



Eilar Associates, Inc.
Acoustical and Environmental Consulting Services

Acoustical Analysis Report for Ash Subdivision

Prepared for:

Escondido North, LLC
Attention: Dylan Bird
30200 Rancho Viejo Road, Suite B
San Juan Capistrano, California 92675
Phone: 949-212-2591

Prepared by:

Eilar Associates, Inc.
210 South Juniper Street, Suite 100
Escondido, California 92025
Phone: 760-738-5570
info@eilarassociates.com

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1.0 Executive Summary

The proposed project, Ash Subdivision, consists of the subdivision of an existing parcel into 20 numbered lots and one lettered lot (open space) to include 20 new single-family residences. The project site is located at the southwest corner of Ash Street and Stanley Avenue and will be annexed into the City of Escondido, California as part of the proposed project.

Operational noise impacts from the project site are expected to be limited to small HVAC unit operation and project-generated traffic. Calculations show that noise impacts from HVAC units are expected to be in compliance with the City of Escondido and County of San Diego noise regulations. No mitigation is deemed necessary to control project-generated noise impacts from mechanical equipment. Project-generated traffic noise is also expected to be less than significant at off-site receivers.

The City of Escondido Municipal Code states that construction activity is prohibited except on Monday through Friday between the hours of 7 a.m. and 6 p.m. and on Saturdays between the hours of 9 a.m. and 5 p.m. Construction activity is also prohibited on Sundays and legal holidays. During permissible hours of operation, noise levels from construction activity may not exceed a one-hour average sound level limit of 75 dBA at any time. An analysis of temporary construction noise considering anticipated activity on site demonstrates that construction noise impacts are expected to remain at or below an hourly average noise level of 75 dBA at surrounding residential properties. Provided construction is limited to the allowable hours of the City of Escondido and equipment is maintained in proper working condition, temporary noise impacts are expected to be less than significant. No mitigation is deemed necessary for the attenuation of temporary noise impacts.

The proposed project is not expected to result in any potentially significant noise impacts by the standards of the California Environmental Quality Act (CEQA). Noise impacts are summarized in Section 5.3.

2.0 Introduction

This acoustical analysis report is submitted to satisfy the noise requirements of the City of Escondido. Its purpose is to assess noise impacts from potential project-related noise sources, such as mechanical equipment and project-generated traffic, and to assess temporary construction noise. This analysis aims to determine if mitigation is necessary and feasible to reduce these noise impacts to comply with the applicable noise regulations of the City of Escondido Municipal Code and the County of San Diego Noise Ordinance. Potential impacts will also be assessed for significance per the California Environmental Quality Act (CEQA).

All noise level or sound level values presented herein are expressed in terms of decibels, with A-weighting to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ} , for a specified duration. Unless a different time period is specified, “ L_{EQ} ” is implied to mean a period of one hour. Some of the data may also be presented as octave-band-filtered and/or 1/3-octave-band-filtered data, which are a series of sound spectra centered about each stated frequency, with half of the bandwidth above and half of the bandwidth below each stated frequency. This data is typically used for machinery noise analysis and barrier calculations.

Sound pressure is the actual noise experienced by a human or registered by a sound level instrument. When sound pressure is used to describe a noise source, the distance from the noise source must be specified in order to provide complete information. Sound power, on the other hand, is a specialized analytical metric used to provide information without the distance requirement, but it may be used to calculate the sound pressure at any desired distance.

Most people describe changes in sound levels along the following lines: (a) a 3 dB sound level change is barely perceptible, (b) a 5 dB sound level change is quite noticeable, whereas (c) a change of 10 dB is described as being dramatic, or about one-half or twice as loud. A 3 dB increase in sound level also represents a doubling of sound energy and is generally considered to be the threshold for significance in terms of increases in sound levels.

2.1 Project Description

The proposed project, Ash Subdivision, consists of the subdivision of an existing parcel into 20 numbered lots and one lettered lot (open space) to include 20 new single-family residences. The project site is currently vacant. Additional information is provided in the project plans, included as Appendix A.

2.2 Project Location

The project site is located at the southwest corner of Ash Street and Stanley Avenue in an unincorporated area of the County of San Diego, California that is proposed to be annexed into the City of Escondido as part of the proposed project. The Assessor's Parcel Number (APN) for the property is 224-130-10-00. The project site is surrounded by existing residential uses in all directions. Properties to the north, south, and a portion of the west of the project site are located within the jurisdiction of the County of San Diego. All other surrounding properties are located within the City of Escondido.

2.3 Applicable Noise Regulations

According to the Escondido Municipal Code, Section 17-229, average hourly noise levels shall not exceed 50 dBA L_{EQ} between the hours of 7 a.m. and 10 p.m. and 45 dBA L_{EQ} between the hours of 10 p.m. and 7 a.m. at residential zones. Likewise, the County of San Diego Noise Ordinance states that noise levels from stationary sources shall not exceed 50 dBA between the hours of 7 a.m. and 10 p.m. and 45 dBA between the hours of 10 p.m. and 7 a.m. at single-family residential zones. These noise limits have been applied to noise impacts generated at the project site by HVAC equipment.

Additionally, Section 17-234 of the City of Escondido Municipal Code states that construction activity is prohibited except on Monday through Friday between the hours of 7 a.m. and 6 p.m. and on Saturdays between the hours of 9 a.m. and 5 p.m. Construction activity is also prohibited on Sundays and legal holidays. During permissible hours of operation, noise levels from construction activity may not exceed a one-hour average sound level limit of 75 dBA at any time, unless a variance has been obtained in advance from the city manager. The County of San Diego Noise Ordinance similarly limits construction activity but contains less restrictive limits, allowing for construction activity between 7 a.m. and 7 p.m., Monday through Saturday, and requiring that construction equipment noise be limited to an eight-hour average of 75 dBA. As the City of Escondido construction noise requirements are more restrictive, they have been applied to this project.

Please refer to Appendix B for pertinent sections of the City of Escondido Municipal Code and the County of San Diego Noise Ordinance.

3.0 Environmental Setting

3.1 Existing Noise Environment

An on-site inspection and a long-term noise measurement were made beginning the morning of Thursday, September 30, 2021 through Friday, October 1, 2021. The noise monitor was placed near the south boundary of the project site, approximately 280 feet west of the Ash Street centerline and approximately 75 feet north of the Lehner Avenue centerline. The microphone was placed at approximately four feet above the existing grade. Ambient noise sources observed included traffic and light aircraft noise. The measured hourly average noise levels are shown in Table 1, and the noise measurement location is shown graphically in Figure 3.

Table 1. Long-Term Measured Noise Levels on Site		
Date	Time	Hourly Average Noise Level (dBA L _{EQ})
September 30, 2021	11 a.m. – 12 p.m.	48.2
	12 p.m. – 1 p.m.	54.6
	1 p.m. – 2 p.m.	62.9
	2 p.m. – 3 p.m.	49.6
	3 p.m. – 4 p.m.	49.5
	4 p.m. – 5 p.m.	49.8
	5 p.m. – 6 p.m.	47.8
	6 p.m. – 7 p.m.	48.8
	7 p.m. – 8 p.m.	48.3
	8 p.m. – 9 p.m.	50.8
	9 p.m. – 10 p.m.	48.5
	10 p.m. – 11 p.m.	46.7
October 1, 2021	11 p.m. – 12 a.m.	44.7
	12 a.m. – 1 a.m.	43.0
	1 a.m. – 2 a.m.	42.4
	2 a.m. – 3 a.m.	42.0
	3 a.m. – 4 a.m.	44.1
	4 a.m. – 5 a.m.	45.6
	5 a.m. – 6 a.m.	50.0
	6 a.m. – 7 a.m.	52.4
	7 a.m. – 8 a.m.	54.6
	8 a.m. – 9 a.m.	52.3
	9 a.m. – 10 a.m.	46.4
10 a.m. – 11 a.m.	46.7	

The average nighttime noise level during the measurement period was found to be 47.1 dBA. The average daytime noise level during the measurement period was found to be 53.7 dBA.

3.2 Future Noise Environment

The future noise environment in the vicinity of the project site will be primarily a result of the same ambient noise sources, as well as the noise generated by the proposed uses at the project site.

3.2.1 Permanent Project-Related Noise Sources

The primary source of noise on the proposed project site is likely to be HVAC units serving the residences on site. The units are anticipated to be at or around 5-ton capacity for each single-family residence. The 5-ton units are expected to have an approximate sound power level of 74 dBA. This noise level has been used to perform a rough analysis of potential noise impacts at off-site properties, as detailed in Section 5.1.1.

3.2.2 Project-Generated Traffic

The proposed project is anticipated to generate approximately 200 Average Daily Trips (ADT) in the vicinity of the project site, according to the Scoping Agreement for Transportation Studies, prepared by Linscott, Law & Greenspan Engineers (see reference). The impacts of project-generated traffic noise have been assessed using this trip generation value and the following existing traffic volumes, provided by SANDAG Transportation Forecast Information Center ABM2+/2021 RP (activity-based regional transportation model) for the year 2025:

- Ash Street, North of Lehner Avenue: 1,800 ADT
- Ash Street, South of Lehner Avenue: 2,300 ADT
- Lehner Avenue, West of Ash Street: 300 ADT
- Stanley Avenue, West of Ash Street: 500 ADT

The analysis of project-generated traffic noise is provided in Section 5.1.2.

3.2.3 Temporary Construction Equipment

According to the project proponent and professional experience, on-site construction activities are expected to take approximately 14 months and will consist of the following stages: grading (three weeks), utilities (one month), paving (one week) and building construction (12 months). The earthwork at the site is expected to roughly balance. It was assumed that grading activity and utility work may overlap, and as such, this work has been evaluated as a single stage. No rock crushing or other impact construction equipment is anticipated to be used on site.

Please refer to Table 2 for anticipated on-site construction equipment during each stage of activity with noise levels and duty cycles for each piece of equipment. Unless otherwise noted, construction equipment noise levels were provided by the UK Department for Environment, Food and Rural Affairs (DEFRA), and duty cycle information was taken from the Federal Highway Administration (FHWA) (see references). Although FHWA offers noise levels of construction equipment, professional experience and observations of construction activity by Eilar Associates, Inc. suggest that the noise levels given by DEFRA are more representative of equipment noise levels that would be generated at smaller scale construction sites such as the proposed project.

Table 2. Anticipated Construction Activity and Equipment Noise Levels			
Equipment	Duty Cycle (%)	Average Noise Level at 50 feet (dBA)	Activity Stage(s)
Backhoe	40	64	Grading/Utilities
Front Loader	40	72	Grading/Utilities
Excavator	40	74	Grading/Utilities
Dump Truck	40	75	Grading/Utilities
Paver	50	71	Paving
Roller	20	69	Paving
Concrete Mixer	40	71	Building Construction
Concrete Pump	20	71	Building Construction
Forklift ¹	40	74	Building Construction
Air Compressor	40	61	Building Construction

¹Eilar Associates, Inc. noise measurements performed at the 91 Freeway/Green River project site near Corona, California, on March 25, 2010.

Equipment noise levels shown above were incorporated into the temporary construction noise impact analysis as shown in Section 5.2.

4.0 Methodology and Equipment

4.1 Methodology

4.1.1 CadnaA Noise Modeling Software

Modeling of the outdoor noise environment is accomplished using CadnaA Version 2022, which is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. CadnaA (Computer Aided Noise Abatement) assists in the calculation, presentation, assessment, and alleviation of noise exposure. It allows for the input of project information such as noise source data, barriers, structures, and topography to create a detailed model and uses the most up-to-date calculation standards to predict outdoor noise impacts. Noise standards used by CadnaA that are particularly relevant to this analysis include ISO 9613 (Attenuation of sound during propagation outdoors). CadnaA provides results that are in line with basic acoustical calculations for distance attenuation and barrier insertion loss.

4.1.2 Formulas and Calculations

Decibel Addition

To determine the combined logarithmic noise level of two known noise source levels, the values are converted to the base values, added together, and then converted back to the final logarithmic value, using the following formula:

$$L_C = 10 \log(10^{L1/10} + 10^{L2/10} + 10^{LN/10})$$

where L_C = the combined noise level (dB), and
 L_N = the individual noise sources (dB).

This procedure is also valid when used successively for each added noise source beyond the first two. The reverse procedure can be used to estimate the contribution of one source when the contribution of another concurrent source is known and the combined noise level is known. These methods can be used for L_{EQ} or other metrics (such as L_{DN} or $CNEL$), as long as the same metric is used for all components.

Project-Generated Traffic Noise Impacts

Changes in traffic noise levels can be predicted by inputting the ratio of the two scenarios into the following logarithmic equation:

$$\Delta = 10 \log(V2 / V1)$$

where: Δ = Change in sound energy,
 $V1$ = original or existing traffic volume, and
 $V2$ = future or cumulative traffic volume.

Construction Vibration Calculations

The construction vibration assessment contained herein is evaluated using calculations of peak particle velocity (PPV). PPV at receivers is calculated as follows:

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

where PPV_{equip} is the peak particle velocity (in inches per second) of the equipment, adjusted for distance, PPV_{ref} is the reference vibration level (in inches per second) at a distance of 25 feet from the equipment, and D is the distance from the equipment to the receiver.

4.2 Measurement Equipment

Some or all of the following equipment was used at the site to measure existing noise levels:

- Soft dB Model Piccolo II Type 2 Sound Level Meter, Serial # P0220110907
- Larson Davis Model CAL200 Type 1 Calibrator, Serial # 16454

The sound level meter was field-calibrated immediately prior to the noise measurement and checked afterward to ensure accuracy. All sound level measurements presented in this report, in accordance with the regulations, were conducted using a sound level meter that conforms to the American National Standards Institute specifications for sound level meters (ANSI S1.4). All instruments are maintained with National Institute of Standards and Technology (NIST) traceable calibration, per the manufacturers' standards.

5.0 Noise Impacts

5.1 Permanent Project-Related Noise Levels

5.1.1 Mechanical Equipment Noise

Noise levels from the proposed HVAC units were calculated in CadnaA at the nearest surrounding properties using the assumptions presented in Section 3.2.1. HVAC equipment was evaluated assuming constant operation during the daytime hours of 7 a.m. to 10 p.m. and assuming operation of each unit for 30 minutes out of an hour for the nighttime hours of 10 p.m. to 7 a.m., to account for reduced equipment use during the cooler nighttime period. HVAC equipment was placed at the approximate center of the rear edge of the graded pads. Receivers have been placed at nearest sensitive locations beyond unoccupied space (i.e., adjacent roadways). Noise limits for single-family residential uses have been applied; the same noise limits apply for properties in the City of Escondido and the County of San Diego. Results of the calculations are shown in Table 3. For graphics showing daytime and nighttime mechanical equipment noise contours and receiver locations, please refer to Figures 5 and 6, respectively.

Table 3. Project-Related Mechanical Noise Levels at Off-Site Receivers					
Receiver	Description	Noise Level (dBA)			
		Daytime (7 a.m. – 10 p.m.)		Nighttime (10 p.m. – 7 a.m.)	
		Noise Limit	Equipment Noise Level	Noise Limit	Equipment Noise Level
R1	North Property Line	50	34.8	45	31.7
R2	East Property Line	50	35.6	45	32.6
R3	South Property Line	50	36.1	45	33.1
R4	West Property Line	50	40.5	45	37.5
R5	West Property Line	50	44.4	45	41.4

As shown above, noise levels at adjacent property lines are anticipated to comply with the applicable daytime and nighttime noise limits of the City of Escondido and the County of San Diego. No mitigation is deemed necessary to reduce noise levels from on-site mechanical equipment at off-site receivers.

5.1.2 Project-Generated Traffic Noise

As detailed herein, the proposed project is anticipated to generate approximately 200 ADT on surrounding roadways. The project does not exceed the thresholds above which a detailed traffic impact analysis would be prepared. For a worst-case analysis of project-generated traffic noise, the anticipated project traffic has been added to each surrounding roadway's existing traffic volume to determine the anticipated increase in noise levels along each roadway resulting from the addition of project traffic. A significant impact is generally expected to be an increase of three decibels. Project-generated traffic noise increases are shown in Table 4.

Table 4. Anticipated Traffic Noise Increases with Project-Generated Traffic					
Road	Segment	Traffic Volume (ADT)			Noise Level Increase (dB)
		Existing	Project	Existing + Project	
Ash Street	North of Lehner	1,800	200	2,000	0.5
	South of Lehner	2,300	200	2,500	0.4
Lehner Avenue	West of Ash	300	200	500	2.2
Stanley Avenue	West of Ash	500	200	700	1.5

As shown in Table 4, as any increases in project-generated traffic noise are anticipated to be less than 3 dB, no direct impacts are anticipated to result from project traffic. For this reason, project-generated traffic noise levels are considered less than significant.

5.2 Temporary Construction Noise Impacts

Construction information detailed in Section 3.2.3 has been input into a CadnaA noise model to assess noise impacts at off-site residential receivers. Please refer to Table 2 for anticipated on-site construction equipment during each stage of activity, construction equipment noise levels, and duty cycles for each piece of equipment. Construction noise levels were calculated at property lines of surrounding sensitive receptors to the north, south, east, and west. Any other potentially noise-sensitive receivers are located at a greater distance from construction activity and would be exposed to lesser noise impacts due to distance attenuation and shielding provided by intervening structures.

For grading and utilities, construction noise sources were evaluated as point sources moving within the site area to account for average noise impacts as equipment moves around the project site. Building construction noise sources were evaluated assuming construction equipment located at the center of six representative lots (three with concrete equipment and three with framing equipment), while paving noise impacts were evaluated considering equipment moving up and down the proposed street area on the site. In all stages, noise calculations consider typical duty cycles of equipment to account for periods of activity and inactivity on the site. Noise levels for each stage of construction are shown in Table 5. Detailed calculations can be found in Appendix C, and graphical representations of construction noise source and receiver locations are provided as Figures 7 through 9.

Table 5. Temporary Construction Noise Levels at Neighboring Properties		
Stage	Receiver Location	Average Noise Level (dBA)
Grading/Utilities	North	58.3
	East	59.4
	South	59.4
	West	65.3
Paving	North	35.4
	East	37.3
	South	40.9
	West	41.2
Building Construction	North	64.5
	East	62.9
	South	61.1
	West	69.0

As shown above, construction noise levels are expected to meet the City of Escondido construction noise limit of 75 dBA at all sensitive receptors with equipment in worst-case locations (nearest to sensitive receptors).

The following “good practice” measures should still be practiced as a courtesy to residential neighbors:

1. Staging areas should be placed as far as possible from sensitive receptors.
2. Place stationary equipment in locations that will have a lesser noise impact on nearby sensitive receptors.
3. Turn off equipment when not in use.
4. Limit the use of enunciators or public address systems, except for emergency notifications.
5. Equipment used in construction should be maintained in proper operating condition, and all loads should be properly secured to prevent rattling and banging.
6. Schedule work to avoid simultaneous construction activities that both generate high noise levels.
7. Use equipment with effective mufflers.
8. Minimize the use of backup alarms.

With construction operating hours limited to those permitted by the City of Escondido and adherence to the general good practice construction noise control techniques, temporary construction noise impacts are expected to be less than significant at off-site receivers.

5.3 CEQA Significance Determination

Noise impacts from the project site are summarized below and classified per the noise portion of the CEQA Environmental Checklist form. This list summarizes conclusions made within the report and classifies the level of significance as: Potentially Significant Impact, Less than Significant with Mitigation Incorporated, Less than Significant Impact, or No Impact. Italics are used to denote language from the CEQA Environmental Checklist form.

XII. NOISE—Would the project result in:

- a) 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?*

Less Than Significant Impact. Operational noise impacts calculated in Section 5.1.1 are not expected to generate a substantial permanent increase in ambient noise levels in the vicinity of the project site. A substantial increase would be considered an increase of three decibels or more, which would represent a doubling of sound energy.

Average daytime and nighttime ambient noise levels as measured on site were combined with the projected equipment noise impacts (assuming constant HVAC operation during daytime hours and equipment operating for 30 minutes per hour during nighttime hours) to determine the cumulative noise impact and the increase in ambient noise levels resulting from operation of the project. Results are shown in Tables 6 and 7 for daytime and nighttime scenarios, respectively.

Table 6. Calculated Cumulative Noise Impacts at Surrounding Property Lines – Daytime Scenario						
Receiver Number	Receiver Location	Noise Level (dBA)				Impact
		Ambient	Equipment	Cumulative	Ambient Increase	
R1	North Property Line	53.7	34.8	53.8	0.1	Less than Significant
R2	East Property Line	53.7	35.6	53.8	0.1	Less than Significant
R3	South Property Line	53.7	36.1	53.8	0.1	Less than Significant
R4	West Property Line	53.7	40.5	53.9	0.2	Less than Significant
R5	West Property Line	53.7	44.4	54.2	0.5	Less than Significant

Table 7. Calculated Cumulative Noise Impacts at Surrounding Property Lines – Nighttime Scenario						
Receiver Number	Receiver Location	Noise Level (dBA)				Impact
		Ambient	Equipment	Cumulative	Ambient Increase	
R1	North Property Line	47.1	31.7	47.2	0.1	Less than Significant
R2	East Property Line	47.1	32.6	47.3	0.2	Less than Significant
R3	South Property Line	47.1	33.1	47.3	0.2	Less than Significant
R4	West Property Line	47.1	37.5	47.6	0.5	Less than Significant
R5	West Property Line	47.1	41.4	48.1	1.0	Less than Significant

The results in Tables 6 and 7 demonstrate that the increase in ambient noise levels from HVAC operation will be less than 3 dBA. Additionally, as demonstrated in Section 5.1.2 of this report, noise impacts from project-generated traffic are not expected to cause a significant direct increase on any surrounding roadway. This impact is also considered to be less than significant.

As shown in Section 5.2 of this report, noise from temporary construction is expected to be less than significant considering the anticipated construction schedule and assuming that equipment is maintained in proper operating condition and uses appropriate mufflers. Construction activity must be limited to the allowable hours of operation set in the City of Escondido Municipal Code. Noise impacts from anticipated construction activity are expected to remain below the 75 dBA construction noise limit set by the City of Escondido. For this reason, this impact is deemed to be less than significant.

As demonstrated above, the project is not expected to cause a substantial permanent or temporary increase in ambient noise levels, and therefore, this impact can be classified as less than significant.

b) Generation of excessive groundborne vibration or groundborne noise levels?

Less Than Significant Impact. The proposed grading phase of construction is expected to generate the highest vibration levels of the three stages, as it includes the use of excavation and grading equipment. According to the Federal Transit Administration Transit Noise and Vibration Assessment Manual (see reference), a small bulldozer (similar to an excavator) generates a peak particle velocity (PPV) of approximately 0.003 inches/second at a distance of 25 feet from equipment. The evaluation of an impact’s significance can be determined by reviewing both the likelihood of annoyance to individuals as well as the potential for damage to existing structures. According to the Caltrans Transportation and Construction Vibration Guidance Manual (see reference), the appropriate threshold for damage to modern residential structures is a PPV of 0.5 inches/second. Annoyance is assessed based on levels of perception, with a PPV of 0.01 being considered “barely perceptible,” 0.04 inches/second as “distinctly perceptible,” 0.1 inches/second as “strongly perceptible,” and 0.4 inches/second as “severe.”

It is estimated that the nearest location an excavator would operate to occupied residences would be approximately 20 feet from the nearest residential structure to the west. At this distance, the PPV would be approximately 0.004 inches/second. This level of vibration falls below the building damage PPV criteria of 0.5 inches/second. In terms of annoyance, the impact would be less than the “barely perceptible” threshold. As construction vibration is not anticipated to cause damage to off-site buildings and is not anticipated to be

perceptible to off-site receivers, it is the opinion of the undersigned that temporary construction vibration impacts would not be “excessive” and therefore are less than significant.

- c) *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 two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?*

No Impact. The project site is not located within an airport land use plan, nor is it located within two miles of a private airstrip, public airport, or public use airport. Therefore, the proposed project would not expose people working in the project area to excessive noise levels from such uses.

6.0 Conclusion

Operational noise impacts from the project site are expected to be limited to small HVAC unit operation and project-generated traffic. Calculations show that noise impacts from HVAC units are expected to be in compliance with the City of Escondido and County of San Diego noise regulations. No mitigation is deemed necessary to control project-generated noise impacts from mechanical equipment. Project-generated traffic noise is also expected to be less than significant at off-site receivers.


The City of Escondido Municipal Code states that construction activity is prohibited except on Monday through Friday between the hours of 7 a.m. and 6 p.m. and on Saturdays between the hours of 9 a.m. and 5 p.m. Construction activity is also prohibited on Sundays and legal holidays. During permissible hours of operation, noise levels from construction activity may not exceed a one-hour average sound level limit of 75 dBA at any time. An analysis of temporary construction noise considering anticipated activity on site demonstrates that construction noise impacts are expected to remain at or below an hourly average noise level of 75 dBA at surrounding residential properties. Provided construction is limited to the allowable hours of the City of Escondido and equipment is maintained in proper working condition, temporary noise impacts are expected to be less than significant. No mitigation is deemed necessary for the attenuation of temporary noise impacts.

The proposed project is not expected to result in any potentially significant noise impacts by the standards of CEQA. Noise impacts are summarized in Section 5.3.

7.0 Certification

All recommendations for noise control are based on the best information available at the time our consulting services are provided. However, as there are many factors involved in sound and impact transmission, and Eilar Associates has no control over the construction, workmanship, or materials, Eilar Associates is specifically not liable for final results of any recommendations or implementation of the recommendations.

The findings and recommendations of this acoustical analysis report are based on the information available and are a true and factual analysis of the potential acoustical issues associated with the Ash Subdivision project, to be located at the southwest corner of Ash Street and Stanley Avenue and annexed into the City of Escondido, California. This report was prepared by Rachael Cowell and Amy Hool.



Rachael S. Cowell, INCE
Acoustical Consultant



Amy Hool, INCE
President/CEO

8.0 References

City of Escondido Municipal Code, Article 12. Noise Abatement and Control.

County of San Diego Noise Ordinance, Sections 36.404, 36.408, 36.409, and 36.410.

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Figures



OpenStreetMap

Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Vicinity Map
 Job # S210703b

Figure 1

San Diego County
Assessor's
Parcel Number:

224-130-10-00

Project Location

2241301000



Eilar Associates, Inc.
210 South Juniper Street, Suite 100
Escondido, California 92025
760-738-5570

Assessor's Parcel Map
Job # S210703b

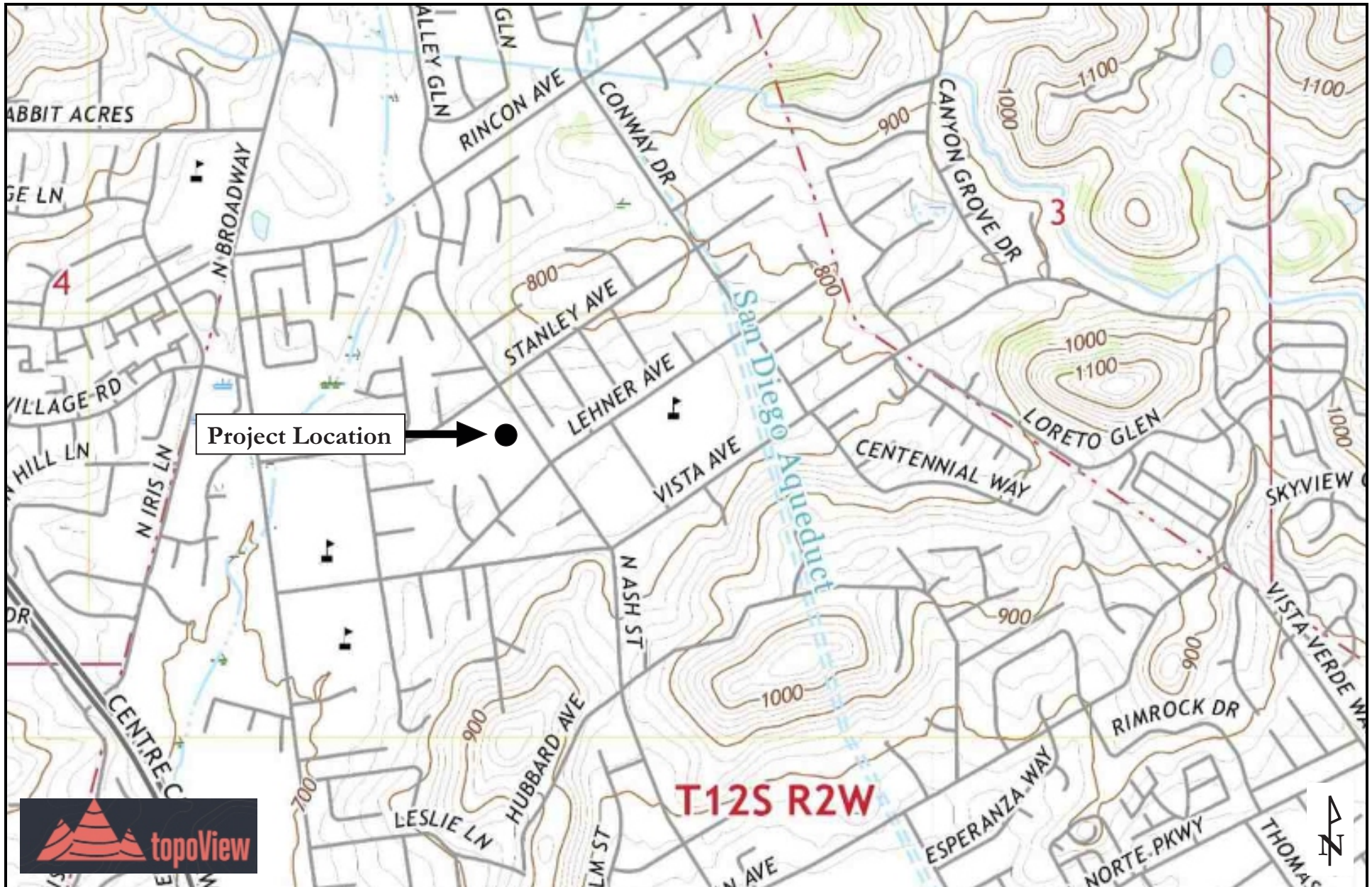
Figure 2



Eilar Associates, Inc.
210 South Juniper Street, Suite 100
Escondido, California 92025
760-738-5570

Satellite Aerial Photograph Showing Noise Measurement Location
Job # S210703b

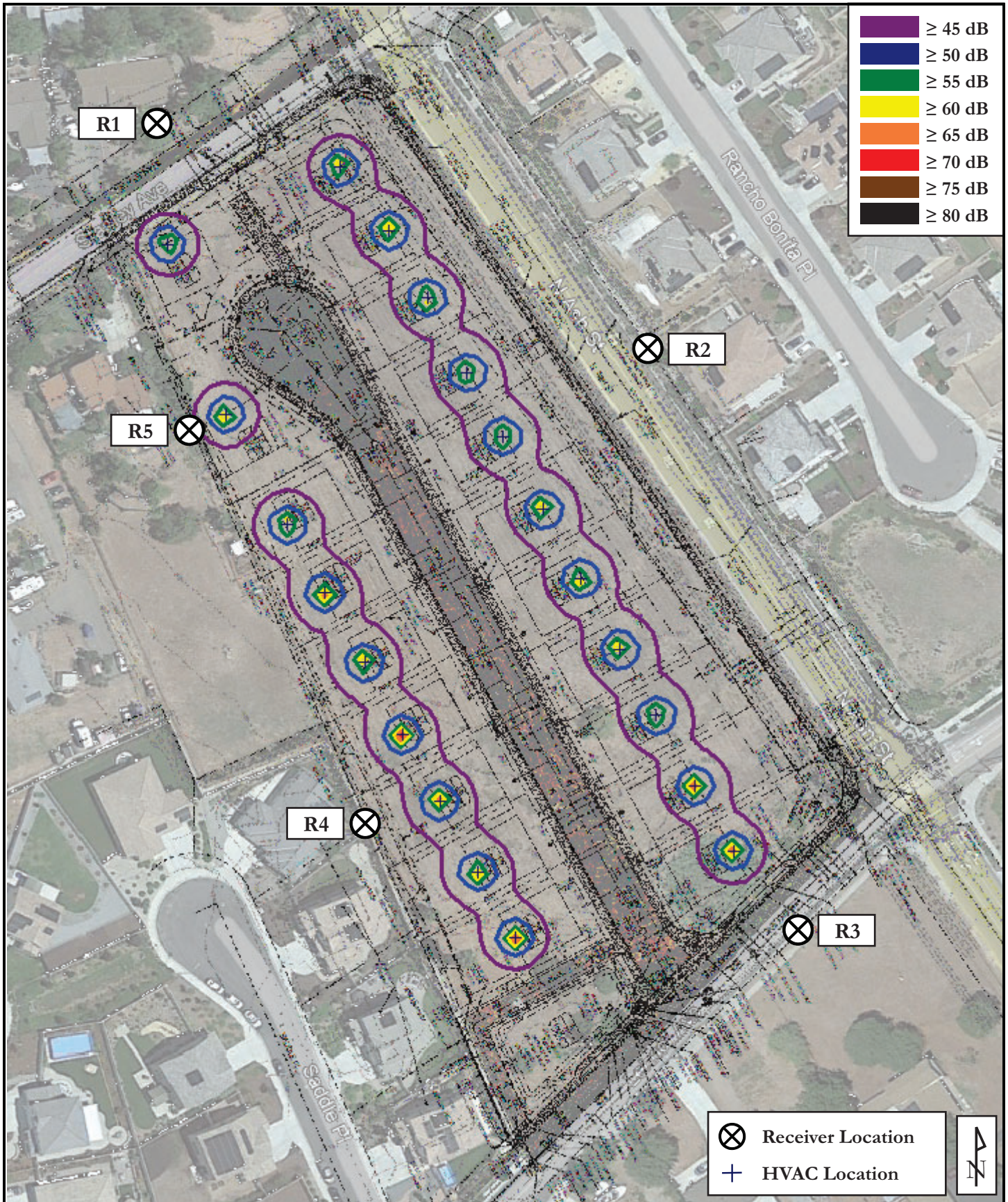
Figure 3



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Topographic Map
 Job # S210703b

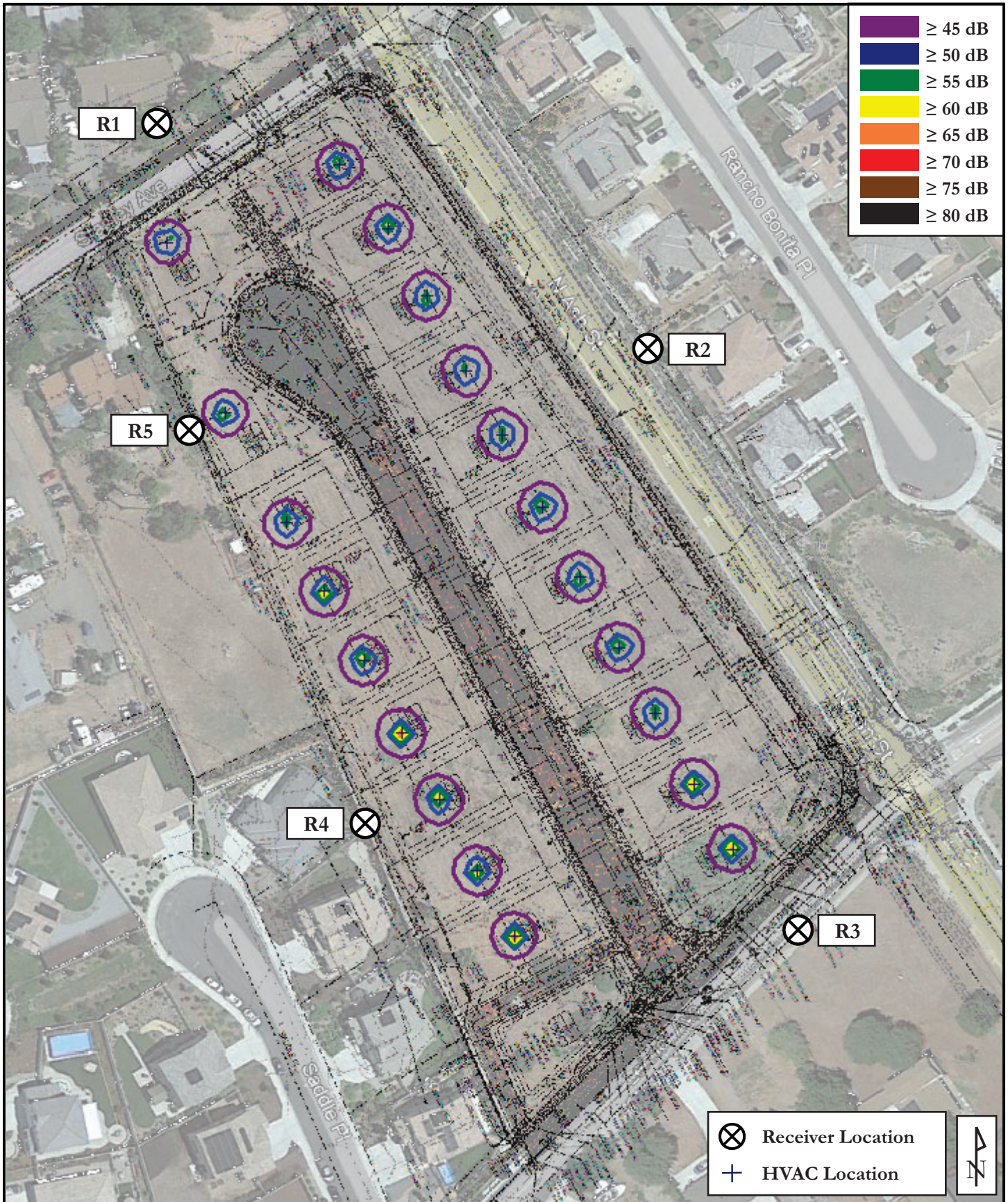
Figure 4



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph Showing
 Equipment Noise Contours and
 Receiver Locations - Daytime
 Job # S210703b

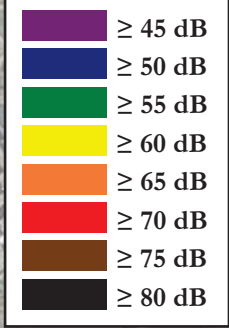
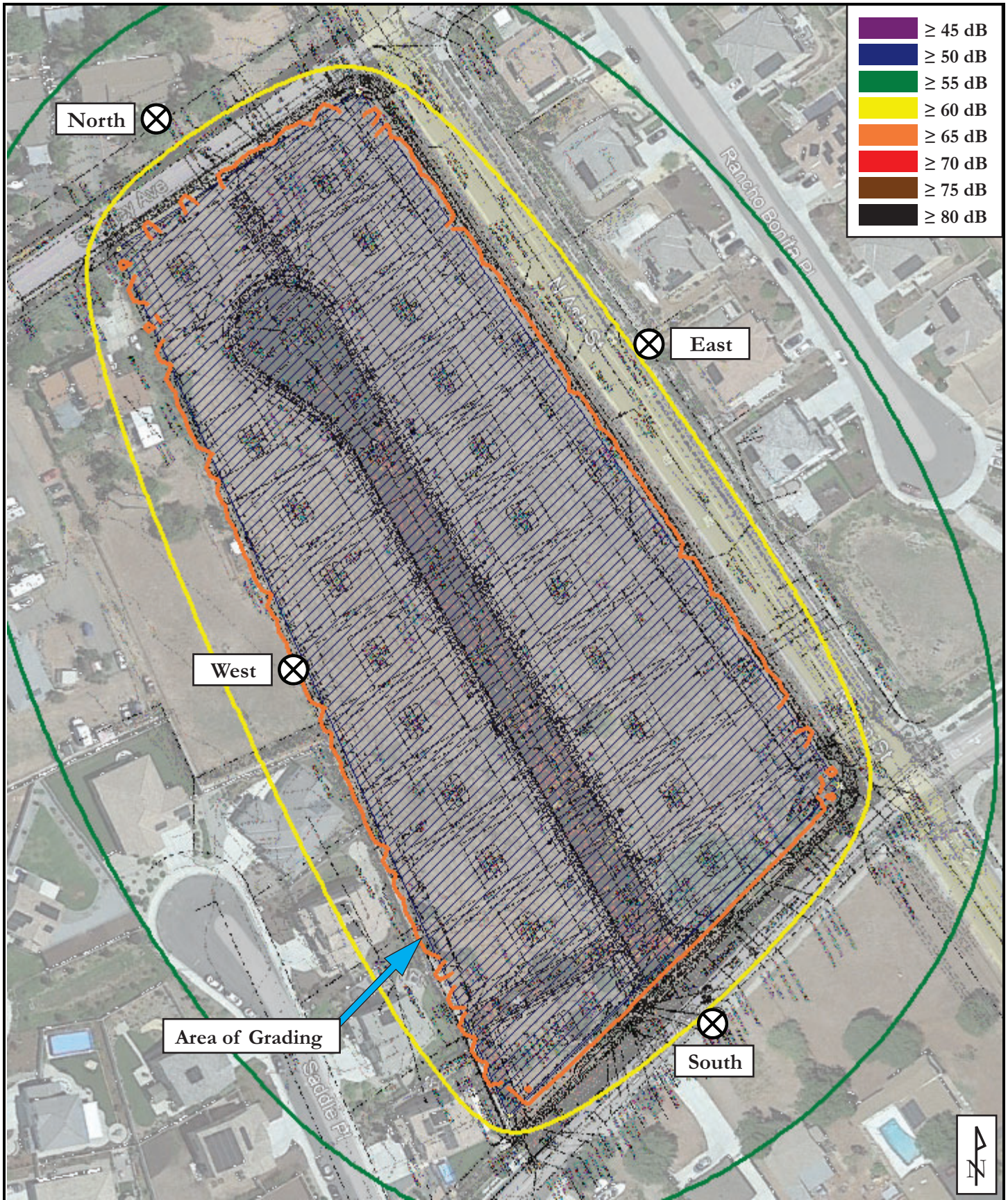
Figure 5



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph Showing
 Equipment Noise Contours and
 Receiver Locations - Nighttime
 Job # S210703b

Figure 6



North ⊗

East ⊗

West ⊗

South ⊗

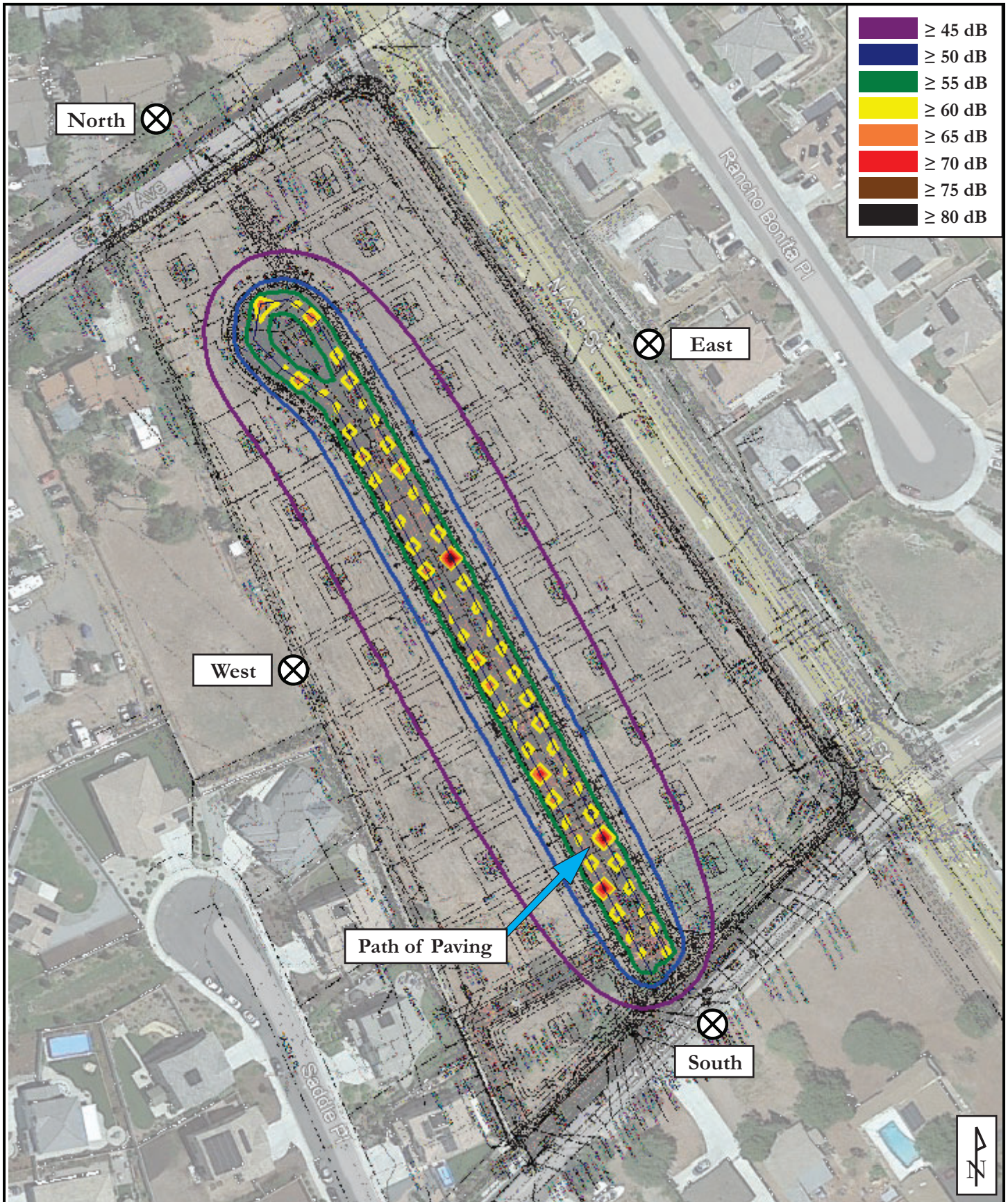
Area of Grading



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph
 Showing Construction Equipment
 Noise Contours and Receiver
 Locations - Grading/Utilities
 Job # S210703b

Figure 7



North ⊗

East ⊗

West ⊗

Path of Paving

South ⊗

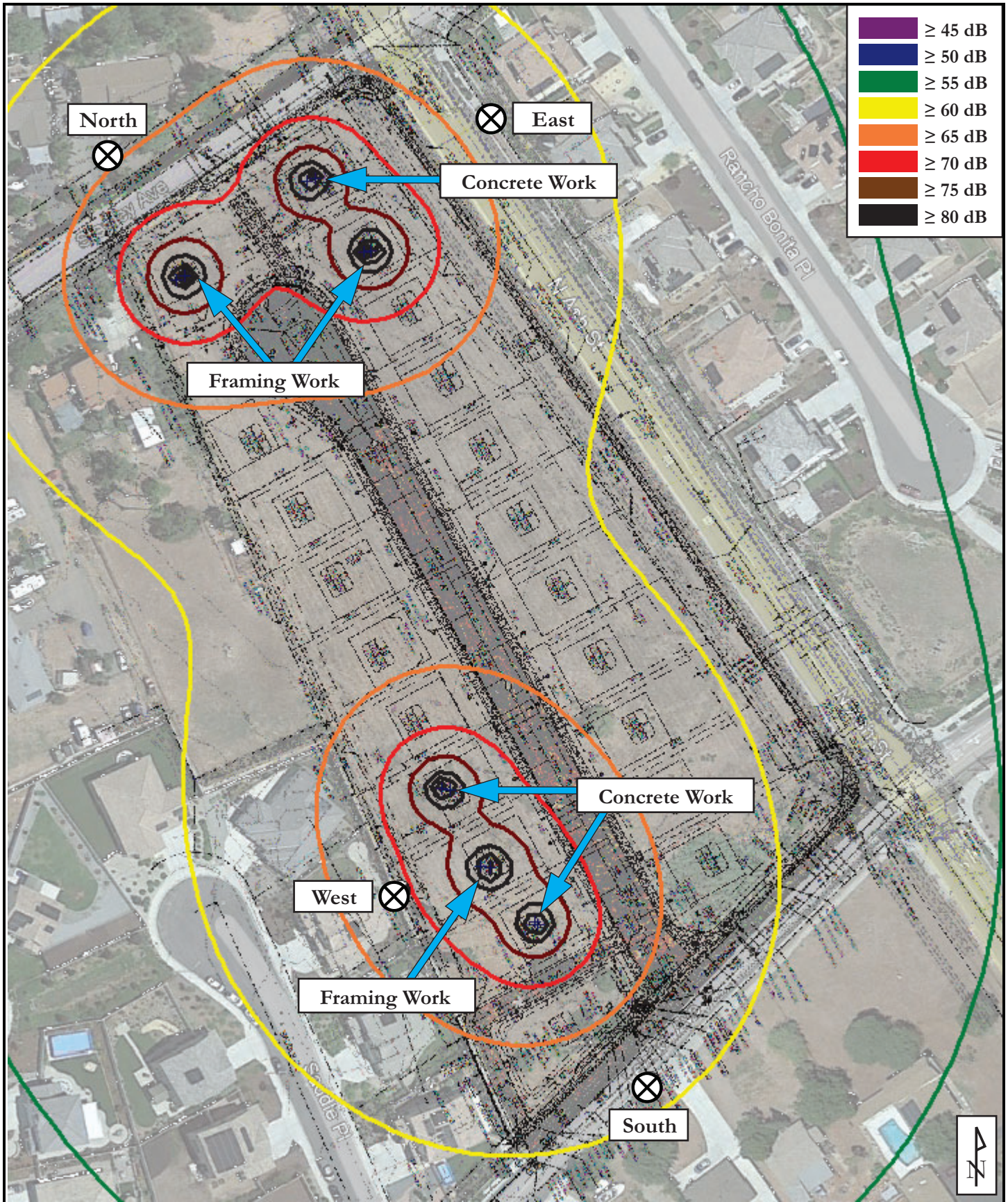
- ≥ 45 dB
- ≥ 50 dB
- ≥ 55 dB
- ≥ 60 dB
- ≥ 65 dB
- ≥ 70 dB
- ≥ 75 dB
- ≥ 80 dB



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph
 Showing Construction Equipment
 Noise Contours and Receiver
 Locations - Paving
 Job # S210703b

Figure 8



Eilar Associates, Inc.
 210 South Juniper Street, Suite 100
 Escondido, California 92025
 760-738-5570

Satellite Aerial Photograph
 Showing Construction Equipment
 Noise Contours and Receiver
 Locations - Building Construction
 Job # S210703b

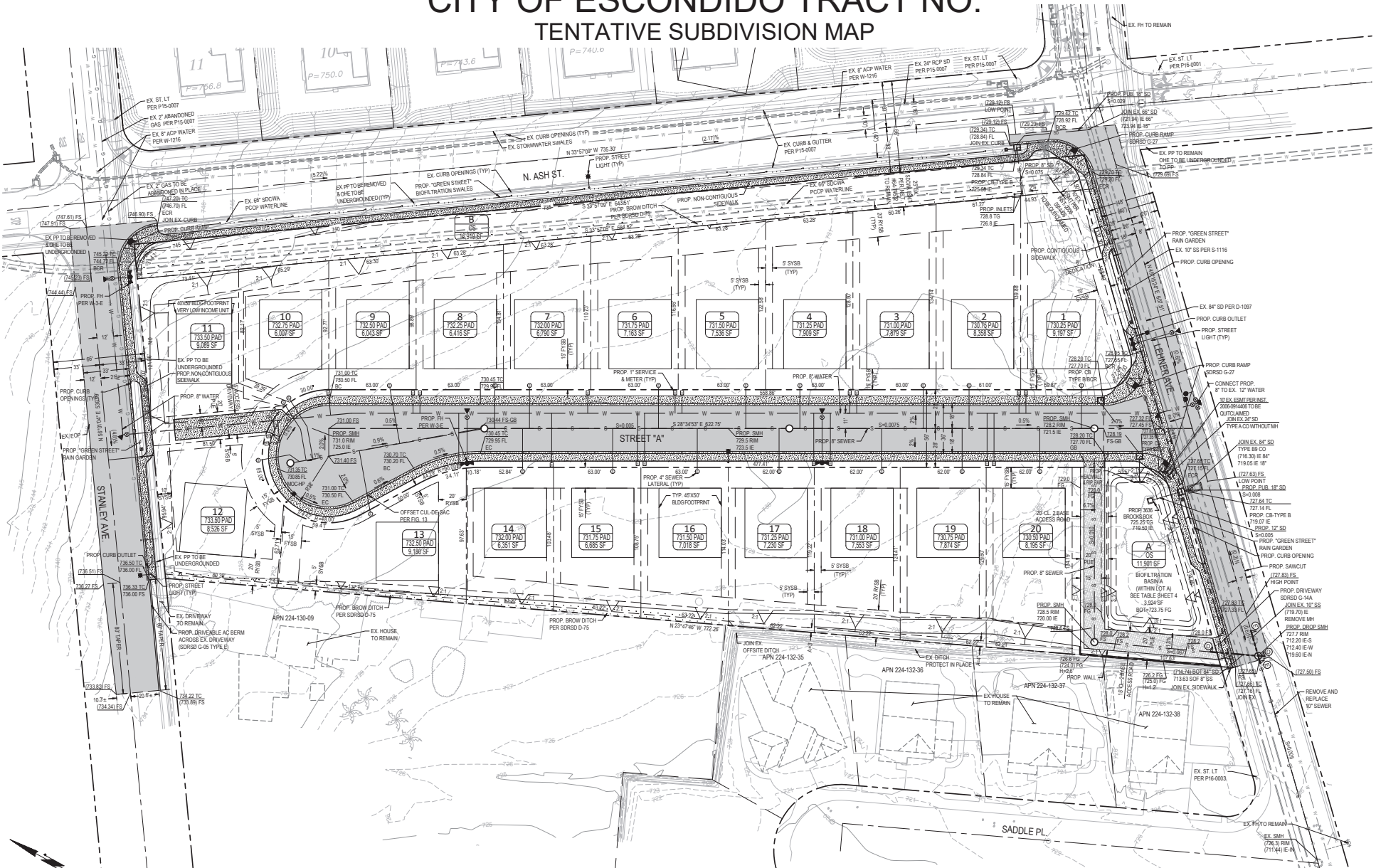
Figure 9



Appendix A

Project Plans

CITY OF ESCONDIDO TRACT NO. TENTATIVE SUBDIVISION MAP





Appendix B

Applicable Noise Regulations

(b) The sound level meter shall be appropriately calibrated and adjusted as necessary by means of an acoustical calibrator of the coupler-type to assure meter accuracy within the tolerances set forth in American National Standards ANSI-SI.4-1971.

(c) For outside measurements, the microphone shall be not less than four (4) feet above the ground, at least four (4) feet distant from walls or other large reflecting surfaces and shall be protected from the effects of wind noises by the use of appropriate wind screens and the location selected shall be at any point on the affected property. In cases when the microphone must be located within ten (10) feet of walls or similar large reflecting surfaces, the actual measured distances and orientation of sources, microphone and reflecting surfaces shall be noted and recorded. In no case shall a noise measurement be taken within five (5) feet of the noise source.

(d) For inside measurements, the microphone shall be at least three (3) feet distant from any wall, ceiling or partition, and the average measurement of at least three (3) microphone positions throughout the room shall be determined. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-229. Sound level limits.

(a) Unless a variance has been applied for and granted pursuant to this article, it shall be unlawful for any person to cause or allow the creation of any noise to the extent that the one-hour average sound level, at any point on or beyond the boundaries of the property on which the sound is produced, exceeds the applicable limits set forth in the following table, except that construction noise level limits shall be governed by Section 17-234 of this article.

TABLE 17-229

Zone	Time	Applicable Limit One-hour Average Sound Level (Decibels)
Residential zones	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
Multi-residential zones	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
Commercial zones	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
Light industrial/	Anytime	70*
Industrial park zones		
General industrial zones	Anytime	75*

* Subject to provisions of Section 17-229 (c)(5).

(b) Maximum Permissible Sound Levels by Receiving Land Use.

(1) The noise standards for the various categories of land use as presented in subsection (a) of this section shall, unless otherwise specifically indicated, apply to each property or portion of property substantially used for a particular type of land use reasonably similar to the land use types shown in subsection (a) of this section. Where two (2) or more dissimilar land uses occur on a single property, the more restrictive noise limits shall apply.

(2) Additional land use classifications may be added by action of the city council to reflect both lower and higher existing ambient levels than those shown.

(3) Where doubt exists when making identification of receiving land use, the city manager shall make an interpretation.

(4) No person shall operate or cause to be operated, any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level to exceed the environmental and/or nuisance interpretation of the applicable limits given in subsection (a) of this section.

(5)(A) Environmental noise shall be measured by the equivalent sound level (Leq) for such hours as are specified.

(B) Nuisance noise shall be measured as a sound level not to be exceeded at any time.

(C) Sound levels by receiving land use shall be measured at the boundary or at any point within the boundary of the property affected.

(D) Fixed location public utility distribution or fixed transmission facilities, located on or adjacent to a property line shall be subject to noise level limits of this section measured at or beyond six (6) feet from the boundary of the easement upon which the equipment is located.

(c) Corrections to Exterior Noise Level Limits.

(1) If the noise is continuous, the Leq for any hour will be represented by any lesser time period within that hour. Noise measurements of a few minutes only will thus suffice to define the noise level.

(2) If the noise is intermittent, the Leq for any hour may be represented by a time period typical of the operating cycle. Measurement should be made of a representative number of noisy/quiet periods. A measurement period of not less than fifteen (15) minutes is, however,

strongly recommended when dealing with intermittent noise.

(3) In the event the alleged offensive noise, as judged by the enforcement officer, contains a steady, audible sound such as a whine, screech or hum, or contains a repetitive impulsive noise such as hammering or riveting, the standard limits set forth in Table 17-229 shall be reduced by ten (10) dB or to the ambient noise level when such noises are not occurring.

(4) If the measured ambient level exceeds that permissible in subsection (a) of this section, the allowable noise exposure standard shall be the ambient noise level. The ambient level shall be measured when the alleged noise violations source is not operating.

(5) The sound level limit at a location on a boundary between two (2) land use classifications is the limit applicable to the receiving land use; provided, however, that the one-hour average sound level limit applicable to extractive industries including but not limited to borrow pits and mines, shall be seventy-five (75) decibels (dB) at the property line regardless of the zone where the extractive industry is actually located.

Fixed-location public utility distribution or transmission facilities located on or adjacent to a property line shall be subject to the noise level limits of this section, measured at or beyond six (6) feet from the boundary of the easement upon which the equipment is located. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-230. Motor vehicles.

(a) Repairs of Motor Vehicles. It shall be unlawful for any person within the city to repair, rebuild or test any motor vehicle in such a manner as to cause disturbing, excessive, or offensive noises as defined in section 17-227 (k) of this article.

(b) On-Highway. Violations for exceeding applicable noise level limits as to persons operating motor vehicles on a public street or highway in the city shall be prosecuted under applicable California Vehicle Code provisions and under federal regulation adopted pursuant to 42 U.S.C. 4905 (a)(1)(A), (B), and (C)(ii), (iii) for which enforcement responsibility is delegated to local governmental agencies.

(c) Off-Highway. Except as otherwise provided for in this article, it shall be unlawful to operate any motor vehicle of any type on any site other than on a public street or highway as defined in the California Vehicle Code in a manner so as to cause noise in excess of those noise levels permitted for on-highway motor vehicles as specified in the table "35 miles per hour or less speed limits" contained in Section 23130 of the California Vehicle Code.

(d) Emergency Vehicles. Nothing in this section shall apply to authorized emergency vehicles when being used in emergency situations.

(e) Urban Transit Buses. Buses as defined in the California Vehicle Code shall at all times comply with the requirements of this section. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-231. Powered model vehicles.

It shall be unlawful for any person to operate any powered model vehicle except between the hours of seven (7) a.m. and nine (9) p.m. and then only in such a manner so as not to emit noise in excess of those levels set forth in section 17-229; however, if powered model vehicles are operated in public parks at a point more than one hundred (100) feet from the property line, the noise level shall be determined at a distance of one hundred (100) feet from the noise source instead of at the property line, and noises from powered model vehicles measured at that distance in excess of the noise limits specified in section 17-229 of this article are prohibited. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-232. Refuse vehicles and parking lot sweepers.

No person shall operate, or permit to be operated, a refuse compacting, processing, or collection vehicle or parking lot sweeper between the hours of ten (10) p.m. to six (6) a.m. in or adjacent to any residential zone unless a variance has been applied for and granted pursuant to this article. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-233. Reserved.

Sec. 17-234. Construction equipment.

Except for emergency work, it shall be unlawful for any person, including the City of Escondido, to operate construction equipment as follows:

(a) It shall be unlawful for any person, including the City of Escondido, to operate construction equipment at any construction site, except on Monday through Friday during a week between the hours of seven (7) a.m. and six (6) p.m. and on Saturdays between the hours of nine (9) a.m. and five (5) p.m., and provided that the operation of such construction equipment complies with the requirements of subsection (d) of this section.

(b) It shall be unlawful for any person, including the City of Escondido, to operate construction equipment at any construction site on Sundays and on days designated by the president, governor or city council as public holidays.

(c) A person may operate construction equipment at his/her residence or for the purpose of constructing or modifying a residence for himself/herself on Monday through Friday of a week between the hours of seven (7) a.m. and six (6) p.m., and on Saturdays, Sundays, and holidays between the hours of nine (9) a.m. and five (5) p.m.; provided, that such operation of construction equipment is not carried on for profit or livelihood and complies with the requirements of subsection (d) of this section.

(d) No construction equipment or combination of equipment, regardless of age or date of acquisition, shall be operated so as to cause noise in excess of a one-hour average sound level limit of seventy-five (75) dB at any time, unless a variance has been obtained in advance from the city manager.

(e) Persons engaged in construction for profit or as a business shall post signs at conspicuous places on a construction site, indicating hours of work as prescribed by this article or authorized by permit and the applicable noise level limits. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-235. Containers and construction material.

It shall be unlawful for any person to handle or transport or cause to be handled or transported in any public place, any container or any construction material in such a way as to create a disturbing, excessive or offensive noise as defined under section 17-227 (k) of this article. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-236. Signal device for food trucks.

No person shall operate or cause to have operated or used any sound signal device other than sound-amplification equipment attached to a motor vehicle wagon or manually propelled cart from which food or any other items are sold which emits a sound signal more frequently than once every ten (10) minutes in any one street block and with a duration of more than ten (10) seconds for any single emission. The sound level of this sound signal shall not exceed ninety (90) decibels at fifty (50) feet. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-237. Landscape equipment.

It shall be unlawful for any person, including the City of Escondido to use any motorized landscape equipment, including but not limited to power blowers and vacuums, which causes a disturbing, excessive or offensive noise as defined under section 17-227 (k) of this article. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-238. Grading.

(a) It shall be unlawful for any person, including the City of Escondido, to do any authorized grading at any construction site, except on Mondays through Fridays during a week between the hours of seven (7) a.m. and six (6) p.m. and, provided a variance has been obtained in advance from the city manager, on Saturdays from ten (10) a.m. to five (5) p.m.

(b) For the purpose of this section, “grading” shall include but not be limited to compacting, drilling, rock crushing or splitting, bulldozing, clearing, dredging, digging, filling and blasting.

(c) In addition, any equipment used for grading shall not be operated so as to cause noise in excess of a one hour sound level limit of seventy-five (75) dB at any time when measured at or within the property lines of any property which is developed and used in whole or in part for residential purposes, unless a variance has been obtained in advance from the city manager. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-239. Multiple family dwelling units.

Notwithstanding any other provisions of this article, it shall be unlawful for any person to create, maintain, or cause to be maintained any sound within the interior of any multiple family dwelling unit which causes the noise level to exceed those limits set forth below in any other dwelling unit:

MISSING TABLE

The monitoring procedures outlined under section 17-228 shall be followed in enforcing this section. (Ord. No. 90-8, § 2, 3-28-90)

Sec. 17-240. General noise regulations.

(a) General Prohibitions. In the absence of objective measurement by use of a sound level meter, it additionally shall be unlawful for any person to make, continue or cause to be made or continued, within the limits of said city, any disturbing, excessive or offensive noise which causes discomfort or annoyance to reasonable persons of normal sensitivity.

The characteristics and conditions which should be considered in determining whether a violation of the provisions of this section exists, include, but are not limited to, the following:

- (1) The level of noise;
- (2) Whether the nature of the noise is usual or unusual;
- (3) Whether the origin of the noise is natural or unnatural;
- (4) The level of the background noise;
- (5) The proximity of the noise to sleeping facilities;

Cross reference(s)--Definitions, § 12.101 et seq.

SEC. 36.403. SOUND LEVEL MEASUREMENT.

(a) A sound level measurement made pursuant to this chapter shall be measured with a sound level meter using A-weighting and a "slow" response time, as these terms are used in ANSI S1.1-1994 or its latest revision.

(b) Each measurement shall be conducted at the boundary line of the property on which the noise source is located or any place on the affected property, but no closer than five feet from the noise source.

(c) The sound level meter shall be calibrated and adjusted by means of an acoustical calibrator of the coupler-type to assure meter accuracy within the tolerances in the ANSI specifications for sound level meters, ANSI S1.4-1983 or its latest revision. The sound level meter shall be used as provided in the manufacturer's instructions.

(Amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.404. GENERAL SOUND LEVEL LIMITS.

(a) Except as provided in section 36.409 of this chapter, it shall be unlawful for any person to cause or allow the creation of any noise, which exceeds the one-hour average sound level limits in Table 36.404, when the one-hour average sound level is measured at the property line of the property on which the noise is produced or at any location on a property that is receiving the noise.

**TABLE 36.404
SOUND LEVEL LIMITS IN DECIBELS (dBA)**

ZONE	TIME	ONE-HOUR AVERAGE SOUND LEVEL LIMITS (dBA)
(1) RS, RD, RR, RMH, A70, A72, S80, S81, S90, S92, RV, and RU with a General Plan Land Use Designation density of less than 10.9 dwelling units per acre.	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
(2) RRO, RC, RM, S86, V5, RV and RU with a General Plan Land Use Designation density of 10.9 or more dwelling units per acre.	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
(3) S94, V4, and all commercial zones.	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
(4) V1, V2	7 a.m. to 7 p.m.	60
V1, V2	7 p.m. to 10 p.m.	55
V1	10 p.m. to 7 a.m.	55
V2	10 p.m. to 7 a.m.	50
V3	7 a.m. to 10 p.m.	70
	10 p.m. to 7 a.m.	65
(5) M50, M52, and M54	Anytime	70

(6)	S82, M56, and M58.	Anytime	75
(7)	S88 (see subsection (c) below)		

(b) Where a noise study has been conducted and the noise mitigation measures recommended by that study have been made conditions of approval of a Major Use Permit, which authorizes the noise-generating use or activity and the decision making body approving the Major Use Permit determined that those mitigation measures reduce potential noise impacts to a level below significance, implementation and compliance with those noise mitigation measures shall constitute compliance with subsection (a) above.

(c) S88 zones are Specific Planning Areas which allow different uses. The sound level limits in Table 36.404 above that apply in an S88 zone depend on the use being made of the property. The limits in Table 36.404, subsection (1) apply to property with a residential, agricultural or civic use. The limits in subsection (3) apply to property with a commercial use. The limits in subsection (5) apply to property with an industrial use that would only be allowed in an M50, M52 or M54 zone. The limits in subsection (6) apply to all property with an extractive use or a use that would only be allowed in an M56 or M58 zone.

(d) If the measured ambient noise level exceeds the applicable limit in Table 36.404, the allowable one-hour average sound level shall be the one-hour average ambient noise level, plus three decibels. The ambient noise level shall be measured when the alleged noise violation source is not operating.

(e) The sound level limit at a location on a boundary between two zones is the arithmetic mean of the respective limits for the two zones. The one-hour average sound level limit applicable to extractive industries, however, including but not limited to borrow pits and mines, shall be 75 decibels at the property line regardless of the zone in which the extractive industry is located.

(f) A fixed-location public utility distribution or transmission facility located on or adjacent to a property line shall be subject to the sound level limits of this section measured at or beyond six feet from the boundary of the easement upon which the facility is located.

(Amended by Ord. No. 7094 (N.S.), effective 3-25-86; amended by Ord. No. 9478 (N.S.), effective 7-19-02; amended by Ord. No. 9621 (N.S.), effective 1-9-04; amended by Ord. No. 9962 (N.S.), effective 1-9-09; amended by Ord. No. 10211 (N.S.), effective 6-1-12)

SEC. 36.405. REPAIRING, REBUILDING OR TESTING MOTOR VEHICLES.

It shall be unlawful for any person to repair, rebuild or test any motor vehicle in such a manner as to cause a disturbing, excessive or offensive noise as defined in section 36.402 of this chapter.

(Amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.406. POWERED MODEL VEHICLES.

It shall be unlawful for any person to operate a powered model vehicle between 9 p.m. and 7 a.m. A powered model vehicle operated in a County park shall meet the daytime sound level standards for an RS zone measured at a point 100 feet from the park property line or 100 feet from where the model vehicle is being operated, whichever is less.

(Amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.407. REFUSE VEHICLES & PARKING LOT SWEEPERS.

No person shall operate or allow to be operated, a refuse compacting, processing, or collection vehicle or a parking lot sweeper between the hours of 10 p.m. to 6 a.m., in or within 100 feet of a residential zone.

(Amended by Ord. No. 7428 (N.S.), effective 2-4-88; amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.408. HOURS OF OPERATION OF CONSTRUCTION EQUIPMENT.

Except for emergency work, it shall be unlawful for any person to operate or cause to be operated, construction equipment:

(a) Between 7 p.m. and 7 a.m.

(b) On a Sunday or a holiday. For purposes of this section, a holiday means January 1st, the last Monday in May, July 4th, the first Monday in September, December 25th and any day appointed by the President as a special national holiday or the Governor of the State as a special State holiday. A person may, however, operate construction equipment on a Sunday or holiday between the hours of 10 a.m. and 5 p.m. at the person's residence or for the purpose of constructing a residence for himself or herself, provided that the operation of construction equipment is not carried out for financial consideration or other consideration of any kind and does not violate the limitations in sections 36.409 and 36.410.

(Amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.409. SOUND LEVEL LIMITATIONS ON CONSTRUCTION EQUIPMENT.

Except for emergency work, it shall be unlawful for any person to operate construction equipment or cause construction equipment to be operated, that exceeds an average sound level of 75 decibels for an eight-hour period, between 7 a.m. and 7 p.m., when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is being received.

(Amended by Ord. No. 9700 (N.S.), effective 2-4-05; amended by Ord. No. 9962 (N.S.), effective 1-9-09)

SEC. 36.410. SOUND LEVEL LIMITATIONS ON IMPULSIVE NOISE.

In addition to the general limitations on sound levels in section 36.404 and the limitations on construction equipment in section 36.409, the following additional sound level limitations shall apply:

(a) Except for emergency work or work on a public road project, no person shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410A, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410A are as described in the County Zoning Ordinance.

**TABLE 36.410A.
MAXIMUM SOUND LEVEL (IMPULSIVE) MEASURED AT OCCUPIED PROPERTY IN DECIBELS (dBA)**

OCCUPIED PROPERTY USE	DECIBELS (dBA)
Residential, village zoning or civic use	82
Agricultural, commercial or industrial use	85

(b) Except for emergency work, no person working on a public road project shall produce or cause to be produced an impulsive noise that exceeds the maximum sound level shown in Table 36.410B, when measured at the boundary line of the property where the noise source is located or on any occupied property where the noise is received, for 25 percent of the minutes in the measurement period, as described in subsection (c) below. The maximum sound level depends on the use being made of the occupied property. The uses in Table 36.410B are as described in the County Zoning Ordinance.



Appendix C

CadnaA Analysis Data and Results

Eilar Associates, Inc.

210 South Juniper Street, Suite 100

Escondido, California 92025-4230

Phone: (760) 738-5570

Date: 10 Aug 2022

Calculation Configuration

Configuration	
Parameter	Value
General	
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	1000.00
Min. Length of Section (#(Unit,LEN))	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rcvr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	1.00
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receivers

Name	M. ID	Level Lr		Limit. Value		Land Use			Height	Coordinates		
		Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)	Type	Auto	Noise Type		X (ft)	Y (ft)	Z (ft)
North	R1	34.8	31.7	0.0	0.0		x	Total	5.00 r	390.29	935.74	5.00
East	R2	35.6	32.6	0.0	0.0		x	Total	5.00 r	775.56	755.60	5.00
South	R3	36.1	33.1	0.0	0.0		x	Total	5.00 r	893.73	298.24	5.00
West1	R4	40.5	37.5	0.0	0.0		x	Total	5.00 r	552.92	382.68	5.00
West2	R5	44.4	41.4	0.0	0.0		x	Total	5.00 r	418.02	691.32	5.00

Point Sources

Name	M.	ID	Result. PWL			Lw / Li		Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Height	Coordinates		
			Day (dBA)	Evening (dBA)	Night (dBA)	Type	Value	norm.	Day dB(A)	Evening dB(A)	Night dB(A)	R		Area (ft²)	Day (min)	Special (min)					Night (min)	X (ft)	Y (ft)
AC		1	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	841.14	358.82	4.00
AC		2	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	811.44	410.55	4.00
AC		3	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	780.80	465.53	4.00
AC		4	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	752.35	517.78	4.00
AC		5	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	721.62	573.17	4.00
AC		6	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	691.98	627.62	4.00
AC		7	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	659.93	684.83	4.00
AC		8	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	631.94	735.50	4.00
AC		9	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	600.58	794.08	4.00
AC		10	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	570.59	847.16	4.00
AC		11	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	532.22	896.91	4.00
AC		12	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	396.41	836.28	4.00
AC		13	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	442.26	702.35	4.00
AC		14	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	490.51	615.85	4.00
AC		15	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	519.90	562.00	4.00
AC		16	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	551.16	507.29	4.00
AC		17	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	580.69	450.41	4.00
AC		18	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	610.21	397.87	4.00
AC		19	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	640.17	342.72	4.00
AC		20	73.6	73.6	73.6	Lw	L2		0.0	0.0	0.0			60.00	0.00	30.00	0.0	(none)	4.00	r	669.70	291.05	4.00

Sound Level Spectra

Name	ID	Type	1/3 Oktave Spectrum (dB)											Source
			Weight.	63	125	250	500	1000	2000	4000	8000	A	lin	
Carrier 25HBC560	L2	Lw	A		60.0	63.0	66.0	69.0	66.0	63.5	63.0	73.6	79.0	Mfr

Eilar Associates, Inc.

210 South Juniper Street, Suite 100

Escondido, California 92025-4230

Phone: (760) 738-5570

Date: 10 Aug 2022

Calculation Configuration

Configuration	
Parameter	Value
General	
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	1000.00
Min. Length of Section (#(Unit,LEN))	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rcvr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	1.00
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receivers

Name	M.	ID	Level Lr		Limit. Value		Land Use			Height	Coordinates		
			Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)	Type	Auto	Noise Type		X (ft)	Y (ft)	Z (ft)
North		R1	58.3	-80.2	0.0	0.0		x	Total	5.00 r	390.29	935.74	5.00
East		R2	59.4	-80.2	0.0	0.0		x	Total	5.00 r	775.56	755.60	5.00
South		R3	59.4	-80.2	0.0	0.0		x	Total	5.00 r	828.08	226.02	5.00
West		R4	65.3	-80.2	0.0	0.0		x	Total	5.00 r	499.30	501.95	5.00

Area Sources

Name	M.	ID	Result. PWL			Result. PWL"			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Moving Pt. Src		
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area	Day	Special	Night	Day				Evening	Night	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)								(ft²)		(min)	(min)	(min)	(dB)	(Hz)		Day	Evening	Night
Backhoe		AS_1	98.8	-1.2	-1.2	56.0	-44.0	-44.0	PWL-Pt	C1		0.0	0.0	0.0				24.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0
Excavator		AS_2	108.9	8.9	8.9	66.1	-33.9	-33.9	PWL-Pt	C2		0.0	0.0	0.0				24.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0
Dump Truck		AS_3	110.2	10.2	10.2	67.4	-32.6	-32.6	PWL-Pt	C3		0.0	0.0	0.0				24.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0
Front Loader		AS_4	106.5	6.5	6.5	63.7	-36.3	-36.3	PWL-Pt	C4		0.0	0.0	0.0				24.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0

Geometry - Area Sources

Name	Height		Coordinates			
	Begin	End	x	y	z	Ground
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Backhoe	5.00	r	356.55	832.01	5.00	0.00
			546.94	956.75	5.00	0.00
			925.53	408.56	5.00	0.00
			665.11	147.04	5.00	0.00
Excavator	5.00	r	356.55	832.01	5.00	0.00
			546.94	956.75	5.00	0.00
			925.53	408.56	5.00	0.00
			665.11	147.04	5.00	0.00
Dump Truck	5.00	r	356.55	832.01	5.00	0.00
			546.94	956.75	5.00	0.00
			925.53	408.56	5.00	0.00
			665.11	147.04	5.00	0.00
Front Loader	5.00	r	356.55	832.01	5.00	0.00
			546.94	956.75	5.00	0.00
			925.53	408.56	5.00	0.00
			665.11	147.04	5.00	0.00

Sound Level Spectra

Name	ID	Type	1/3 Oktave Spectrum (dB)											Source
			Weight.	63	125	250	500	1000	2000	4000	8000	A	lin	
Backhoe	C1	Lw (c)		105.0	97.0	95.0	95.0	94.0	91.0	90.0	81.0	98.8	106.8	Defra
Excavator	C2	Lw (c)		111.0	114.0	107.0	104.0	103.0	101.0	100.0	97.0	108.9	117.0	Defra
Dump Truck	C3	Lw (c)		119.0	115.0	106.0	104.0	106.0	103.0	99.0	91.0	110.2	120.9	Defra
Front Loader	C4	Lw (c)		113.0	113.0	102.0	104.0	100.0	98.0	97.0	89.0	106.5	116.6	Defra
Paver	C5	Lw (c)		113.0	113.0	109.0	103.0	100.0	98.0	92.0	85.0	106.7	117.1	Defra
Roller	C6	Lw (c)		111.0	106.0	108.0	103.0	98.0	93.0	85.0	77.0	104.6	114.1	Defra
Concrete Mixer Truck	C7	Lw (c)		111.0	100.0	97.0	101.0	102.0	100.0	95.0	89.0	106.1	112.6	
Concrete Pump Truck	C8	Lw (c)		106.0	107.0	102.0	101.0	102.0	99.0	95.0	91.0	106.1	111.7	Defra
Air Compressor	C9	Lw (c)		115.0	104.0	95.0	90.0	88.0	86.0	89.0	78.0	96.5	115.4	Defra
Forklift	C10	Lw (c)		94.8	102.3	102.7	104.0	104.3	102.9	98.3	91.6	108.8	110.7	Brutoco

Eilar Associates, Inc.

210 South Juniper Street, Suite 100

Escondido, California 92025-4230

Phone: (760) 738-5570

Date: 10 Aug 2022

Calculation Configuration

Configuration	
Parameter	Value
General	
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	1000.00
Min. Length of Section (#(Unit,LEN))	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rcvr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	1.00
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receivers

Name	M.	ID	Level Lr		Limit. Value		Land Use			Height	Coordinates		
			Day (dBA)	Night (dBA)	Day (dBA)	Night (dBA)	Type	Auto	Noise Type		X (ft)	Y (ft)	Z (ft)
North		R1	35.4	-80.2	0.0	0.0		x	Total	5.00 r	390.29	935.74	5.00
East		R2	37.3	-80.2	0.0	0.0		x	Total	5.00 r	775.56	755.60	5.00
South		R3	40.9	-80.2	0.0	0.0		x	Total	5.00 r	828.08	226.02	5.00
West		R4	41.2	-80.2	0.0	0.0		x	Total	5.00 r	499.30	501.95	5.00

Line Sources

Name	M.	ID	Result. PWL			Result. PWL'			Lw / Li			Correction			Sound Reduction		Attenuation			Operating Time			K0	Freq.	Direct.	Moving Pt. Src			
			Day (dBA)	Evening (dBA)	Night (dBA)	Day (dBA)	Evening (dBA)	Night (dBA)	Type	Value	norm.	Day dB(A)	Evening dB(A)	Night dB(A)	R	Area (ft²)	Day (min)	Special (min)	Night (min)	(dB)	(Hz)	Day				Evening	Night	Speed (mph)	
Paver		LS_1	92.5	-7.5	-7.5	66.7	-33.3	-33.3	PWL-Pt	C5		0.0	0.0	0.0				30.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0	6.2		
Roller		LS_2	90.4	-9.6	-9.6	64.6	-35.4	-35.4	PWL-Pt	C6		0.0	0.0	0.0				12.00	0.00	0.00	0.0		(none)	1.0	0.0	0.0	6.2		

Geometry - Line Sources

Name	Height		Coordinates				
	Begin (ft)	End (ft)	x (ft)	y (ft)	z (ft)	Ground (ft)	
Paver	5.00	r	790.23	277.39	5.00	0.00	
			613.93	601.33	5.00	0.00	
			547.93	717.70	5.00	0.00	
			513.19	776.76	5.00	0.00	
			492.34	794.13	5.00	0.00	
			470.20	790.22	5.00	0.00	
			464.55	761.56	5.00	0.00	
			487.13	739.41	5.00	0.00	
			525.35	714.23	5.00	0.00	
			778.07	261.75	5.00	0.00	
Roller	5.00	r	790.23	277.39	5.00	0.00	
			613.93	601.33	5.00	0.00	
			547.93	717.70	5.00	0.00	
			513.19	776.76	5.00	0.00	
			492.34	794.13	5.00	0.00	
			470.20	790.22	5.00	0.00	
			464.55	761.56	5.00	0.00	
			487.13	739.41	5.00	0.00	
			525.35	714.23	5.00	0.00	
			778.07	261.75	5.00	0.00	

Sound Level Spectra

Name	ID	Type	1/3 Oktave Spectrum (dB)											Source
			Weight.	63	125	250	500	1000	2000	4000	8000	A	lin	
Backhoe	C1	Lw (c)		105.0	97.0	95.0	95.0	94.0	91.0	90.0	81.0	98.8	106.8	Defra
Excavator	C2	Lw (c)		111.0	114.0	107.0	104.0	103.0	101.0	100.0	97.0	108.9	117.0	Defra
Dump Truck	C3	Lw (c)		119.0	115.0	106.0	104.0	106.0	103.0	99.0	91.0	110.2	120.9	Defra
Front Loader	C4	Lw (c)		113.0	113.0	102.0	104.0	100.0	98.0	97.0	89.0	106.5	116.6	Defra
Paver	C5	Lw (c)		113.0	113.0	109.0	103.0	100.0	98.0	92.0	85.0	106.7	117.1	Defra
Roller	C6	Lw (c)		111.0	106.0	108.0	103.0	98.0	93.0	85.0	77.0	104.6	114.1	Defra
Concrete Mixer Truck	C7	Lw (c)		111.0	100.0	97.0	101.0	102.0	100.0	95.0	89.0	106.1	112.6	
Concrete Pump Truck	C8	Lw (c)		106.0	107.0	102.0	101.0	102.0	99.0	95.0	91.0	106.1	111.7	Defra
Air Compressor	C9	Lw (c)		115.0	104.0	95.0	90.0	88.0	86.0	89.0	78.0	96.5	115.4	Defra
Forklift	C10	Lw (c)		94.8	102.3	102.7	104.0	104.3	102.9	98.3	91.6	108.8	110.7	Brutoco

Eilar Associates, Inc.

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Date: 10 Aug 2022

Calculation Configuration

Configuration	
Parameter	Value
General	
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.00
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	1000.00
Min. Length of Section (#(Unit,LEN))	1.00
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	6.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	0
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rcvr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Excl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	1.00
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (Schall 03 (1990))	
Strictly acc. to Schall 03 / Schall-Transrapid	
Aircraft (???)	
Strictly acc. to AzB	

Receivers

Name	M.	ID	Level Lr		Limit. Value		Land Use			Height	Coordinates			
			Day	Night	Day	Night	Type	Auto	Noise Type		X	Y	Z	
			(dBA)	(dBA)	(dBA)	(dBA)				(ft)	(ft)	(ft)	(ft)	
North		R1	64.5	-80.2	0.0	0.0		x	Total	5.00	r	350.92	905.96	5.00
East		R2	62.9	-80.2	0.0	0.0		x	Total	5.00	r	653.51	936.76	5.00
South		R3	61.1	-80.2	0.0	0.0		x	Total	5.00	r	775.54	176.76	5.00
West		R4	69.0	-80.2	0.0	0.0		x	Total	5.00	r	578.11	327.35	5.00

Point Sources

Name	M.	ID	Result. PWL			Lw / Li		Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Height	Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R		Area	Day	Special					Night	(dB)	(Hz)
			(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)		(ft²)	(min)	(min)	(min)				(ft)	(ft)	(ft)	(ft)	
Concrete Mixer		S1	106.1	106.1	106.1	Lw	C7		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	684.22	302.25	5.00
Concrete Pump		S2	106.1	106.1	106.1	Lw	C8		0.0	0.0	0.0		12.00	0.00	0.00	0.0		(none)	5.00	r	686.68	300.14	5.00
Compressor		S3	96.5	96.5	96.5	Lw	C9		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	642.38	346.37	5.00
Forklift		S4	108.8	108.8	108.8	Lw	C10		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	649.33	345.07	5.00
Concrete Mixer		S5	106.1	106.1	106.1	Lw	C7		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	611.11	407.19	5.00
Concrete Pump		S6	106.1	106.1	106.1	Lw	C8		0.0	0.0	0.0		12.00	0.00	0.00	0.0		(none)	5.00	r	617.62	406.32	5.00
Compressor		S7	96.5	96.5	96.5	Lw	C9		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	402.27	808.66	5.00
Forklift		S8	108.8	108.8	108.8	Lw	C10		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	408.79	811.27	5.00
Concrete Mixer		S9	106.1	106.1	106.1	Lw	C7		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	505.23	885.55	5.00
Concrete Pump		S10	106.1	106.1	106.1	Lw	C8		0.0	0.0	0.0		12.00	0.00	0.00	0.0		(none)	5.00	r	511.74	888.59	5.00
Compressor		S11	96.5	96.5	96.5	Lw	C9		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	550.41	829.95	5.00
Forklift		S12	108.8	108.8	108.8	Lw	C10		0.0	0.0	0.0		24.00	0.00	0.00	0.0		(none)	5.00	r	555.62	830.82	5.00

Sound Level Spectra

Name	ID	Type	1/3 Oktave Spectrum (dB)											Source
			Weight.	63	125	250	500	1000	2000	4000	8000	A	lin	
Backhoe	C1	Lw (c)		105.0	97.0	95.0	95.0	94.0	91.0	90.0	81.0	98.8	106.8	Defra
Excavator	C2	Lw (c)		111.0	114.0	107.0	104.0	103.0	101.0	100.0	97.0	108.9	117.0	Defra
Dump Truck	C3	Lw (c)		119.0	115.0	106.0	104.0	106.0	103.0	99.0	91.0	110.2	120.9	Defra
Front Loader	C4	Lw (c)		113.0	113.0	102.0	104.0	100.0	98.0	97.0	89.0	106.5	116.6	Defra
Paver	C5	Lw (c)		113.0	113.0	109.0	103.0	100.0	98.0	92.0	85.0	106.7	117.1	Defra
Roller	C6	Lw (c)		111.0	106.0	108.0	103.0	98.0	93.0	85.0	77.0	104.6	114.1	Defra
Concrete Mixer Truck	C7	Lw (c)		111.0	100.0	97.0	101.0	102.0	100.0	95.0	89.0	106.1	112.6	
Concrete Pump Truck	C8	Lw (c)		106.0	107.0	102.0	101.0	102.0	99.0	95.0	91.0	106.1	111.7	Defra
Air Compressor	C9	Lw (c)		115.0	104.0	95.0	90.0	88.0	86.0	89.0	78.0	96.5	115.4	Defra
Forklift	C10	Lw (c)		94.8	102.3	102.7	104.0	104.3	102.9	98.3	91.6	108.8	110.7	Brutoco