OUTDOOR SOUND STUDY FOR:

Two Rocks Ventures

6095 Bodega Avenue
Petaluma, CA
RGD Project #: 18-051

PREPARED BY:

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DATE:

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1. Introduction

The proposed project would construct a new cannabis cultivation building which includes three greenhouse structures. The project site is located at 6095 Bodega Avenue in Sonoma County, California. The surrounding land uses are zoned “land extensive agriculture” (LEA). The nearest residence is located near the north property line approximately 150 feet from the nearest proposed project building.

This report assesses the potential noise impacts of the project’s operation by comparing cannabis production noise levels to the standards of the Sonoma County General Plan as well as its potential to increase ambient noise levels.

2. Environmental Noise Fundamentals

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter detects the sound with a microphone and assigns it a number called a sound level. Sound levels are expressed in units of decibels. To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car passby or airplane flyover. To express the average noise level the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 5 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time. The median sound level is the L_{50} which is the sound level exceeded 50% of the time.

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (DNL or L_{dn}) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the L_{eq} except they include a 10 dB penalty during nighttime hours (and a 5 dB penalty during evening hours in the CNEL) to account for peoples increased sensitivity during these hours. The CNEL and L_{dn} are typically less that one decibel apart.

In environmental noise, a change in noise level of 3 dB is considered a just noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness.

3. Acoustical Criteria

3.1. Sonoma County General Plan 2020

The Noise Element of the County's General Plan has policies regarding noise and land use compatibility. These standards are referenced in General Plan Policy NE-1c.

> ***Policy NE-1c:*** *Control non-transportation related noise from new projects. The total noise level resulting from new sources shall not exceed the standards in Table NE-2 as measured at the exterior property line of any adjacent noise sensitive land use. Limit exceptions to the following:*
>
> *(1) If the ambient noise level exceeds the standard in Table NE-2, adjust the standard to equal the ambient level, up to a maximum of 5 dBA above the standard, provided that no measurable increase (i.e. +/- 1.5 dBA) shall be allowed*
>
> *(2) Reduce the applicable standards in Table NE-2 by five dBA for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises, such as pile drivers and dog barking at kennels*
>
> *(3) Reduce the applicable standards in Table NE-2 by 5 decibels if the proposed use exceeds the ambient level by 10 or more decibels*
>
> *(4) For short term noise sources which are permitted to operate no more than six days per year, such as concerts or race events, the allowable noise exposures shown in Table NE-2 may be increased by 5 dB. These events shall be subject to a noise management plan including provisions for maximum noise level limits, noise monitoring, complaint response and allowable hours of operation. The plan shall address potential cumulative noise impacts from all events in the area.*
>
> *(5) Noise levels may be measured at the location of the outdoor activity area of the noise sensitive land use, instead of the exterior property line of the adjacent noise sensitive land use where:*
>
> *(a) the property on which the noise sensitive use is located has already been substantially developed pursuant to its existing zoning, and*
>
> *(b) there is available open land on those noise sensitive lands for noise attenuation.*
>
> *This exception may not be used on vacant properties which are zoned to allow noise sensitive uses.*

TABLE NE-2: Maximum Allowable Exterior Noise Exposures for Non-transportation Noise Sources

Hourly Noise Metric[1], dBA	***Daytime (7 a.m. to 10 p.m.)***	***Nighttime (10 p.m. to 7 a.m.)***
L50 (30 minutes in any hour)	*50*	*45*
L25 (15 minutes in any hour)	*55*	*50*
L08 (5 minutes in any hour)	*60*	*55*
L02 (1 minute in any hour)	*65*	*60*

[1] The sound level exceeded n% of the time in any hour. For example, the L50 is the value exceeded 50% of the time or 30 minutes in any hour; this is the median noise level. The L02 is the sound level exceeded 1 minute in any hour.

3.2. Increase in Noise

The California Environmental Quality Act (CEQA) Guidelines require the determination of whether a project will generate a substantial increase in noise levels in the project vicinity above levels existing without the project. CEQA does not specify a method for determining when a project would cause a significant increase in noise. Therefore, for the purposes of assessing impact due to the project, this report uses thresholds based on a FAA Draft Policy discussing screening and impact thresholds for increases in aircraft noise.

The project will cause a significant adverse noise impact if it will:

- raise the L_{dn} by more than 5 dBA and the future L_{dn} is less than 60 dBA

  OR

- raise the L_{dn} by more than 3 dBA and future L_{dn} is 60 dBA or greater and less than 65 dBA

  OR

- raise the L_{dn} by more than 1.5 dBA and the future L_{dn} is 65 dBA or greater

4. Existing Noise Environment

To quantify the existing noise environment, a noise measurement program was conducted at the project site. One continuous long-term noise measurement (LT-1) was made with a Larson-Davis Model 820 sound level meter from 12 July 2018 to 16 July 2018. Short-term, 15-minute, measurements (ST-1 and ST-2) were also made with a Larson-Davis Model 824 sound level meter on 12 July 2018.

The sound level meters used in the measurement program meet Type 1 specifications (ANSI S1.4) and their calibration was checked with an acoustical calibrator (Larson-Davis Model Cal200). The noise measurement locations are shown in Figure 1.

Figure 1: Site Plan and Ambient Noise Measurement Locations

Source: Map data ©2018 Google

The monitor at LT-1 was located on a utility pole near the setback of the neighboring residences approximately 620 feet from the Bodega Avenue roadway centerline and 12 feet above ground. This location was chosen to represent the ambient noise levels at the setback of the nearest residential buildings. The dominant noise source was traffic on Bodega Avenue. Based on audio recordings, landscaping equipment (e.g. lawnmowers) were occasionally operating near LT-1 during the daytime. Other noise sources such as livestock were audible but did not contribute significantly to the overall noise levels.

Figure 2 shows the measured hourly average sound level (L_{eq}) and the sound level descriptors used in the County noise standards (L_{50}, L_{25}, L_8 and L_2).

Table 1 shows the day-night average sound level (L_{dn}) and the representative ambient noise level during quiet hours. The ambient noise level was determined by averaging the four quietest hours during the daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM).

Figure 2: Long-Term Sound Measurement Results at Location LT-1

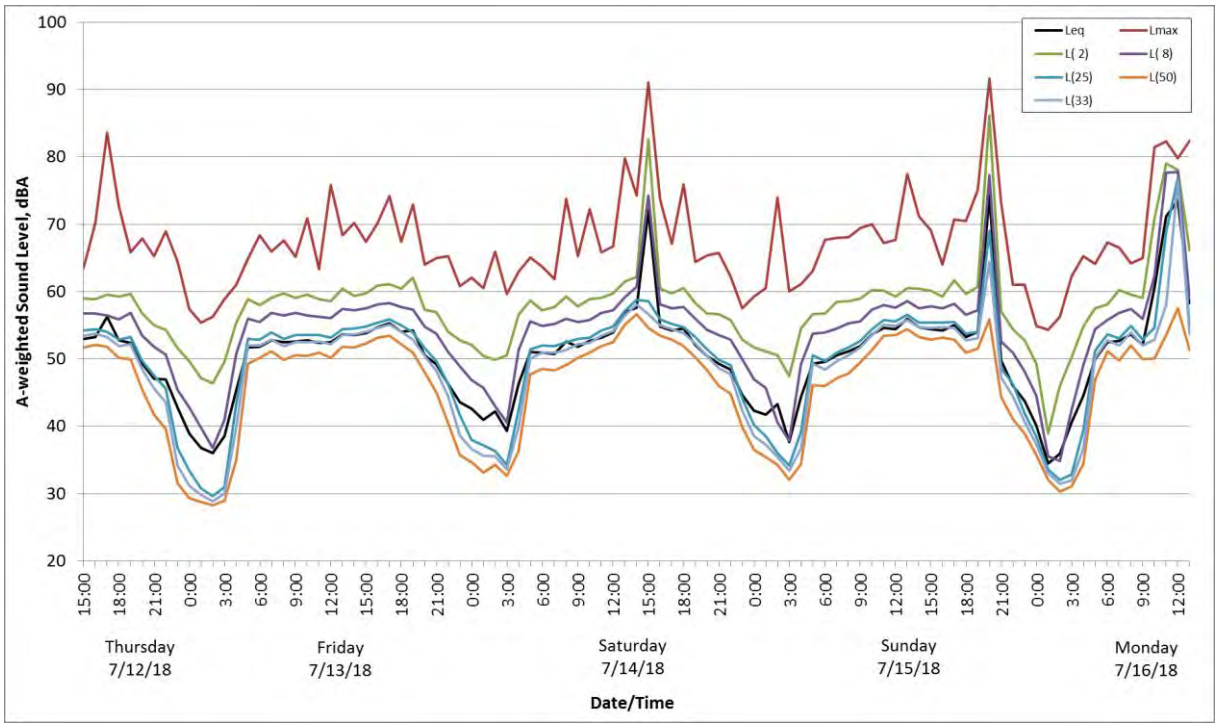

Table 1: Measured Ambient Noise Levels

Location	Time Period	A-weighted Sound Level during the quietest hours, dBA					L_{dn} (dBA)
		L_{eq}	L_{02}	L_{08}	L_{25}	L_{50}	
LT-1	7:00 AM – 10:00 PM	52	59	56	52	49	61
	10:00 PM – 7:00 AM	40	50	43	36	33	

Short-term measurements at Locations ST-1 and ST-2 were conducted near the project property lines to quantify noise levels at those locations. Traffic was also the dominant ambient noise source at the short-term measurement locations. During the short-term measurements, aircraft (including helicopters) were occasionally observed and were audible. Table 2 shows the short-term measurement summary.

Table 2: Short-term Measurement Summary – 12 July 2018

Location	Time	A-weighted Sound Level, dBA						
		L_{eq}	L_2	L_8	L_{25}	L_{50}	L_{dn}*	L_{max}
ST-1	3:28 PM – 3:43 PM	51	56	54	52	50	58	Bell: 40 – 43
ST-2	3:46 PM – 4:01 PM	51	58	54	51	49	59	Motorcycle: 63 Jet: 52 Helicopter: 58 – 60

*L_{dn} calculated based on correlation with long-term measurement

5. Project Generated Noise

The proposed project includes the construction of a cannabis cultivation facility consisting of three greenhouse cultivation spaces with a total building size of 14,000 square feet. Noise associated with the project will include mechanical equipment, mobile machinery, and project generated traffic. These are discussed in the following sections.

The project site is surrounded by land uses zoned “Land Extensive Agriculture” (LEA). The outdoor areas of the residences as shown in Figure 3 are used as assessment locations based on Policy NE-1c Item 5 of the County’s General Plan. This policy allows for the noise level standard to be applied at the outdoor activity area of an adjacent noise sensitive land use rather than at the property line if the adjacent land is open space or agricultural.

Based on our site observations, the existing ambient noise levels at the residences are expected to be largely dominated by traffic on Bodega Avenue and comparable to the measured noise levels. To quantify the ambient noise levels at the residence further from Bodega Avenue (Location R-5), the measured noise levels were adjusted based on the distance from the roadway. A standard rate of attenuation of 3 dB per doubling of distance from the roadway centerline was used. Table 3 shows the calculated noise levels at the nearest residences.

Figure 3: Proposed Project and Surrounding Residences

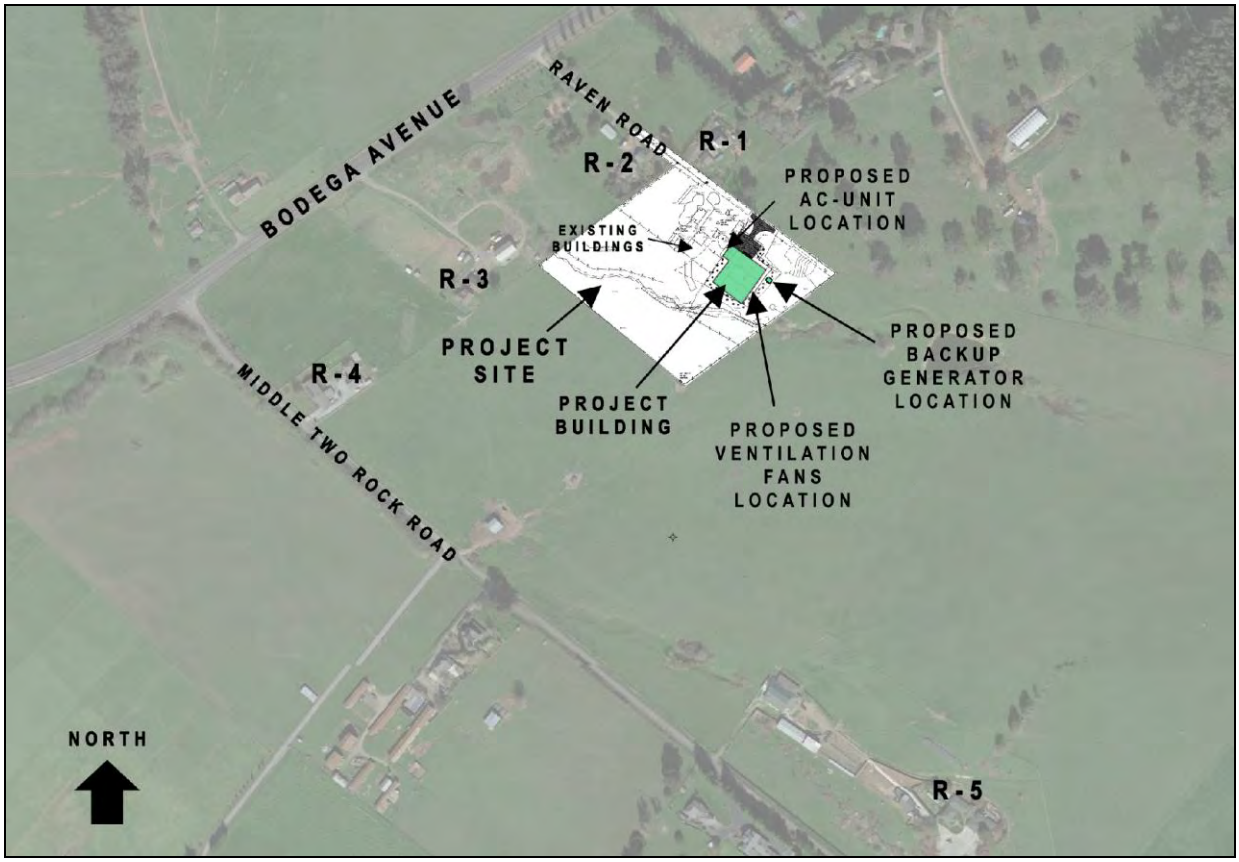

Table 3: Ambient Noise Levels at the Residences

Location	A-weighted Sound Level, dBA								
	Daytime				Nighttime				L_{dn}
	L_2	L_8	L_{25}	L_{50}	L_2	L_8	L_{25}	L_{50}	
R-1	56	53	50	47	47	41	34	31	58
R-2	56	53	50	47	48	41	34	31	58
R-3	56	53	50	47	48	41	34	31	58
R-4	56	53	50	47	48	41	34	31	58
R-5	53	50	46	43	44	37	30	27	55

5.1. Mechanical Equipment

According to information from the project applicant, the proposed cannabis cultivation facility would include a total of nine 54-inch ventilation fans, three 24-inch ventilation fans and one outdoor emergency generator at the rear of the building. The ventilation fans will run based on the temperature and will be set up for "staged cooling". The fans are expected to rarely operate at night since they would only be needed if the temperatures remain above 85 degrees at night. Table 4 shows the various expected scenarios.

Table 4: Ventilation Fan Operation Scenarios

Scenario	54-inch fan	24-inch fan
Hot Days (95 – 100 degrees)	3 per greenhouse (9 total)	1 per greenhouse (3 total)
Normal Days (70 degree)	1 or 2 fans per greenhouse (3 to 6 total)	1 per greenhouse (3 total)
Normal Nights	0	0
Hottest Nights	1 per greenhouse (3 total)	0

There will also be one to two air conditioning units for the "vegetation" area located near the north corner of the building which will operate only during the daytime. The requirement of dehumidifiers inside the facility is to be determined since it would depend on the conditions inside the facility when the facility is in operation. There is a backup generator used primarily for fire and security systems in the event of a power outage. The backup generator is anticipated to be tested occasionally and only during daytime hours.

To quantify representative sound levels from mechanical equipment associated with the project, manufacturer sound level data provided by the project applicant/Nexus Corporation (Project's Greenhouse designer) were used. These include an American Coolair Corporation model CBH54LE1231 (54-inch ventilation fan), an American Coolair Corporation model CBL24JE1231 (24-inch ventilation fan), a Bryant model 280ANV060-A air-conditioning unit, and a Caterpillar Model D60-4LC generator.

As the specifics of the dehumidifiers have not yet been determined, this analysis assumes that the cannabis cultivation building would include a total of six dehumidifiers (two for each of the three greenhouse spaces) and their sound levels are comparable to a dehumidifier (Ideal-Air model 700828) RGD measured in 2018.

Table 5 shows a summary of the noise sources discussed above and an associated sound level referenced to a distance of 5 feet. These equipment quantities and sound levels are used in our analysis.

Table 5: Mechanical Equipment Noise Source Summary

Mechanical Equipment	Equipment during Hot Day	Equipment during Hottest Nights	Make/Model	L50, dBA at reference distance of 5 feet
54-inch ventilation fan	9	3	American Coolair Corp CBH54LE1231	68
24-inch ventilation fan	3	0	American Coolair Corp CBL24JE1231	69
Air-conditioning unit	2	0	Bryant model 280ANV060	64
Dehumidifier	6	6	Ideal-Air model 700828	48
Back-up Generator	1	0	Caterpillar model D60-4LC with sound-rated enclosure	87

The calculations of mechanical equipment noise at the residences (for the purposes of determining compliance with the County requirement) include adjustments for distance and multiple pieces of equipment. For distance, we used a standard attenuation rate for a point source of 6 dB per doubling of distance. For multiple pieces of equipment, we used a standard rate of 3 dB per doubling of noise sources. For indoor equipment, a noise attenuation of 15 dBA was also applied to account for the noise reduction provided by the facility building with openings for ventilation. For the generator located in the rear, the calculation included an adjustment for acoustical shielding provided by the project building for receivers R-1, R-2, R-3 and R-4.

Table 6 and Table 7 show the calculated noise levels from mechanical equipment at the nearest residences compared with the applicable General Plan noise limit for steady noise (L_{50}).

In all cases, the calculated noise levels from mechanical equipment do not exceed the General Plan noise limits of Policy NE-1c (Table NE-2) at the nearest residences.

Table 6: Predicted Daytime Mechanical Equipment Noise Levels

Mechanical Equipment	Receiver				
	R-1	R-2	R-3	R-4	R-5
Distance (feet)	157 to 275	273 to 410	630 to 730	1050 to 1125	1500 to 1640
Daytime Ambient ($L_{50,}$ dBA)	47	47	47	47	43
Calculated Mechanical Equipment Noise					
L_{50} at Residence (dBA)	**43**	**40**	**40**	**31**	**38**
Calculation of Noise Standard					
GP Table NE-2					
Baseline Daytime Noise Standard (L_{50} dBA)	50	50	50	50	50
Corrections to noise standard (GP Policy NE-1c)					
1. Correction for ambient exceeds standard	0	0	0	0	0
2. Correction for simple tone	0	0	0	0	0
3. Correction for source exceeds ambient by 10 dBA or more	0	0	0	0	0
4. Correction for usage (6 or fewer days per year)	0	0	0	0	0
Applicable Daytime Noise Standard with corrections (L_{50} dBA)	**50**	**50**	**50**	**50**	**50**
Estimated Mechanical Equipment Noise Exceeds Allowable Level? (Yes/No)	**No**	**No**	**No**	**No**	**No**

Table 7: Predicted Nighttime Mechanical Equipment Noise Levels

Mechanical Equipment	Receiver				
	R-1	R-2	R-3	R-4	R-5
Distance (feet)	157 to 275	273 to 410	630 to 730	1050 to 1125	1500 to 1640
Nighttime Ambient ($L_{50,}$ dBA)	31	31	31	31	27
Calculated Mechanical Equipment Noise					
L_{50} at Residence (dBA)	**34**	**30**	**25**	**21**	**23**
Calculation of Noise Standard					
GP Table NE-2					
Baseline Nighttime Noise Standard (L_{50} dBA)	45	45	45	45	45
Corrections to noise standard (GP Policy NE-1c)					
1. Correction for ambient exceeds standard	0	0	0	0	0
2. Correction for simple tone	0	0	0	0	0
3. Correction for source exceeds ambient by 10 dBA or more	0	0	0	0	0
4. Correction for usage (6 or fewer days per year)	0	0	0	0	0
Applicable Nighttime Noise Standard with corrections (L_{50} dBA)	**45**	**45**	**45**	**45**	**45**
Estimated Mechanical Equipment Noise Exceeds Allowable Level? (Yes/No)	**No**	**No**	**No**	**No**	**No**

5.2. Mobile Machinery

We understand that production operations could involve the use of a Cat model EP15KRT PAC electric powered forklift for moving materials in the project building corridor.

Based on our experience, electric forklifts tend to generate lower noise levels compared to propane powered forklifts. However, since there is no acoustical data for the project's electric forklift from the manufacturer, this analysis assumes that noise from the project's electric forklift is equal to the noise from a propane powered forklift RGD measured in 2017 which generated a maximum noise level of 78 dBA at 25 feet. We have also assumed that the project's forklift would have a usage factor of 40% (24 minutes in an hour).

To calculate the noise level from the forklift at the receivers, a standard rate of attenuation of 6 dB per doubling of distance was used. We have also included a factor of 15 dBA to account for the acoustical shielding provided by the exterior walls of the project building facility with ventilation openings.

Table 8 shows the calculated noise levels compared with the applicable noise standard. Since use of the forklift is expected to occur more than 6 times per year, no corrections for usage were made to the applicable noise standard.

The calculated noise levels from the operation of a forklift do not exceed the General Plan noise limits in Policy NE-1c (Table NE-2).

Table 8: Calculated Noise Levels of a Forklift

Mobile Machinery	Residence				
	R-1	R-2	R-3	R-4	R-5
Distance (feet)	200	320	670	1040	1580
Ambient ($L_{25,}$ dBA)	50	50	50	50	46
Calculated Mobile Machinery Noise					
L_{25} at Residence (dBA)	**45**	**41**	**34**	**31**	**27**
Calculation of Noise Standard					
GP Table NE-2					
Baseline Daytime Noise Standard (L_{25} dBA)	55	55	55	55	55
Corrections to noise standard (GP Policy NE-1c)					
1. Correction for ambient exceeds standard	0	0	0	0	0
2. Correction for simple tone	0	0	0	0	0
3. Correction for source exceeds ambient by 10 dBA or more	0	0	0	0	0
4. Correction for usage (6 or fewer days per year)	0	0	0	0	0
Applicable Daytime Noise Standard with corrections (L_{25} dBA)	**55**	**55**	**55**	**55**	**55**
Estimated Mobile Machinery Noise Exceeds Allowable Level? (Yes/No)	**No**	**No**	**No**	**No**	**No**

5.3. Increase in Noise

According to the project applicant, the operation is anticipated to have up to six full-time employees with one employee living on-site and another working remotely. The general public will not be allowed on-site and materials will typically be transported by delivery vans or box trucks.

Based on the project's Cannabis Trip Generation Form PJR-127 dated 16 August 2017, there are currently six existing average daily trips associated with two administrative employees and an average daily trip of less than one truck per day for consultants and contractors. In the future, it is anticipated that there will be a total of 12 average daily passenger car trips to and from the project site and approximately 1 medium truck per day associated with cannabis importation, disposal, miscellaneous deliveries, transportation to distributor, and work-related visitors.

Based on calculations with the FHWA Traffic Noise Model (TNM) and a standard rate of attenuation of 3 dB per doubling of distances for line sources, the noise from

additional traffic traveling on Bodega Avenue at 55 mph generates a noise level of L_{dn} 37 dBA at a distance of 50 feet from the roadway centerline. Based on the long-term measurement, this would result in an increase in L_{dn} of less than 1 dBA.

For the residences along Raven road, assuming that half the proposed daily passenger car trip and the medium truck would occur within the same hour and are traveling at 10 mph, the calculated traffic noise is an hourly average noise level of L_{eq} 46 dBA at a distance of 40 feet from the roadway centerline. Compared to the hourly average noise level in the area, this would result in an increase in hourly L_{eq} of 1 dBA or less.

In order to consider the effect of project generated noise sources throughout the day and compare it with the adopted thresholds, the day-night average sound levels (L_{dn}) were calculated with assumptions on the duration of daily use for each noise source. The assumptions are shown in Table 9 and the calculated increases in noise are shown in Table 10.

Table 9: Assumptions of Noise Source Duration

Noise Source	Duration per Day (Hours)
Mechanical Equipment	24
Forklift	8
Project-Generated Traffic	(12 auto trips and 1 truck trip)

Table 10: Calculated Increase in Noise Due to the Project

Receiver	Noise Source	L_{dn}, dBA		
		Existing	With Project	Increase
R1	Ambient	58	58	
	Project Generated Noise	--	45	
	Total	58	58	< 1
R2	Ambient	58	58	
	Project Generated Noise	--	41	
	Total	58	59	1
R3	Ambient	58	58	
	Project Generated Noise	--	39	
	Total	58	59	1
R4	Ambient	58	58	
	Project Generated Noise	--	33	
	Total	58	58	< 1
R5	Ambient	55	55	
	Project Generated Noise	--	37	
	Total	55	55	< 1

Noise levels from multiple sources combine in a logarithmic manner, Table 10 shows the combination of the project generated noise and the ambient noise (L_{dn}) is about 58 to 59 dBA for the residences along Bodega Avenue (R-1 to R-4) and 55 dBA at the residence to the south further from Bodega Avenue (R-5). Our calculations show that the noise due to the project contributes 1 dBA or less to the overall noise level at the nearest residences.

6. Conclusions

6.1. General Plan Policy NE-1c (Table NE-2)

The noise from the project meets the applicable General Plan standards in Policy NE-1c (Table NE-2) at the nearest residences without any additional treatment.

6.2. Increase in Noise

The L_{dn} at the residences will be less than 60 dBA with the operation of the project. Therefore, the threshold for a significant increase in noise is an increase in L_{dn} of 5 dBA. Our calculations indicate that the project will increase the L_{dn} by 1 dBA or less which is less than the significance threshold.

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