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Project 1741

RE:
Avila Cottages
Avila Beach
San Luis Obispo County, CA

Requested by:
SCM Avila Beach Partners, LLC
115 W Canon Perdido St
Santa Barbara, CA 93101

1 Executive Summary

45dB Acoustics has reviewed regulatory noise requirements of the San Luis Obispo County General Plan Noise Element for the proposed Avila Cottages project. This acoustic assessment will accompany Planning and Permitting application for the project to the County of San Luis Obispo Planning and Building Department.

The existing and future transportation noise impact and the potential noise impacts of on-site operations were acoustically modeled and documented according to three scenarios:

1. Project site with no future development
2. Project site with the built project.
3. Project site with the built project in the year 2037

Noise modeling of the site was based on sound level measurements and average daily traffic volumes on Avila Beach Drive and interior roads. Existing sound level near residential uses in the development are in the range of daytime Leq = 35 dBA to 45 dBA (see Appendix for definitions used in this report).

The proposed project meets or exceeds applicable state and local noise restrictions and regulations.

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2 Introduction

This sound level assessment is intended to determine the potential off-site and on-site noise impacts associated with the proposed development project. The project will involve the construction of 50 cottages and a main lodge. The following topics are presented in this report in response to County of San Luis Obispo requirements for projects identified by the Noise Element of the County's General Plan:

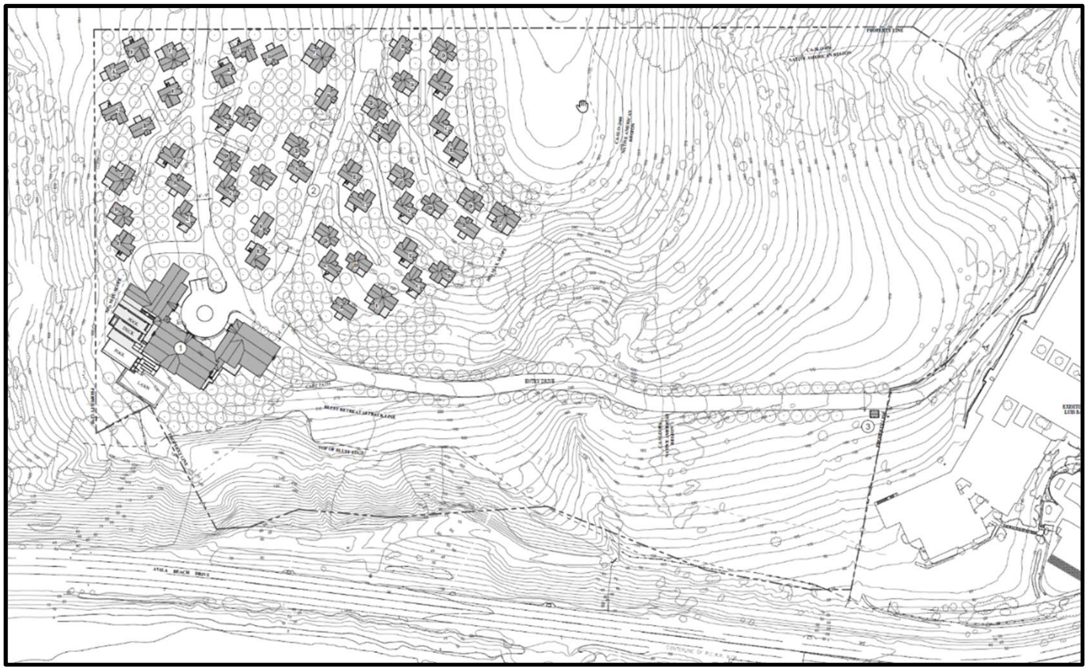
- The topographical relationship of noise sources and the dwelling/occupied sites to be developed
- Identification of noise sources and their characteristics, including predicted noise spectra at the exterior of the proposed dwelling structure, considering present and future land use
- Basis for the sound level prediction (measured or obtained from published data), noise attenuation measures to be applied, and an analysis of the noise insulation effectiveness of the proposed construction showing that the prescribed interior noise level requirements are met
- Analysis of the potential impact of short-term construction noise
- Information on fundamentals of noise and vibration to aid in interpreting the report

3 Project Description

The subject of this sound level assessment is the proposed development site located north of Avila Beach Drive and west of Ana Bay Road. The vicinity of the site is shown in Figure 1.

Figure 1: Site Vicinity

Figure 2: Site plan showing cottages and main lodge



4 Sound Level Contours

Figure 3: Sound Level Contours, Leq 1 hr = dBA, daytime - - No Project

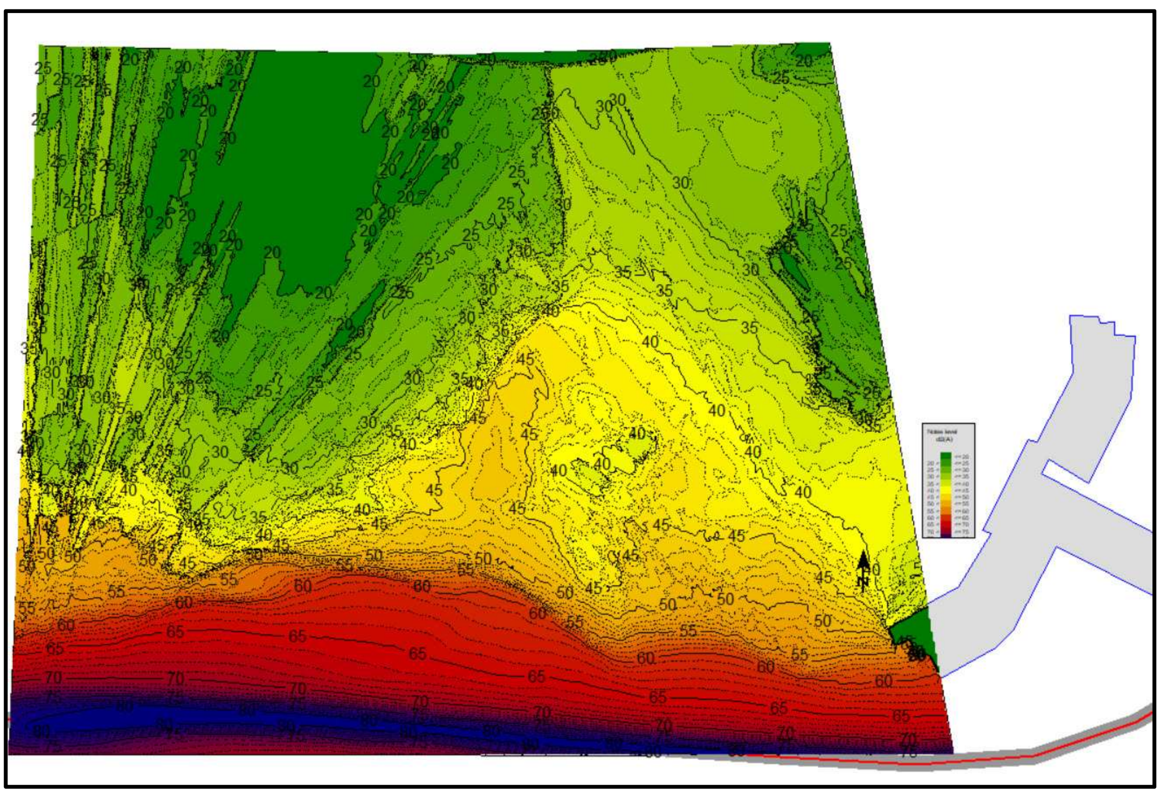


Figure 4: Existing Sound Level Contours, year 2017, with Project

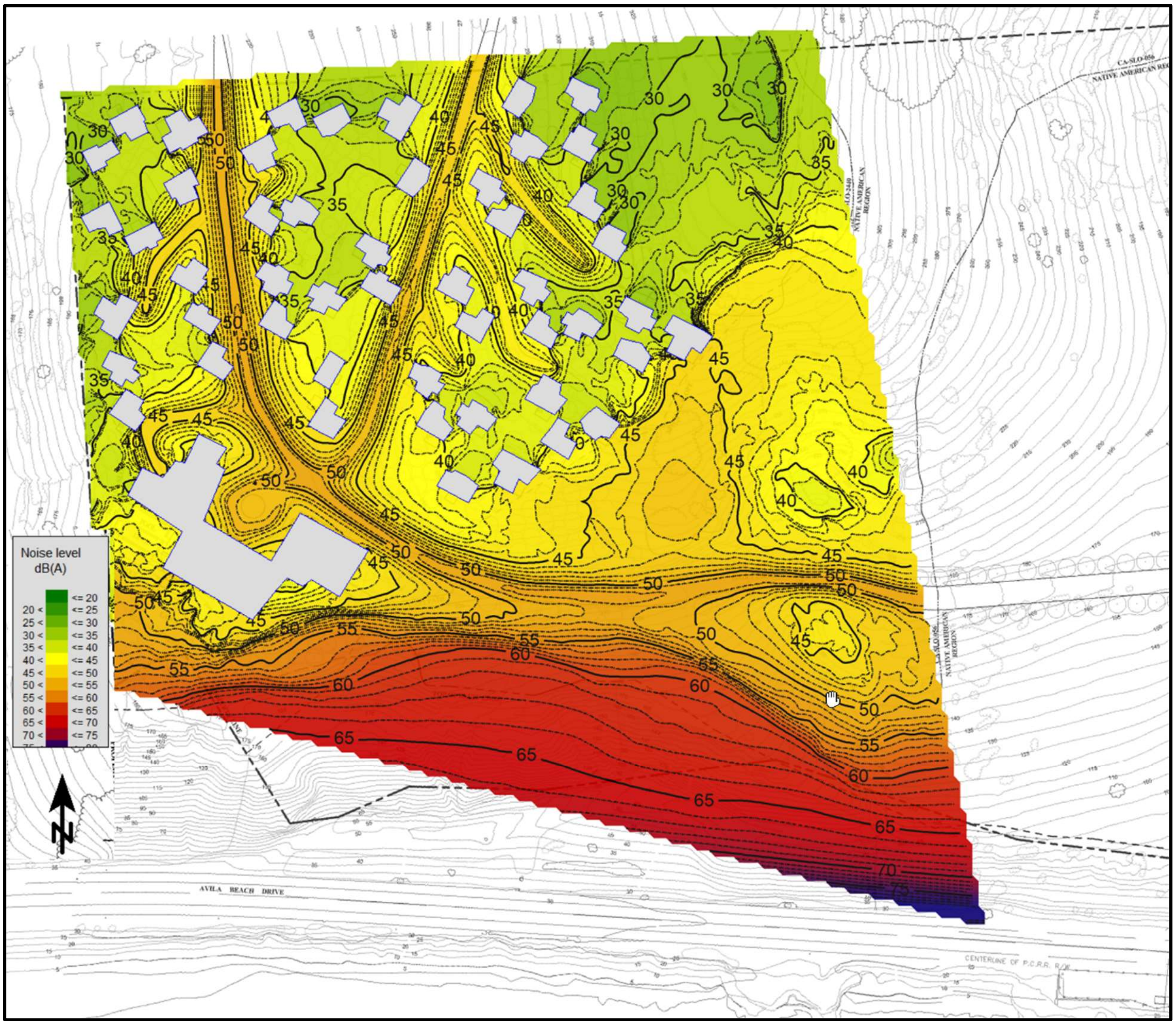
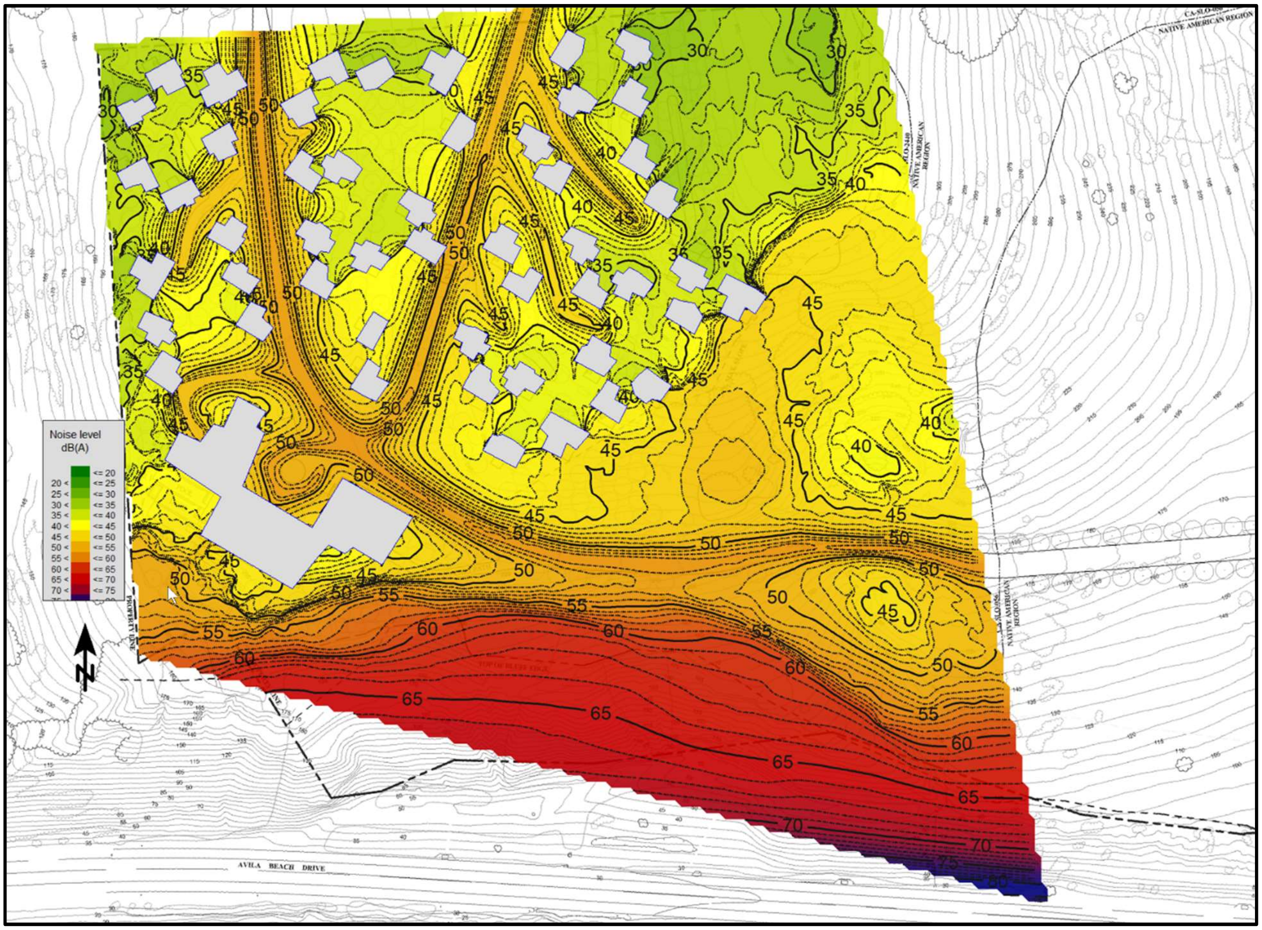


Figure 5: Future Sound Level Contours, year 2037, with Project



5 Potential Short-Term Construction Noise

A grading plan and construction phasing plan has not been developed at this time; therefore, only a general estimate of construction noise levels can be provided. The primary noise from Project construction would be from site preparation. Grading would require the use of heavy equipment such as bulldozers, loaders, and scrapers. No blasting would be necessary.

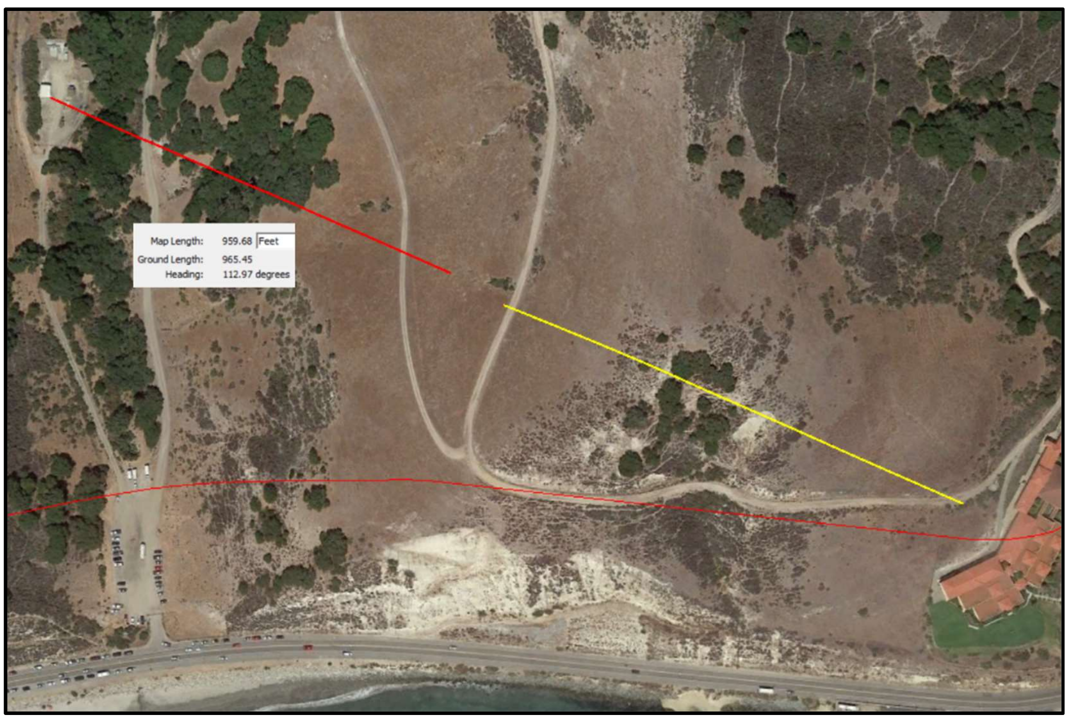
Construction of the Project would generate a temporary increase in noise in the Project area. The increase in noise level would be primarily experienced close to the noise source. The magnitude of the impact would depend on the type of construction activity, noise level generated by various pieces of construction equipment, duration of the construction phase, noise shielding, distance and line-of-sight between the noise source and receiver. Construction activity and delivery of construction materials and equipment should be limited to daytime hours (between 7:00 a.m. and 7:00 p.m.), Monday through Saturday.

This Project would implement conventional construction techniques and equipment. Standard equipment such as scrapers, graders, backhoes, loaders, tractors, cranes, and miscellaneous trucks would be used for construction of most Project facilities. Sound levels of typical construction equipment range from approximately 65 dBA to 95 dBA at 50 feet from the source (USEPA 1971). Worst-case noise levels are typically associated with grading. Noise sources associated with grading of the proposed Project, and associated noise levels, are shown in Figure 6.

Figure 6: Grading Noise Source Sound Levels

Noise Source	Noise Level	Number
Bulldozer	85 dBA at 50 feet	1
Scraper	85 dBA at 50 feet	1
Backhoe	85 dBA at 50 feet	1
Water Truck	85 dBA at 50 feet	1
Roller	75 dBA at 50 feet	1

Figure 7: Distances to Nearby Potential Sensitive Receptors



Acoustical calculation predicts estimated worst-case noise from construction activity. The closest occupied property is the single family rural residence located approximately 950 feet northwest of the centroid of the site. The hospitality / resort area is approximately 800 feet southeast of the Project site. It was assumed that one bulldozer, one scraper, one backhoe, one water truck, and one roller would operate continuously across the west end of the Project site. No correction was applied for downtime associated with equipment maintenance, breaks, or similar situations. The calculations assumed point source acoustical characteristics. Using standard point source calculations, a combined level of 91 dBA Leq at 50 feet would attenuate to approximately 65 dBA Leq at 1,000 feet.

Because construction noise levels would be less than 75 dBA Leq (8 hours) at all occupied residential / hotel properties, there would be less than significant impact from Project construction. However, to minimize disturbances from construction activity, the following measures should be considered:

- Build the structures closest to residential sensitive receptors first. This will then act as a noise barrier for subsequent construction further away.
- Select equipment capable of performing the necessary tasks with the lowest sound level and the lowest acoustic line-of-sight height possible.
- Implement alternatives to the standard backup alarms as feasible. These alternatives include strobe lights or products such as the Brigade Electronics, Inc. Broadband Sound system, which is equally effective while generating a lower noise level.
- Use specially-quieted equipment, such as quieted and enclosed air compressors and properly-working manufacturer-recommended mufflers on all engines.
- Construct enclosures around noise-producing stationary sources such as generators used for night lighting.
- Perform construction vehicle maintenance off site or between 7:00 a.m. and 7:00p.m.
- Place the laydown area as far as possible from the closest noise sensitive receptors.
- Limit the delivery of material (with the exception of concrete) to the hours between 7:00 a.m. and 7:00 p.m.

6 Regulatory Setting

Noise regulations are addressed by federal, state, and local government agencies, discussed below. Local policies are generally adaptations of federal and state guidelines, adjusted to prevailing local condition.

6.1 Federal Regulation

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

a) Promulgating noise emission standards for interstate commerce.
b) Assisting state and local abatement efforts.
c) Promoting noise education and research.

The Department of Transportation (DOT) assumes a role in noise control for federal highways. The Federal Aviation Administration (FAA) regulates noise of aircraft and airports. Surface transportation system noise is regulated by the Federal Transit Administration (FTA). Freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). For this project, the nearest airport is not a potential noise factor.

6.2 State Regulation

California State Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) requires noise insulation inside single-family detached housing to provide an annual average noise level of no more than 45 dBA CNEL. When such structures are located within a 55 dBA CNEL (or greater) noise contour, an acoustical analysis is required to ensure that interior levels do not exceed the 45 dBA CNEL annual threshold. In addition, Title 21, Chapter 6, Article 1 of the California Administrative Code requires that all habitable rooms shall have an interior CNEL of 45 dBA or less. The 2013 California Green Building Standards Code (CGBSC), Division of the State Architect - Structural Safety (DSA-SS) (CCR, Title 24, Part 11) submittal guideline, chapter 5 contains mandatory requirements for acoustical control:

"5.507.4.1 Exterior noise transmission prescriptive method

"Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 ... within the 65 CNEL or LDN noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway source as determined by the Noise Element of the General Plan."

Chapter 5.507.4.1.1 governs acoustical performance and noise exposure where noise contours are not readily available:

"Buildings exposed to a noise level of 65 dB Leq-1-hr during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30)."

The performance method described above may be used to comply with CGBSC in the following way:

"...wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (Leq -1Hr) of 50 dBA in occupied areas during any hour of operation."

6.3 Local Regulation

The County of San Luis Obispo General Plan, Noise Element Part 1 Policy Document (Reference 2) provides regulation and guidelines regarding noise. The Noise Element provides the conclusions, recommendations, and strategies necessary to ensure an appropriately quiet and pleasurable interior environment for the residents of the proposed project. Since the regulation of transportation noise sources such as roadway and train traffic primarily fall under either State or Federal jurisdiction, the local jurisdiction generally uses land use and planning decisions to limit locations or volumes of such transportation noise sources, to avoid development within noise impact zones, or to shield impacted receivers or sensitive receptors.

7 Conclusions

The Project as presented is not adversely impacted by noise radiated from any identified noise source. The Project does not have an adverse impact on noise radiated toward any nearby sensitive receptor.

for 45dB Acoustics, LLC
A California Limited Liability Company

by David Lord, PhD
August 10, 2017

8 Appendix

8.1 Sound Level Measurement

Multiple sound level measurements were conducted on Saturday, July 22, 2017, during a peak traffic period to quantify the existing acoustical environment on the Project site and to calibrate the acoustic model. In general, the protocol defined in ASTM E1014 - 12 Standard Guide for Measurement of Outdoor A-Weighted Sound Levels was followed.

Two Norsonic Model Nor140 American National Standards Institute (ANSI) Type 1 Integrating Sound Level Meters were used for data collection. A SoftdB Piccolo Type 2 sound level meter collected continuous sound level data at the side of Avila Beach Drive at the base of the site. All meters were roughly five feet above grade to simulate the average height of the human ear. All microphones were fitted with a windscreen. Weather conditions during the measurements were approximately 74 degrees Fahrenheit (°F), 50 percent relative humidity, 4.6 mph wind speed from WSW, and clear sky conditions. Each sound level meter was calibrated before and after the measurement period. Results are mapped in Figure 8.

Traffic counts were taken from San Luis Obispo County official traffic volume and hourly maximum data for similar Saturday time period. The measurement results are summarized in Figure 9.

Figure 8: Location of On-site Sound Level Measurements

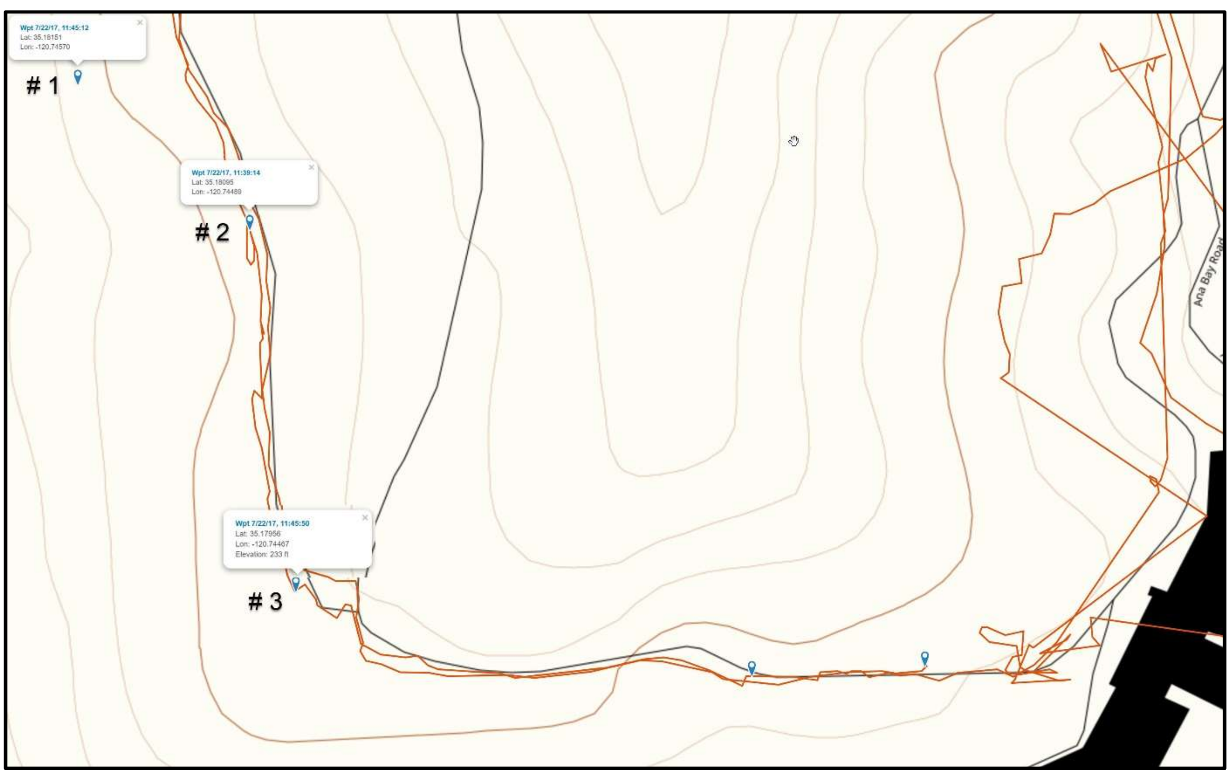
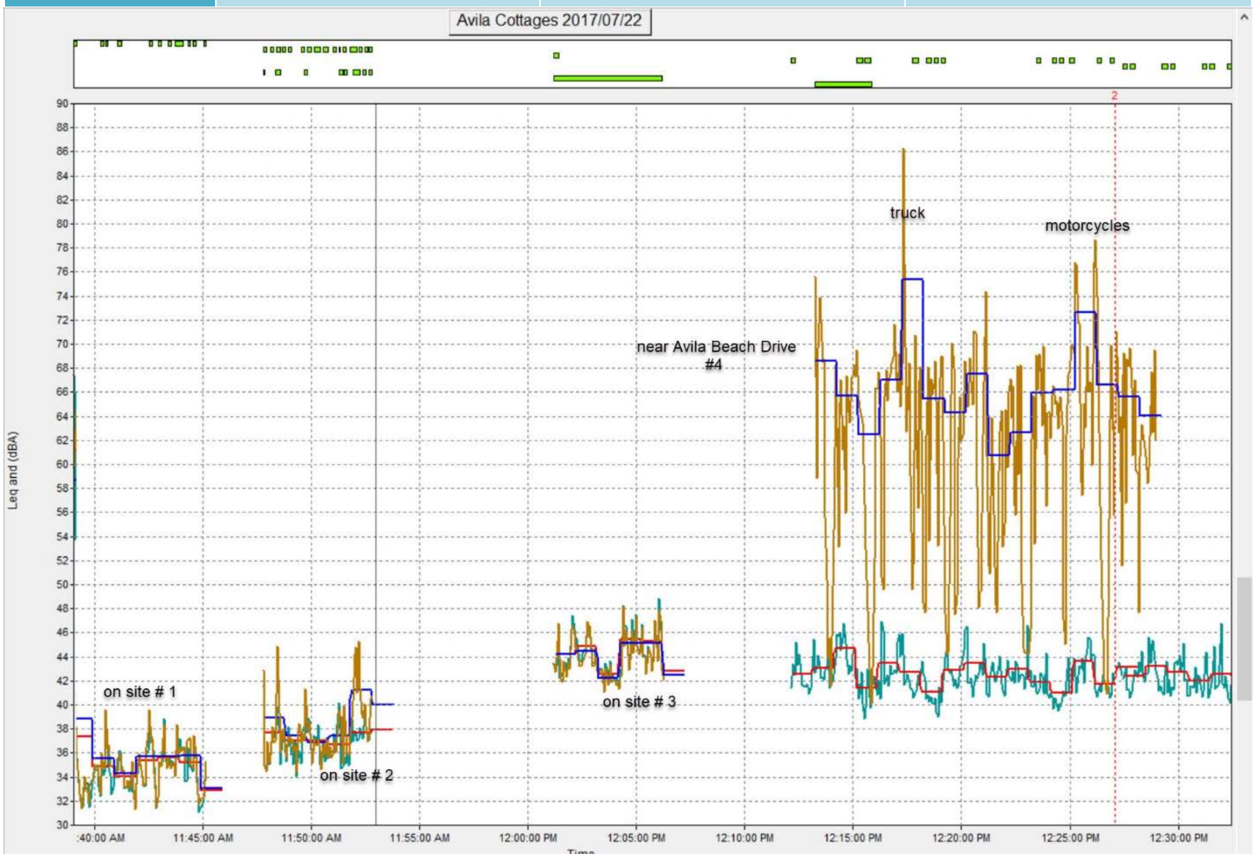


Figure 9: Sound level measurement results

Position	GPS Waypoint Timestamp	Avg. Leq (Individual Msmts.) [dBA]	
1	11:39	32.3 (32.6, 31.9)	
2	11:45	36.7 (36.6, 36.8)	
3	11:31 (start), 12:15	43.1 (43.2, 43.0)	
4 (Avila Beach Drive)		(5min) 69.9, 42.5 (10min) 68.1, 42.5 (14min) 68.3, 42.5	
4 (Piccolo)		(1 hour) 67.3 Lmax = 85.5	11:12-12:12



8.2 Sound Level Analysis

Sound level contours were generated using sound level data along with County Traffic Data; an example of which is shown in Figure 10.

Buildings were incorporated into SoundPLAN® using the site plan drawing.

Figure 10: County Traffic Data for Avila Beach Drive, June 2017.

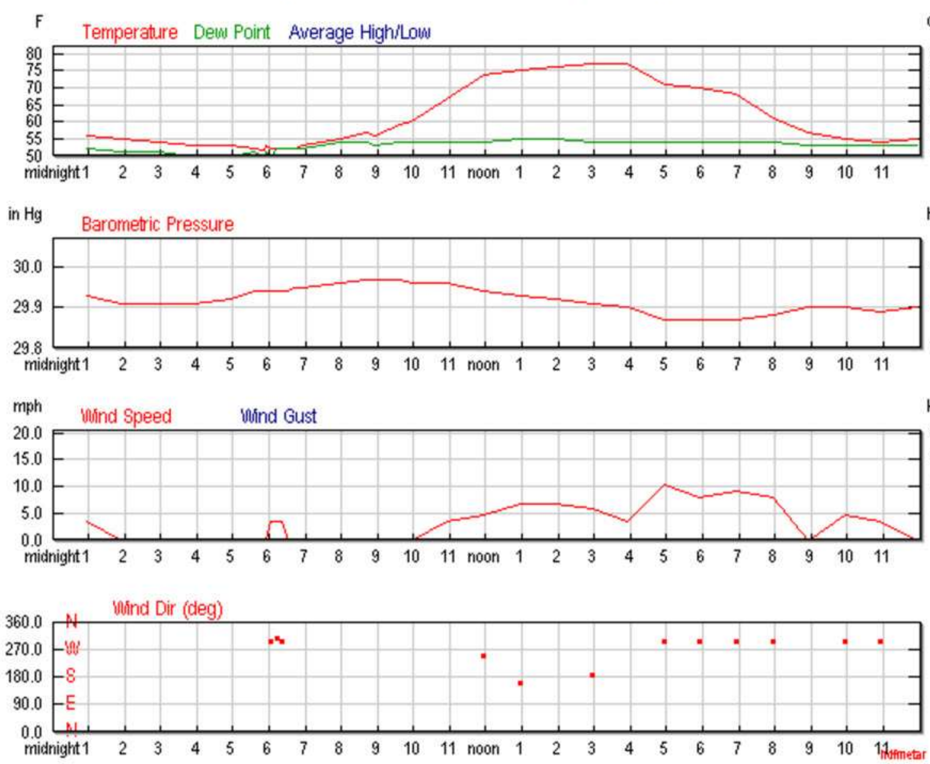
saturdays	daily total	peak hour
6/3/2017	6874	774
6/10/2017	7860	770
6/17/2017	10522	1175
6/24/2017	8458	982

Figure 11: Weather Conditions, Saturday, July 22, 2017

Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Conditions
10:56 AM	**66.9** °F	**54.0** °F	63%	**29.96** in	**10.0** mi	Variable	**3.5** mph	Clear
11:56 AM	**73.9** °F	**54.0** °F	50%	**29.94** in	**10.0** mi	WSW	**4.6** mph	Clear
12:56 PM	**75.0** °F	**55.0** °F	50%	**29.93** in	**10.0** mi	SSE	**6.9** mph	Clear

Daily Weather History Graph



8.3 Future Noise Level

The calculated future (year 2037) noise level at residential sensitive receiver locations will be approximately 1.5 dB greater that existing (year 2017) noise levels, based on existing measured sound level and future traffic growth of approximately one percent per year for 20 years. An increase in 1.5 dB will have a less-than-significant impact on the surrounding area.

The Maximum Exterior Noise exposure compatible with noise sensitive uses without mitigation is 60 dBA Ldn/CNEL. Based on the measured and modeled noise environment for the Project, nearby residential sensitive receivers require no noise mitigation, as they are generally below 50 dBA with the project in place.

8.4 Noise Modeling

SoundPLAN is used to model the complex terrain in this rural environment, first with no project and then with buildings at the west side of the site. The software calculates sound attenuation of environmental noise, even over complex terrain, uneven ground conditions, and with complex obstacles. The modeling software calculates the sound field in accordance with ISO 9613-2 "Acoustics - Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." This standard states that "this part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors, in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night."

SoundPLAN is a general environmental noise modeling computer program developed for highway, rail, and industrial applications. The software has a graphical interface for modeling the 3-D geometry of the noise sources, and the shielding, absorption and reflection of sound provided by the surrounding ground topography. Noise levels are calculated at specific receiver points or a grid of receiver points, which are then used to generate noise contour lines over a large area.

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) is incorporated in SoundPLAN. Acoustic modeling considered the peak-hour traffic volume, average estimated vehicle speed, and estimated vehicle mix, i.e., percentage of cars, medium trucks, heavy trucks, buses, and motorcycles and emergency vehicles. Sound levels caused by line sources such as traffic generally attenuate at a rate of 4 dB when the distance from the road is doubled, depending on the ground surface hardness between the source and the receiving property. The actual sound level at any receptor location is dependent upon such factors as the source- to-receptor distance and the presence of intervening structures, barriers, and topography. Topographic differences in this setting are an overriding factor. The acoustic propagation model assumes "medium-hard soil" propagation conditions, which corresponds to a drop-off rate of 3.5 dBA per doubling of distance. The sound level model is considered a worst-case representation of the roadway noise propagation across the site.

8.5 Terminology

A-Weighted Sound Level (dBA)
The sound pressure level in decibels as measured on a sound level meter using the internationally standardized A-weighting filter or as computed from sound spectral data to which A-weighting adjustments have been made. A-weighting de-emphasizes the low and very high frequency components of the sound in a manner similar to the response of the average human ear. A-weighted sound levels correlate well with subjective reactions of people to noise and are universally used for community noise evaluations.

Air-borne Sound
Sound that travels through the air, differentiated from structure-borne sound.

Ambient Sound Level
The prevailing general sound level existing at a location or in a space, which usually consists of a composite of sounds from many sources near and far. The ambient level is typically defined by the Leq level.
Background Sound Level
The underlying, ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as Traffic, typically make up the background. The background level is generally defined by the L90 percentile noise level.

Community Noise Equivalent Level (CNEL)
The Leq of the A-weighted noise level over a 24-hour period with a 5 dB penalty applied to noise levels between 7 p.m. and 10 p.m. and a 10 dB penalty applied to noise levels between 10 p.m. and 7 a.m. CNEL is similar to Ldn.

Day-Night Sound Level (Ldn)
The Leq of the A-weighted noise level over a 24-hour period with a 10 dB penalty applied to noise levels between 10 p.m. and 7 a.m. Ldn is similar to CNEL.
Decibel (dB)
The decibel is a measure on a logarithmic scale of the magnitude of a particular quantity (such as sound pressure, sound power, sound intensity) with respect to a reference quantity.

DBA or dB(A)
A-weighted sound level. The ear does not respond equally to all frequencies, but is less sensitive at low and high frequencies than it is at medium or speech range frequencies. Thus, to obtain a single number representing the sound level of a noise containing a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are dBA. The A-weighted sound level is also called the noise level.

Energy Equivalent Level (Leq)
Because sound levels can vary markedly in intensity over a short period of time, some method for describing either the average character of the sound or the statistical behavior of the

variations must be utilized. Most commonly, one describes ambient sounds in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called Leq. In this report, an hourly period is used.

Field Sound Transmission Class (FSTC)
A single number rating similar to STC, except that the transmission loss values used to derive the FSTC are measured in the field. All sound transmitted from the source room to the receiving room is assumed to be through the separating wall or floor-ceiling assembly.

Outdoor-Indoor Transmission Class (OITC)
A single number classification, specified by the American Society for Testing and Materials (ASTM E 1332 issued 1994), that establishes the A-weighted sound level reduction provided by building facade components (walls, doors, windows, and combinations thereof), based upon a reference sound spectrum that is an average of typical air, road, and rail transportation sources. The OITC is the preferred rating when exterior façade components are exposed to a noise environment dominated by transportation sources.

Percentile Sound Level, Ln
The noise level exceeded during *n* percent of the measurement period, where *n* is a number between 0 and 100 (e.g., L10 or L90)

Sound Transmission Class (STC)
STC is a single number rating, specified by the American Society for Testing and Materials, which can be used to measure the sound insulation properties for comparing the sound transmission capability, in decibels, of interior building partitions for noise sources such as speech, radio, and television. It is used extensively for rating sound insulation characteristics of building materials and products.

Structure-Borne Sound
Sound propagating through building structure. Rapidly fluctuating elastic waves in gypsum board, joists, studs, etc.

Sound Exposure Level (SEL)
SEL is the sound exposure level, defined as a single number rating indicating the total energy of a discrete noise-generating event (e.g., an aircraft flyover) compressed into a 1-second time duration. This level is handy as a consistent rating method that may be combined with other SEL and Leq readings to provide a complete noise scenario for measurements and predictions. However, care must be taken in the use of these values since they may be misleading because their numeric value is higher than any sound level which existed during the measurement period.

Subjective Loudness Level
In addition to precision measurement of sound level changes, there is a subjective characteristic which describes how most people respond to sound:

- A change in sound level of 3 dBA is *barely perceptible* by most listeners.
- A change in level of 6 dBA is *clearly perceptible*.
- A change of 10 dBA is perceived by most people as being *twice* (or *half*) as loud.

8.6 Characteristics of Sound

When an object vibrates, it radiates part of its energy as acoustical pressure in the form of a sound wave. Sound can be described in terms of amplitude (loudness), frequency (pitch), or duration (time). The human hearing system is not equally sensitive to sound at all frequencies. Therefore, to approximate this human, frequency-dependent response, the A-weighted filter system is used to adjust measured sound levels. The normal range of human hearing extends from approximately 0 to 140 dBA. Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. Because of the physical characteristics of noise transmission and of noise perception, the relative loudness of sound does not closely match the actual amounts of sound energy. Table 1 below presents the subjective effect of changes in sound pressure levels.

Table 1: Sound Level Change Relative Loudness/Acoustic Energy Loss

0 dBA	Reference 0%
-3 dBA	Barely Perceptible Change 50%
-5 dBA	Readily Perceptible Change 67%
-10 dBA	Half as Loud 90%
-20 dBA	1/4 as Loud 99%
-30 dBA	1/8 as Loud 99.9%

Source: Highway Traffic Noise Analysis and Abatement Policy and Guidance, U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch, June 1995.

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. This phenomenon is known as spreading loss. Generally, sound levels from a point source will decrease by 6 dBA for each doubling of distance. Sound levels for a highway line source vary differently with distance because sound pressure waves propagate along the line and overlap at the point of measurement. A closely spaced, continuous line of vehicles along a roadway becomes a line source and produces a 3 dBA decrease in sound level for each doubling of distance. However, experimental evidence has shown that where sound from a highway propagates close to “soft” ground (e.g., plowed farmland, grass, crops, etc.), a more suitable drop-off rate to use is not 3.0 dBA but rather 4.5 dBA per distance doubling (FHWA 2010).

When sound is measured for distinct time intervals, the statistical distribution of the overall sound level during that period can be obtained. The Leq is the most common parameter associated with such measurements. The Leq metric is a single-number noise descriptor that represents the average sound level over a given period of time. For example, the L50 noise level is the level that is exceeded 50 percent of the time. This level is also the level that is exceeded 30 minutes in an hour. Similarly, the L02, L08 and L25 values are the noise levels that are exceeded

2, 8, and 25 percent of the time or 1, 5, and 15 minutes per hour. Other values typically noted during a noise survey are the Lmin and Lmax. These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Home construction varies in outdoor-to-indoor sound transmission. In California, homes that are 30 years old or older can provide a noise level reduction of 20 to 25 dBA with closed windows. The noise reduction found in newer residential units and office buildings is generally 30 dBA or more (HMMH, 2006).

8.7 Evidence of Compliance

Evidence of compliance shall consist of submittal of an acoustical analysis report, prepared under the supervision of a person experienced in the field of acoustical engineering, with the application for building permit. The report shall show topographical relationship of noise sources and dwelling site, identification of noise sources and their characteristics, predicted noise spectra at the exterior of the proposed dwelling structure considering present and future land usage, basis for the prediction (measured or obtained from published data), noise attenuation measures to be applied, and an analysis of the noise insulation effectiveness of the proposed construction showing that the prescribed interior noise level requirements are met. If interior allowable noise levels are met by requiring that windows be unopenable or closed, the design for the structure must also specify the means that will be employed to provide ventilation and cooling, if necessary, to provide a habitable interior environment.

9 References

1. California Resources Agency. 2007. *Title 14. California Code of Regulations* Chapter 3: Guidelines for Implementation of the California Environmental Quality Act Article 5. Preliminary Review of Projects and Conduct of Initial Study Sections, 15060 to 15065.
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