

**Appendix N –  
Noise Impact Analysis  
Prepared by Giroux & Associates dated October 21, 2013;  
Noise Addendum  
Prepared by Giroux & Associates dated October 23, 2013**

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**NOISE IMPACT ANALYSIS**  
**ESPERANZA HILLS-YORBA LINDA ESTATES**  
**CITY OF YORBA LINDA, CALIFORNIA**

Prepared for:

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# NOISE SETTING

## BACKGROUND

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted sound. Sound is characterized by various parameters that describe the physical properties of sound waves. These properties include the rate of oscillation (frequency), the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound wave. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The unit of sound pressure ratioed to the faintest sound detectable to a person with normal hearing is called a decibel (dB). Sound or noise can vary in intensity by over one million times within the range of human hearing. A logarithmic loudness scale similar to the Richter Scale for earthquake magnitude is therefore used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all sound frequencies within the entire spectrum. Noise levels at maximum human sensitivity from around 500 to 2,000 cycles per second are factored more heavily into sound descriptions in a process called “A-weighting,” written as “dBA.”

Leq is a time-averaged sound level; a single-number value that expresses the time-varying sound level for the specified period as though it were a constant sound level with the same total sound energy as the time-varying level. Its unit is the decibel (dB). The most common averaging period for Leq is hourly.

Because community receptors are more sensitive to unwanted noise intrusion during more sensitive evening and nighttime hours, state law requires that an artificial dBA increment be added to quiet time noise levels. The 24-hour noise descriptor with a specified evening and nocturnal penalty is called the Community Noise Equivalent Level (CNEL). CNEL's are a weighted average of hourly Leq's over a twenty-four hour period with a weighting factor applied to noises occurring during evening hours from 7:00 p.m. to 10:00 p.m. (relaxation hours) and at night from 10:00 p.m. to 7:00 a.m. (sleeping hours) of 5 dBA and 10 dBA, respectively. Ldn is almost equivalent to CNEL except for no application of the 5 dBA evening hour weighting.

## PLANNING STANDARDS

Orange County has developed guidelines based on the California State model for acceptable community noise levels that are based upon the CNEL rating scale to insure that noise exposure is considered in any development, as shown in Figure 1. CNEL-based standards apply to noise sources whose noise generation is preempted from local control (such as from on-road vehicles, trains, airplanes, etc.) and are used to make land use decisions as to the suitability of a given site for its intended use. These CNEL-based standards are stated in the Noise Element of the General Plan. Local jurisdictions generally regulate the level of non-transportation noise that one use may impose upon another through a Noise Ordinance.

Figure 1 contains four classes of acceptability and has a number of overlapping compatibility noise levels within several criteria. In order to reduce the potential ambiguity of various conditional acceptabilities, Orange County developed a more clear-cut matrix of acceptable noise levels shown in Table 1 and explained in Table 2.

For new residential uses, Orange County recommends an exterior noise level of up to 65 dB CNEL and an interior noise level of 45 dB CNEL. The exterior level applies to outdoor recreational uses such as back yards, patios, spas, etc. Interior standards apply to habitable rooms. Typical noise attenuation with closed, double-paned windows in modern frame and stucco construction is about 20-30 dB. Noise attenuation with partially open windows is 10-15 dB CNEL. Interior standards can therefore be readily met without any “extra” mitigation if exterior levels are 55-60 dB CNEL with open windows. With closed dual-paned windows, exterior levels of 65-75 dB CNEL can be accommodated while still meeting interior standards.

The City of Yorba Linda has established similar noise compatibility thresholds as shown below.

### Yorba Linda General Plan Land Use Noise Standards (dB CNEL)

General Plan Land Use Designation	Interior Standard	Exterior Standard
Residential, including public institutions and hospitals	45	65
Neighborhood Commercial	---	70
Office Commercial	50	70
Light Industry/Business Park	55	75
Open Space	--	70

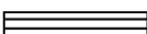
Source: City of Yorba Linda General Plan, 1993, Table N-2

Use of a residential noise standard of 65 dBA CNEL exterior and 45 dB CNEL interior is appropriate for either the County of Orange or City of Yorba Linda jurisdiction.

**Figure 1**  
**Orange County Land Use Compatibility Matrix**  
**for Community Noise Exposure**

Land Use Category	Community Noise Exposure Ldn or CNEL, dB								
	50	55	60	65	70	75	80	85	
Residential – Low Density Single-Family, Duplex, Mobile Homes	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Residential – Multi-Family	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Transient Lodging – Motels, Hotels	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Auditoriums, Concert Halls, Amphitheaters	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Sports Arena, Outdoor Spectator Sports	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Playgrounds, Neighborhood Parks	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Office Buildings, Business Commercial and Professional	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable
Industrial Manufacturing Utilities, Agriculture	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable	Normally Unacceptable

**INTERPRETATION**

-  **Normally Acceptable:** Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
-  **Conditionally Acceptable:** New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
-  **Normally Unacceptable:** New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
-  **Clearly Unacceptable:** New construction or development should generally not be undertaken.

Source: State of California Governor's Office of Planning and Research, General Plan Guidelines, 1990.

**TABLE 1**

**COMPATIBILITY MATRIX FOR ORANGE COUNTY LAND USES AND  
COMMUNITY NOISE EQUIVALENT LEVELS (CNEL)**

<u>Type of Use</u>	<u>65+ dB CNEL</u>	<u>60-65 dB CNEL</u>
<u>Residential</u>	3a, b, e	2a, e
<u>Commercial</u>	2c	2c
<u>Employment</u>	2c	2c
<u>Open Space</u>		
Local	2c	2c
Community	2c	2c
Regional	2c	2c
<u>Educational Facilities</u>		
School (K through 12)	2c, d, e	2c, d, e
Preschool, college, other	2c, d, e	2c, d, e
<u>Places of Worship</u>	2c, d, e	2c, d, e
<u>Hospitals</u>		
General	2a, c, d, e	2a, c, d, e
Convalescent	2a, c, d, e	2a, c, d, e
<u>Group Quarters</u>	1a, b, c, e	2a, c, e
<u>Hotels/Motels</u>	2a, c	2a, c
<u>Accessory Uses</u>		
Executive Apartments	1a, b, e	2a, e
Caretakers	1a, b, c, e	2a, c, e

**Table 2**  
**Explanation and Definitions**

**Action Required to Ensure Compatibility**  
**Between Land use and Noise from External Sources**

1. Allowed if interior and exterior community noise levels can be mitigated.
2. Allowed if interior levels can be mitigated.
3. New residential uses are prohibited in areas within the 65-decibel CNEL contour from any airport or air station; allowed in other areas if interior and exterior community noise levels can be mitigated. The prohibition against new residential development excludes limited “in-fill” development within an established neighborhood

**Standards Required for Compatibility of Land Use and Noise**

- |    |                    |   |
|----|--------------------|---|
| a. | Interior Standard: | CNEL of less than 45-decibels (habitable rooms only).   |
| b. | Exterior Standard: | CNEL of less than 65-decibels in outdoor living areas.  |
| c. | Interior Standard: | Leq(h)=45 to 65 decibels interior noise level, depending on interior use.   |
| d. | Exterior Standard: | Leq(h) of less than 65 decibels in outdoor living areas.  |
| e. | Interior Standard: | As approved by the Board of Supervisors for sound events of short duration such as aircraft fly-over’s or individual passing railroad trains. |

Leq (h) – The A-weighted equivalent sound level averaged over a period of “h” hours. An example would be Leq (12) where the equivalent sound level is the average over a specified 12-hour period (such as 7:00 a.m. to 7:00 p.m.). Typically, time period “h” is defined to match the hours of operation of a given type of use.

## ORANGE COUNTY NOISE STANDARDS

The County's noise standards for non-transportation sources are articulated in the Noise Ordinance. Noise from one land use, crossing the property line of an adjacent property, are regulated by Division 6, Section 4-6 of the Orange County Code. The Orange County Code, as seen in Table 3, limits noise levels to 55 dB(A) during the day and 50 dB(A) night at any residential property line from noise generated on an adjacent property with some allowable deviation for specified periods of time. The larger the deviation from the baseline standard, the shorter the allowed duration of the event up to a maximum of 20 dB. After 10 p.m., all the above thresholds are decreased by 5 dB. The City of Yorba Linda has established identical noise standards (55 dBA daytime and 50 dBA night).

Construction noise requirements are also discussed in the Orange County Noise Ordinance. The weekday (including Saturday) hours from 7 a.m. to 8 p.m. are the times allowed in the Orange County Noise Ordinance for construction or grading. Division 6 (Sec. 4-6-1, et seq.) of the County Code also contains standard requirements related to the distance separation between construction activities and any occupied dwellings. Construction noise levels are exempt from the numerical performance standards in the noise ordinance. However, EMA's "Standard Condition for Approval" N10 requires that:

1. All powered equipment operating within 1,000 feet of a dwelling must have a properly operating and maintained muffler.
2. Stockpiling and staging activities must be located as far as practicable from dwellings

The City of Yorba Linda similarly exempts construction related activities from noise regulations provided the activities take place between the hours of 7 a.m. to 8 p.m. on weekdays, including Saturday. No construction is allowed at any time on Sunday or on a federal holiday. Orange County and the City of Yorba Linda have identical regulations with regards to permissible hours of construction activity.

**Table 3**  
**Orange County**  
**Residential Exterior Noise Standards**

<i>Noise Zone</i>	<i>Noise Level</i>	<i>Time Period</i>
<i>1</i>	<i>55 dB(A)</i>	<i>7:00 a.m.--10:00 p.m.</i>
	<i>50 dB(A)</i>	<i>10:00 p.m.-- 7:00 a.m.</i>

It shall be unlawful for any person at any location within the unincorporated area of the County to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, either incorporated or unincorporated, to exceed:

- The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or
- +5 dB for a cumulative period of more than 15 minutes in any hour, or
- +10 dB for a cumulative period of more than 5 minutes in any hour, or
- +15 dB for a cumulative period of more than 1 minute in any hour, or
- +20 dB or the maximum measured ambient level for any period of time.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the noise levels shall be reduced by five (5) dB(A).

In the event the ambient noise level exceeds any of the noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise levels.

## BASELINE NOISE LEVELS

Existing noise levels on the proposed project site derive mainly from vehicular sources on the adjacent roadways. Short term on-site noise measurements were conducted on Tuesday November 6, 2012 from 2:00 p.m. – 3:00 p.m. at two locations. Measurement locations are shown in Figure 2 and the monitoring results are summarized below.

**Measured Noise Levels (dBA)**

	<b>Leq</b>	<b>Lmax</b>	<b>Lmin</b>	<b>L10</b>	<b>L33</b>	<b>L50</b>	<b>L90</b>
Meter 1	46.3	63.0	39.0	45.5	42.0	41.5	40.0
Meter 2	56.6	69.0	39.0	61.5	53.5	47.0	41.0

Meter 1 was located along Aspen Way close to the project access roadway extension. Results for Meter 1 show that existing noise levels are quite low with observed noise readings at Meter 1 of 46 dB Leq. Monitoring experience shows that 24-hour weighted CNELs can be reasonably well estimated from mid-afternoon noise readings. CNEL's are approximately equal to mid-afternoon Leq plus 2-3 dB (Caltrans Technical Noise Supplement, 2009). This would equate to an existing CNEL of 48-49 dB at the proposed site. Such levels are well within Orange County residential compatibility guidelines.

The Meter 2 location is along San Antonio Road, south of Aspen Way. Observed Leqs at this location of almost 57 dB would equate to a CNEL of 59-60 dB. These readings demonstrate that existing ambient noise levels in the project area are low and do not propose an impediment to the proposed residential development though project development could impose a significant noise impact on existing uses. These low baseline levels do suggest, however, that the proposed project area is sensitive to even a moderate increase in traffic noise.

**Figure 1**  
**Noise Meter Locations**



**Meter 1:** Eastern terminus of Aspen Way.

**Meter 2:** West side of San Antonio Rd, approximately 500 feet south of Aspen Way intersection. Next to driveway of 4465 and 4485 San Antonio (west side of roadway). Meter placed 50 feet to San Antonio centerline.

## **NOISE IMPACTS**

### **NOISE SIGNIFICANCE CRITERIA**

Noise impacts are considered significant if they result in:

- a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

### **STANDARDS OF SIGNIFICANCE**

Noise impacts are considered significant if they expose persons to levels in excess of standards established in local general plans or noise ordinances. The exterior noise standard for Orange County for residential uses is 65 dBA CNEL in usable outdoor space. If required, attenuation through setback and project perimeter barriers is anticipated to be used to reduce traffic noise to the 65 dBA CNEL goal. However, an inability to achieve this goal through the application of reasonably available mitigation measures would be considered a significant impact.

Impacts may also be significant if they create either a substantial permanent or temporary increase. The term "substantial" is not quantified in CEQA guidelines. In most environmental analyses, "substantial" is taken to mean a level that is clearly perceptible to humans. In practice, this is at least a +3 dB increase. Some agencies, such as Caltrans, require substantial increases to be +10 dB or more if noise standards are not exceeded by the increase. For purposes of this analysis, a +3 dB increase is considered a significant increase if it causes the residential noise/land use guidelines of 65 dBA CNEL to be exceeded. The following noise impacts due to project-related traffic would be considered significant:

1. If construction activities were to audibly intrude into adjacent residential areas during periods of heightened noise sensitivity.
2. If project traffic noise were to cause an increase by a perceptible amount (+3 dB CNEL) and expose receivers to levels exceeding the Orange County compatibility noise standards.

## CONSTRUCTION NOISE IMPACTS

### Heavy Equipment

Temporary construction noise impacts will vary markedly because the noise strength of construction equipment ranges widely as a function of the equipment used and its activity level. Short-term construction noise impacts tend to occur in discrete phases dominated initially by grading activities, then by foundation and construction. The earth-moving sources are the noisiest, with equipment noise typically ranging from 75 to 90 dBA at 50 feet from the source.

Figure 2 shows the range of noise emissions for various pieces of construction equipment. Point sources of noise emissions are attenuated by a factor of 6 dBA per doubling of distance through geometrical (spherical) spreading of sound waves. The quieter noise sources will drop to a 65 dBA exterior/45 dBA interior noise level by about 200 feet from the source while the loudest may require over 1,000 feet from the source to reduce the 90+ dBA source strength to a generally acceptable 65 dBA exterior exposure level. This estimate assumes a clear line-of-sight from the source to the receiver. Variations in terrain elevation or existing structures will act as noise barriers that may interrupt equipment noise propagation. Construction noise impacts are, therefore, somewhat less than that predicted under idealized input conditions

There are noise-sensitive receivers within 1,000 feet of planned construction activities. FHWA has developed a construction activity noise model that is an industry standard for assessing construction activity noise impacts.

Quantitatively, the primary noise prediction equation is expressed as follows for the hourly average noise level ( $L_{eq}$ ) at distance  $D$  between the source and receiver (dBA):

$$L_{eq} = L_{max @ 50'} - 20 \log (D/50') + 10 \log (U.F\%/100) - I.L.(bar)$$

Where:

$L_{max @ 50'}$  is the published reference noise level at 50 feet

U.F.% is the usage factor for full power operation per hour

I.L.(bar) is the insertion loss for intervening barriers

Published reference noise levels for heavy construction equipment used in clearing, excavation and grading include the following:

Dozers 85 dBA

Tractors 80 dBA

Backhoes 86 dBA

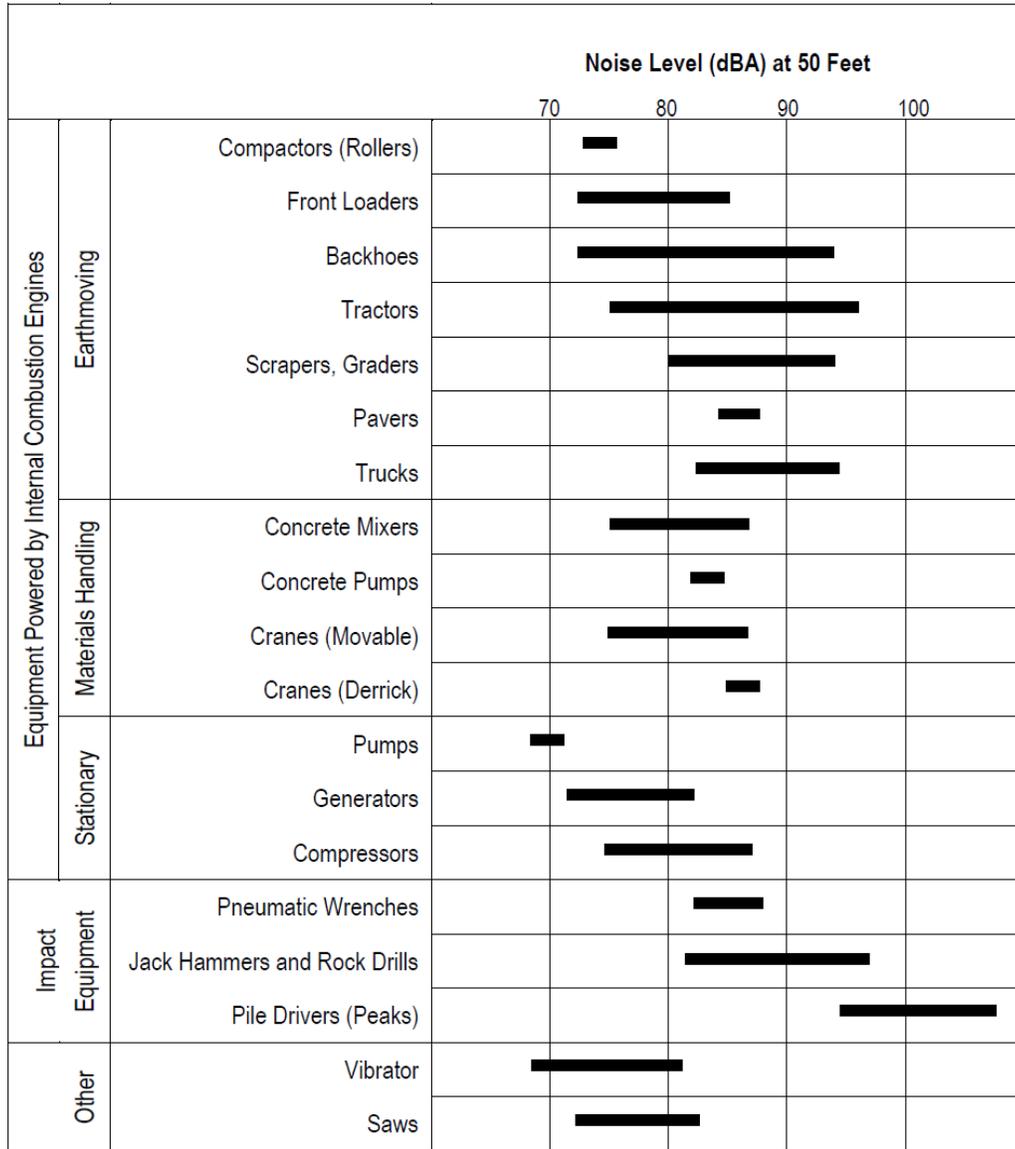
Excavators 86 dBA

Graders 86 dBA

Source: Noise Control for Buildings..., BBN, 1987

Figure 2

## Typical Construction Equipment Noise Generation Levels



Source: EPA PB 206717, Environmental Protection Agency, December 31, 1971, "Noise from Construction Equipment and Operations."

Assuming three large pieces of equipment operate in close proximity, their combined Lmax reference level is 91 dBA at 50 feet. Under a clear line of sight and a typical usage factor of 40 percent, the hourly noise level as a function of distance is as follows:

Distance to Source	Hourly Level
100 feet	81 dBA
200 feet	75 dBA
300 feet	71 dBA
400 feet	69 dBA
500 feet	67 dBA
640 feet	65 dBA
800 feet	63 dBA
1000 feet	61 dBA

Levels of 65 dBA can interfere with comfortable conversation and levels of 75 dBA can intrude into quiet interior activities such as reading or children napping even with closed windows. Typically, noise levels at adjacent residential uses will not reach 75 dBA Leq during construction. Equipment noise may reach 65 dBA at the closest existing homes at 600 feet from any Esperanza Hills lot. However, completed structures, possible perimeter walls and terrain shielding will reduce the construction noise footprint. County policy is therefore to restrict construction activities involving heavy equipment to hours of lesser residential sensitivity if occupied residences are nearby.

According to Orange County Municipal Code, permissible hours of construction are 7 a.m. to 8 p.m. on weekdays and on Saturdays. Construction is not permitted on any national holiday or on any Sunday. These hours are included as conditions on any project construction permits and these limits will serve to minimize any adverse construction noise impact potential.

Although construction noise impacts are considered less-than-significant, and mitigation measures are not required, the following construction practices are recommended to further reduce construction noise levels:

- All mobile equipment should have properly operating and maintained mufflers.
- Possible haul routes should avoid residential development, where feasible.
- Noise-generating construction equipment should be placed in staging areas as far as possible from existing residences.
- High noise-producing activities should be scheduled between the hours of 8:00 a.m. and 5:00 p.m. to minimize disruption to sensitive uses.
- Construction related equipment including heavy-duty equipment should be turned off when not in use for more than 5 minutes.

- Construction hours, allowable workdays, and the phone number of the job superintendent should be clearly posted at all construction entrances to allow for surrounding residents to contact the job superintendent. If the County of Orange or the job superintendent receives a complaint, the superintendent should investigate, take appropriate corrective action, and report the action taken to the reporting party. Contact specifications should be included in the proposed project construction documents, which shall be revised by the County of Orange prior to issuance of a grading permit.

### **Movement of Construction Equipment and Workers**

In addition to equipment noise, the movement of equipment and workers onto the project site during construction would generate temporary traffic noise along access routes to the project areas. The major pieces of heavy equipment moving into the development areas could also impact currently low ambient noise levels.

Depending upon final site design and property availability, several alternative access points options have been developed. Construction vehicle access could therefore utilize different site entries/exits.

The CalEEMod computer model predicts the peak construction day which will be the most intensive traffic period in terms of worker traffic, vendor trucks and heavy-duty diesel vehicles delivering equipment and building supplies. The forecast peak daily traffic is as follows:

Worker Trips	– 136/day
Vendor (Medium) Trucks	– 20/day
Vendor (Heavy) Trucks	– 20/day

If this traffic occurs from 7 a.m. to 3 p.m., the calculated CNEL is 54 dB at 50 feet from the centerline. The measured daytime baseline noise level was 46 dB Leq. CNELs are typically 2-3 dB higher than daytime Leq levels (because of nocturnal noise penalties in the CNEL calculation). A background level of 49 dB CNEL is considered representative at homes near candidate access points. The Orange County General Plan standard for usable outdoor residential space is 65 dB CNEL.

Three access points were considered where construction traffic noise was calculated as follows:

Option 1	Stonehaven Way	– 50 feet to receiver
Option 2	Aspen Way	– 50 feet to receiver
Option 2A	San Antonio (S of Aspen)	– 250 feet to receiver

The calculated peak daily construction traffic noise, compared to the measured baseline and the General Plan standard is as follows:

Access Location	Peak Noise (dB CNEL)	Compared to	
		Baseline	GP Standard
Option 1 Stonehaven Drive	54 dB	+5 dB	-11 dB
Option 2 Aspen Way	54 dB	+5 dB	-11 dB
Option 2A San Antonio	47 dB	-2 dB	-18 dB

Peak construction activity traffic will be temporary. Significance thresholds relate to chronic conditions such that construction noise is generally exempt from noise ordinance performance standards if the activity is restricted to hours of lesser sensitivity. However, as a rule of thumb, increases of +5 dB above the baseline are often considered a clearly noticeable increase. In terms of this guideline, peak daily construction access noise would be temporarily clearly noticeable for the Option 2 (Aspen) or Option 1 (Stonehaven) alternatives, and even less than background for the 2A (San Antonio access road south of Aspen Way) option.

## CONSTRUCTION ACTIVITY VIBRATION

Typical background vibration levels in residential areas are usually 50 VdBA or lower, below the threshold of human perception. Perceptible vibration levels inside residences are typically attributed to the operation of heating and air conditioning systems, door slams or street traffic. Construction activities and street traffic are some of the most common external sources of vibration that can be perceptible inside residences.

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the “soft” sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels. The range of vibration decibels (VdBb) is as follows:

- 65 VdBb - threshold of human perception
- 72 VdB - annoyance due to frequent events

- 80 VdBb - annoyance due to infrequent events
- 94-98 VdBb - minor cosmetic damage

To determine potential impacts of the project’s construction activities, estimates of vibration levels induced by the construction equipment at various distances are presented in Table 4.

**Table 4**  
**Approximate Vibration Levels Induced by Construction Equipment**

<b>Equipment</b>	<b>Approximate Vibration Levels (VdBA)*</b>				
	<b>25 feet</b>	<b>50 feet</b>	<b>100 feet</b>	<b>600 feet</b>	<b>1000 feet</b>
Large Bulldozer	87	81	75	59	55
Loaded Truck	86	80	74	58	54
Jackhammer	79	73	67	51	47
Small Bulldozer	58	52	46	30	26

\* (FTA Transit Noise & Vibration Assessment, Chapter 12, Construction, 2006)

The on-site construction equipment that will create the maximum potential vibration is a large bulldozer. The stated vibration source level in the FTA Handbook for such equipment is 81 VdB at 50 feet from the source. The nearest existing residence is approximately 600 feet from the closest Esperanza Hills lot. By 600 feet the vibration level dissipates to 59 VdB which is below the threshold of human perception. Most construction equipment will operate at even greater distance separation. Construction activity vibration impacts are judged as less-than-significant.

## PROJECT-RELATED VEHICULAR NOISE IMPACTS

Long-term noise concerns from the development of residential uses at the project site center primarily on mobile source emissions on project area roadways. These concerns were addressed using the California specific vehicle noise curves (CALVENO) in the federal roadway noise model (the FHWA Highway Traffic Noise Prediction Model, FHWA-RD-77-108). The model calculates the Leq noise level for a particular reference set of input conditions, and then makes a series of adjustments for site-specific traffic volumes, distances, roadway speeds, or noise barriers. The typical Orange County day-night travel percentages and auto-truck vehicle mixes is then applied to convert one-hour Leq levels to a weighted 24-hour CNEL.

Table 5 summarizes the calculated 24-hour CNEL level at 50 feet from the roadway centerline along project adjacent roadway segments. Three time frames were evaluated; existing conditions with and without project, year 2020 with and without project, and 2035 with and without project. Three project alternatives were evaluated with differing project access points.

Option 1 provides site access via Stonehaven Drive

Option 2 via Aspen Way

Option 2A via San Antonio Road approximately 1,850 feet south of Aspen Way

The noise analysis utilized data from the project traffic analysis, prepared by Linscott Law & Greenspan, Inc, in March 2013, for this project. Vehicular traffic volumes and roadway travel speeds were obtained from the traffic report. With a project this large it is very unlikely that build-out would occur immediately. By 2020 and 2035, when area build-out occurs, the projects impacts are diluted and not as significant as contrasting with existing conditions. Nevertheless, existing conditions are overlaid with project traffic as a worst case impact analysis.

As expected, each option will cause a significant noise increase along the primary access route. Option 1 causes a significant impact along Via del Agua and Stonehaven Drive. However, even at area build-out in 2035 the “with project” traffic noise levels at 50 feet from the roadway centerline are less than 65 dB CNEL, the recommended compatibility threshold for sensitive uses.

If all project traffic site egress and ingress were via Aspen Way as per Option 2, because current utilization use of Aspen Way is low, addition of all project traffic, in the existing time frame, could create as much as a +15 dB CNEL increase at 50 feet from roadway centerline with anticipated future traffic growth. By 2020, this increase is reduced to approximately +11 dB CNEL and to +8 dB CNEL in 2035. Although this impact is considered substantial, the overall noise level, even in 2035 is less than the 65 dB CNEL residential exterior noise compatibility threshold (assuming a 25 mph travel speed) at 50 feet from the roadway centerline. Although traffic noise impacts would be noticeable as compared to no project alternatives, area traffic noise levels, even on Aspen Way, would remain below 65 dB CNEL. There are two residences within 50 feet of the Aspen Way centerline such that these residences would be expected to experience the full 58 dB CNEL noise level in the future as compared to 43 dB CNEL currently.

Option 2 could also cause a significant impact along San Antonio Road between Aspen Way and Yorba Linda Blvd. Residences along the eastern alignment with this section of San Antonio Road are set back from the roadway centerline by more than 100 feet which reduces the “2035

with project” noise levels at the nearest residence to 59 dB CNEL, also less than the 65 dB CNEL compatibility threshold.

Option 2A would impact the same San Antonio Road residences as in Option 2 between the proposed project access point at San Antonio Road and Yorba Linda Blvd. The impact for the eastern roadway residences is the same as with Option 2, as project traffic would pass by these homes under either alternative. Since the impacted residences are more than 100 feet from the roadway centerline, the “2035 with project” impact, even at build-out, is not expected to reach exceed 58 dB CNEL.

Option 2A would be expected to produce the least project related traffic noise impact. The largest traffic noise impact for this scenario is +4.6 if the project were built-out immediately and +4.1 dB CNEL in 2020 or 2035. Although larger than the +3 dB CNEL threshold, the only impacted residences are setback 100 feet from the roadway and would experience future traffic noise levels well below the Orange County General Plan standard. Although there are several residences along the west side of the roadway, these homes have a nearly 150 foot setback from the centerline and have a perimeter noise wall.

Although all access options would result in a noticeable noise increase over existing conditions to a number of residences, the overall traffic noise environment remains below 65 dB CNEL. Therefore, project traffic noise levels are considered adverse but less-than-significant.

**Table 5  
Near Term Traffic Noise Impact Analysis  
(CNEL in dB at 50 feet from Centerline)**

<i>Road Segment</i>	<i>Existing</i>	<i>Existing + Option 1</i>	<i>Existing + Option 2</i>	<i>Existing + Option 2A</i>	<i>Existing Impacts Option 1</i>	<i>Existing Impacts Option 2</i>	<i>Existing Impacts Option 2A</i>
Yorba Linda Blvd/ Imperial Hwy-Kellog Dr	72.0	72.2	70.9	72.2	0.1	-1.1	0.1
Village Center-San Antonio	72.0	72.3	71.0	72.3	0.3	-0.9	0.3
San Antonio-La Palma	72.0	72.0	70.9	72.2	0.0	-1.0	0.2
Weir Canyon/ E of La Palma	74.0	74.1	74.1	74.1	0.1	0.1	0.1
San Antonio Rd/ N of Yorba Linda Blvd	56.5	56.5	60.8	60.8	0.0	<b>4.3</b>	<b>4.3</b>
Aspen Way/ E of San Antonio	43.4	-	58.0	-	-	<b>14.6</b>	0.0
Via Del Agua/ W of Site Ent	52.3	59.8	-	-	<b>7.4</b>	-	-
N of Yorba Linda Blvd	55.6	60.6	-	-	<b>5.0</b>	-	-
Stonehaven Dr E of Site Ent	53.1	56.2	-	-	<b>3.1</b>	-	-
N of Yorba Linda Blvd	55.2	57.4	-	-	2.2	-	-

**2020 Traffic Noise Impact Analysis  
(CNEL in dB at 50 feet from Centerline)**

<i>Road Segment</i>	<i>2020</i>	<i>2020 + Option 1</i>	<i>2020 + Option 2</i>	<i>2020 + Option 2A</i>	<i>2020 Impacts Option 1</i>	<i>2020 Impacts Option 2</i>	<i>2020 Impacts Option 2A</i>
Yorba Linda Blvd/ Imperial Hwy-Kellog Dr	72.7	72.8	71.6	72.8	0.1	-1.1	0.1
Village Center-San Antonio	72.4	72.7	71.4	72.7	0.3	-1.0	0.3
San Antonio-La Palma	72.5	72.5	71.5	72.7	0.0	-1.0	0.2
Weir Canyon/ E of La Palma	74.5	74.6	74.6	74.6	0.1	0.1	0.1
San Antonio Rd/ N of Yorba Linda Blvd	57.0	-	61.1	61.1	-	<b>4.1</b>	<b>4.1</b>
Aspen Way/ E of San Antonio	47.6	-	58.3	-	-	<b>10.7</b>	-
Via Del Agua/ W of Site Ent	52.7	59.8	-	-	<b>7.1</b>	-	-
N of Yorba Linda Blvd	58.4	61.7	-	-	<b>3.3</b>	-	-
Stonehaven Dr E of Site Ent	53.4	56.4	-	-	3.0	-	-
N of Yorba Linda Blvd	55.6	57.6	-	-	2.0	-	-

**2035 Traffic Noise Impact Analysis  
(CNEL in dB at 50 feet from Centerline)**

<i>Road Segment</i>	<i>2035</i>	<i>2035 + Option 1</i>	<i>2035 + Option 2</i>	<i>2035 + Option 2A</i>	<i>2035 Impacts Option 1</i>	<i>2035 Impacts Option 2</i>	<i>2035 Impacts Option 2A</i>
Yorba Linda Blvd/ Imperial Hwy-Kellog Dr	72.3	72.4	72.4	73.6	0.1	0.1	1.3
Village Center-San Antonio	71.2	71.4	71.4	72.7	0.2	0.2	1.5
San Antonio-La Palma	71.8	71.8	72.0	73.2	0.0	0.2	1.4
Weir Canyon/ E of La Palma	74.9	75.0	75.0	75.0	0.1	0.1	0.1
San Antonio Rd/ N of Yorba Linda Blvd	57.2	-	61.8	61.8	-	<b>4.6</b>	<b>4.6</b>
Aspen Way/ E of San Antonio	50.2	-	58.6	-	-	<b>8.4</b>	-
Via Del Agua/ W of Site Ent	55.5	60.5	-	-	<b>5.0</b>	-	-
N of Yorba Linda Blvd	60.0	62.5	-	-	<b>2.5</b>	-	-
Stonehaven Dr E of Site Ent	55.8	57.8	-	-	2.0	-	-
N of Yorba Linda Blvd	57.9	59.2	-	-	1.3	-	-

## **ON-SITE NOISE EXPOSURE**

Measured on-site noise levels indicate that no mitigation is required to ensure that proposed Esperanza Hills residences are exposed to noise levels within the Orange County General Plan compatibility guidelines. Projected noise levels along the most concentrated point of project access/egress would be less than 65 dB CNEL at 50 feet from the roadway centerline. Internal roadway traffic noise along more dispersed travel routes would be even farther below the County guidelines for residential use.

## NOISE IMPACT SUMMARY AND MITIGATION

Short-term construction noise intrusion and vibration impacts will be limited by conditions on construction permits requiring compliance with the Orange County Noise Ordinance. The allowed hours of construction are 7 a.m. and 8 p.m. on weekdays and Saturdays. Construction is not permitted on any national holiday or on any Sunday. In addition the following construction practices are recommended:

- All mobile equipment should have properly operating and maintained mufflers.
- Possible haul routes should avoid residential development, where feasible.
- Noise-generating construction equipment and construction staging areas should be located as far as possible from existing residences.
- High noise-producing activities should be scheduled between the hours of 8:00 a.m. and 5:00 p.m. to minimize disruption to sensitive uses.
- Construction related equipment including heavy-duty equipment should be turned off when not in use for more than 10 minutes.
- Construction hours, allowable workdays, and the phone number of the job superintendent should be clearly posted at all construction entrances to allow for surrounding residents to contact the job superintendent. If the County of Orange or the job superintendent receives a complaint, the superintendent should investigate, take appropriate corrective action, and report the action taken to the reporting party. Contact specifications should be included in the proposed project construction documents, which shall be revised by the County of Orange prior to issuance of a grading permit.

When construction details are finalized, noise impacts along anticipated travel routes should be evaluated for noise impacts due to construction crew commuting, vendor deliveries and equipment mobilization. At the current time, all excess earthworks for both Option 1 and Option 2 will be transported to an adjacent site requiring no on-road haul.

The project noise impact study indicates a substantial noise increase from project-related traffic on Aspen Way in Option 2, and Stonehaven Drive in Option 1 for both the existing and future time period. Project related traffic noise impacts are expected to greatly exceed the +3 dB CNEL perception threshold at 50 feet from the roadway centerline. However, overall traffic noise is expected to be less than 60 dB CNEL at 50 feet from the Aspen Way centerline. This noise level is less than the General Plan noise compatibility guidelines for residential use. The project will also cause the perception thresholds to be exceeded for cumulative traffic noise impacts both along Aspen Way and San Antonio Road but again, the compatibility thresholds are not exceeded.

Option 2A (San Antonio Road) is predicted to create the smallest traffic noise impact of all project options. With this option, the only segment with a significant noise increase is on San

Antonio Road north of Yorba Linda Blvd. Homes along this segment are sufficiently setback from the road such that even future traffic noise levels are calculated to be less than 58dB CNEL.

Homes within the Esperanza Hills development are anticipated to be within the Orange County noise compatibility guidelines with no special mitigation requirements. Since the City of Yorba Linda establishes identical guidelines regarding permissible hours of construction activity, any conditions applied to Orange County will be sufficient to meet the City of Yorba Linda requirements.

**NOISE ADDENDUM**  
**ESPERANZA HILLS-YORBA LINDA ESTATES**  
**CITY OF YORBA LINDA, CALIFORNIA**

Prepared for:

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Date:

October 23, 2013

Project No.: P12-013 Noise Addendum

## **INTRODUCTION**

As initially proposed the entrance and egress for the Esperanza Hills project related traffic was via Aspen Way and initial noise readings were only obtained to document baseline noise levels in the Aspen Way vicinity. Additional project access points have since been introduced though the final site design is not yet determined. Baseline noise levels at these alternative access points are analyzed in this addendum.

## **NOISE MONITORING**

Long term noise measurements were conducted for 72 hours on Friday October 18, 2013 to Monday October 21, 2013, at two locations representative of the additional project alternatives. Noise measurements document the existing noise levels generated by area roadways for the Stonehaven Drive alternative as well as the San Antonio Road alternative. Measurement locations are shown in Figures 1 and 2. The monitoring results are shown in Tables 1 and 2.

Meter 1 was located along the project access road off Stonehaven Drive along the current water district road. The meter was placed at the existing gate, approximately 200 feet from the Stonehaven Drive centerline. Observed CNELs at the gate were in the mid-to-upper 40's. This would equate to CNELs of 51-55 dB at 50 feet from the Stonehaven Drive centerline. Calculated existing noise levels are 53-55 dB CNEL at 50 feet from the centerline of Stonehaven Drive. Measured and calculated traffic noise levels are in agreement.

Meter 2 was located along San Antonio Road approximately 50 feet from the roadway centerline at the approximate locale of the project access road. Measured CNELs were in the high 50's (57-59 dB CNEL). Calculated noise levels are approximately 57 dB CNEL at 50 feet from the centerline. Again, measured and calculated traffic noise levels are in agreement. Noise levels along San Antonio Road are slightly higher than those along Stonehaven Drive.

Because existing noise levels along Stonehaven Drive are a bit quieter, this project alternative would cause a slightly larger traffic impact for adjacent sensitive uses. However, as shown in the project noise impact report, neither alternative is expected to create a "with project" noise level that exceeds the recommended 65 dB CNEL noise compatibility threshold for residential use.

**Figure 1**  
**Option 1 Stonehaven Drive Alternative**  
**Noise Monitor Location**



**Figure 2**  
**Option 2A San Antonio Alternative**  
**Noise Monitor Location**



**Table 1**  
**Noise Measurements**  
**Existing Hourly Leq's (dB)**  
**Option 1 Stonehaven Drive Alternative**

<b>Time Interval</b>	<b>Leqs Day 1</b>	<b>Leqs Day 2</b>	<b>Leqs Day 3</b>
14:00-15:00	39	38	39
15:00-16:00	37	36	41
16:00-17:00	38	42	39
17:00-18:00	53	52	38
18:00-19:00	43	45	51
19:00-20:00	39	42	39
20:00-21:00	41	41	41
21:00-22:00	44	42	40
22:00-23:00	44	42	39
23:00-24:00	40	41	37
0:00-1:00	37	41	38
1:00-2:00	39	40	36
2:00-3:00	43	41	36
3:00-4:00	41	38	35
4:00-5:00	41	41	33
5:00-6:00	41	41	34
6:00-7:00	42	41	37
7:00-8:00	45	44	43
8:00-9:00	49	45	45
9:00-10:00	45	41	47
10:00-11:00	44	42	41
11:00-12:00	40	38	46
12:00-13:00	39	41	40
13:00-14:00	37	37	37

**Resultant CNEL (dB)**

<b>Measurement Parameter</b>	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>
<b>24-Hour CNEL</b>	49	48	45

**Table 2**  
**Noise Measurements**  
**Existing Hourly Leq's (dB)**  
**Option 2A San Antonio Road Alternative**

<b>Time Interval</b>	<b>Leqs Day 1</b>	<b>Leqs Day 2</b>	<b>Leqs Day 3</b>
14:00-15:00	58	62	58
15:00-16:00	58	57	58
16:00-17:00	58	57	57
17:00-18:00	59	58	56
18:00-19:00	55	55	54
19:00-20:00	54	54	53
20:00-21:00	54	54	51
21:00-22:00	52	53	49
22:00-23:00	53	50	48
23:00-24:00	52	49	43
0:00-1:00	50	50	43
1:00-2:00	50	49	39
2:00-3:00	48	47	40
3:00-4:00	46	44	40
4:00-5:00	43	43	42
5:00-6:00	46	42	54
6:00-7:00	52	50	50
7:00-8:00	56	50	56
8:00-9:00	59	54	57
9:00-10:00	60	54	57
10:00-11:00	58	54	56
11:00-12:00	59	56	57
12:00-13:00	58	60	59
13:00-14:00	59	56	57

**Resultant CNEL (dB)**

<b>Measurement Parameter</b>	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>
<b>24-Hour CNEL</b>	59	58	57