Project. November 21.

_____. 2024b. Lighthouse Church and Coffee Project Trip Generation Comparison Analysis Memorandum . October 21.

San Bernardino County. 1992. Airport Comprehensive Land Use Plan for Yucca Valley Airport. February. Website: https://www.sbcounty.gov/Uploads/lus/Airports/YuccaValley.pdf (accessed December 2024).

Town of Yucca Valley. 2013. Yucca Valley General Plan Update Environmental Impact Report. August. Website: https://www.yucca-valley.org/our-town/departments/community-development/planning/general-plan-update (accessed December 2024).

_____. 2014. General Plan Noise Element. February 4. Website: https://www.yucca-valley.org/home/showpublisheddocument/2594/637009395714400000 (accessed December 2024).

_____. 2024. Municipal Code. April 2.

ATTACHMENT B

FIGURES

LSA

LEGEND

Project Location

FIGURE 1

N

0 290 580

FEET

SOURCE: ESRI Streets, 2021; Google Earth, 2023.

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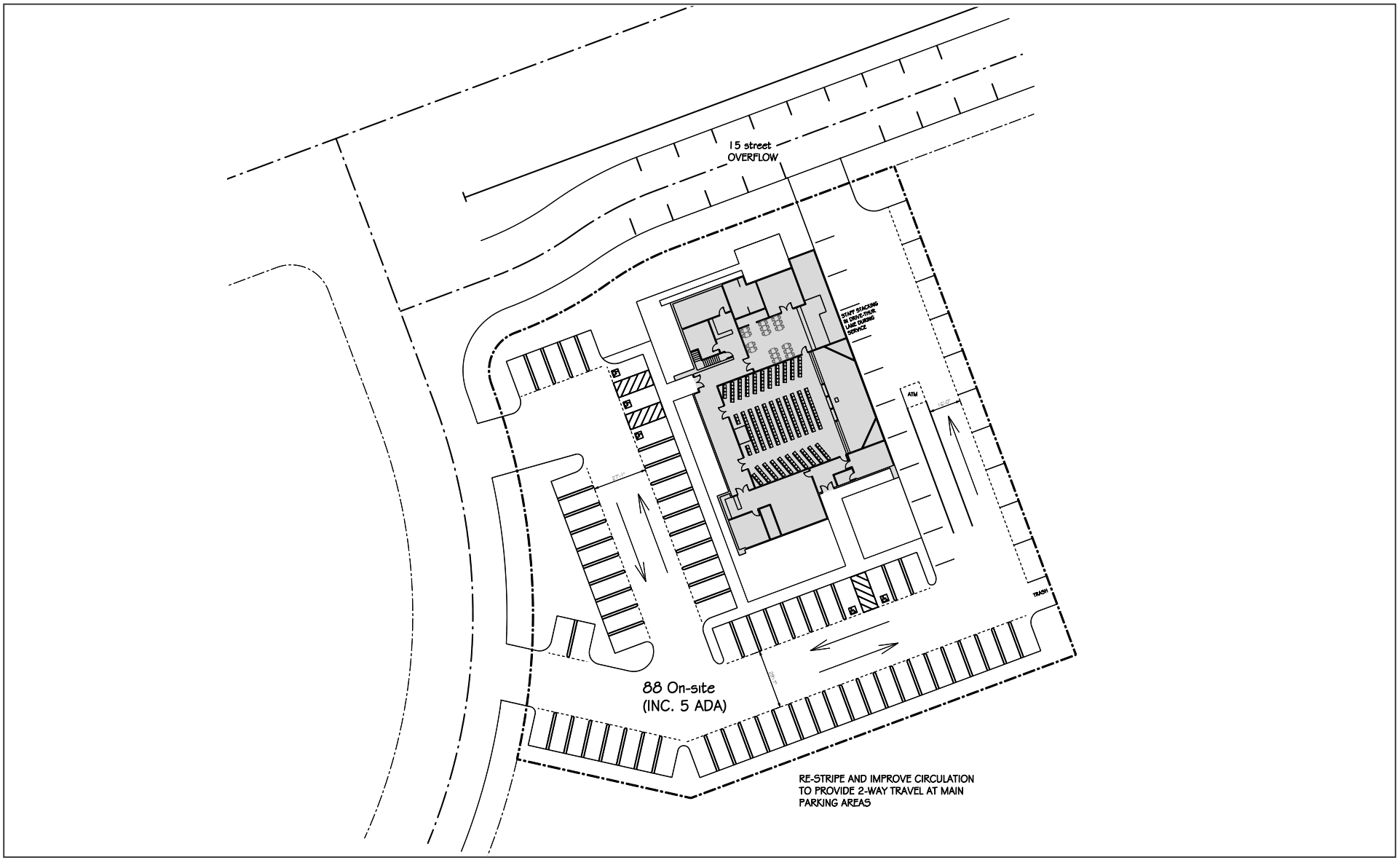
Lighthouse Church and Coffee Project

Regional and Project Location



LSA

FIGURE 2

N

0 40 80

FEET

SOURCE: Design Concepts

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Lighthouse Church and Coffee Project

Site Plan

LSA

LEGEND

Project Site Boundary

LT-1 Long-term Noise Monitoring Location

FIGURE 3

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0 80 160

FEET

SOURCE: Google Earth 2024

Lighthouse Church and Coffee Project

Noise Monitoring Locations

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ATTACHMENT C

NOISE SURVEY SHEETS

Noise Measurement Survey – 24 HR

Project Number: 20241938
Project Name: Lighthouse Church & Coffee

Test Personnel: Ämber Hazelrigg
Equipment: Spark 706RC (SN:18571)

Site Number: LT-1 Date: 08/20/2024

Time: From 12:00 p.m. To 2:00 p.m.

Site Location: 57155 Twentynine Palms Highway. On a light pole on the north end of the parking lot approximately 110 ft from Twentynine Palms Highway centerline.

Primary Noise Sources: Traffic on Twentynine Palms Highway (Route 62) and Dumosa Avenue.

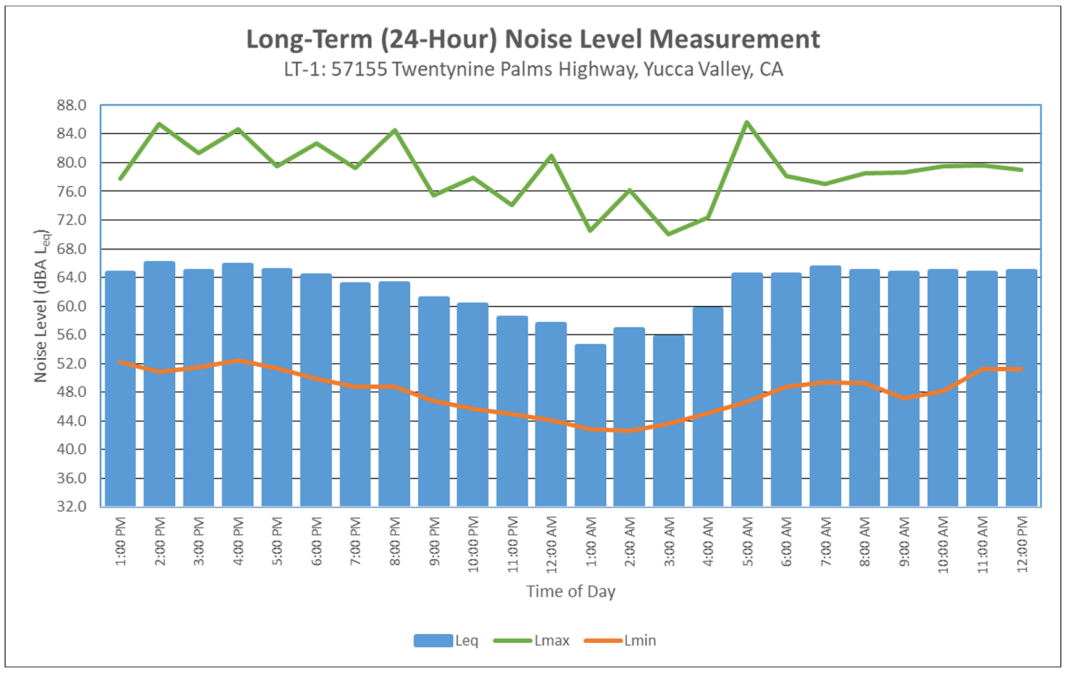
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
1:00 PM	8/20/24	64.6	77.8	52.2
2:00 PM	8/20/24	66.0	85.4	50.8
3:00 PM	8/20/24	64.9	81.4	51.4
4:00 PM	8/20/24	65.7	84.7	52.5
5:00 PM	8/20/24	65.0	79.5	51.3
6:00 PM	8/20/24	64.3	82.7	49.9
7:00 PM	8/20/24	63.0	79.2	48.8
8:00 PM	8/20/24	63.1	84.5	48.7
9:00 PM	8/20/24	61.0	75.5	46.8
10:00 PM	8/20/24	60.2	77.9	45.7
11:00 PM	8/20/24	58.3	74.1	44.9
12:00 AM	8/21/24	57.5	81.0	44.1
1:00 AM	8/21/24	54.5	70.5	42.8
2:00 AM	8/21/24	56.8	76.2	42.6
3:00 AM	8/21/24	55.7	70.0	43.6
4:00 AM	8/21/24	59.6	72.4	45.0
5:00 AM	8/21/24	64.4	85.6	46.7
6:00 AM	8/21/24	64.4	78.1	48.7
7:00 AM	8/21/24	65.3	77.1	49.4
8:00 AM	8/21/24	64.9	78.5	49.3
9:00 AM	8/21/24	64.6	78.6	47.1
10:00 AM	8/21/24	64.8	79.5	48.1
11:00 AM	8/21/24	64.6	79.6	51.2
12:00 PM	8/21/24	64.9	79.0	51.2

Source: Compiled by LSA Associates, Inc. (2024).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: 20241938
Project Name: Lighthouse Church & Coffee

Test Personnel: Ämber Hazelrigg
Equipment: Spark 706RC (SN: 17206)

Site Number: LT-2 Date: 08/20/2024

Time: From 12:00 p.m. To 12:00 p.m.

Site Location: 57075 Twentynine Palms Highway. On a tree south of the Stater Brothers grocery store and approximately 42 ft from Yucca Trail centerline.

Primary Noise Sources: Traffic from Yucca Trail.

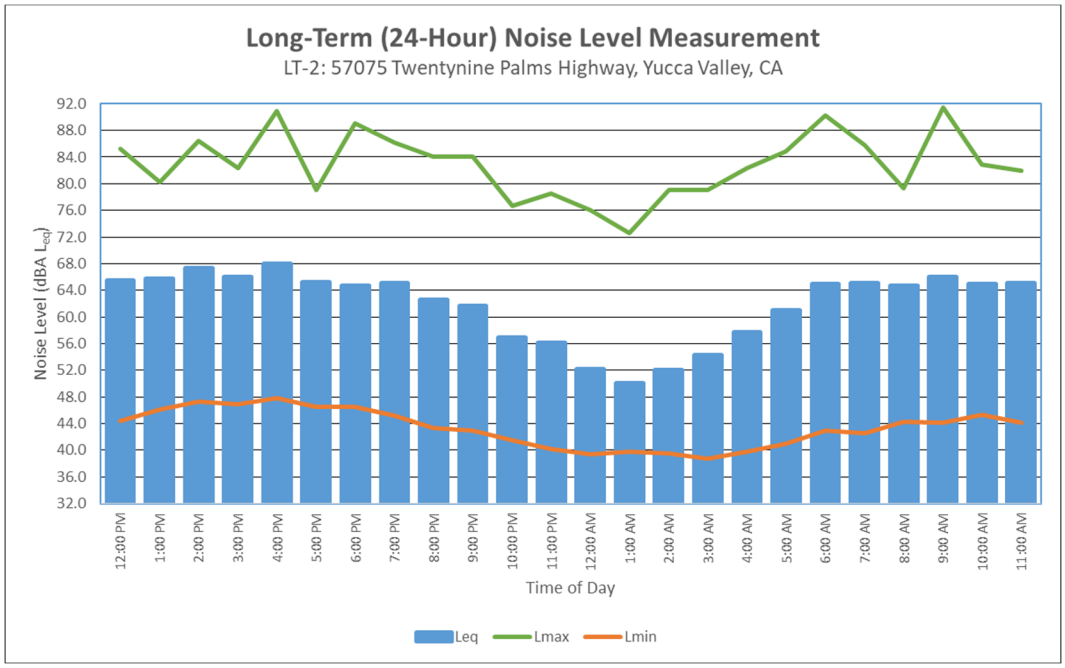
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
12:00 PM	8/20/24	65.5	85.2	44.4
1:00 PM	8/20/24	65.7	80.2	46.1
2:00 PM	8/20/24	67.4	86.5	47.3
3:00 PM	8/20/24	66.0	82.3	46.9
4:00 PM	8/20/24	68.0	90.9	47.8
5:00 PM	8/20/24	65.3	79.0	46.5
6:00 PM	8/20/24	64.7	89.1	46.5
7:00 PM	8/20/24	65.1	86.2	45.2
8:00 PM	8/20/24	62.6	84.0	43.4
9:00 PM	8/20/24	61.7	84.0	43.0
10:00 PM	8/20/24	57.0	76.7	41.5
11:00 PM	8/20/24	56.2	78.5	40.2
12:00 AM	8/21/24	52.2	76.0	39.4
1:00 AM	8/21/24	50.0	72.6	39.8
2:00 AM	8/21/24	52.1	79.0	39.5
3:00 AM	8/21/24	54.3	79.1	38.7
4:00 AM	8/21/24	57.7	82.3	39.8
5:00 AM	8/21/24	61.0	84.8	40.9
6:00 AM	8/21/24	65.0	90.2	42.9
7:00 AM	8/21/24	65.1	85.8	42.6
8:00 AM	8/21/24	64.7	79.3	44.2
9:00 AM	8/21/24	66.1	91.4	44.1
10:00 AM	8/21/24	65.0	82.9	45.3
11:00 AM	8/21/24	65.1	81.9	44.1

Source: Compiled by LSA Associates, Inc. (2024).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



ATTACHMENT D

SPEAKERPHONE SPECIFICATIONS

HME

Customer Driven

Memo

Re: Drive-Thru Sound Pressure Levels From the Menu Board or Speaker Post

The sound pressure levels from the menu board or speaker post are as follows:

1. Sound pressure level (SPL) contours (A weighted) were measured on a typical HME SPP2 speaker post. The test condition was for pink noise set to 84 dBA at 1 foot in front of the speaker. All measurements were conducted outside with the speaker post placed 8 feet from a non-absorbing building wall and at an oblique angle to the wall. These measurements should not be construed to guarantee performance with any particular speaker post in any particular environment. They are typical results obtained under the conditions described above.

2. The SPL levels are presented for different distances from the speaker post:

Distance from the Speaker (Feet)	SPL (dBA)
1 foot	84 dBA
2 feet	78 dBA
4 feet	72 dBA
8 feet	66 dBA
16 feet	60 dBA
32 feet	54 dBA

3. The above levels are based on factory recommended operating levels, which are preset for HME components and represent the optimum level for drive-thru operations in the majority of the installations.

Also, HME incorporates automatic volume control (AVC) into many of our Systems. AVC will adjust the outbound volume based on the outdoor, ambient noise level. When ambient noise levels naturally decrease at night, AVC will reduce the outbound volume on the system. See below for example:

Distance from Outside Speaker	Decibel Level of standard system with 45 dB of outside noise without AVC	Decibel level of standard system with 45 dB of outside noise with AVC active
1 foot	84 dBA	60 dBA
2 feet	78 dBA	54 dBA
4 feet	72 dBA	48 dBA
8 feet	66 dBA	42 dBA
16 feet	60 dBA	36 dBA

If there are any further questions regarding this issue please contact HME customer service at 1-800-848-4468.

Thank you for your interest in HME's products.

HM Electronics, Inc. | 14110 Stowe Drive | Poway, CA 92064
phone: 800.848.4468 | fax: 858.452.7207 | www.hme.com