2.2.7 Noise and Vibration

The analysis of the potential noise impacts of the SR-74 (Ortega Highway) widening project from Calle Entradero (PM 1.0) to the City/County limits (PM 1.9) is based on the Final Technical Noise Impact Analysis Report for Ortega Highway from Calle Entradero to 0.27 mi east of La Pata Avenue (LSA, June 2007) and the Final Technical Noise Impact Analysis Report Addendum for Ortega Highway (LSA, July 2008). It should be noted that the project limits covered in the Final Technical Noise Impact Analysis Report for Ortega Highway from City/County limits (PM 1.9) to 0.27 mi east of La Pata Avenue are located outside the City limits and are proceeding as a separate project; therefore, it is not analyzed as a part of this Final EIR section. In addition, receptors and proposed noise barriers located in the unincorporated County areas that are referenced in this section will be noted but not evaluated. The Final Technical Noise Impact Analysis Report and addendum are on file and available for review at the City and the Department District 12 offices.

2.2.7.1 Regulatory Setting

CEQA provides the broad basis for analyzing and abating highway traffic noise effects. The intent of this law is to promote the general welfare and foster a healthy environment. CEQA requires a strictly baseline versus build analysis to assess whether a project will have a noise impact. If a project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless such measures are not feasible.

Table 2.2.7-1 lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise levels discussed in this section with common activities.

In accordance with CEQA, a noise impact occurs when the future noise level is substantially higher than existing levels. If it is determined that the project will have noise impacts, mitigation measures must be considered.

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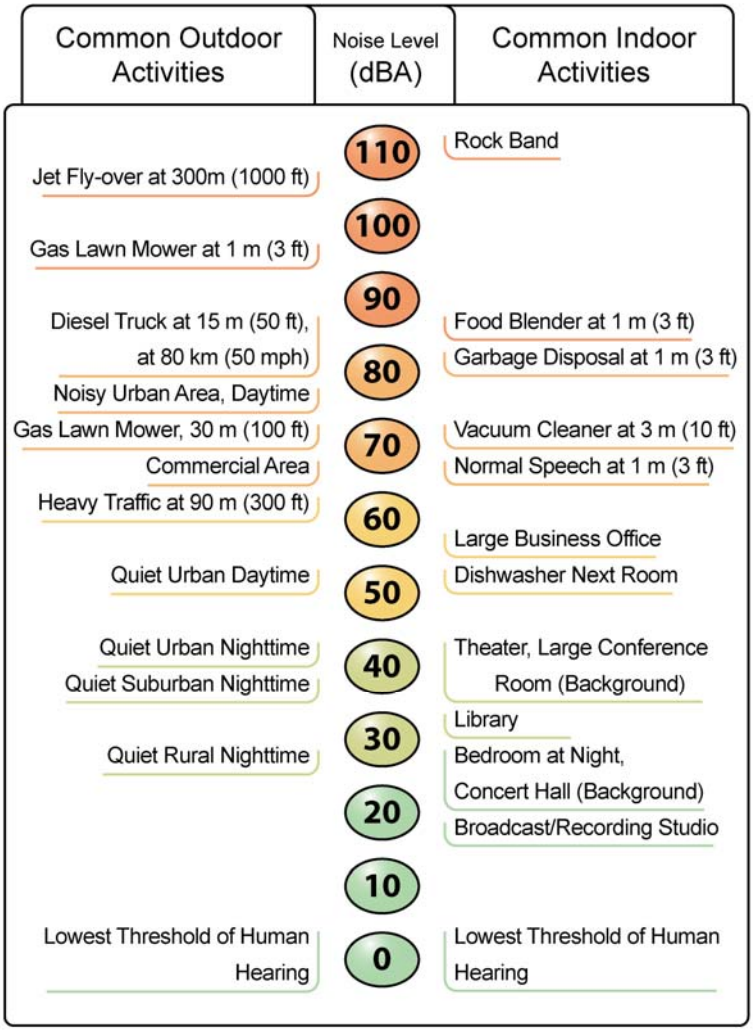
Table 2.2.7-1 Noise Level of Common Activities



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2.2.7.2 Affected Environment

The applicable technical reports used to prepare this section include the Final Technical Noise Impact Analysis Report for Ortega Highway from Calle Entradero to 0.27 mi east of La Pata Avenue (LSA, June 2007) and the addendum to the Final Technical Noise Impact Analysis Report for Ortega Highway (LSA, July 2008). It should be noted that the project limits covered in the Final Technical Noise Impact Analysis Report for Ortega Highway from Calle Entradero (PM 1.0) to the City/ County limits (PM 1.9).

Identified noise-sensitive areas can be largely categorized into three groups for the purpose of this study: Group 1 (below), Group 2 (above), and Group 3 (at-grade elevations). Group 1 comprises areas that are below grade elevations in comparison with Ortega Highway. Noise-sensitive land uses in Group 1 include existing residential structures along eastbound Ortega Highway that are mostly protected by existing slopes and property walls located below the highway elevations, with elevations ranging from several feet to approximately 15 ft below highway grade. Noise-sensitive land uses in Group 2 consist of the homes along westbound Ortega Highway that are mostly above grade. Last, noise-sensitive land uses in Group 3 include residences along eastbound and westbound Ortega Highway that are situated roughly at the same elevation as Ortega Highway. Land uses within the project area that are not considered noise-sensitive include a horse ranch.

Department engineers visited the project site on several occasions to identify possible noise monitoring locations for long-term 24 hour noise measurements and short-term measurements, each of these measurements are described below.

Long-term 24-Hour Noise Measurements

The following are the results of the long-term noise measurements, which were conducted along eastbound and westbound Ortega Highway at Receptors R-1 (28361 Via Anzar), R-2 (31071 Via Sorona), and R-3 (28271 Ortega Highway). The peak traffic noise hours at Receptors R-1 and R-2 (south side) and R-3 (north side) of Ortega Highway occurred between 7.00 a.m. and 8:00 a.m., with an L_{eq} of 59.8 at Receptor R-1, 55.8 at Receptor R-2, and 69.5 dBA at Receptor R-3, respectively. Tables 2.2.7-2, 2.2.7-3, and 2.2.7-4, show the results of the long-term 24-hour noise measurements. Figure I-1 in Appendix I, shows the receptors locations. Following are descriptions of the three measurement sites.

Table 2.2.7-2 Measured 24-Hour Noise Level at Receptor R-1 (28361 Via Anzar)

Start Time	End Time	Measured 1 Hour dBA L_{eq}
9:00	10:00	59.5
10:00	11:00	58.7
11:00	12:00	58.6
12:00	13:00	58.3
13:00	14:00	58.4
14:00	15:00	58.3
15:00	16:00	58.8
16:00	17:00	58.5
17:00	18:00	57.5
18:00	19:00	56.1
19:00	20:00	53.6
20:00	21:00	52.7
21:00	22:00	51.2
22:00	23:00	50.7
23:00	0:00	49.6
0:00	1:00	48.1
1:00	2:00	47.7
2:00	3:00	46.5
3:00	4:00	48.1
4:00	5:00	53.6
5:00	6:00	57.7
6:00	7:00	59.0
7:00	8:00	59.8
8:00	9:00	59.4
9:00	1:00	58.8

Note: Noise levels were measured at this site from January 14 to January 15, 2004
dBA = A-weighted decibel
L_{eq} = hourly equivalent continuous nose levels

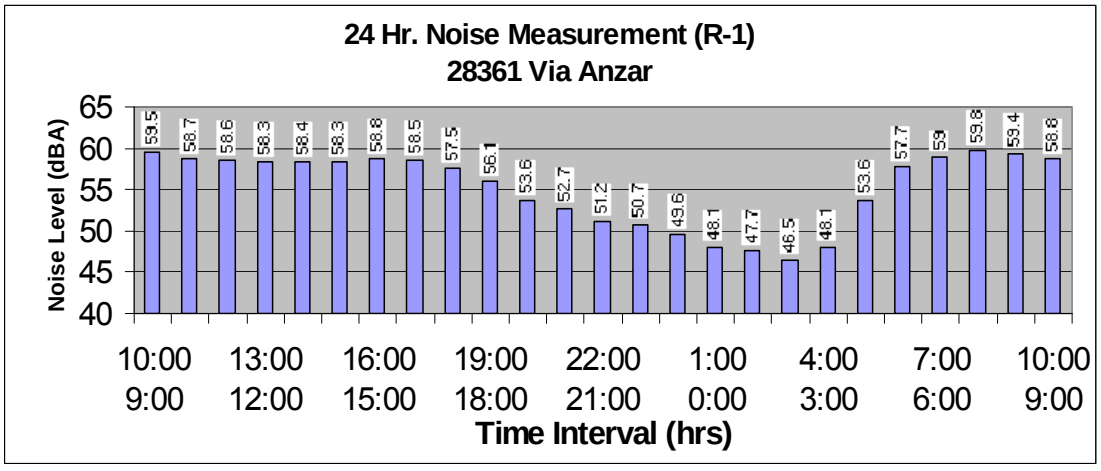


Table 2.2.7-3 Measured 24-Hour Noise Level at Receptor R-2 (31071 Via Sonora)

Start Time	End Time	Measured 1 Hour dBA L_{eq}
14:45	15:00	54.2
15:00	16:00	54.4
16:00	17:00	54.1
17:00	18:00	53.4
18:00	19:00	52.3
19:00	20:00	49.8
20:00	21:00	48.9
21:00	22:00	48.0
22:00	23:00	46.2
23:00	0:00	45.1
0:00	1:00	43.0
1:00	2:00	40.9
2:00	3:00	42.2
3:00	4:00	44.1
4:00	5:00	46.7
5:00	6:00	52.9
6:00	7:00	55.3
7:00	8:00	55.8
8:00	9:00	55.3
9:00	10:00	54.0
10:00	11:00	54.6
11:00	12:00	55.1
12:00	13:00	55.3
13:00	14:00	54.4
14:00	14:45	54.5

Note: Noise levels were measured at this site from January 21 to January 22, 2004
dBA = A-weighted decibel
L_{eq} = hourly equivalent continuous nose levels

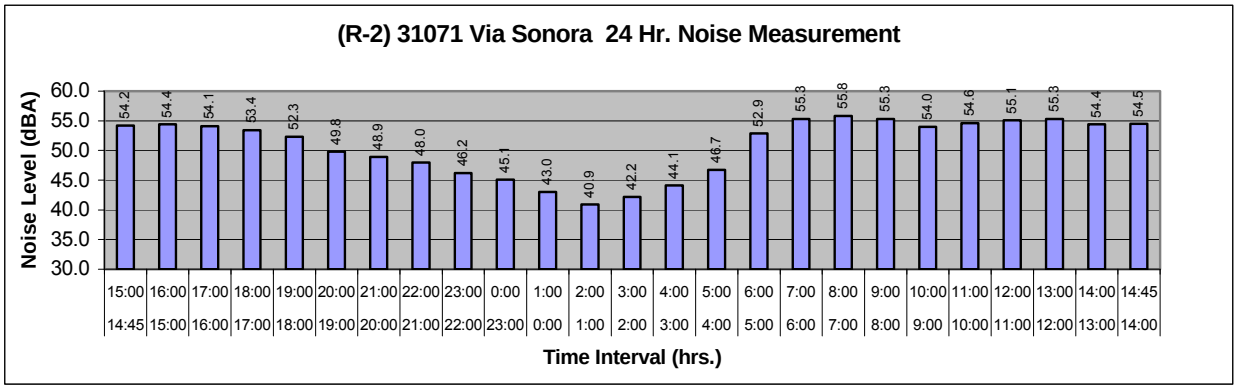
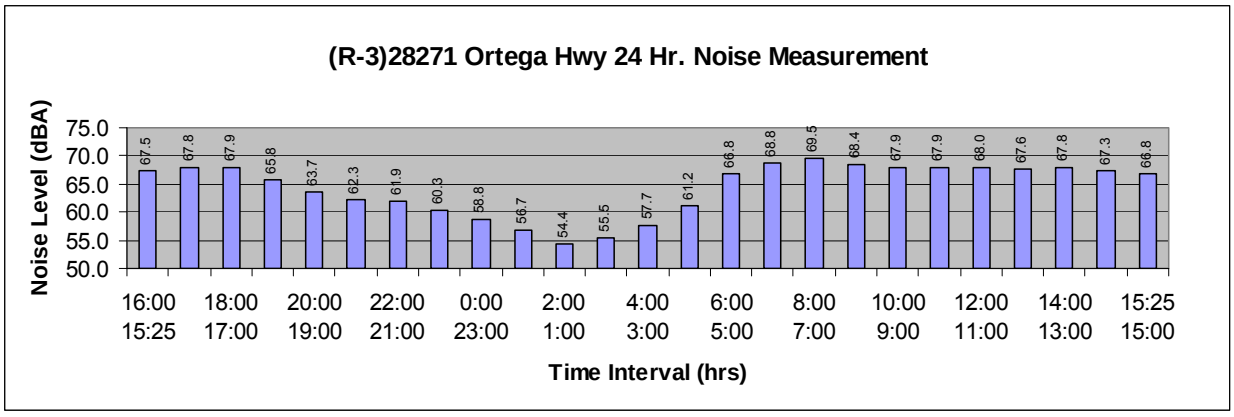


Table 2.2.7-4 Measured 24-Hour Noise Level at Receptor R-3 (28271 Ortega Highway)

Start Time	End Time	Measured 1 Hour dBA L_{eq}
15:25	16:00	67.5
16:00	17:00	67.8
17:00	18:00	67.9
18:00	19:00	65.8
19:00	20:00	63.7
20:00	21:00	62.3
21:00	22:00	61.9
22:00	23:00	60.3
23:00	0:00	58.8
0:00	1:00	56.7
1:00	2:00	54.4
2:00	3:00	55.5
3:00	4:00	57.7
4:00	5:00	61.2
5:00	6:00	66.8
6:00	7:00	68.8
7:00	8:00	69.5
8:00	9:00	68.4
9:00	10:00	67.9
10:00	11:00	67.9
11:00	12:00	68.0
12:00	13:00	67.6
13:00	14:00	67.8
14:00	15:00	67.3
15:00	15:25	66.8

Note: Noise levels were measured at this site from January 21 through January 22, 2004
dBA = A-weighted decibel
L_{eq} = hourly equivalent continuous nose levels



- **Site R-1.** 28361 Via Anzar. The measurement was conducted in the backyard of this single-family residence. This site was selected for a 24-hour measurement because it represents a typical home at below highway grade elevation and represents an area of frequent human outdoor activity for homes along Via Anzar. The surrounding communities on both sides are single-family residences. The worst traffic noise level of 59.8 dBA L_{eq} was recorded between 7:00 a.m. and 8:00 a.m.
- **Site R-2.** 31071 Via Sorona. The measurement was conducted in the backyard of this single-family residence. This site was selected for a 24-hour measurement because it represents an area of frequent human outdoor activity for homes along Via Sorona. The surrounding communities on both sides are single-family residences. The worst traffic noise level of 55.8 dBA L_{eq} was recorded between 7:00 a.m. and 8:00 a.m.
- **Site R-3.** 28271 Ortega Highway. The measurement was conducted in the side yard/backyard of this single-family residence. This site was selected for a 24-hour measurement because it has a direct line of sight to Ortega Highway and represents an area of frequent human outdoor activity. The surrounding communities on both sides are single-family residences. The worst traffic noise level of 69.5 dBA L_{eq} was recorded between 7:00 a.m. and 8:00 a.m.

Short-term Measurements

Short-term (10-minute interval) measurements were conducted at 15 locations and at sensitive receptors along the proposed project area. As shown in Table 2.2.7-5, the peak-hour noise levels at sensitive outdoor human use areas (in backyards) for the first-row residences along eastbound Ortega Highway ranged from 59.0 to 64.2 dBA. The second-row noise measurements along eastbound Ortega Highway ranged from 52.5 to 60.7 dBA L_{eq}. The westbound Ortega Highway short-term noise measurements for first-row residences ranged from 58.7 to 70.2 dBA L_{eq}. The following is a description of the above measurement sites.

- **Site A-1 (Eastbound).** 28391 Via Anzar. The measurement was conducted in the backyard of this single-family residence on Via Anzar. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes along Via Anzar that are below grade elevation in comparison with Ortega Highway. The surrounding communities on both sides are single-family residences. The short-term traffic noise level of 60.5 dBA L_{eq} was recorded between 8:35 a.m. and 8:45 a.m.

Table 2.2.7-5 Existing Noise Levels (Short-term Measurements)

Eastbound Ortega Highway Short-term Noise Measurements (10-minute) for First Row and Second Row

Type of Development	Receiver, First Row	First-Row Address	10 minute dBA L_{eq}	Receiver, Second Row	Second-Row Address	10-minute dBA L_{eq}	Difference (dBA)	Time	Date
SFR[1]	A1	28391 Via Anzar[2]	60.5	A2	28402 Via Anzar[2]	52.5	8.0**	8:35 a.m.–8:45 a.m.	2/4/04
SFR	B1	28351 Via Anzar[2]	59.0	B2	283 42 Via Anzar[2]	52.6	6.4**	8:50 a.m.–9:00 a.m.	2/4/04
SFR	C1	31102 Calle Entradero	64.2	C2	31112 Calle Entradero	60.7	3.5	9:25 a.m.–9:35 a.m.	2/4/04
SFR	D1	28111 Paseo Asteca	60.2	D2	28112 Paseo Asteca	55.5	4.7	9:54 a.m.–10:04 a.m.	2/4/04
SFR	E1	30882 Via Errecarte[2]	62.8	E2	30892 Via Erregarte[2]	53.8	9.0**	10:30 a.m.–10:40 a.m.	2/4/04

Source: LSA Associates, Inc., Final Technical Noise Impact Analysis Report, June 27, 2007.
[1] SFR = single-family residence.
[2] This monitoring location is also used for modeling calibration.
dBA = a-weighted decibel
L_{eq} = hourly equivalent continuous noise levels

Westbound Ortega Highway Short-term Noise Measurements (10-minute) for First Row

Type of Development	Receiver	First-Row Address	Time	10-minute dBA L_{eq}	Date
SFR	F-1	No. 6 Palm Hill Drive, rear portion of balcony	8:23 a.m.–8:33 a.m.	58.7	2/5/04
SFR	F-2	No. 6 Palm Hill Drive, top of slope	8:34 a.m.–8:44 a.m.	66.9	2/5/04
SFR	G-1	28241 Ortega Highway	8:50 a.m.–9:00 a.m.	70.2	2/5/04
SFR	H-1	28321 Ortega Highway	9:11 a.m.–9:21 a.m.	68.6	2/5/04
SFR	I-1	Along Ortega Highway, first house just to the west of Horno Drive	9:32 a.m.–9:42 a.m.	64.4	2/5/04

Source: LSA Associates, Inc., Final Technical Noise Impact Analysis Report, June 27, 2007.
dBA = a-weighted decibel
L_{eq} = hourly equivalent continuous noise levels
SFR = single-family residence

- **Site A-2 (Eastbound).** 28402 Via Anzar. The measurement was conducted in the front yard of this second-row single-family residence on Via Anzar. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes along Via Anzar that are below grade elevation in comparison with Ortega Highway. The surrounding communities on both sides are single-family residences. The short-term traffic noise level of 52.5 dBA L_{eq} was recorded between 8:35 a.m. and 8:45 a.m. This reading was recorded simultaneously in conjunction with site A-1. The difference between noise levels at sites A-1 and A-2 was later used for calibration. Site A-2 (second row) is shielded by the first-row two-story homes.
- **Site B-1 (Eastbound).** 28351 Via Anzar. The measurement was conducted in the backyard of this single-family residence on Via Anzar. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes on Via Anzar. The surrounding communities on both sides are single-family residences. The short-term traffic noise of 59.0 dBA L_{eq} was recorded between 8:50 a.m. and 9:00 a.m.
- **Site B-2 (Eastbound).** 28342 Via Anzar. The measurement was conducted in the front yard of this second-row single-family residence on Via Anzar. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes along Via Anzar. The surrounding communities are single-family residences. The short-term traffic noise level of 52.6 dBA L_{eq} was recorded between 8:50 a.m. and 9:00 a.m. This reading was recorded simultaneously in conjunction with site B-1. The difference between noise levels at sites B-1 and B-2 was later used for calibration. Site B-2 (second row) is shielded by the first-row two-story homes.
- **Site C-1 (Eastbound).** 31102 Calle Entradero. The measurement was conducted in the backyard of this single-family residence along eastbound Ortega Highway. This noise measurement represents an area of frequent human outdoor activity, which is shielded by the existing 5 ft high property block wall. The house is located on the southeast corner of Calle Entradero and Ortega Highway. Surrounding communities to the east and south are single-family residences. The short-term traffic noise level of 64.2 dBA L_{eq} was recorded between 9:25 a.m. and 9:35 a.m.
- **Site C-2 (Eastbound).** 31112 Calle Entradero. The measurement was conducted in the front yard of this second-row single-family residence on Calle Entradero. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes along Calle Entradero. The

surrounding communities on the north and east sides are single-family residences. The short-term traffic noise level of 60.7 dBA L_{eq} was recorded between 9:25 a.m. and 9:35 a.m. This reading was recorded simultaneously in conjunction with site C-1; however, the difference between noise levels at sites C-1 and C-2 was not used for calibration. This is due to an angle noise received from Ortega Highway at site C-2 during the measurement. Site C-2 (second row) is not considered to be shielded.

- **Site D-1 (Eastbound).** 28111 Paseo Asteca. The measurement was conducted in the backyard area of the single-family residence along eastbound Ortega Highway. This noise measurement represents an area of frequent human outdoor activity that is shielded by existing shallow slope and a 3 ft high block wall. The house is located at the southeast corner of Via Cordova and Ortega Highway. The surrounding communities to the east and south are residential buildings. The short-term traffic noise level of 60.2 dBA L_{eq} was recorded between 9:54 a.m. and 10:04 a.m.
- **Site D-2 (Eastbound).** 8112 Paseo Asteca. The measurement was conducted in the front yard of this second-row single-family residence. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity for homes along Paseo Asteca. The surrounding communities on all sides are single-family residences. The short-term traffic noise level of 55.5 dBA L_{eq} was recorded between 9:54 a.m. and 10:04 a.m. This reading was recorded simultaneously in conjunction with site D-1; however, the difference between noise levels at site D-1 versus D-2 was not used for calibration. This is due to an angle noise received at this location from Ortega Highway during the measurement. Site D-2 (second row) is not considered to be shielded; however, site D-1 was partially shielded by the existing property block wall.
- **Site E-1 (Eastbound).** 30882 Via Errecarte. The measurement was conducted in the backyard area of this single-family residence along eastbound Ortega Highway. This noise measurement represents an area of frequent human outdoor activity that is shielded by a shallow slope and a 2.5 ft high block wall. The house is located at the southeast corner of Via Errecarte and Ortega Highway. The surrounding communities to the east and south are residential buildings. The short-term traffic noise level of 62.8 dBA L_{eq} was recorded between 10:30 a.m. and 10:40 a.m.
- **Site E-2 (Eastbound).** 30892 Via Errecarte. The measurement was conducted in the backyard area of this second-row single-family residence. The surrounding communities on the north, south, and east sides are single-family residences. The

short-term traffic noise level of 53.8 dBA L_{eq} was recorded between 10:30 a.m. and 10:40 a.m. This reading was recorded simultaneously in conjunction with site E-1. The difference between noise levels at sites E-1 and E-2 was used for calibration. Receiver E-2 was shielded by the neighboring homes to the north.

- **Site F-1 (Westbound).** No. 6 Palm Hill Drive. The measurement was conducted in various locations of this three-story home located along westbound Ortega Highway. This site was selected for a 10-minute measurement on the rear portion of the balcony because it represents an area of frequent human outdoor activity. The surrounding communities on the north, east, and west sides are single-family residences. The short-term traffic noise level of 58.7 dBA L_{eq} was recorded between 8:23 a.m. and 8:33 a.m.
- **Site F-2 (Westbound).** No. 6 Palm Hill Drive. The measurement was conducted along the top of slope for this first-row three-story home located along westbound Ortega Highway. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity. The surrounding communities on the north, east, and west sides are single-family residences. The short-term traffic noise level of 66.9 dBA L_{eq} was recorded between 8:34 a.m. and 8:44 a.m. This area is in direct line of sight of Ortega Highway. In addition, this particular site represents similar homes located along the north side and above the highway grade elevation.
- **Site G-1 (Westbound).** 28241 Ortega Highway. The measurement was conducted along the top of slope for this first-row, three-unit, two-story dwelling along westbound Ortega Highway. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity. The surrounding communities on the north, east, and west sides are single-family residences. The short-term traffic noise level of 70.2 dBA L_{eq} was recorded between 8:50 a.m. and 9:00 a.m. This area is in direct line of sight of Ortega Highway. In addition, this particular site represents similar homes located above the highway grade elevation and a relatively close distance to the north side of Ortega Highway.
- **Site H-1 (Westbound).** 28321 Ortega Highway. The measurement was conducted for this first-row one-story residential/commercial combination structure along westbound Ortega Highway. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity. The surrounding communities on the north, east, and west sides are single-family residences. The short-term traffic noise level of 68.6 dBA L_{eq} was recorded between 9:11 a.m. and 9:21 a.m. This area is in direct line of sight of Ortega Highway. In addition, this

particular site represents similar homes located at the same elevation with Ortega Highway and a close distance to the north side of the highway.

- **Site I-1 (Westbound).** This house is located just to the west of Horno Drive, along the north side of Ortega Highway. The measurement was conducted for this first-row one-story residential structure. This site was selected for a 10-minute measurement because it represents an area of frequent human outdoor activity. The surrounding communities on the east and west sides are single-family residences. The short-term traffic noise level of 64.4 dBA L_{eq} was recorded between 9:32 a.m. and 9:42 a.m. This area is in direct line of sight of Ortega Highway. In addition, this particular site represents similar homes located slightly above highway grade elevation and a close distance to the north side of Ortega Highway.

2.2.7.3 Environmental Consequences

Temporary Impacts

No Build Alternative

The No Build Alternative would not result in construction in the project area and, therefore, would result in no short-term noise impacts during construction.

Build Alternatives 1 and 2

Construction Noise Impacts

Two types of short-term noise impacts would occur during construction of the project. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and construction activities will remain on site for the duration of the construction phase, will be present during construction work hours, and will be removed during nonwork hours. A high single-event noise exposure potential at a maximum level of 87 dBA L_{max} from trucks passing at 15 m (50 ft) will exist. However, the projected construction traffic will be minimal when compared to existing traffic volumes on Ortega Highway and other affected streets, and its associated long-term noise level change will not be perceptible.

The second type of short-term noise impact is related to noise generated during excavation, grading, and roadway construction. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated and, therefore, the noise levels along the project

alignment as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 2.2.7-6 lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 15 m (50 ft) between the equipment and a noise receptor.

Table 2.2.7-6 Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 ft)	Suggested Maximum Sound Levels for Analysis (dBA at 50 ft)
Pile Drivers, 12,000 to 18,000 ft-lb/blow	81–96	93
Rock Drills	83–99	96
Jackhammers	75–85	82
Pneumatic Tools	78–88	85
Pumps	74–84	80
Dozers	77–90	85
Scrapers	83–91	87
Haul Trucks	83–94	88
Cranes	79–86	82
Portable Generators	71–87	80
Rollers	75–82	80
Tractors	77–82	80
Front-End Loaders	77–90	86
Hydraulic Backhoe	81–90	86
Hydraulic Excavators	81–90	86
Graders	79–89	86
Air Compressors	76–89	86
Trucks	81–87	86

Source: Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman 1987.
dBA = a-weighted decibel ft = feet ft-lb/blow = foot per pound per blow

Typical noise levels at 15 m (50 ft) from an active construction area range up to 91 dBA L_{max} during the noisiest construction phases. The site preparation phase, which includes grading and paving, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three or four minutes at lower power settings.

Construction of the Build Alternatives is expected to require the use of earthmovers, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated between 79 and 89 dBA L_{max} at a distance of

15 m (50 ft) from the active construction area for the grading phase. As seen in Table 2.2.7-6, the maximum noise level generated by each scraper is assumed to be approximately 87 dBA L_{max} at 15 m (50 ft) from the scraper in operation. Each bulldozer would also generate approximately 85 dBA L_{max} at 15 m (50 ft). The maximum noise level generated by water trucks and pickup trucks is approximately 86 dBA L_{max} at 15 m (50 ft) from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source.

The worst-case composite noise level at the nearest noise-sensitive receptor during this phase of construction would be 91 dBA L_{max} (at a distance of 15 m [50 ft] from an active construction area).

The closest sensitive receptor locations are located 15 m (50 ft) from the project construction boundary. Therefore, these receptor locations may be subject to short-term noise reaching 91 dBA L_{max} generated by construction activities along the project alignment. To minimize the construction noise impact for sensitive land adjacent to the project site, construction noise is regulated by Caltrans Standard Specifications, Section 7-1.01I, "Sound Control Requirements," in the Standard Special Provisions. These provisions follow:

> "Sound control shall conform to the provisions in Section 7-1.01I, Sound Control Requirements, of the Standard Specifications and these special provisions. The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA at a distance of 15 m (50 ft). This requirement in no way relieves the contractor from responsibility for complying with local ordinances regulating noise level. The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixer or transient equipment that may or may not be owned by the contractor. The use of loud signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel. Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional will be allowed therefore."

With implementation of the Caltrans standard noise specification, potential temporary noise impacts of Build Alternatives 1 and 2 are considered less than significant.

Construction-Related Groundborne Vibration Impacts

Construction-related vibration generated by construction equipment can result in varying degrees of ground vibration, depending on the equipment. The operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings situated on soil near the active construction area respond to these vibrations that range from no perception to low rumbling sounds with perceptible vibrations and slight damage at the highest vibration levels. Typically, construction-related vibrations do not reach vibration levels that would result in damage to nearby structures. However, old and fragile structures would require special consideration to avoid damage.

Table 2.2.7-7 shows the vibration damage potential threshold criteria. Table 2.2.7-7 indicates that the vibration damage threshold is 0.3 peak particle velocity (PPV) (inches per second [in/sec]) for old residential structures and 0.5 PPV (in/sec) for new residential structures. Table 2.2.7-8 shows the vibration annoyance potential criteria. Tables 2.2.7-7 and 2.2.7-8 were used to evaluate short-term, construction-related groundborne vibration.

Table 2.2.7-7 Guideline Vibration Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources[1]	Continuous/ Frequent Intermittent Sources[2]
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Department Transportation- and Construction-Induced Vibration Guidance Manual, June 2004.
[1] Transient sources create a single, isolated vibration event, such as blasting or drop balls.
[2] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
in/sec = inches per second
PPV = peak particle velocity

Table 2.2.7-8 Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (in/sec)	
	Transient Sources[1]	Continuous/Frequent Intermittent Sources[2]
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: Department Transportation- and Construction-Induced Vibration Guidance Manual, June 2004.
[1] Transient sources create a single, isolated vibration event, such as blasting or drop balls.
[2] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
in/sec = inches per second
PPV = peak particle velocity

Build Alternatives 1 and 2 may require the use of a vibratory steel wheel roller during AC placement to compact the AC. Other heavy-tracked construction equipment may be required for project construction. As shown in Table 2.2.7-9, a typical vibratory steel wheel roller would generate approximately 0.210 PPV (in/sec) when measured at 25 ft. Table 2.2.7-9 also shows that typical heavy-tracked construction equipment would generate approximately 0.003 to 0.089 PPV (in/sec) when measured at 25 ft. In addition, the project proposes to use cast-in-drilled-hole (CIDH) piles as an alternative to pile drivers. Vibration generated from drilling using the CIDH method would be negligible. Therefore, no groundborne vibration impacts from the installation of CIDH piles would occur.

Table 2.2.7-9 Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV at 25 ft (in/sec)
Vibratory roller	0.210
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003
Crack-and-seat operations	2.4

Sources: Federal Transit Administration 1995 (except Hanson 2001 for vibratory rollers) and Caltrans 2000 for crack-and-seat-operations.
ft = feet in/sec = inches per second PPV = peak particle velocity

The closest existing residence is located on the southeast corner of Calle Entradero and Ortega Highway. The distance from the house to the edge of Ortega Highway is approximately 25 ft and would be exposed to groundborne vibration levels of 0.210 PPV (in/sec) and 0.089 PPV (in/sec) from potential AC placement and heavy tracked

construction equipment, respectively. As shown in Table 2.2.7-7, short-term construction-related vibration levels from heavy tracked construction equipment is well below 0.3 PPV (in/sec) for older residential structures.

The closest existing historical residence is the Hankey Rowse house, which is located on the southwest corner of Via Cristal and Ortega Highway. The distance from the house and garage to the edge of Ortega Highway is approximately 50 ft and 20 ft, respectively. Therefore, the house and garage would be exposed to groundborne vibration levels of 0.098 PPV (in/sec) and 0.268 PPV (in/sec), respectively. Table 2.2.7-8 shows that this level of groundborne vibration is considered strongly perceptible to humans. Although the City has designated the house as historic, the house is constructed of wood frame structures and may be considered as an older residential structure, with maximum vibration impact criteria of 0.3 PPV (in/sec). However, the garage located next to the house is identified as a modern structure with a maximum vibration level of 0.5 PPV (in/sec). Vibration levels generated by AC placement and heavy tracked construction equipment would be below the impact criteria of 0.3 PPV (in/sec) for older residential structures and would not damage either the house or the garage structures. Table 2.2.7-8 shows that this level of groundborne vibration is considered strongly perceptible to humans. Therefore, impacts from short-term construction-related vibration levels generated by heavy-tracked construction equipment are considered less than significant.

Permanent Impacts

No Build Alternative

Groundborne Vibration Impacts

The No Build Alternative would not have groundborne vibration impacts beyond those of the existing condition.

Traffic Noise Impacts

The No Build Alternative would result in increased noise levels at many of the same receptors under the future 2035 traffic conditions, as shown in Table 2.2.7-10. These increases are approximately 1 to 2 dBA from existing conditions and there would not be a significant noise increase. Therefore, under the No Build Alternative, the noise increase of 1 to 2 dBA is considered less than significant.

Table 2.2.7-10 Projected Noise Levels, dBA L_{eq}

Receptor No.	Existing Noise Levels	Future (2035) No Build	Future (2035) Build	Change from Existing Noise Levels
Eastbound Side				
1	70.9	72.3	72.8	1.9
1A	58.4	59.8	60.3	1.9
2	61.8	63.2	63.7	1.9
2A	55.9	57.3	57.8	1.9
2B	55.4	56.9	57.3	1.9
3A	54.0	55.4	55.9	1.9
R-2 K-1	60.5	62.0	62.1	1.6
4	60.2	61.6	61.8	1.6
4A	54.2	55.6	55.9	1.7
5	59.7	61.1	61.3	1.6
5B	62.7	64.1	64.5	1.8
6	68.6	70.0	70.1	1.5
6A	56.7	58.1	58.6	1.9
7	70.6	72.1	71.4	0.8
7A	55.8	57.2	57.4	1.6
8	65.8	67.2	65.7	-0.1
8A	57.5	58.9	58.7	1.2
9	67.0	68.4	66.0	-1.0
10	69.6	71.1	70.1	0.5
10A	58.4	59.8	59.4	1.0
11	70.2	71.6	70.4	0.2
11A	57.9	59.3	59.2	1.3
12	64.2	65.6	65.2	1.0
13	65.2	66.6	66.2	1.0
13A	56.6	58.1	58.2	1.6
14	64.3	65.7	65.5	1.2
14A	54.0	55.4	55.6	1.6
R-1	63.6	65.0	64.8	1.2
15	62.9	64.3	64.2	1.3
15A	53.1	54.5	54.8	1.7
16 K-3	65.1	66.5	66.2	1.1
16A	53.9	55.4	55.6	1.7
17	64.1	65.6	65.3	1.2
17B	65.2	66.6	66.6	1.4
17A	59.2	60.7	60.5	1.3
18	66.9	68.3	66.9	0.0
18A	56.6	58.0	58.4	1.8
19	63.6	65.1	64.3	0.7
19A	54.9	56.3	56.7	1.8
20	62.8	64.2	64.3	1.5
21	63.7	65.2	65.7	2.0
21M[1]	69.5	71.0	71.8	2.3
21N	66.2	67.6	68.3	2.1
Westbound Side				
22	69.3	70.7	71.3	2.0
23	66.3	67.8	68.4	2.1
24	62.2	63.6	64.1	1.9
25	65.8	67.3	67.9	2.1
26	67.6	69.0	69.6	2.0
27	63.4	64.8	65.5	2.1
28 K4	67.2	68.6	69.6	2.4
29	69.9	71.4	72.5	2.6
30	71.1	72.6	73.0	1.9

Table 2.2.7-10 Projected Noise Levels, dBA L_{eq}

Receptor No.	Existing Noise Levels	Future (2035) No Build	Future (2035) Build	Change from Existing Noise Levels
31 K5	71.4	72.8	77.1	5.7
32	68.5	70.0	73.8	5.3
33	68.0	69.5	73.0	5.0
34	69.1	70.5	73.6	4.5
35	68.6	70.1	73.5	4.9

Source: LSA Associates, Inc., June 2008.
[1] Shaded rows indicate that receptors are located outside of the project limits.
dBA = a-weighted decibel
L_{eq} = hourly equivalent continuous noise levels

Build Alternatives 1 and 2

The potential traffic noise impact for Build Alternatives 1 and 2 would be the same because the proposed roadway alignments are the same.

Groundborne Vibration Impacts

Groundborne vibrations are mostly associated with passenger vehicles and trucks traveling on poor roadway conditions, such as potholes, bumps, expansion joints, or other discontinuities in the road surface. Passenger vehicles and delivery trucks would cause effects such as rattling of windows, and the source is almost always airborne noise. As the project will use new asphalt pavement, there will be no potholes, bumps, expansion joints, or other discontinuities in the road surface that would generate groundborne vibration or noise impacts from vehicular traffic traveling on Ortega Highway. Therefore, groundborne vibration impacts generated by vehicles traveling on Ortega Highway under the Build Alternatives would be considered less than significant under Build Alternatives 1 and 2.

Traffic Noise Impacts

This noise analysis was conducted to determine the potential noise impacts at sensitive receptors within the boundaries of this project for 2035. The highest traffic noise occurs when the traffic is very heavy but remains free-flowing. Traffic engineers refer to this condition as level of service (LOS) C for worst-case traffic conditions. The existing and future 2035 peak-hour volumes were provided by the Department District 12 for worst-case traffic conditions. These traffic volumes were used to evaluate potential long-term noise impacts associated with project operations. Traffic on other local surface streets was not modeled because the dominant noise source is Ortega Highway. It should be noted that the existing

noise levels were not adjusted to the peak traffic noise because short-term noise measurements were conducted during the peak traffic noise hour, and the existing traffic volumes were used to establish the existing noise levels using the existing peak-hour volume.

As indicated above, future noise levels were modeled using traffic volumes provided by the Department District 12 Traffic Operations South for the worst-case traffic conditions. Topographic constituents such as existing slopes were included in the modeling. Table 2.2.7-10 summarize the results of the predicted future noise levels at representative receptor locations. As shown in Table 2.2.7.10, the predicted noise levels (future build) do not result in significant increases except for Receptor No. 31K5.

As shown in Table 2.2.7-10, Receptor 31 K5 is predicted to experience a traffic noise level of 77 dBA L_{eq}. This noise level is considered a severe traffic noise impact by the Department because it exceeds 75 dBA L_{eq} and is considered potentially significant. Appendix I shows the residence represented by Receptor 31 K5 has an access onto Ortega Highway, hence a sound wall would not be effective with a break in the wall to accommodate the driveway. Interior noise mitigation shall be offered to the property owner of the Receptor 31 K5**.** If interior noise mitigation is provided, an agreement must be entered into with the owner of the subject property that specifies that the Department is not responsible for any future cost of operating or maintaining the noise mitigation. This mitigation is expected to reduce the interior noise levels by approximately 5 dBA.

2.2.7.4 Avoidance, Minimization, and/or Mitigation Measures

The following minimization measure must be implemented and Mitigation Measure N-1 must be implemented to reduce permanent significant noise impacts for Build Alternatives 1 and 2 to below a level of significance.

Construction of the proposed Build Alternatives shall comply with the Department's Standard Specifications, "Sound Control Requirements."

N-1 To reduce permanent significant noise impacts to Receptor 31 K5 to below a level of significance, the Department shall offer interior noise mitigation measures such as installation of double-paned windows and a mechanical heating and cooling system (air conditioning).

2.2.7.5 Level of Significance

The No Build Alternative would have no temporary noise impacts; and predicted future noise levels are considered less than significant.

For Build Alternatives 1 and 2, temporary, direct, or indirect noise impacts are considered less than significant. With the implementation of the Department's standard specifications and Mitigation Measure N-1 that requires the offering of interior noise mitigation (e.g., double-paned windows and mechanical heating and cooling) for Receptor 31 K5, the permanent, direct, or indirect noise impacts of the Build Alternatives is considered less than significant.