



June 30, 2020
45dB Project #20048

Acoustics Analysis: Paris Valley Road Winery 5625 Highway 46 Paso Robles, CA 93446	Requested by: Kirk Consulting, Inc. Attn: Leeza Segal 805.461.5765 leeza@kirk-consulting.net	Owner and Client: Paris Valley Road (Chalk Knoll) Attn: Craig Stoller PO Box 391 Paso Robles, CA 93447 805.542.0133
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1 Executive Summary

45dB Acoustics, LLC (“**45dB**”) has described and acoustically modeled amplified music sound levels at all proposed outdoor locations at the above address. This report is intended to be used as supporting documentation toward a Conditional Use Permit with Special Events Program from the County of San Luis Obispo. Traffic noise due to Highway 46 is significant at this location and is the primary existing noise source.

Amplified music at several proposed locations from the proposed plans was modeled using SoundPLAN® noise propagation software to model sound level contours. All amplified music zones are anticipated to comply with the County Code, provided that sound levels at any zone, and particularly the westernmost zone near Building 1, does not exceed 92dBA at 10 feet from the speaker. For reference, this level is appropriate for an outdoor music live concert venue. We have provided some self-management tools commercially available in case the winery’s ownership would like further assistance in ensuring they do not exceed this level. We conclude that the project will be in compliance with the Ordinance, including hourly LAeq, LAmix, and LAImax levels.

for 45dB Acoustics, LLC

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2 Introduction

This sound level assessment is submitted as supporting information for the County to permit amplified outdoor music as part of a Special Events Program within a Conditional Use Permit. The Events Program is to include up to 40 annual events of up to 300 attendees each. Amplified music for events is requested to occur past 5pm until 10pm. Several proposed amplified music locations on the property are evaluated in this report for compliance with the County's Ordinance.

The following factors are considered:

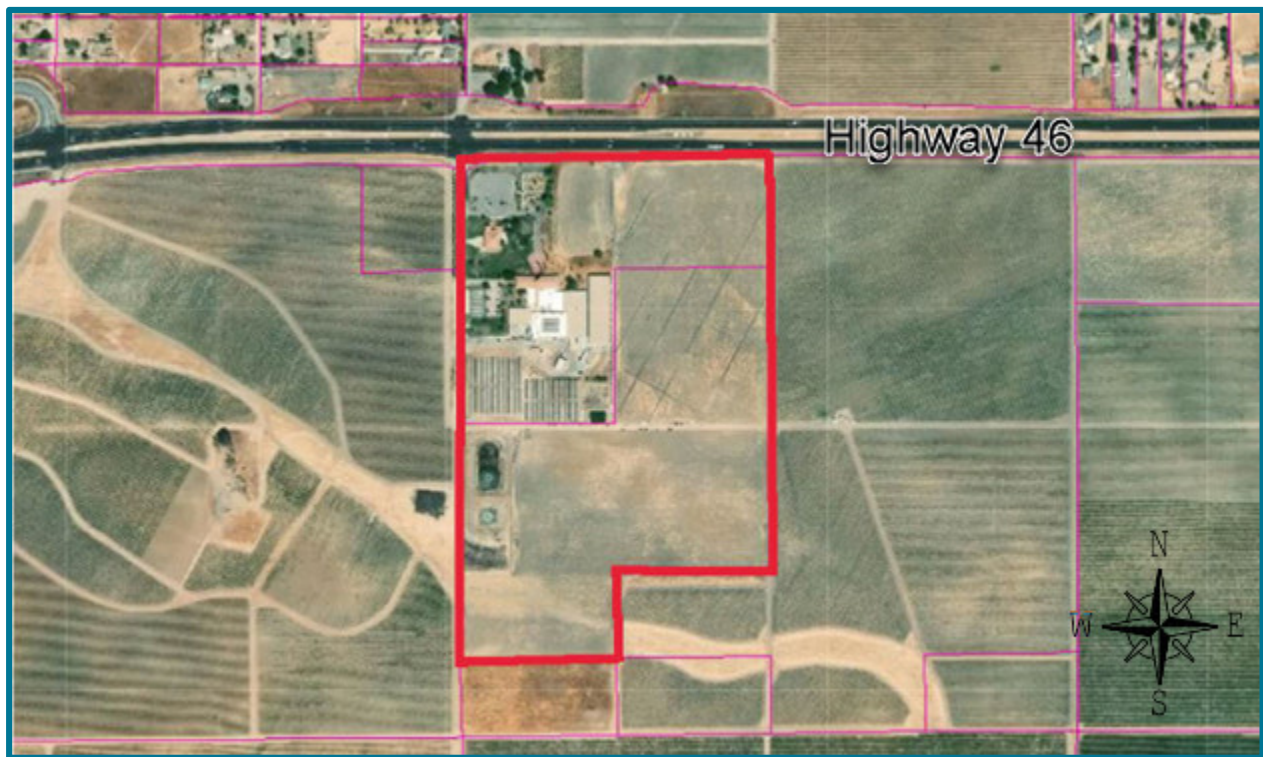
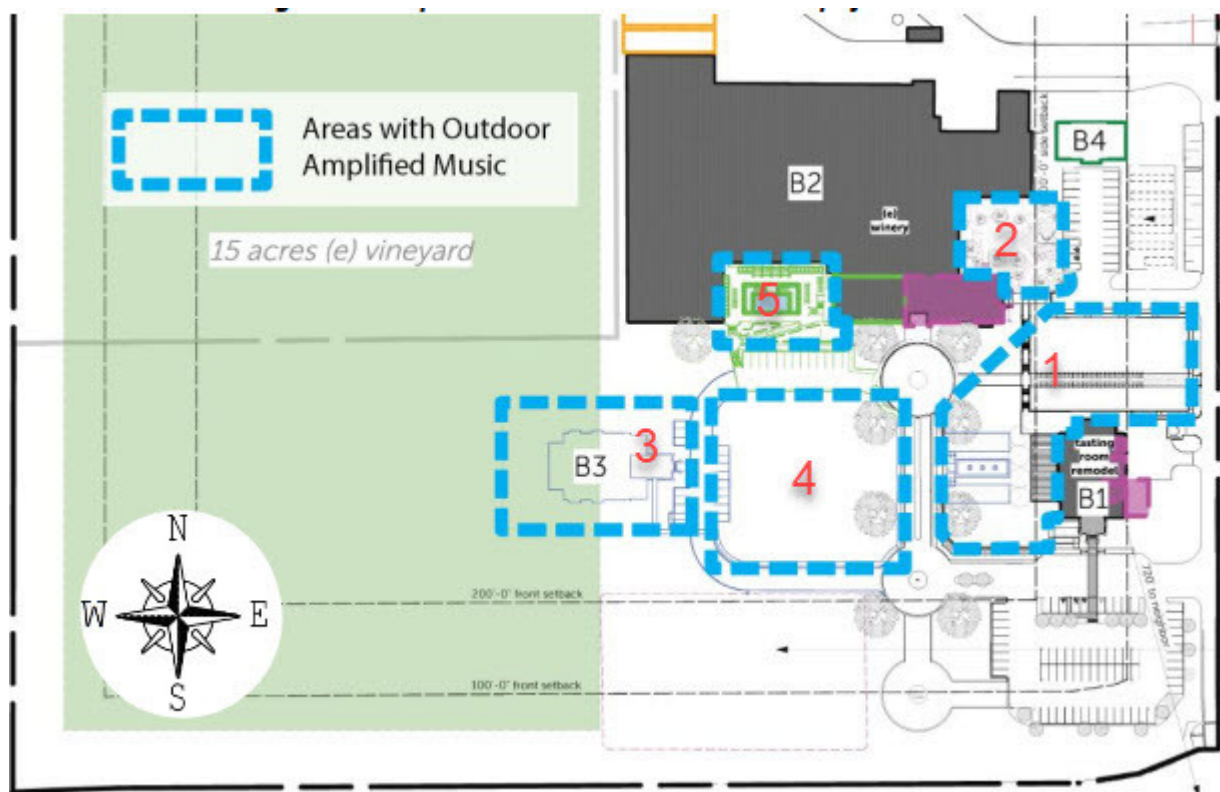
- The topographical relationship of amplified noise sources and the nearby potential sensitive receptors
- Identification of noise sources and their characteristics, and evaluation of predicted sound levels at the site's property lines
- Factors affecting sound level prediction at the property line, noise attenuation measures to be applied (if any), and analysis of the noise propagation considering the physical layout of the built environment
- Information on fundamentals of noise and vibration to aid in interpreting the report

Paris Valley Road Winery is located in a rural area approximately 6 miles east of the City of Paso Robles, CA (Figure 1). The site plan for future amplified music events is shown in Figure 2, where five amplified music setup zones were modeled within this report. The five zones as numbered in Figure 2 are:

1. Area surrounding Building 1 Tasting Room
2. Courtyard area east of the existing Building 2 Winery Building
3. Nearby surroundings of the proposed Building 3 Bed & Breakfast
4. Central open area between the proposed B&B, Winery, and Tasting Room buildings
5. Member and proposed B&B guest lounge and pool at the northern courtyard of the Winery Building

All zones were initially modeled together, operating at once. Although all zones are not expected to have amplified music simultaneously, this provides a simplified starting point in order to verify any limitations that should be placed upon the music for this project. This is particularly helpful in a project such as this where the distances between the on-site sound sources (speakers) are relatively far away from the nearest residential receivers, and the terrain is essentially flat.

Compliance was evaluated and conclusions drawn from these results. Because the results indicate that, even with all speakers operating at a high level which might occur during a lively dance party, compliance with the Ordinance is expected. Therefore, there is no need to model individual speaker zones separately.

Figure 1: Project location showing property lines in red (Kirk Consulting)**Figure 2: Diagram showing distribution of speakers (Kirk Consulting)**

3 Compliance Requirement

The County's Noise Level Standards for Winery Special Events from Title 22.30.070.D.2.i(3) page 4-15 of the Land Use Ordinance is reprinted in Table 1. The maximum daytime level (up until 10 p.m.) was evaluated utilizing the noise propagation modelling of SoundPLAN®.

Table 1: County of San Luis Obispo Land Use Ordinance Applicable Noise Limit

(3) **Limitation on use.** Special events are limited to 40 days a year. Any special event proposing outdoor amplified music shall only be allowed from 10 a.m. to 5 p.m. No outside amplified sound shall occur before 10 a.m. or after 5 p.m. The standard relating to amplified music may only be waived or modified where a finding can be made by the Review Authority that the noise at the property line will not exceed 65dB.

4 Modeled Exterior Noise Levels and Compliance Prediction

All sound level contours in this report are presented as daytime A-weighted decibels (dBA) for direct comparison to the Ordinance.

Reflection from the buildings and terrain, as well as the attenuation due to ground cover (e.g., concrete, lawn, etc.), and air properties all affect the propagation of noise and resulting sound levels, and were included in the acoustic models presented. The ISO 9613-2 calculation standard implemented into SoundPLAN® conservatively assumes downwind propagation in all directions from noise sources.

Highway 46 is the principal ambient noise source for the area. An annual daily traffic value of 26,000 vehicles traveling in each direction was used, split into cars and some light trucks and apportioned into day, evening, and nighttime hourly vehicle counts, was utilized here.

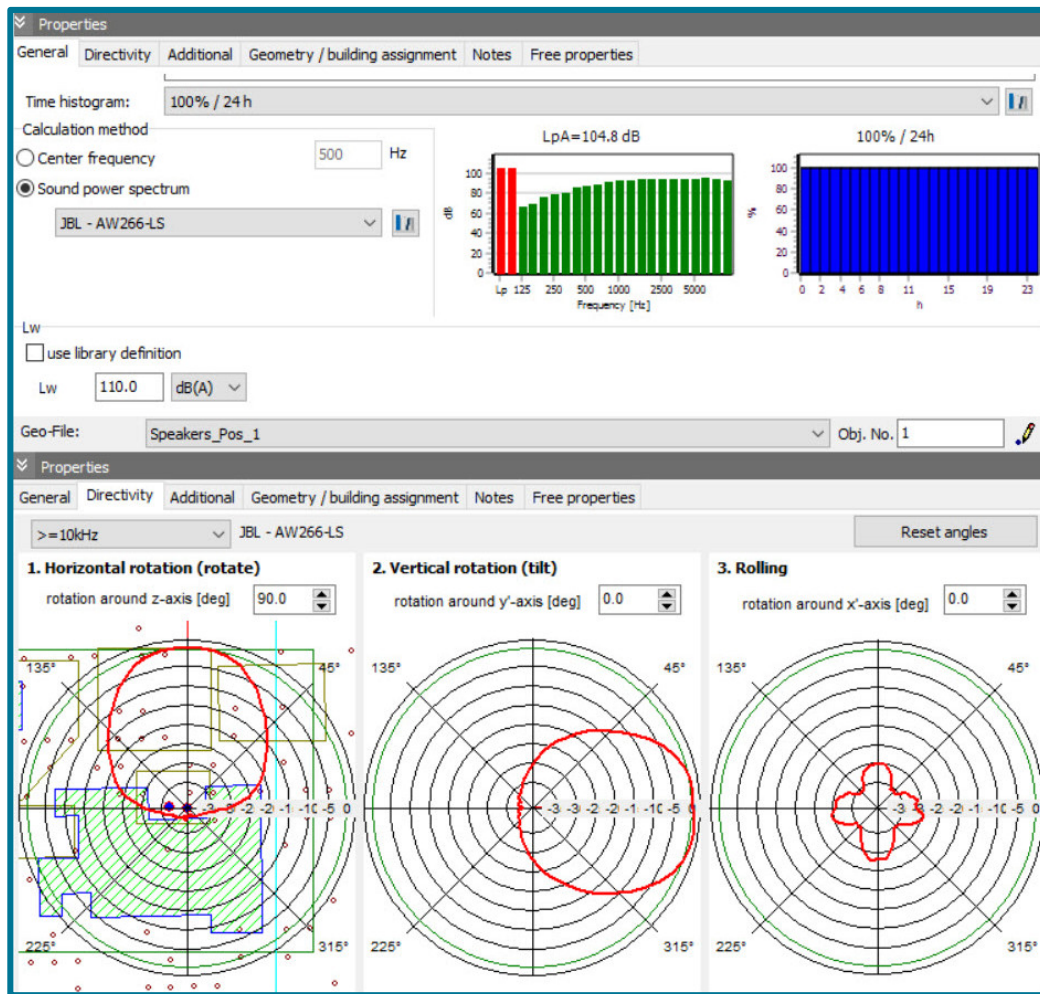
Figure 3: CalTrans traffic counts for Highway 46

Rte	CO	Description	Back Peak Hour	Back Peak Month	Back AADT	Ahead Peak Hour	Ahead Peak Month	Ahead AADT
046	SLO	DOVER CYN RD	710	6700	5400	710	6700	5400
046	SLO	YORK MOUNTAIN ROAD	810	7600	6200	810	7600	6200
046	SLO	VINEYARD DRIVE	850	8000	6500	850	8000	6500
046	SLO	SOUTH JCT. RTE. 101	960	9800	8200	3300	35000	29700
046	SLO	PASO ROBLES AIRPORT ROAD	4900	52000	43400	3100	34500	29300
046	SLO	MC MILLAN CANYON ROAD	5200	23300	21500	2000	12900	18700

4.1 Speaker Sound Levels

One sound **power** level “ L_{WA} ” emission setting of 110 dBA re 1 Watt was used for each speaker, based upon our previous field measurements, experience and knowledge of sound levels for different types of event settings (see Appendix section 6.1). The speaker sound power equates to a sound **pressure** level of 89 dBA re 20 μ Pa at 10 feet directly away from the speaker face/axis. Putting 2 speakers close to one another creates a sound level for the listener of approximately 92 dBA, typical for an outdoor music venue. Note that this is a slightly lower sound level than might be experienced at an indoor night club.

Speakers are modeled realistically here as point sources *with directivity*—meaning that the speaker outputs more sound in the direction that its center axis is pointed than at the sides or back. However, in this study due to the distance to the nearest point source, the directivity is not an important consideration.

Figure 4: Speaker sound source power level and directivity characteristics

4.2 Determination of Compliance

Figure 5 shows the sound level contours for the existing area with only traffic noise and no project-related noise. Four receivers are identified—three to the north and one to the south—to compare the levels at the closest residential locations, for reference only.

Figure 6 resulting sound level contours for the area including concurrent “concerts” in all five locations. Though significantly “drowned out” or overtaken by speaker levels, some relatively low-level parking lot noise was also included to address that potential concern.

Again, although amplified music is not anticipated to occur at all locations concurrently, this provides a simplified analysis condition to evaluate predicted compliance.

Compliance is judged here by whether or not the sound levels at the property line exceed either the 50 LAeq-1hr daytime limit, or the 65 dB(A) maximum level. To provide perspective as to how this may impact the property lines, Figure 7 shows these same sound level contours overlaid

on the project site, with the property lines added as dashed red lines. Assuming all property lines are potential residential receivers, sound levels are increased most at the western property line.

Assuming only one Zone would have amplified music at any one time, by mathematical properties of sound level arithmetic, the maximum level at the property line would be 3dB lower than those shown in Figure 7. This means that event at the highest sound level location due to amplified music—at the western property line near Building 1—the sound levels are anticipated to comply with the maximum noise level of 65dBA. Levels at the eastern and southern property lines are even less affected, and therefore are also expected to comply.

It is evident from Figure 5 and Figure 6 that sound levels at the property locations across Highway 46 to the north are not significantly affected by the addition of all five zones of amplified music concurrently emitting from the site, because the road traffic has a masking effect. Because levels at these receivers are already anticipated to exceed the daytime LAeq-1hr level limit of the Code, we rely upon Note 1 of the County Code, which states that any area with an existing ambient level of greater than the level within the Code shall have a criteria of the ambient plus 1dB. As such, the properties to the north are expected to experience a less-than-significant increase for the neighboring properties and as such compliance is predicted at these properties.

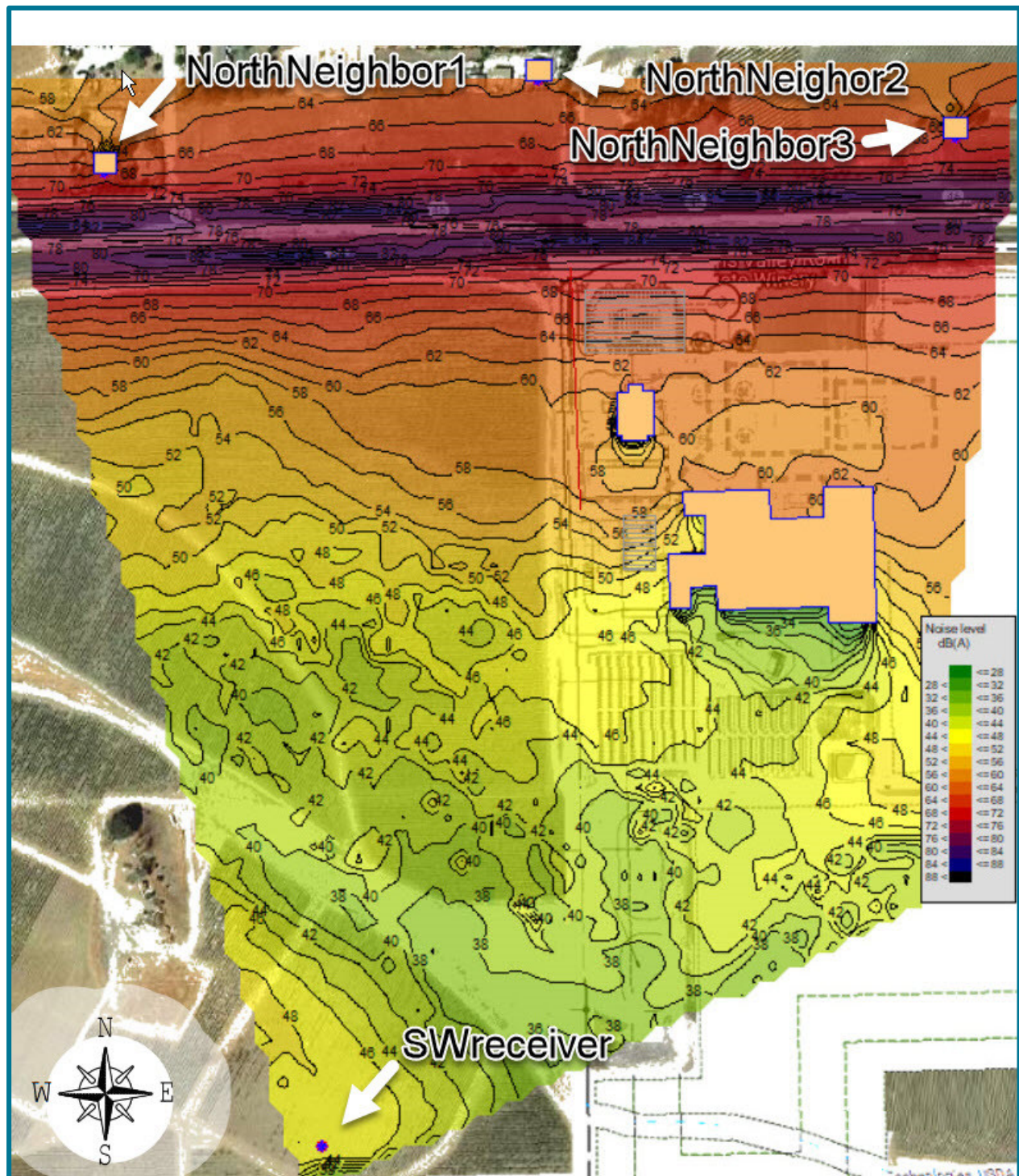
Figure 5: Existing site traffic noise sound levels (without Project)

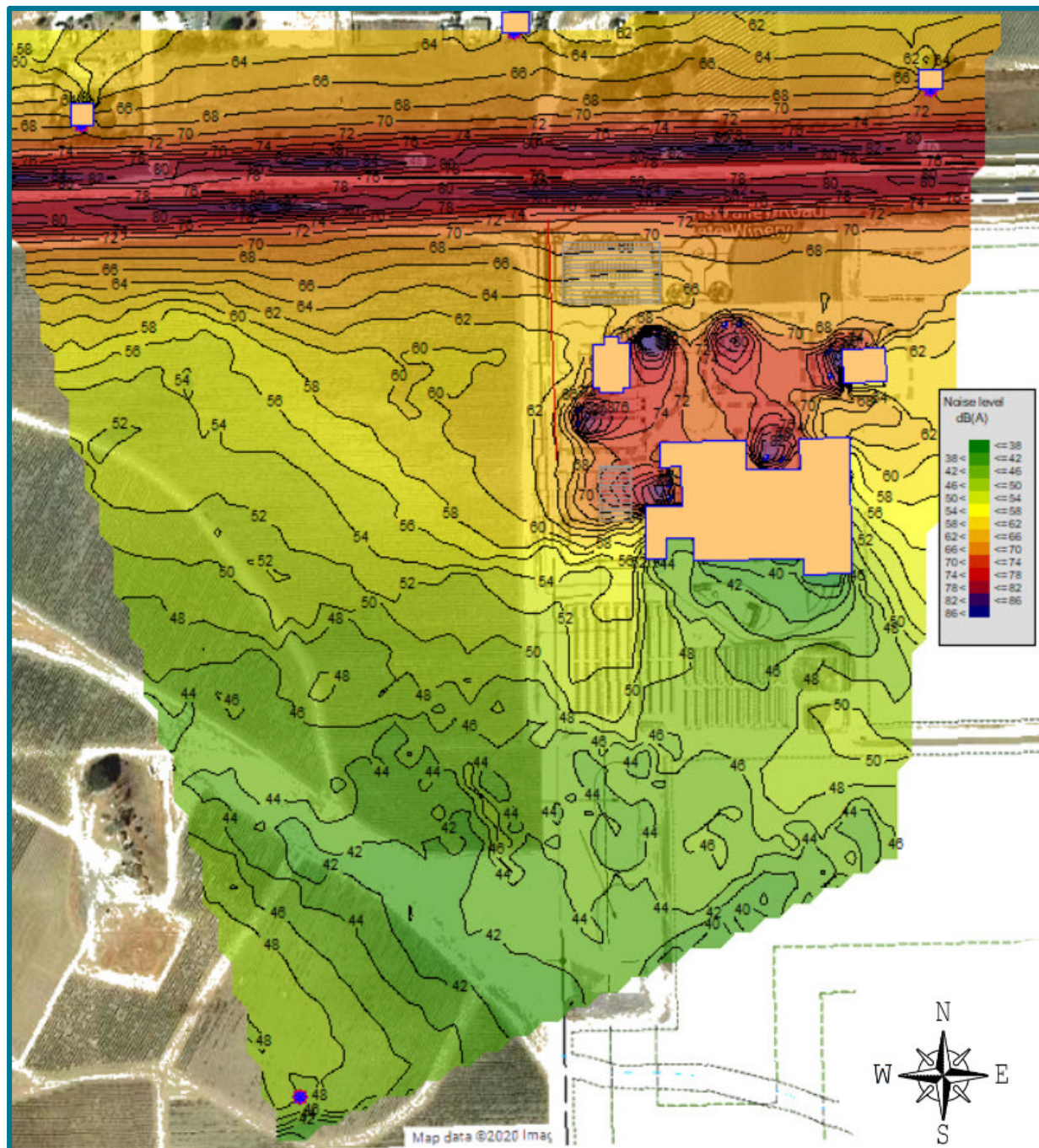
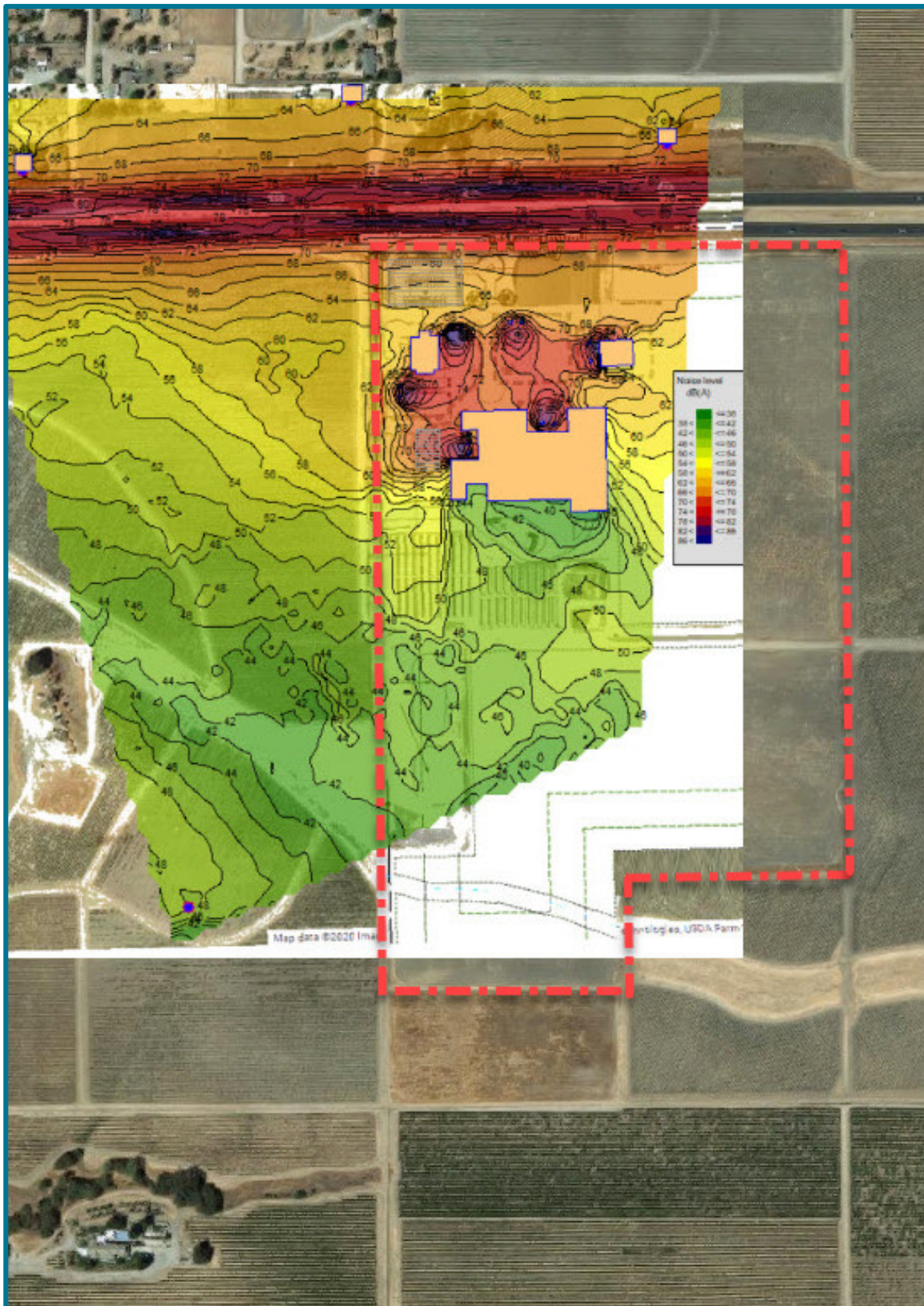
Figure 6: Existing site traffic noise sound levels (with Project)

Figure 7: Sound levels with property lines overlaid

4.3 Self-Management of Sound Levels

Compliance with the Code for this project assumes that speaker levels will not exceed 92dBA within the local area of the concert area. This may be difficult to judge for the DJ or management. As such, we provide some potential tools below that may be utilized to help Paris Valley Road Winery manage their own sound levels. This is not a requirement, and there are no mitigation requirements for this project. We merely provide the below as supplementary information.

There are many commercial solutions for monitoring sound levels at a given location that may be of assistance in maintaining good neighbor relationships. Below are two such solutions we would suggest if the winery ownership wishes to monitor their own sound levels:

- www.StudioSixDigital.com offers a suite of affordable apps called “Audio Tools” for Apple-brand devices (e.g., iPhone or iPod). When a Class 2 (survey grade) or Class 1 (precision grade) external microphone is plugged into such a device and calibrated, accurate sound levels may be acquired. The Studio Six website lists several compliant microphone options.
- For an affordable standalone Class 2 sound level meter, SoftdB’s Piccolo II is sold in the USA through Scantek, Inc. here: <https://www.scantekinc.com/products/sound-level-meters/softdb/piccolo-compact-sound-level-meter-and-datalogger/> This meter would allow for a permanent sound level monitoring and datalogging “station” at any desired location without the need for an Apple product.
- Any sound measurement device must be calibrated using a separate calibrator in order to continually ensure that the device/meter is calibrated to report accurate sound levels. A Class 2 calibrator can be purchased from many suppliers.
- A visual red/yellow/green “stoplight” visual indicator is offered in several formats by www.SoundEar.com, including a computer desktop virtual display, or a wall-mounted or tabletop device. These items can be purchased through <http://www.scantekinc.comn/www.ScantekInc.com> as well.

5 Conclusions

Our study concludes that all amplified music zones are anticipated to comply with the County Code, provided that sound levels at any zone, and particularly the westernmost zone near Building 1, does not exceed 92dBA at 10 feet from the speaker. For reference, this level is one appropriate for an outdoor music live concert venue. We have provided self-management tools commercially available in case the winery’s ownership would like further assistance in ensuring they do not exceed the permitted level. We conclude that the project will be in compliance with the Ordinance, including hourly LAeq, LAm_{ax}, and LAIm_{ax} levels.

6 Appendix

6.1 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.

Table 2: Examples of sound pressure levels

0dB SPL	- The threshold of hearing. This is the quietest sound that a child or young adult with good hearing can detect at 1kHz. It is not silence/
10 - 20dB SPL	Very Faint A gentle breeze through the trees.
20 - 30dB SPL	A soft whisper (at 1 meter).
30 - 40dB SPL	A quiet auditorium.
40 - 60dB SPL	Background music in a cafe, bar or restaurant.
60 - 70dB SPL	Typical conversation levels (from the listener's position).
70 - 80dB SPL	The cabin of an aircraft during normal cruise conditions.
80 - 90dB SPL	Typical wedding or dinner-dance band (typical audience position).
90 - 100dB SPL	Loud orchestra (playing <i>fff</i> , as it would sound in the front row of the audience).
100 - 110dB SPL	Typical disco.
110 - 115dB SPL	A loud rock band (front rows of audience).
115 - 130dB SPL	Threshold of pain. Often given as 120 dB SPL, this varies with frequency, and from person to person.
140dB SPL	Jet engine from 3 meters.

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 3 below presents the subjective effect of changes in sound pressure levels.

Table 3: 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.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, State law requires that, for planning purposes, an artificial dB increment be added to quiet-time noise levels in a 24-hour noise descriptor called the CNEL or Ldn. This increment is incorporated in the calculation of CNEL or Ldn, described earlier.

6.2 Terminology/Glossary

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, and 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.

Noise reduction (NR)

Noise reduction is the difference between outdoor sound level and indoor sound level. It is not identical to Sound Transmission Class.

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. Once built, as much as a 5-point reduction in Apparent Outside-Inside Transmission Class (OITC) from the original, as-designed OITC may be expected.

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 Power Level

Sound power level is the acoustic energy emitted by a source which produces a **sound pressure level** at some distance. While the sound power level of a source is fixed, the sound pressure level depends upon the distance from the source and the acoustic characteristics of the area in which it is located.

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.

6.3 SoundPLAN Acoustics Software

SoundPLAN®, the software used for this acoustic analysis, is an acoustic ray-tracing program dedicated to the prediction of noise in the environment. Noise emitted by various sources propagates and disperses over a given terrain in accordance with the laws of physics. Worldwide, governments and engineering associations have created algorithms to calculate acoustical phenomena to standardize the assessment of physical scenarios. Accuracy has been validated in independent published studies to be ± 2.7 dBA with an 85% confidence level for a wide range of scenarios and calculation standards.

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.” Accuracy of this

calculation standard is stated to be +/- 1dB at source-receiver distances of less than 1000m and noise source heights of less than 10m.

6.4 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. Some common noise levels of various sources are shown in Table 4. We assume these are sound pressure levels at the listener's ear, in decibels (dB).

Table 4: How Loud are Things? (<https://chchearing.org/noise/common-environmental-noise-levels/>)

• 50 refrigerator	• 40 quiet office, library	• 40 quiet residential area
• 50 – 60 electric toothbrush	• 50 large office	• 70 freeway traffic
• 50 – 75 washing machine	• 65 – 95 power lawn mower	• 85 heavy traffic, noisy restaurant
• 50 – 75 air conditioner	• 80 manual machine, tools	• 90 truck, shouted conversation
• 50 – 80 electric shaver	• 85 handsaw	• 95 – 110 motorcycle
• 55 coffee percolator	• 90 tractor	• 100 snowmobile
• 55 – 70 dishwasher	• 90 – 115 subway	• 100 school dance, boom box
• 60 sewing machine	• 95 electric drill	• 110 disco
• 60 – 85 vacuum cleaner	• 100 factory machinery	• 110 busy video arcade
• 60 – 95 hair dryer	• 100 woodworking class	• 110 symphony concert
• 65 – 80 alarm clock	• 105 snow blower	• 110 car horn
• 70 TV audio	• 110 power saw	• 110 – 120 rock concert
• 70 – 80 coffee grinder	• 110 leafblower	• 112 personal cassette player on high
• 70 – 95 garbage disposal	• 120 chain saw, hammer on nail	• 117 football game (stadium)
• 75 – 85 flush toilet	• 120 pneumatic drills, heavy machine	• 120 band concert
• 80 pop-up toaster	• 120 jet plane (at ramp)	• 125 auto stereo (factory installed)
• 80 doorbell	• 120 ambulance siren	• 130 stock car races
• 80 ringing telephone	• 125 chain saw	• 143 bicycle horn
• 80 whistling kettle	• 130 jackhammer, power drill	• 150 firecracker
• 80 – 90 food mixer or processor	• 130 air raid	• 156 capgun
• 80 – 90 blender	• 130 percussion section at symphony	• 157 balloon pop
• 80 – 95 garbage disposal	• 140 airplane taking off	• 162 fireworks (at 3 feet)
• 110 baby crying	• 150 jet engine taking off	• 163 rifle
• 110 squeaky toy held close to the ear	• 150 artillery fire at 500 feet	• 166 handgun
• 135 noisy squeeze toys	• 180 rocket launching from pad	• 170 shotgun

7 References

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