

**Appendix P Noise Impacts from the Bear Valley
Parkway Specific Alignment Plan
(September 2016)**

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September 27, 2016

Ann Dolmage, Associate Planner
City of Escondido, Planning Division
201 North Broadway
Escondido, CA 92026

Subject: Noise Impacts from the Bear Valley Parkway Full-Width Specific Alignment Plan Project Component, Escondido, CA.

Dear Ms. Dolmage:

The following presents the results of Harris & Associates' (Harris) analysis of the potential noise impacts of the Full-Width Specific Plan for the Alignment of Bear Valley Parkway adjacent to the proposed 661 Bear Valley Parkway residential development in the City of Escondido (City). The Full-Width Specific Alignment Plan (SAP) roadway improvements would address goals in the City's General Plan Mobility Element, such as bicycle and pedestrian access, and would make Bear Valley Parkway compliant with infrastructure requirements for classification as a Major Road. The SAP would also improve the geometry of the intersection at Bear Valley Parkway and Encino Drive. Construction of the SAP component of the project would occur independent of the proposed 661 Bear Valley Parkway residential development. The full-width road widening would involve relocation of existing retaining walls and fences, as well as the acquisition/dedication of additional right of way along the property lines of residences located on the west side of Bear Valley Parkway between Sunset Drive and Encino Drive.

This memorandum describes the regulatory setting, the potential for permanent changes in operational noise as a result of the project, and potential impacts from groundborne vibration, and temporary construction-related noise.

This analysis refers to the Acoustical Site Assessment prepared by Investigative Science and Engineering (ISE) on April 27, 2016 for the residential development component of the project.

Noise Terms and General Principles

Environmental noise is comprised of infinite combinations of sound intensities of varying frequency and duration. The following weighted and averaging terms are used to reasonably characterize environmental noise (County of San Diego 2009).

- A-weighted Sound Pressure Level (decibel (dB) or dBA). Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more heavily (A-weighted) so that the response of the average human ear is simulated.



- Equivalent Sound Level (L_{eq}). Environmental noise often fluctuates over time. To be able to describe this in a practicable manner the L_{eq} was developed. L_{eq} is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.
- One-Hour Equivalent Noise Level (L_{eq-h}). A one-hour equivalent noise level is a measurement of noise intensity, which is the equivalent sound level (L_{eq}) over a one hour averaging period.
- Maximum Sound Level (L_{MAX}). The highest sound level reached when measuring noise with a sound level meter using the A-weighted network and slow time weighting. The maximum sound level is equivalent to the industry standard known as L_{MAX} .
- Impulsive Noise. Any single noise event or a series of single noise events, which causes a high peak noise level of short duration (one second or less), measured at a specific location. Examples include, but are not limited to, a gunshot, an explosion or a noise generated by construction equipment.
- Noise Sensitive Land Use (NSLU). Any residence, hospital, school, hotel, resort, library, or similar facility where quiet is an important attribute of the environment.

Regulatory Setting

As described in the City of Escondido Noise Ordinance Section 17-234 (Construction Equipment), it is illegal for any person to operate construction equipment at any construction site except on Monday through Friday between the hours of 7 am and 6 pm and on Saturdays between the hours of 9 am and 5 pm. Section 17-238 (Grading) further restricts grading activities. It states that it is illegal to do any authorized grading at any construction site except on Mondays through Fridays between the hours of 7 am and 6 pm and, provided a variance has been obtained in advance from the City Manager, on Saturdays from 10 am to 5 pm.

Furthermore, Section 17-234 of the City of Escondido Noise Ordinance states that no construction equipment or combination of equipment shall be operated so as to cause noise in excess of a one-hour average sound level limit of 75 decibels (dB) L_{eq-h} at any time.

The City's General Plan Community Protection Element Noise Policy 5.5 requires construction projects and new development to ensure acceptable vibration levels at nearby noise-sensitive uses based on Federal Transit Administration (FTA) criteria. The FTA Transit Noise Impact and Vibration Assessment (2006) stipulates an impact criterion for groundborne vibration at residences or buildings where people normally sleep of 80 velocity in decibels (VdB)¹ for infrequent events² and 75 VdB for occasional events.³ It also stipulates an impact criterion for groundborne vibration of 0.3 inches per second peak particle velocity (in/sec PPV)⁴ at engineered concrete and masonry structures and 0.2 in/sec PPV at non-engineered timber and masonry buildings.

¹ Groundborne vibration related to human annoyance is generally related to root mean square (rms) velocity levels expressed in velocity in decibels (VdB) relative to 1 micro-inch/second.

² Infrequent events are defined as fewer than 30 vibration events of the same kind per day.

³ Occasional events are defined as between 30 and 70 vibration events of the same source per day.

⁴ Groundborne vibration related to potential building damage effects is generally related to the peak particle velocity (PPV) in inches/second.



Permanent Operational Noise

The SAP would not generate new vehicle trips on Bear Valley Parkway or surrounding roadways. There would be no substantial change in permanent operational noise as a result of implementation of the SAP and this memorandum does not analyze the issue further.

Groundborne Vibration

Thresholds of Significance

The project site is surrounded by residences where people normally sleep. The residences are likely constructed of engineered concrete or masonry; however, to be conservative, this analysis assumes they are constructed of non-engineered timber and masonry. While construction activities would occur during the daytime and would not disturb sleep, residences may be occupied during daytime construction, resulting in nuisance to daily activities. Construction activities are characterized by infrequent (fewer than 30 per day) vibration events, according to the City's General Plan EIR. Therefore, for the purposes of this analysis, an impact would occur if construction would generate vibration levels greater than the threshold described in the City's General Plan Community Protection Element Noise Policy 5.5 (80 VdB or 0.2 in/sec PPV at the nearest residential receptor). An impact would also occur if construction activities were to occur outside of the hours specified in the City's Noise Ordinance.

Methodology and Assumptions

The exact number and type of construction equipment required for the proposed SAP road widening is currently unknown. It was assumed that the construction equipment used for the SAP would be similar to that anticipated to be needed for construction of the residential development component of the project, given the similarities in location and site conditions. However, the SAP would require construction equipment more specific to road-widening activities and relocation of existing walls and other structures.

The Federal Transit Administration (FTA), in its 2006 Transit Noise and Vibration Impact Assessment, describes equipment typically used in transportation construction projects.⁵ The vibration source levels from construction equipment typically used in road construction, which can reasonably be assumed to be necessary for construction of the SAP project component, are shown in Table 1.

⁵ The Acoustical Site Assessment (ISE 2016) did not anticipate the need for pile drivers, caissons, or equipment necessary to construct slurry walls, given the proposed project site conditions. This analysis makes the same assumption.



Table 1: Vibration Levels for Typical Construction Equipment

Equipment	PPV at 25 ft. (in/sec)	PPV at 40 ft. (in/sec) ¹	VdB at 25 ft. (1 μ-in/sec)	VdB at 40 ft. (1 μ-in/sec) ²	VdB at 75 ft. (1 μ-in/sec) ²
Vibratory Roller	0.210	0.104	94	88	80
Hoe Ram	0.089	0.044	87	81	73
Large bulldozer	0.089	0.044	87	81	73
Loaded trucks	0.076	0.038	86	80	72
Jackhammer	0.035	0.017	79	73	65
Small bulldozer	0.003	0.001	58	52	44
<p>Notes:</p> <p>1. Based on the propagation adjustment formula $PPV = PPV_{25\text{ feet}} \times (25/\text{distance from the equipment to the receptor})^{1.5}$</p> <p>2. Based on the propagation adjustment formula $VdB = VdB_{25\text{ feet}} - 30\log(\text{distance from the equipment to the receptor}/25)$</p> <p>Source: FTA Transit Noise and Vibration Impact Assessment, May 2006</p>					

Analysis

The nearest residences would be located approximately 40 feet from the construction activity on Bear Valley Parkway. As shown in Table 1, construction equipment would not exceed the 0.2 in/sec PPV vibration significance criteria for building damage effects at a distance of 40 feet. Therefore, no structural damage impacts to nearby residences are anticipated to result from implementation of the SAP.

However, as shown in Table 1, at 40 feet from the proposed construction activities, construction equipment including large dozers and rollers would have the potential to generate vibration which exceeds the 80 VdB vibration significance criteria for human annoyance. A distance of 75 feet between the heaviest piece of equipment (vibratory roller) and sensitive receptor would be required before groundborne vibration would fall below the significance criteria. During SAP construction, equipment would likely be distributed throughout the construction site and would not be used simultaneously such that groundborne vibration in one location would not be constant.

Mitigation

Implementation of Mitigation Measures NOI-1 and NOI-2 would minimize temporary groundborne vibration impacts from construction activities at adjacent residences.

NOI-1 Construction Notification. The construction contractor shall provide written notification to all residences located within 75 feet of the proposed construction activities at least three weeks prior to the start of construction activities, informing them of the estimated start date and duration of daytime vibration-generating construction activities. This notification shall include information about the potential for nuisance vibration. The City shall provide a phone number for the affected residences to call if they have concerns about construction-related vibration. If additional houses are built within 75 feet of the proposed SAP prior to completion of



construction of the proposed SAP, written notification shall be provided to these residences as well.

NOI-2 Vibration Best Management Practices. For construction activities within 75 feet of residences on Bear Valley Parkway, the construction contractor shall implement the following measures during construction:

1. Stationary sources, such as temporary generators, shall be located as far from nearby vibration-sensitive receptors as possible.
2. Trucks shall be prohibited from idling along streets serving the construction site where vibration-sensitive receptors are located.
3. Demolition, earthmoving, and ground-impacting operations shall be phased so as not to occur in the same time period.

If additional houses are built within 75 feet of the proposed SAP prior to completion of construction of the proposed SAP, the best management practices shall be implemented for these residences as well.

Temporary Construction Noise

Thresholds of Significance

For the purposes of this analysis, construction noise would have a significant impact if it would exceed the threshold of significance defined in the City of Escondido’s Noise Ordinance of 75 dB Leq-h and occur outside the hours of 7 am through 6 pm weekdays, and 10 am to 5 pm on Saturday. See the Regulatory Setting section of this memorandum for more detail on the Noise Ordinance.

Methodology and Assumptions

The type of equipment assumed to be required for construction of the proposed SAP is described in the Groundborne Vibration section of this memorandum. The Federal Highway Administration’s (FHWA) Roadway Construction Noise Model (RCNM) was used to estimate the worst-case noise level that would result from simultaneous operation of the three noisiest construction equipment types anticipated to be required for SAP construction.⁶ Estimated noise levels at 50 feet for assumed equipment are provided in Table 2.

Table 2: Noise Levels at 50 feet for Typical Construction Equipment

Equipment Description	Spec L _{max} (dBA)	Actual L _{max} (dBA)
Jackhammer	85	88.9
Dozer	85	81.7
Excavator	85	80.7

Source: Federal Highway Administration’s Roadway Construction Noise Model (RCNM) 2008

⁶ As previously stated, during SAP construction, equipment would likely be distributed throughout the construction site and would not be used simultaneously such that noise and groundborne vibration in one location would not be constant. However, to estimate a conservative, worst-case noise level, this analysis assumes simultaneous operation of the three noisiest equipment types.



Analysis

The nearest residences would be located approximately 40 feet from SAP construction area. According to the RCNM, the worst-case calculated L_{eq} of construction activities associated with simultaneous operation of the three potentially noisiest construction equipment types for the project would be 86.1 dBA at 40 feet from construction activities. This worst-case assumption is conservative because construction equipment would typically be dispersed over the construction area and would not operate simultaneously in a single location. The worst-case calculated L_{eq} of construction activities associated with the project would be 80.6 dBA at a distance of 75 feet from construction activities and 74.9 dBA at a distance of 145 feet.

As required by City Noise Ordinance Section 17-234, construction activities would only occur between the hours of 7 a.m. and 6 p.m. on weekdays and no nighttime construction would occur. However, temporary construction noise from the proposed full-width SAP could potentially exceed the City's 75 dBA L_{eq-h} threshold at nearby sensitive receptors.

Mitigation

Implementation of Mitigation Measures NOI-1 through NOI-3 would minimize noise from construction activities such that noise levels would not exceed an hourly average noise level of 75 dBA at an adjacent residence. With the implementation of Mitigation Measures NOI-1, NOI-2 and NOI-3, impacts from implementation of the SAP would be less than significant.

NOI-3 Prior to grading activities, the construction contractor shall implement and monitor the noise reduction measures described below to the extent necessary to reduce construction noise levels to below an hourly average noise level of 75 dBA at any residential property line. Noise reduction measures are required for all construction within 145 feet of a residence. Any one or a combination of measures can be used as necessary. Typical measures that may be implemented include the following, as necessary, to achieve compliance with the City's noise ordinance:

1. Use "quiet" gasoline-powered compressors or other electric-powered compressors, and use electric rather than gasoline or diesel powered forklifts for small lifting.
2. Locate stationary noise sources, such as temporary generators, as far from nearby receptors as possible.
3. Use the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) for construction equipment and trucks.
4. Muffle and enclose stationary noise sources within temporary sheds or incorporate insulation barriers.
5. Limit simultaneous operation of construction equipment or limit construction time within an hour to reduce hourly average noise level.
6. Implement temporary noise barriers, such as sound blankets, of a sufficient height and thickness around the perimeter of the construction area to minimize construction noise to 75 dBA as measured at the applicable property lines of the adjacent uses.



To ensure compliance with the City's Noise Ordinance, noise monitoring shall be conducted on the first day of typical construction. A one-hour noise measurement shall be conducted in accordance with Section 17-228 of the City's Noise Ordinance at 50 feet from the most intensive construction activity. If it is determined that construction would have the potential to exceed the hourly construction noise level limit at any residential property, additional noise control measures shall be implemented as necessary and an additional noise measurement will be conducted to confirm compliance.

Should you have any questions regarding this memo, please contact me at 619.236.1778, ext. 2528 or Sharon.Toland@WeAreHarris.com.

Sincerely,

Harris & Associates

Sharon Toland
Project Manager

References

City of Escondido. *General Plan*. May 2012.

County of San Diego. *Guidelines for Determining Significance: Noise*. January 27, 2009.

US Department of Transportation. Federal Highway Administration's Roadway Construction Noise Model (RCNM) Version 1.1. December 8, 2008.

Federal Transit Administration. *Transit Noise and Vibration Impact Assessment Manual*. May 2006.
Available at: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf.

Investigative Science and Engineering, Inc. *Acoustical Site Assessment 661 Bear Valley Tentative Subdivision Map Escondido, CA*. April 27, 2016 (Revised).

