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Carlsbad, CA 92010
619-609-0712

May 13, 2021

Trish Edmonson
Cornerstone Communities
4365 Executive Drive, Suite 600
San Diego, CA 92121

Re: Laurel Heights, Santee
Construction Vibration Analysis

Ms. Edmonson:

At your request, dBF Associates, Inc. has conducted an analysis of construction vibration associated with the subject project, an 80-condominium development at 7737 Mission Gorge Road, in the City of Santee.

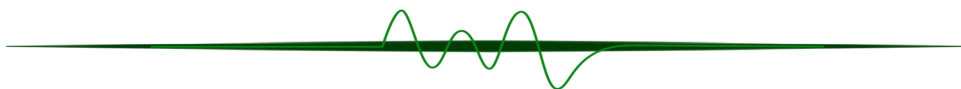
The City of Santee does not regulate construction vibration levels, only times of day; per Santee Municipal Code section 5.04.090, construction may occur on non-holidays, Monday through Saturday, between 7:00 a.m. and 7:00 p.m.

In the absence of vibration limits, Caltrans criteria were used. For continuous or frequent intermittent sources, vibration is “barely perceptible” at 0.01 in/sec PPV and “distinctly perceptible” at 0.04 in/sec PPV. Damage to “older residential structures” could occur at 0.3 in/sec PPV.

Project construction would use the equipment in Table 1.

The project site is bounded by commercial uses on the north, single-family residences on the south, an apartment complex on the east, and a mobile home park on the west.

The residential structures to the south are as close as 60 feet from construction activity. On the east, the multifamily structures are as close as 40 feet from construction activity, and the single-family residence is as close as 20 feet. On the west, most mobile homes are as close as 40 feet from construction activity. There are two mobile homes that would be approximately 16 feet away, and there are three mobile homes that are currently as close as two feet, but the project proponent has stated that these three homes will be moved to at least five feet away from the property line.



Vibration levels were estimated using the following Caltrans formula:

$$PPV_{Equipment} = PPV_{Ref} (25/D)^n \quad (in/sec) \quad (Eq. 12)$$

Where:

PPV_{Ref} = reference PPV at 25 ft.

D = distance from equipment to the receiver in ft.

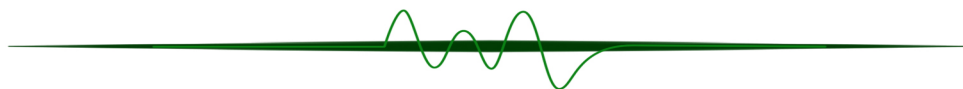
$n = 1.1$ (the value related to the attenuation rate through ground)

Note: For PPVs measured at a different reference distance than 25 feet, that value was substituted into the equation.

Equipment	Vibration Level (PPV)	Distance		
		0.3 in/sec	0.04 in/sec	0.01 in/sec
Small Vibratory Roller	0.022 in/sec at 100 feet [ATS] – 0.029 in/sec at 99 feet [University of Nebraska]	9-12 feet	58-75 feet	205-263 feet
Hand-Operated Tamper	0.0079 in/sec at 49.2 feet [King / Demarco]	2 feet	11 feet	40 feet
Walk-Behind Compactor	0.0039 in/sec at 49.2 feet [King / Demarco]	1 foot	6 feet	21 feet
Excavators, Dozers, Loaders, Motor Grader, Backhoe	0.089 in/sec at 25 feet [FTA]	8 feet	52 feet	182 feet
Trucks, Reach Lift	0.076 in/sec at 25 feet [FTA]	7 feet	45 feet	158 feet
Small Bulldozer	0.003 in/sec at 25 feet [FTA]	-	2 feet	8 feet

To avoid building damage from vibration:

- Within 8 feet of structures, grading should be accomplished with a small bulldozer or similar equipment.
- Within 12 feet of structures, soil compaction should be accomplished using a hand-operated tamper or walk-behind compactor.
- Document pre-construction building conditions of structures within 12 feet of grading activity.





To avoid annoyance from vibration:

- When grading occurs within 52 feet of a residence, use a small bulldozer, or temporarily relocate the resident(s).
- When soil compaction occurs within 75 feet of a residence, use a hand-operated tamper or walk-behind compactor, or temporarily relocate the resident(s).
- When soil compaction occurs within 11 feet of a residence, temporarily relocate the resident(s).

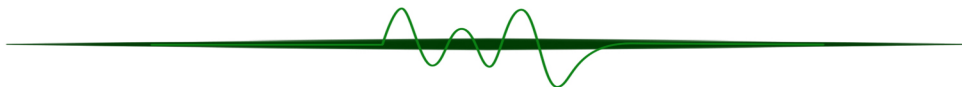
Note: these distances are in terms of the through-ground path. For example, a piece of equipment five feet from a structure, but at the top of a five-foot-high retaining wall, is functionally 10 feet from the structure for the purpose of evaluating vibration.

Please contact me at 619-609-0712 x102 if you have any questions.

Sincerely,

dBF ASSOCIATES, INC.

Steven Fiedler, INCE
Principal



References

- ATS Consulting. 2013. Final Construction Noise and Vibration Report. SR 520, I-5 to Medina: Bridge Replacement and HOV Project. March 21.
- Caltrans. 2013. Transportation and Construction Vibration Guidance Manual. September.
- Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment.
- Impacts of Construction Vibrations on Rock Pinnacles and Natural Bridges, General Hitchcock Highway, Tucson, AZ. Ken W. King and Matthew J. DeMarco.
- Northern Expressway Environmental Report, Volume 2, Vibrations. 2007. Kellogg Brown & Root Pty. Ltd., Sinclair Knight Merz Pty. Ltd., QED Pty. Ltd., Department for Transport Energy and Infrastructure, Government of South Australia. March.
- Report on the Pre-Design Studies of Noise and Ground Vibration for N.W.L.R.S., City of Calgary. 1986. Appendix C, Vibration Study, Antelope Valley Roadway Project, University of Nebraska, Lincoln, Nebraska. October.

