Appendix D

Noise and Vibration Alternatives Analysis

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October 21, 2015

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Subject: Santa Clara River Levee Improvements Downstream of the Union Pacific Railroad (SCR-3) Project
Noise and Vibration

Dear Lisa:

The noise and vibration analysis was performed in accordance with the guidelines prepared by the County of Ventura to ensure consistent and complete assessment of noise and vibration impacts for the proposed Santa Clara River Levee Improvements Downstream of the Union Pacific Railroad (SCR-3) Project (SCR-3 Project or proposed Project) (Ventura County, 2011). The noise and vibration impacts from the construction, operation and maintenance of the proposed Project are addressed in support of the project Environmental Impact Report.

Sincerely,
ACENTECH INCORPORATED

Ramon E. Nugent, PE
Principal Consultant

Santa Clara River Levee Improvements Downstream of UPRR (SCR-3) Project – Noise and Vibration Alternative Analysis

Introduction

Noise is defined as any unwanted sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. Because the effects of noise accumulate over time, it is necessary to deal not only with the intensity of sound but also the duration of human exposure to the sound.

The unit of sound measurement is the decibel (dB). The dB scale is a logarithmic measure used to quantify sound power or sound pressure. A sound power level describes the acoustical energy of a sound and is independent of the medium in which the sound is traveling. As such, sound power levels are not measurable with a sound level meter, which only measures sound pressure levels. A sound pressure level is a physical measure of the pressure field a sound wave produces, and is presented in dB as the ratio of a measured pressure to a reference pressure. In air, that reference pressure is 20 micropascals (µPa).

Noise Effects on Humans. The human ear is not uniformly sensitive to all noise frequencies. Therefore, the "A" weighting scale was devised to correspond with the ear's sensitivity. The A-weighting scale uses specific weighting of sound pressure levels from about 31.5 hertz (Hz) to 8 kilohertz (kHz) for the purpose of determining the human response to sound. The resulting unit of measure is the A-weighted decibel (dBA).

Because noise levels can vary over a given time period, they are quantified further using the Equivalent Sound Level (Leq) and Day-Night Sound Level (Ldn). The Leq is an average of the time-varying sound energy for a specified time period. The Ldn is an average of the time-varying sound energy for one 24-hour period, with a 10 decibel correction factor added to the sound energy for the time period of 10:00 p.m. to 7:00 a.m. to account for the expected increase in annoyance during nighttime hours. In California, the Community Noise Equivalent Level, CNEL, is often cited. CNEL is similar to Ldn except the period between 7:00 p.m. and 10:00 p.m. has a 5 decibel addition as opposed to 10 decibels. Ldn and CNEL are normally within 0.5 dB of each other. Figure 1 has been included in order to better explain the qualitative nature of community noise environments expressed in terms of Ldn.

Noise Propagation. In air, sound from a point source radiates according to inverse square laws either spherically or hemispherically from the source, depending upon whether the noise source is near a reflecting surface such as the ground. Consequently, sound will decrease at a rate of 6 dB per doubling of distance from a point source. Additional decreases will occur due to sound absorption in the air, interaction with the ground, and shielding by intervening obstacles. A noise source which is relatively long, such as a constant stream of traffic, is called a line source, and the sound spreads cylindrically, at a rate of 3 dB per doubling of distance.

Vibration Effects. Vibration from objects in contact with the ground will propagate energy through the ground and can be perceptible by humans and animals in the form of perceptible movement or in the form of rumbling sound caused by the vibration of room surfaces. The latter is described as ground-borne noise. High levels of vibration can result in architectural damage and structural damage depending upon the amplitude of the vibration and the fragileness of the building or structure.

Vibration is an oscillatory motion which can be described in terms of the displacement, velocity, or acceleration. Because the motion is oscillatory, there is no net movement of the vibration element and the average of any of the motion descriptors is zero. Displacement is the easiest descriptor to understand. For a vibrating floor, the

displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement and acceleration is the rate of change of the speed.

When assessing damage potential, vibration is often measured and reported in terms of peak particle velocity (PPV). For evaluating human response, the accepted manner to measure and report vibration is in terms of the root mean square (rms) amplitude. Like noise, vibration is normally expressed in terms of decibels with a reference velocity of $1x10^{-6}$ inches per second in the United States. The abbreviation "VdB" is often used for vibration decibels to reduce the potential for confusion with sound decibels. Figure 2 illustrates common vibration sources and the human and structural response to ground-borne vibration.

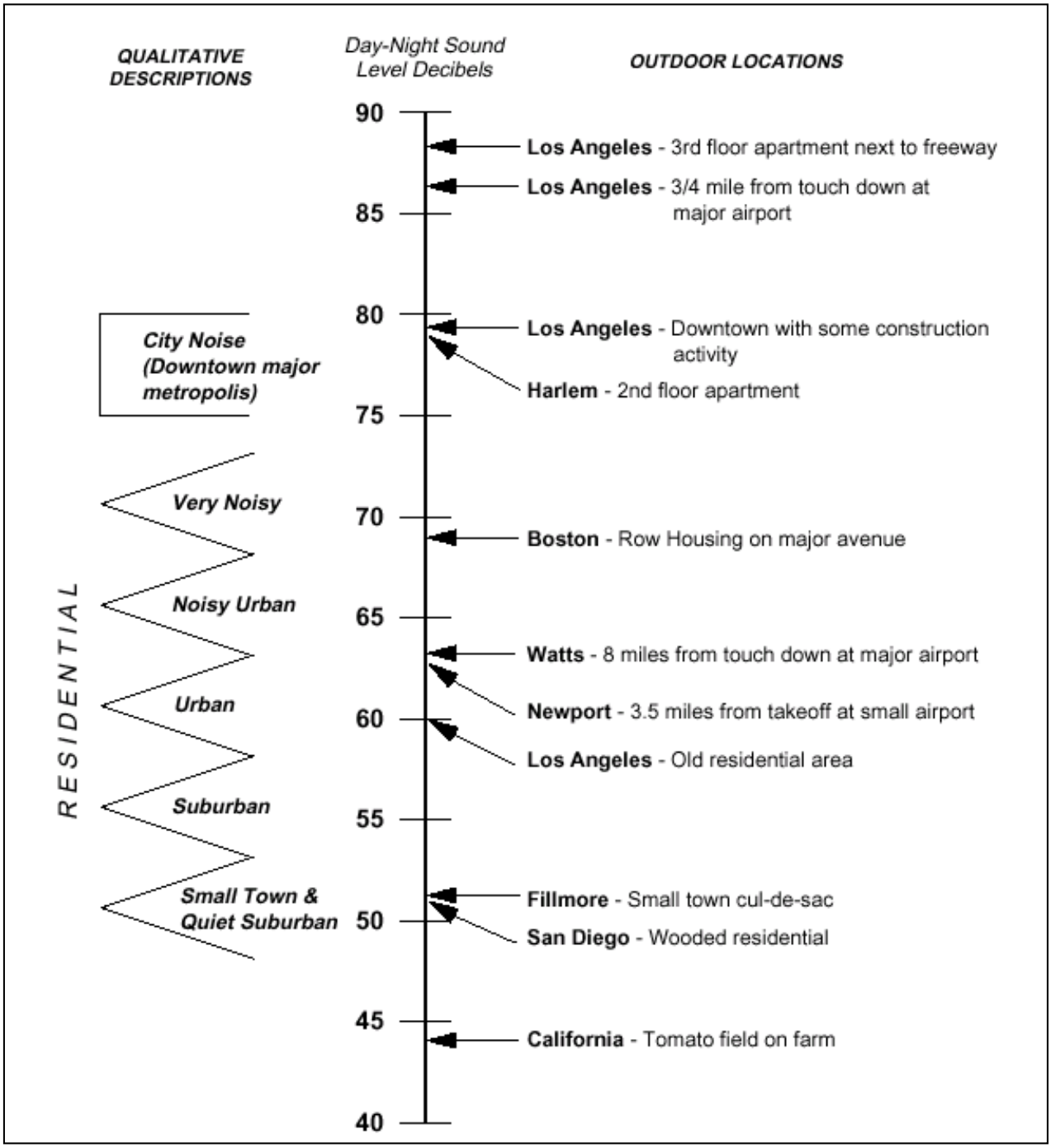


Figure 1 Community Noise Environments

Source: OPR, 2003

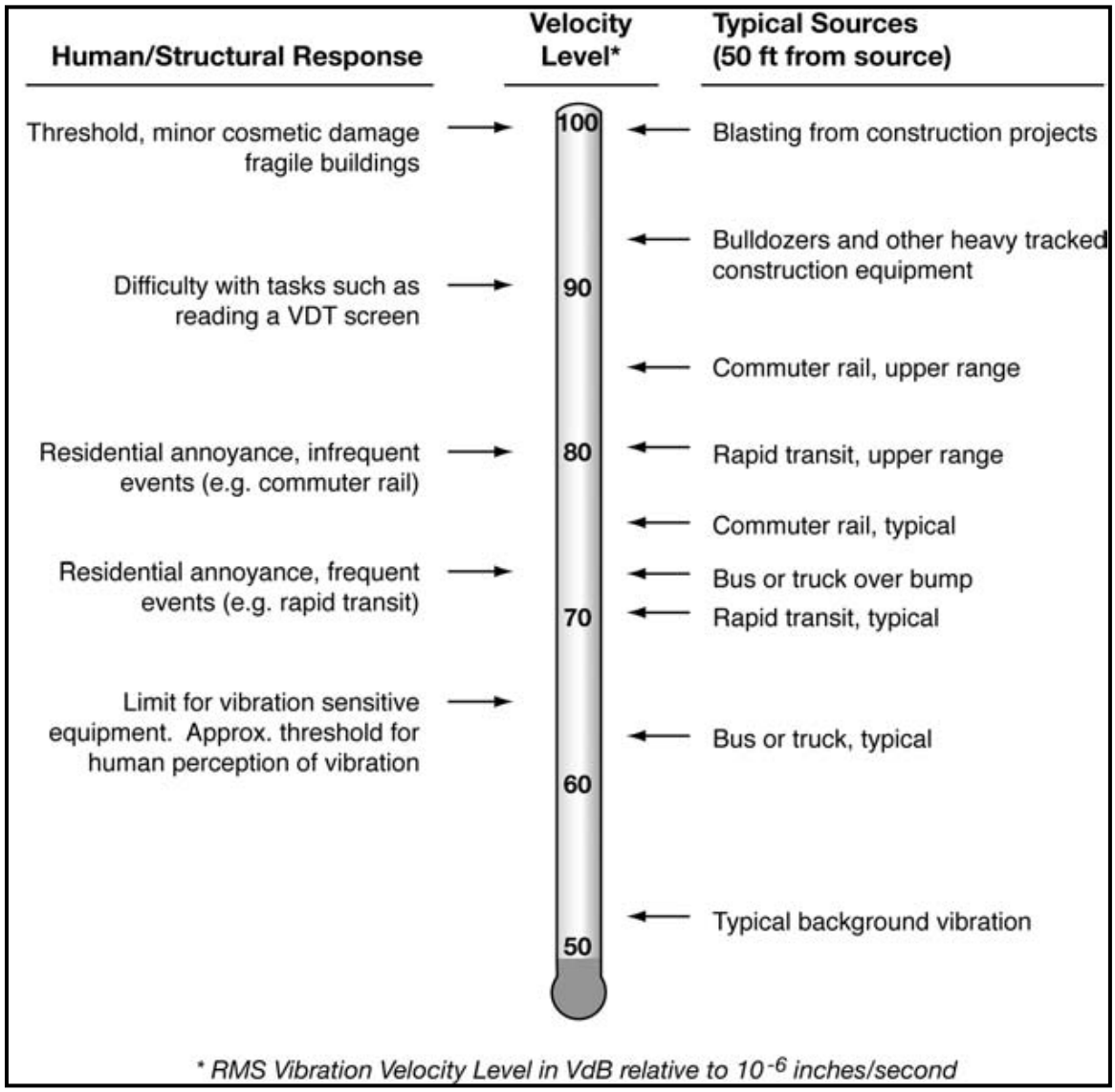


Figure 2 Typical Levels of Ground-Borne Vibration

Source: FTA, 2006.

Applicable Regulations

Federal, State, and local laws, regulations and ordinances relating to noise and vibration issues for the Project are presented and discussed below.

Federal

There are no federal regulations that would place environmental noise limits on the proposed Project; however, there have been legislation and publications that would relate to the environmental analysis. Federal Noise Control Act of 1972 regulates noise emissions from operation of construction equipment and facilities; establishes noise emission standards for construction equipment and other categories of equipment; and provides standards for the testing, inspection, and monitoring of such equipment. It gives states and municipalities primary responsibility for noise control. (USEPA, 1972)

In 1974, the United States Environmental Protection Agency (USEPA, 1974) published Information on "Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety". This

document provides information for state and local governments to use in developing their own ambient noise standards. The USEPA determined that an Ldn of 55 dBA protects the public from indoor and outdoor activity interference with an adequate margin of safety. Since that time, federal, State and local agencies have used those findings to establish planning documents for their communities.

Occupational Health and Safety Act of 1970 regulates worker noise exposure to 90 dBA over an eight-hour work shift. Areas above 85 dBA need to be posted as high noise level areas and hearing protection is required. (OSHA, 1970). Cal-OSHA administers these regulations in California.

State

There are no State regulations that would place environmental noise limits on the proposed Project; however, there have been legislation and publications that would relate to the environmental analysis. The State has established guidelines for the development of noise elements in city and county General Plans, as discussed below. (OPR, 2003)

The State General Plan Guidelines includes the noise element guidelines, which provide a basis for comprehensive local programs to control and abate environmental noise and to protect citizens from excessive exposure. The adopted noise element is administered by the local government and serves as a guideline for compliance with the State's noise insulation standards.

The State of California Noise Insulation Standards sets a CNEL of 45 dBA in any habitable room, including multiple-family, single family and hotel and motel rooms (California, 1974).

The California Department of Transportation (Caltrans) has established guidance for assessing impacts due to architectural or structural damage from ground vibration (Caltrans, 2004). Caltrans has also synthesized criteria relating to human perception. Some individuals may be annoyed at barely perceptible levels of vibration, depending on the activities in which they are participating. Table 1 and Table 2 provide a summary of the Caltrans guidance.

Table 1. Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.10
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.30
New residential structures	1.0	0.50
Modern industrial/commercial buildings	2.0	0.50

Source: Caltrans. 2004

Note(s): Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 2. Guideline Vibration Annoyance Potential Criteria		
Human Response	**Maximum PPV (in/sec)**	
	Transient Sources	**Continuous/Frequent Intermittent Sources**
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.40

Source: Caltrans, 2004.

Note(s): Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Local

The Ventura County General Plan Goals, Policies and Programs (General Plan) has established a goal of protecting the health, safety and general welfare of County residents by elimination or avoidance of adverse noise impacts on existing and future noise sensitive uses (Ventura County, 2015). Land uses considered to be noise sensitive include residential, educational, and health facilities, research institutions, certain recreational, and entertainment facilities (typically, indoor theaters and parks for passive activities) and churches. Uses considered less sensitive to noise include commercial and industrial facilities and certain noise-generating recreational facilities, such as playgrounds and gymnasiums (Ventura County, 2015).

Goals

2.16.1 To protect the health, safety, and general welfare of County residents by elimination or avoidance of adverse noise impacts on existing and future noise sensitive uses.

Policies

2.16.2-1 All discretionary development shall be reviewed for noise compatibility with surrounding uses. Noise compatibility shall be determined from a consistent set of criteria based on the standards listed below. An acoustical analysis by a qualified acoustical engineer shall be required of discretionary developments involving noise exposure or noise generation in excess of the established standards. The analysis shall provide documentation of existing and projected noise levels at on-site and off-site receptors, and shall recommend noise control measures for mitigating adverse impacts.

(4) Noise generators, proposed to be located near any noise sensitive use, shall incorporate noise control measures so that ongoing outdoor noise levels received by the noise sensitive receptor, measured at the exterior wall of the building, does not exceed any of the following standards:

a. L_{eq} 1H of 55dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 6:00 a.m. to 7:00 p.m.

b. L_{eq} 1H of 50dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 7:00 p.m. to 10:00 p.m.

c. L_{eq} 1H of 45dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 10:00 p.m. to 6:00 a.m.

Section 2.16.2(4) is not applicable to increased traffic noise along any of the roads identified within the 2020 Regional Roadway Network Public Facilities Appendix of the Ventura County General Plan. In addition, State and Federal highways, all railroad line operations, aircraft in flight, and public utility facilities are noise generators having Federal and State regulations that preempt local regulations.

(5) Construction noise shall be evaluated and, if necessary, mitigated in accordance with the County Construction Noise Threshold Criteria and Control Plan.

The General Plan sets the following priorities for noise control:

(1) Reduction of noise emissions at the source.

(2) Attenuation of sound transmission along its path, using barriers, landforms modification, dense plantings, and the like.

(3) Rejection of noise at the reception point via noise control building construction, hearing protection or other means.

The Ventura County Construction Noise Threshold Criteria and Control Plan sets forth noise threshold criteria (NTC), which applies only to those noise-sensitive receptors that are sensitive to noise impacts during the specified hours, as designated in Table 3.

Table 3. Noise-Sensitive Receptors

Receptor Description	Typical Sensitive Time Period
Hospitals, Nursing Homes (quasi-residential)	24 hours
Single-Family and Multi-Family Dwellings (residential)	Evening/Night
Hotels/Motels (quasi-residential)	Evening/Night
Schools, Churches, Libraries (when in use)	Daytime/Evening

Source: Ventura, 2010 – Figure 3 (p. 5).

The NTC specified in the Ventura County Construction Noise Threshold Criteria and Control Plan (Ventura County, 2010) is as follows:

Normally, no evening or nighttime construction activity is permitted in areas having noise-sensitive receptors. However, in the event such activity is deemed necessary and is permitted, reduced noise threshold criteria are provided for construction that must occur during evening and/or nighttime hours. Emergency construction work is exempt from these construction noise thresholds.

Daytime Construction - Daytime (7:00 a.m. to 7:00 p.m. Monday through Friday, and from 9:00 a.m. to 7:00 p.m. Saturday, Sunday and local holidays) generally means any time period not specifically defined as a more noise-sensitive time period. The daytime construction noise threshold criteria are given in Table 4. Depending on project duration, the daytime noise threshold criteria shall be the greater of the fixed Leq(h) limit (which includes non-construction evening and nighttime noise) or the measured ambient Leq(h) plus 3 dB.

Table 4. Daytime Construction Activity Noise Threshold Criteria

Construction Duration	Fixed Leq(h), dBA	Hourly Equivalent, dBA
0 to 3 days	75	Ambient Leq(h) + 3 dB
4 to 7 days	70	
1 to 2 weeks	65	
2 to 8 weeks	60	
Longer than 8 weeks	55	

Source: Ventura County, 2010 – Figure 4 (p. 7).
Note 1. The instantaneous Lmax shall not exceed the NTC by 20 dBA more than eight times per daytime hour.
Note 2. Local ambient Leq measurements shall be made on any mid-week day prior to project work.

Evening Construction - Evening hours (7:00 p.m. to 10:00 p.m.) are more noise-sensitive time periods. Therefore, evening construction noise threshold criteria differ from the daytime criteria. Overall project construction noise, for the noise-sensitive hours specified, shall not exceed the noise threshold criteria listed in Table 5, at the nearest noise-sensitive receptor area or 10 feet from the façade of the nearest noise-sensitive building.

Table 5. Evening Construction Activity Noise Threshold Criteria

Receptor Location	Fixed Leq(h), dBA	Hourly Equivalent, dBA
Residential	50	Ambient Leq(h) + 3 dB

Source: Ventura County, 2010 – Figure 5 (p. 7).

Note 1. The instantaneous Lmax shall not exceed the NTC by 20 dBA more than six times per evening hour.

Note 2. Hourly evening local ambient noise measurements shall be made on a typical mid-week evening prior to project work.

Nighttime Construction - Nighttime hours (10:00 p.m. to 7:00 a.m. Monday through Friday, and from 10:00 p.m. to 9:00 a.m. Saturday, Sunday and local holidays) are the most noise-sensitive time periods. Therefore, nighttime and holiday construction noise threshold criteria differ from the daytime and evening criteria. Overall project construction noise, for the noise-sensitive hours specified, shall not exceed the noise threshold criteria listed in Table 6, at the nearest noise-sensitive receptor area or 10 feet from the façade of the nearest noise-sensitive building.

Table 6. Nighttime Construction Activity Noise Threshold Criteria

Receptor Location	Fixed Leq(h), dBA	Hourly Equivalent, dBA
Residential, Live-in Institutional	45	Ambient Leq(h) + 3 dB

Source: Ventura County, 2010 – Figure 6 (p. 7).

Note 1. The instantaneous Lmax shall not exceed the NTC by 20 dBA more than four times per nighttime hour.

Note 2. Hourly nighttime local ambient noise measurements shall be made on a typical mid-week night prior to project work.

Maximum Construction Noise - In addition, the construction-related, slow response, instantaneous maximum noise (Lmax) shall not exceed the noise threshold criteria by 20 dBA more than eight times per daytime hour, more than six times per evening hour and more than four times per nighttime hour.

The County references vibration criteria used by the FTA (FTA, 2006) to assess potentially significant impact from construction vibration (Ventura County, 2011).

Table 7. Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate Lv†
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

† RMS velocity in decibels (VdB) re 1 micro-inch/second

Source: FTA, 2006

Table 8. Construction Vibration Annoyance Criteria

Land Use Category	GBV Impact Levels (VdB re 1 micro-inch /sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep, such as hotels and hospitals.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
2. “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

Source: FTA, 2006

Affected Environment

Ambient noise measurements were made using Type 1 environmental noise monitors, Larson Davis Model 870. Measurements were made at two locations, shown Figure 3. The location of the nearest schools, churches and hospitals are also identified in Figure 3 Noise Measurement Locations. These locations represent the nearest noise sensitive land uses near the project. Noise measurements were taken using standard industry practices including positioning the microphone five feet above grade and using field calibrators NIST traceable standards.[1]

Table 9 presents the results of the ambient noise measurements made starting on Thursday March 13 and ending on Friday March 14, 2014.

The existing noise environment included contributions from traffic on Ventura Freeway (US 101 or Highway 101), Amtrak and Metrolink Trains, local traffic on N. Ventura Road, and occasion aircraft over-flights. Location 1 is slightly shielded from N. Ventura Road by terrain, which may partially explain the approximate eight decibel difference between the two sites during hours of heavy traffic.

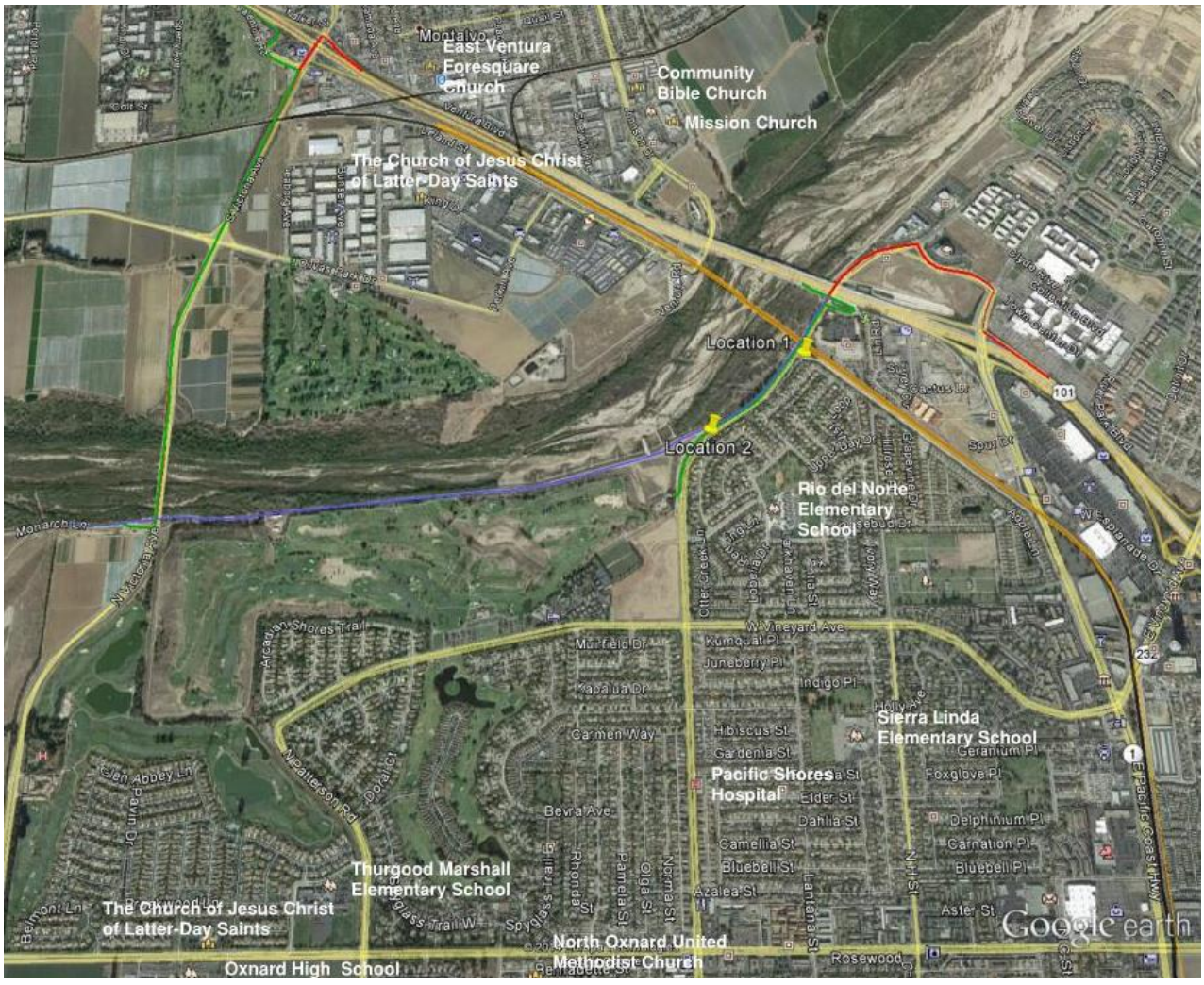


Figure 3 Noise Measurement Locations

[1] National Institute of Standards and Technology is an agency of the U.S. Department of Commerce providing metrological traceability to a NIST-traceable instrument.

Table 9. Ambient Noise Measurements		
Time [a]	**Hourly Leq(h), dBA**	
	Measurement Location 1: NW corner of Subdivision, east of N. Ventura Rd. 140 ft from center of N. Ventura Rd. and 1,180 ft from center of US 101 [b]	**Measurement Location 2: SW corner of Subdivision, east of N. Ventura Rd. 73 ft from center of N. Ventura Rd. and 2,660 ft from center of US 101 [b]**
15:00	60	68
16:00	60	68
17:00	58	68
18:00	60	68
19:00	59	67
20:00	66	66
21:00	57	65
22:00	54	65
23:00	56	60
0:00	57	59
1:00	57	57
2:00	59	55
3:00	61	57
4:00	65	61
5:00	64	66
6:00	61	69
7:00	59	72
8:00	58	69
9:00	60	66
10:00	58	67
11:00	57	66
12:00	60	68
13:00	58	67
14:00	61	67
15:00	61	68
16:00	--	69
Ldn	**67**	**71**
CNEL	**67**	**71**
Daytime Lmax	**87**	**99**
Average Daytime Leq(h) (between 06:00 and 19:00)	**59**	**68**

Note(s):

a. Daytime hours are shaded (Source: Ventura County, 2010)

b. Backyards are shielded by a six foot block wall.
Lmax = Instantaneous maximum noise level
Leq(h) = Average or mean noise level over a period of time (1-hour)

The data presented in Table 9 are presented graphically in Figure 4 and Figure 5.

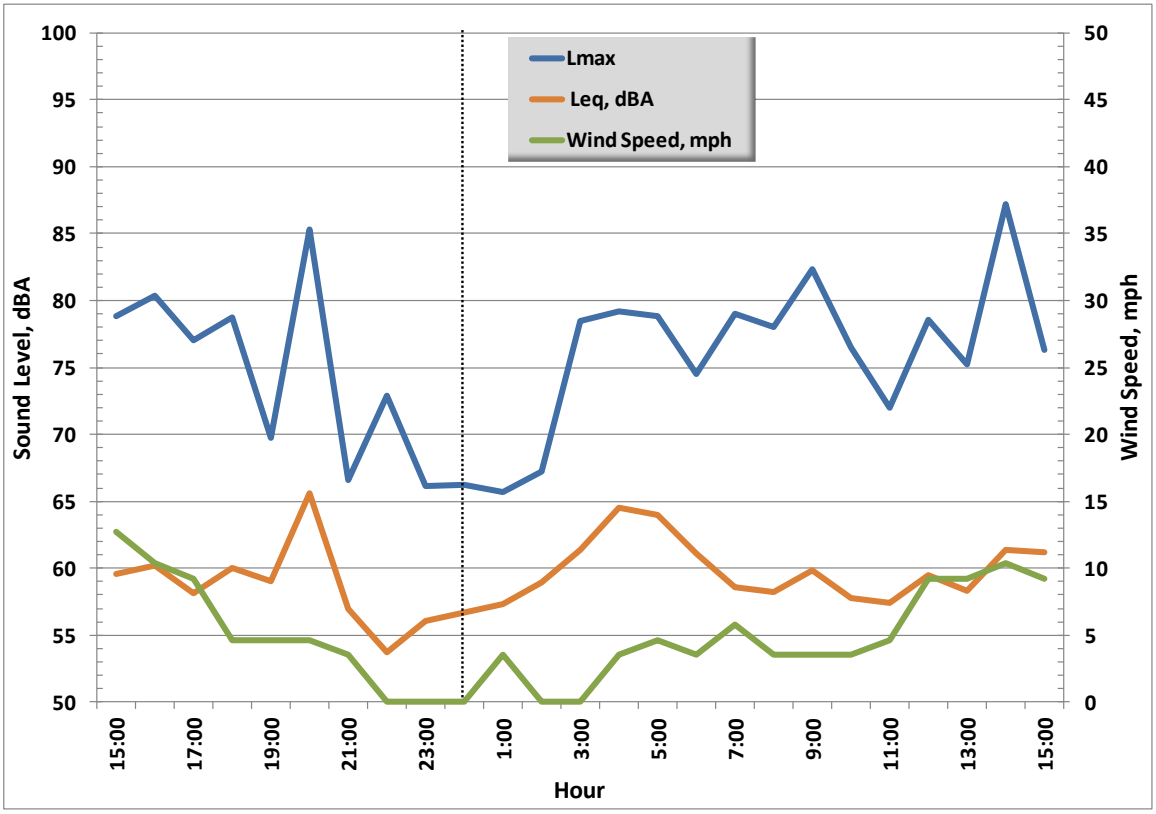


Figure 4 Ambient Noise Measured at Location 1: NW corner of subdivision east of N. Ventura Rd.

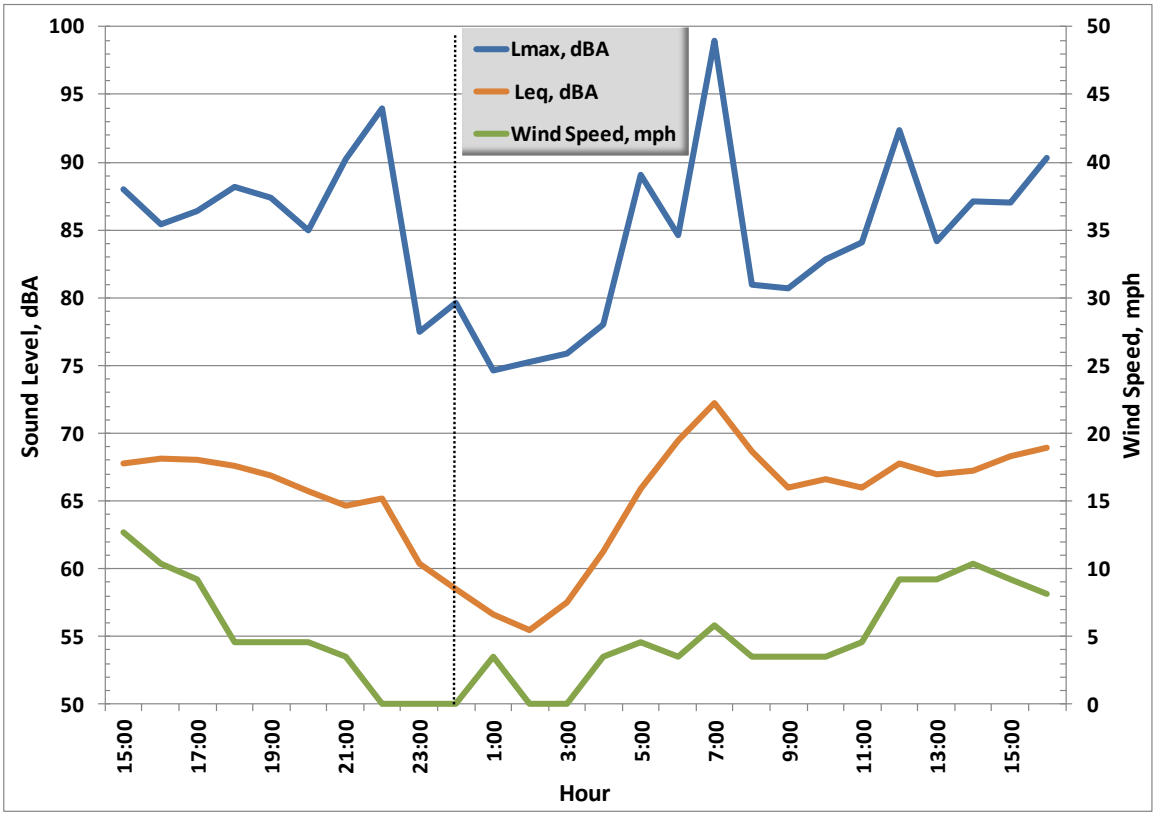


Figure 5 Ambient Noise Measured at Location 2: SW corner of subdivision east of N. Ventura Rd.

The calculated Leq(h) noise contours (lines of equal sound level) from the noisiest construction period were calculated using CadnaA, a computer-aided noise model. The major sources of noise (surface traffic) were incorporated into a computer-aided noise model in order to show typical daytime noise contours. The model included the conditions observed, terrain elevations, location of buildings and walls, and traffic data (vehicles per day, vpd, percent heavy trucks and average speed) provided by the project traffic engineer (Garland Associates, 2015):

- N. Ventura Road 11,000 vpd 10% Heavy Vehicles 50 mph
- S Victoria Avenue 38,700 vpd 10% Heavy Vehicles 60 mph
- US 101 139,000 vpd 20% Heavy Vehicles 65 mph
- Vineland Avenue 10,000 vpd 10% Heavy Vehicles 40 mph

Figure 6 Ambient Noise Contours Along Reaches 1 - 3, shows the resulting noise contours due to traffic on N. Ventura Road, Vineyard Avenue and South Victoria Avenue. The Leq(h) noise contours are in 3 dB increments starting at 52 dBA.

Figure 7 shows the resulting noise contours due to traffic on N. Ventura Road with influences from the US 101 freeway and the UPRR. We calibrated the model to produce the average daytime hour based upon the field measurements at Location 1 and Location 2. The Leq(h) noise contours are in 3 dB increments starting at 52 dBA. The measurement locations and the backyard locations adjacent to the measurement locations were also modeled. These modeling locations are represented by a "⊗" symbol in the figure. The noise level result for the backyard near Measurement Location 1 is approximately 3 db less (56 dBA) and for the backyard near Measurement Location 2 was 6 dB less (62 dBA). These differences are the result of shielding from the traffic noise by the property walls.

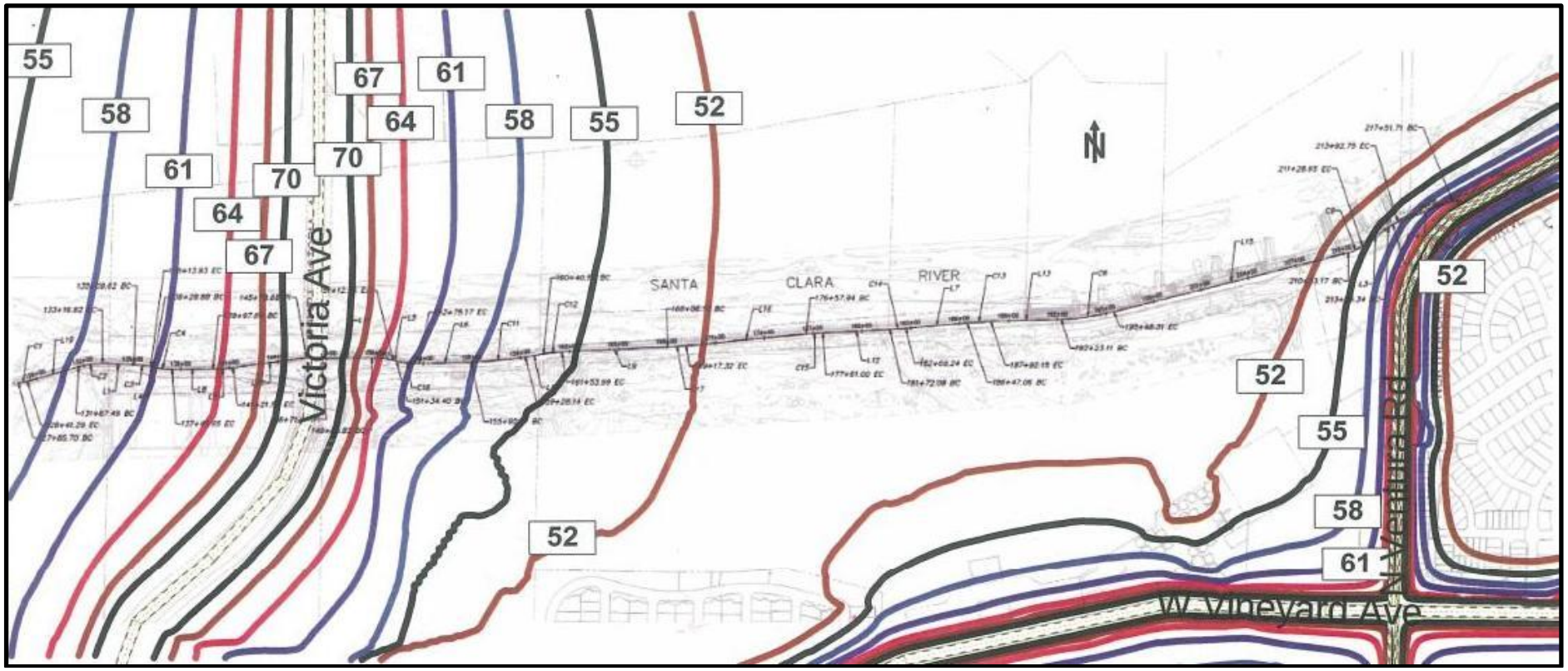


Figure 6 Ambient Noise Contours Along Reaches 1 - 3

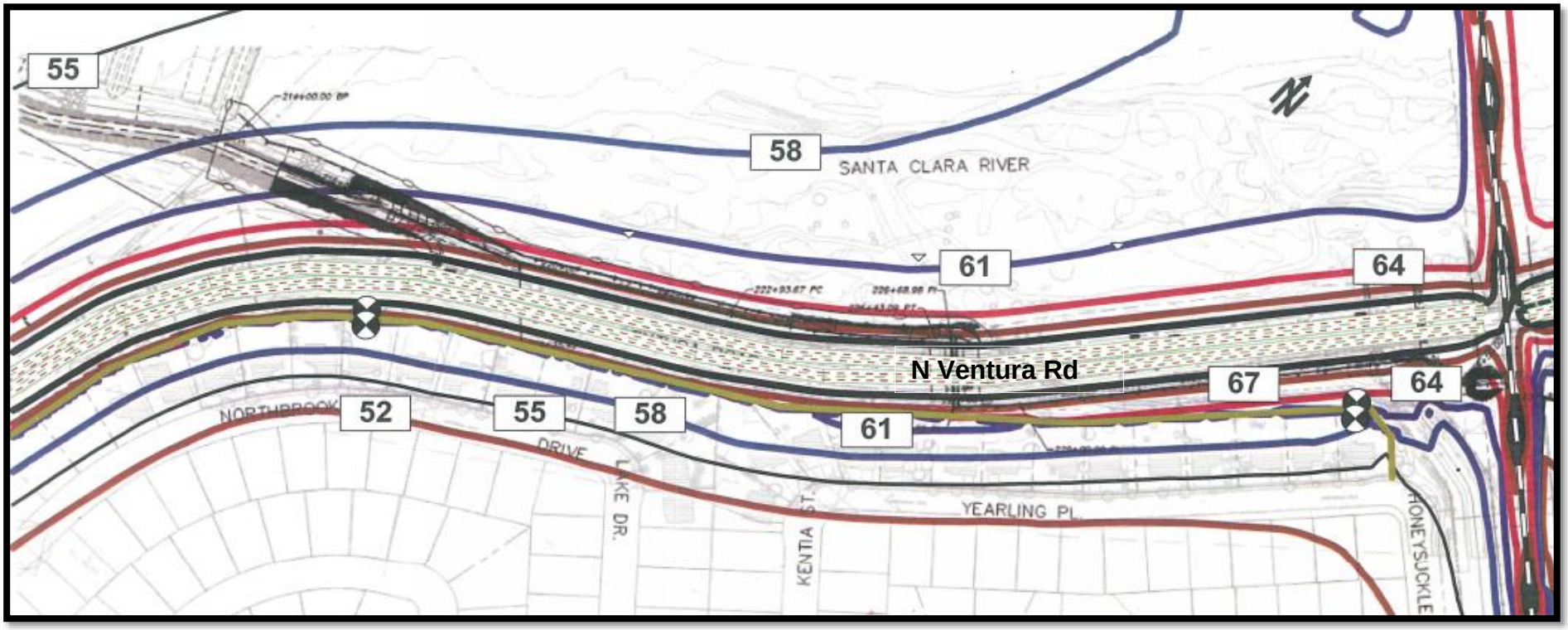


Figure 7 Ambient Noise Contours Along Reach 4, Leq(h)

Impacts and Mitigation Measures

Significance Criteria

The Ventura County Construction Noise Threshold Criteria and Control Plan (Ventura County, 2010) has established noise thresholds for assessing construction noise impacts, which will be used as the significance criteria (Criteria N-1 and N-2). Since construction will last longer than eight weeks, and will occur only during daytime hours, the following significance criteria will be used for noise sensitive receivers, which would be limited to residences, hospitals, nursing homes, schools, churches, and libraries (when in use):

- Criteria N-1.Leq(h) of 55 dB(A) for construction or the measured ambient Leq(h) plus 3 dB.

  The modeling results shown in Figure 6 will be used to establish the ambient Leq(h). Residential areas above 52 dBA would have a criterion of ambient Leq(h) plus 3 dB and other areas would have a Leq(h) criterion of 55 dBA.

  Based upon measured ambient Leq(h) presented in Table 9 and the results of the modeling for the back yards shown in Figure 7, the ambient noise level is 56 dBA for the first four residential backyards nearest UPRR, which are further away from N. Ventura Road. For the other residential backyards along N. Ventura Road where the road is not depressed and is closer to the backyards the ambient noise level is 62 dBA. Based upon the modeling results, shown in Figure 7 above, residential areas that are above 52 dBA would have a criterion of ambient Leq(h) plus 3 dB. The criterion for residential backyards further from N Ventura Road would be 55 dBA.

- Criteria N-2.Maximum Levels of 75 dB(A) or the measured ambient Leq(h) plus 20 dB during construction.

  Based upon measured ambient Leq(h) presented in Table 9 and the results of the modeling shown in Figure 6 and Figure 7, the Maximum Level criterion for areas where the ambient Leq(h) is above 55 dBA is the modeled results plus 20 dBA.

Based on the policies in the Ventura County General Plan (Ventura County, 2015), operation and maintenance noise generators, proposed to be located near any noise sensitive use, shall incorporate noise control measures so that ongoing outdoor noise levels received by the noise sensitive receptor, measured at the exterior wall of the building, does not exceed any of the following standards:

- Criteria N-3.Leq(h) of 55 dB(A) or ambient noise level plus 3 dB(A), whichever is greater, during any hour from 6:00 a.m. to 7:00 p.m.

  Based upon the ambient Leq(h) contours in Figure 6 and figure 7, the criteria is ambient noise level plus 3 dB(A) for all noise sensitive areas adjacent to Reaches 1 – 4 (maintenance between the hours of 7:00 p.m. and 6:00 a.m. is not anticipated).

The County references vibration criteria used by the FTA (FTA, 2006) to assess potentially significant impact from construction vibration (Ventura County, 2011).

- Criteria N-4. Maximum PPV Vibration levels of 0.2 in/sec for structural damage to non-engineered timber and masonry buildings.
- Criteria N-5. RMS Vibration levels of 72 VdB for annoyance in residences and buildings where people sleep, such as hotels and hospitals.
- Criteria N-6. RMS Vibration levels of 75 VdB for annoyance in institutional land uses.

Criteria N-5 was developed to assess vibration impacts resulting from nighttime annoyance. Criteria N-5 was developed to assess vibration impacts resulting from activity interference when people are awake. Since the construction activities and the operation and maintenance activities will occur during daytime hours, Criteria N-6

is more appropriate for assessing impacts due to daytime vibration. The same vibration criteria will be used for operational impacts.

Construction Impact Analysis

Construction of the proposed Project is anticipated to occur over a 27-month period, beginning in 2016 and ending in 2017. The proposed Project consists of two phases. Phase 1 occurs in Reaches 1 to 3 over a 32-week period for Option 1A or 29 weeks for Option 1B. Reach 4 (Phase 2) would be constructed over the course of 48 weeks following the completion of Phase 1. Construction noise levels will vary from hour-to-hour and day-to-day, depending on the equipment in use and the operations being performed. Grading, excavation, and construction activities related to the proposed Project would increase the ambient noise levels in the project area on an intermittent basis. Construction activities would occur between 7:00 a.m. and 7:00 p.m., Monday through Friday. No construction is expected on weekends or holidays. Maximum noise levels (Lmax) for construction equipment were estimated based upon the "actual measured" noise emissions and acoustical use factors published by the U.S. Department of Transportation Federal Highway Administration Office of Environment and Planning (DOT, 2006), as presented in Appendix A. The Leq(h) was calculated assuming that all equipment listed for the each task were operating. The Lmax was based upon the noisiest equipment item listed for that task. The calculated Leq(h) noise contours (lines of equal sound level) from the noisiest week(s) of construction were calculated using CadnaA, a state-of-the-art computer noise model. In addition to the roadways described above, the location of housing and terrain were also included in the modeling. Existing industrial equipment and aircraft activity are not included in the model. The model considers the spatial locations and sizes of noise sources, the elevation of sources and the surrounding topography, noise reduction resulting from obstructions such as buildings and walls, and ground and air absorption.

The evaluation assumed that the project will implement the following:

1. Use of a vibratory pile driver rather than an impact pile driving.
2. Use of well-maintained equipment with engine exhaust mufflers in good working condition.
3. Utilizing the minimum size/type of equipment to complete the activity.

Reaches 1-3: Levee System with Landfill Tie-ins and Golf Course Protection.

Within Reaches 1-3, VCWPD is considering two design options, both of which would fully protect residential and commercial properties at risk during a one percent annual chance flood event. The first option (Option 1A) provides a continuous raised earthen levee, reducing the need for landfill tie-ins, and provides the highest level of flood protection. The second option (Option 1B) takes advantage of the existing high ground located along stretches of the existing levee, essentially eliminating levee improvements in Reach 2 in place of filling the existing City of Oxnard River Ridge Golf Course swale (i.e., low-lying or depressed and often wet stretch of land on a golf course). Construction activities for Reaches 1-3 will require the temporary use of noise-generating construction equipment similar to those presented in Appendix A, which shows the maximum noise levels for each item of equipment as well as the duration of use and usage factor (the percent of time operating at maximum level).

Option 1A – Full Levee System would provide for a continuous raised earthen levee on top of the existing levee for the full limits of the project improvements in Reaches 1-3 (Station 128+75 to 217+50, approximately 8,875 feet), while minimizing tie-ins to the existing landfills. Approximately 28,500 cubic yards (CY) of excavated soils would be reused on-site, whereas other materials (e.g., general debris, vegetation, and abandoned facilities) would be managed in accordance with Ventura County Ordinance #4421 to the extent practicable. Approximately 36,000 CY of new fill material and 3,000 CY of ¼-ton riprap would then be placed to raise and

protect the existing levee. Sheet pile would be installed along approximately 400 feet of Reach 3 from Station 214+00 to 217+50 and would tie into the Reach 4 improvements. The sheet pile would be installed to depths ranging up to about 50 feet below ground to provide scour protection. This activity would occur in conjunction with the Reach 4 improvements.

Within Reaches 1-3, a 12-foot wide crushed miscellaneous base (CMB) maintenance road would be re-created along the top of the raised portions of the levee. Six-foot chain link fencing (approximately 1,800 feet) and three "swing" gates would be added to maintain security.

Option 1A construction activities for Reaches 1-3 would require the temporary use of noise-generating construction equipment similar to those presented in Appendix A, which shows the maximum noise levels for each item of equipment as well as the duration of use and usage factor (the percent of time operating at maximum level) and the Leq(h) for each task. Table 10 presents the construction schedule, the noise levels for each task and the total noise level during each week, assuming that the overlapping tasks are co-located on the construction site.

Figure 8 Construction Noise Contours for Option 1A in Reach 1 – 3, shows the noise contours during weeks 11 through 13 when construction activities include Levee embankment fill and concrete retaining wall construction activities. As a worst case scenario, the levee embankment fill construction was modeled at two locations, adjacent to the concrete retaining wall construction activities and toward the western end of Reach 3.

The modeled noise levels approach 55 dBA in the front yards of the houses in the NW corner of the Cypress Point housing development (located at the bottom of Figure 8), however this remains below the impact criterion N-1 of ambient Leq(h) plus 3 dBA.

The nearest noise sensitive receivers to Reaches 1 – 3 include residences south of Arcadian Shores Trail in the Cypress Point housing development and the Residence Inn Oxnard River Ridge, both located on the south side of the River Ridge Golf Club golf course. Comparing the ambient noise contours in Figure 6 to the construction noise contours in Figure 8, construction noise at these noise sensitive receivers will not exceed the N-1 significance criteria of ambient plus 3 dBA.

The residential community south and east of N. Ventura Road where Reach 3 and Reach 4 intersect is approximately 200 feet from the nearest construction activity and is protected by a 6-foot high property wall. Comparing the ambient noise contours in Figure 6 to the construction noise contours in Figure 8, construction noise at these noise sensitive receivers will not exceed the N-1 significance criteria of ambient plus 3 dBA.

Maximum noise levels can be estimated based upon the difference between Lmax and Leq In Appendix A for these two construction activities. For levee fill, Lmax for the nosiest equipment is 1 dB less than the Leq(h). For concrete retaining wall construction, Lmax is 1 dB more than the Leq(h). Therefore, the Leq(h) contours near the construction sites in Figure 8 are within 1 dB of the Lmax contours and all noise sensitive receivers remain below the N-2 impact criterion of 75 dBA.

Table 10 – Hourly Leq at 50 feet During Construction in Reaches 1-3 (Phase 1) Option 1A

Hourly Leq @ 50 feet During Construction in Reaches 1-3 (Phase 1) Option 1A

Santa Clara River (SCR-3) Levee System

		Weeks																													
Task No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	**Mobilization**	73	73	73	73																												
2	**Clearing and Grubbing**					86	86																										
3	**Demolition & Removals**					76	76																										
5	**Traffic Control**					73	73																										
6	**Foundation Excavation**							86	86	86	86																						
7	**Levee Embankment Fill**											86	86	86	86	86	86	86	86	86	86	86	86										
8	**Landfill Tie-In**																							81									
9	**Riprap (1/4-Ton)**																							81	81	81							
10	**Concrete Retaining Wall**											86	86	86																			
11	**Structural Excavation & Backfill**														81	81																	
12	**Flap Gate – 24", 66"**																											79					
13	**Slide Gates**																												79	79			
14	**CMB Access Road**																							83	83	83	83						
15	**6' Chain Link Fence**																														78		
16	**Chain Link Gate**																															80	
17	**Hydroseeding (slopes)**																																72
18	**Vegetation Thinning**				84																												
Total		**73**	**73**	**73**	**84**	**87**	**87**	**86**	**86**	**86**	**86**	**89**	**89**	**89**	**87**	**87**	**86**	**86**	**86**	**86**	**86**	**86**	**86**	**86**	**85**	**85**	**83**	**79**	**79**	**79**	**78**	**80**	**72**

Sources: DOT 2006; VCWPD 2015.

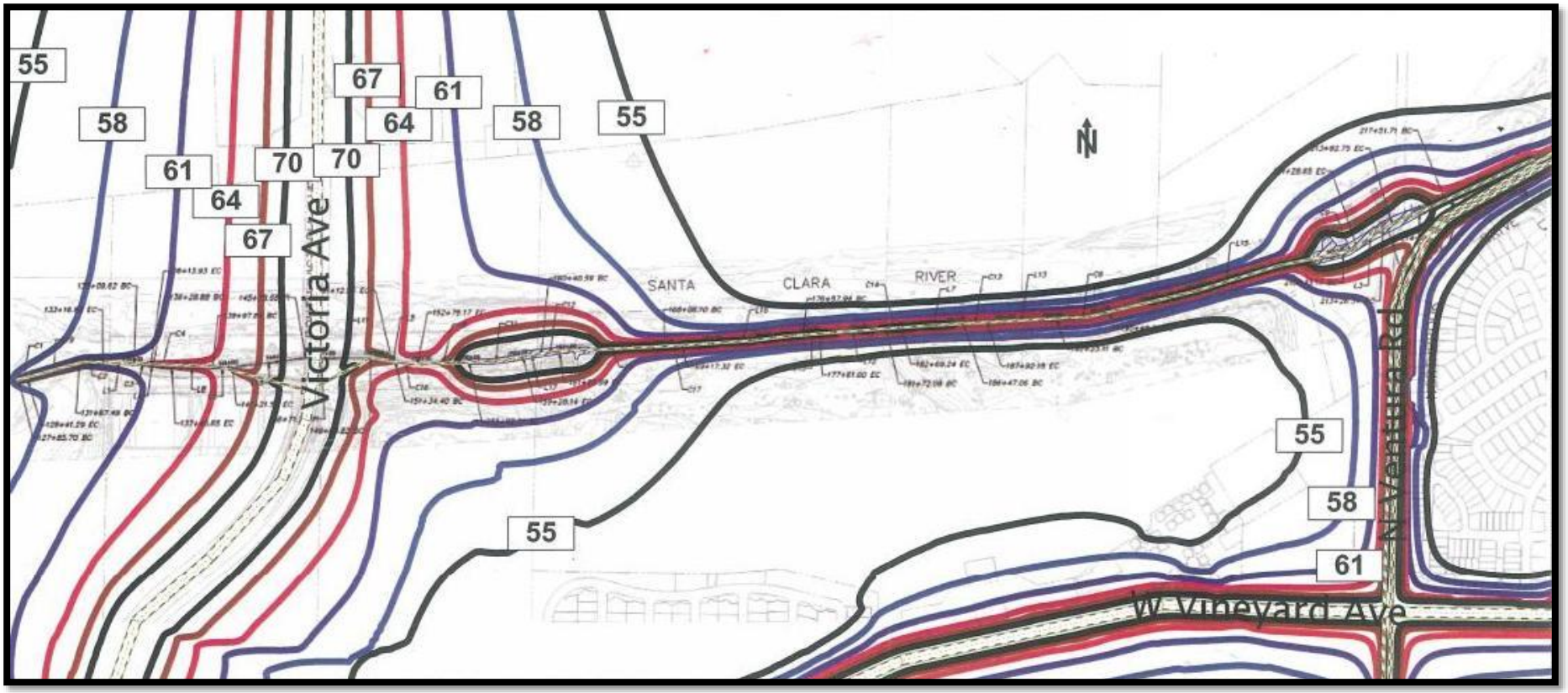


Figure 8 Construction Noise Contours for Option 1A in Reach 1 – 3, Leq(h)

Option 1B – Minimum Levee System includes an earthen raised levee within Reach 1 between Stations 128+75 and 150+00 (approximately 2,125 feet) that ties into the existing closed Bailard and Coastal Landfills as high ground, as well as raising the levee within Reach 3 between Stations 202+00 and 217+50 (approximately 1,550 feet), with a tie-in at the downstream end to the Santa Clara Landfill. To raise the levee, approximately 6,090 CY of the existing levee material would be excavated to prepare the foundation. Approximately 13,000 CY of new fill material and 2,040 CY of ¼-ton riprap would then be placed to raise and protect the existing levee. Excavated soils would be reused on-site, whereas other materials (e.g., general debris, vegetation, and abandoned facilities) would be managed in accordance with Ventura County Ordinance #4421 to the extent practicable. Additionally, gas monitoring or collection system lines associated with the landfills would be relocated in those areas where the landside fills are being constructed in close proximity.

No improvements to the existing levee would occur in Reach 2. However, the existing golf course drainage swale, located at the mid-point of Reach 2, would be filled in to close a potential path for floodwater to escape from the Santa Clara River and reach residential areas located south of the golf course. A pipe would be installed beneath the fill to convey flows that currently pass through the swale to the river; a flap gate would be installed over the end of the pipe to prevent river flows from entering it during floods. Within Reaches 1 and 3, the design of the raised levee portions would include re-creating a 12-foot wide CMB maintenance road along the top of the levee totaling approximately 3,500 feet in length. Access to the levee and associated maintenance road would remain restricted following completion of the proposed Project, as is the case under existing conditions. Six-foot chain link fencing (approximately 1,800 feet) and three “swing” gates would be added to maintain security. As with Option 1A, sheet pile would be installed in conjunction with Reach 4 improvements along approximately 400 feet of Reach 3 from Station 214+00 to 217+50.

Option 1B construction activities for Reaches 1 and 3 will require the temporary use of noise-generating construction equipment similar to those presented in Appendix B, which shows the maximum noise levels for each item of equipment as well as the duration of use and usage factor (the percent of time operating at maximum level) and the Leq(1hr) for each task. Construction activities associated with Option 1B would take approximately 29 weeks as presented in Table 11, which shows the noise levels for each week of construction. Although week 6 indicates the highest total noise level for all operations, the activity would be spread across the Reaches. Week 15 through 16, when construction activities include levee embankment fill, golf course fill, and 66-inch RCP placement construction activities, was selected for modeling since the last two activities would occur in close proximity and levee embankment fill could occur at the same time at the eastern end of Reach 3 next to a residential area.

Figure 9 Construction Noise Contours for Option 1B in Reach 1 – 3, shows the noise contours during week 15 through 16. Comparing the ambient noise contours in Figure 6 above at noise sensitive locations (residential areas) with the construction noise contours in Figure 9, construction noise at these noise sensitive receivers will not exceed the N-1 significance criteria of ambient plus 3 dBA.

Maximum noise levels can be estimated based upon the difference between Lmax and Leq in Appendix B for the construction activities during week 15 through 16 (Task 7, 10 and 11). The nosiest equipment are 2 dB or less greater than the Leq(h). Therefore, the Leq(h) contours near the construction sites in Figure 8 are within 2 dB of the Lmax contours and all noise sensitive receivers remain below the N-2 impact criterion of 75 dBA.

Table 11 – Hourly Leq at 50 feet During Construction in Reaches 1-3 (Phase 1) Option 1B

		Weeks																											
Task No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	**Mobilization**	73	73	73	73																									
2	**Clearing and Grubbing**					87	87																							
3	**Demolition & Removals**					76	76																							
4	**Diversion & Control of Water**												79										79							
5	**Traffic Control**					70	70																							
6	**Foundation Excavation**							86	86																					
7	**Levee Embankment Fill**									84	84	84	84	84	84	84	84													
8	**Landfill Tie-In**																	82	82											
9	**Riprap (1/4-Ton)**																			81	81	81								
10	**Golf Course Fill**													83	83	83	83	83	83	83	83	83								
11	**66-inch RCP**															81	81													
12	**Flap Gate – 24", 66"**																								79					
13	**Slide Gates**																									79	79			
14	**Concrete Headwall**																								85					
15	**CMB Access Road**																						83	83						
16	**6' Chain Link Fence**																											78		
17	**Chain Link Gate**																												80	
18	**Hydroseeding (slopes)**																													72
19	**Vegetation Thinning**						84																							
Total		**73**	**73**	**73**	**73**	**87**	**89**	**86**	**86**	**84**	**84**	**84**	**85**	**87**	**87**	**88**	**88**	**86**	**86**	**85**	**85**	**85**	**84**	**83**	**86**	**79**	**79**	**78**	**80**	**72**

Sources: DOT 2006; VCWPD. 2015.

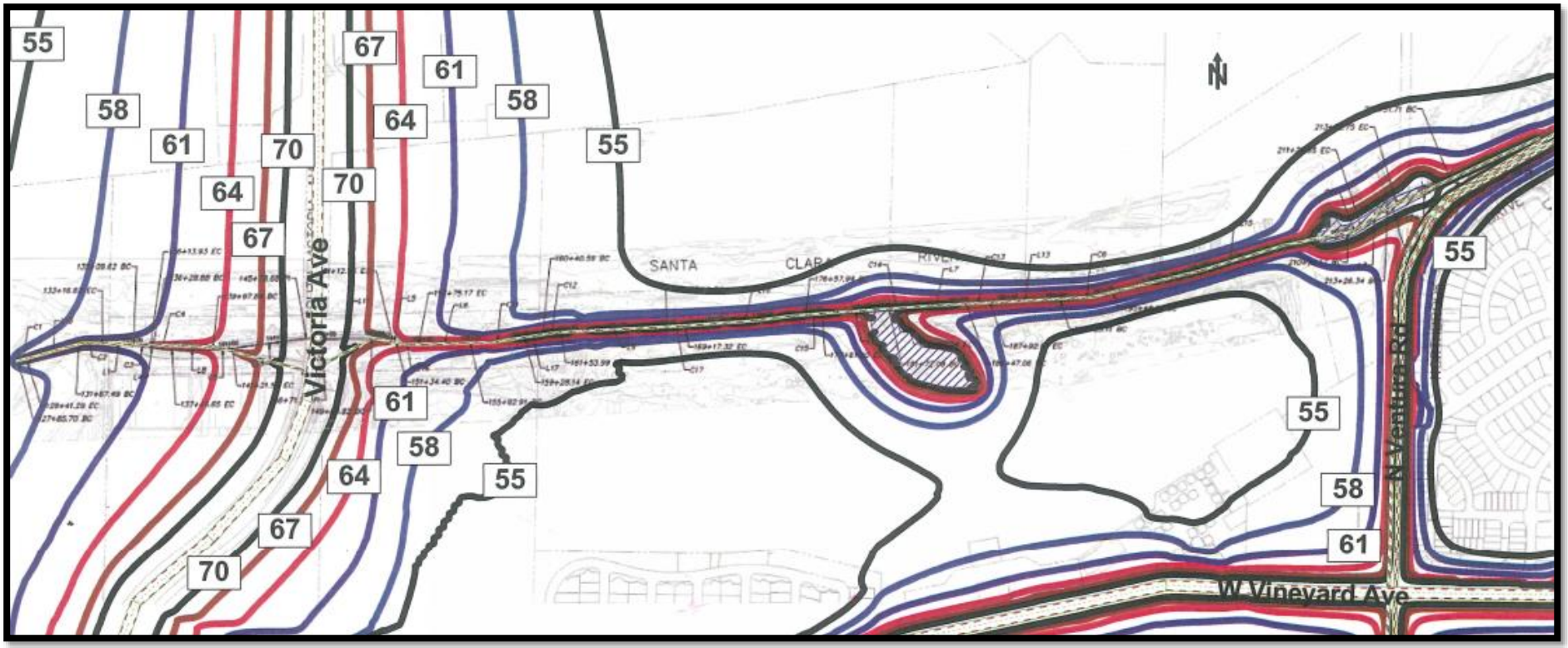


Figure 9 Construction Noise Contours for Option 1B in Reach 1 – 3, Leq(h)

Reach 4

Proposed Project – Reach 4

The proposed Project includes construction of a floodwall on the river side of N. Ventura Road for approximately 968 feet. The floodwall would have a visible height of approximately six feet. The floodwall would be located approximately 17.5 feet from the existing roadway pavement of N. Ventura Road. On the river side of the floodwall, a 15-foot-wide soil cement maintenance access road would be installed at the base of the floodwall to permit regular facility inspections. Sheet pile would be placed on the river side of the access road at depths of up to about 50 feet below ground using a vibratory pile driver. In some locations along the westerly end of the floodwall, a short slope would be constructed on the river side of the access road. Additionally, loose rock riprap would be placed on the slope to protect the floodwall from scour. The floodwall itself would include a concrete foundation with a concrete or masonry wall. The floodwall would then split across N. Ventura Road at the high point in the road (Station 227+00). A six-foot-high flood gate would be installed at this roadway crossing. The flood gate system would include a steel floating panel that hinges into a recess in the pavement along N. Ventura Road. In its normal position, the gate would be flat and act as the roadway surface. Construction of the gate requires modifications to N. Ventura Road and installation of the concrete abutments on each side of the gate. The concrete abutments would be tied directly into the adjacent proposed floodwalls. In addition, the relocation of numerous utilities under the roadway impacted by the gate would be required (existing gas, water, and sewer lines, as well as storm drains).

The floodwall would continue along the top of the existing slope on the south side (land side) of N. Ventura Road for approximately 888 feet, then transition to a 40-foot-long earthen embankment abutting and perpendicular to the south UPRR embankment. For this alternative, the eastern bank of the UPRR embankment would be lined with concrete to serve as a flood barrier. This would allow the railroad embankment to provide the same flood protection as a floodwall.

A similar 40-foot-long earthen embankment would be constructed on UPRR land northeast of the railroad embankment to tie into the flood protection structure to be constructed by The Village development. The floodwall would vary in height from six feet down to four feet near the El Rio Drain. At the El Rio Drain crossing, to accommodate the new floodwall, the existing outlet structure would be reconstructed, and a flap gate added to the channel section that discharges directly under N. Ventura Road. The maintenance access bridge over the El Rio Drain would not be modified (protected in place). The design in Reaches 1-3 would be identical to the proposed Project (either Option 1A or 1B).

Construction activities for Reach 4 will require the temporary use of noise-generating construction equipment similar to those presented in Appendix C, which shows the maximum noise levels for each item of equipment as well as the duration of use and usage factor (the percent of time operating at maximum level) and the Leq(1hr) for each task. Construction activities would last approximately 48 weeks. Table 12 - Hourly Leq at 50 feet During Construction in Reach 4 (Phase 2) shows the noise levels for each week of construction. Tasks 8, 10 and 11 are particular to the proposed Project.

Figure 10 shows the noise contours during weeks 30 through 31 that are applicable to Alternative 1. The unmitigated Leq(h) noise levels in the nearest backyards exceed 70 dBA. The ambient noise levels in the backyards nearest N. Ventura Road are in the range of 61 dBA as shown in Figure 7. The noise levels from construction are calculated to exceed the N-1 significance criteria (ambient of 61 dBA plus 3 dB) for the nearest seven residences centered on the construction activities. Noise mitigation NM-1, Movable Construction Noise Barriers, should be implemented to reduce Leq(h) noise levels. An estimated 10-ft high movable barrier

extending approximately 30 feet in both directions from the construction activity and located along the sidewalk would be required to reduce noise levels to below the N-1 significance criteria. Noise mitigation NM-2, monitoring in nearest residential backyards during the construction activities would determine if the N-1 significance criteria were exceeded and would be used to evaluate further noise mitigation as required.

Maximum noise levels can be estimated based upon the difference between Lmax and Leq(h) in Appendix C for the construction activities during weeks 30 through 31 (Task 7 and Task 8). The nosiest equipment are within 1 dB of the Leq(h). Therefore, the Leq(h) contours near the construction sites in are within 1 dB of the Lmax contours and all noise sensitive receivers remain below the N-2 impact criterion 75 dBA.

Alternative 2 – Reach 4: River Side Floodwall

Alternative 2 includes an approximately 2,600-foot-long floodwall along the river side of N. Ventura Road from the east end of Reach 3 (Station 217+50) to Highway 101 (Reach 4). The floodwall would vary in height from 6 feet to over 22 feet. The largest heights would be in the vicinity of the UPRR bridge, where the visible height at this location would be approximately 22 feet. The floodwall would be located approximately 17.5 feet from the existing roadway pavement of N. Ventura Road. This distance accommodates the future bikeway (16-feet wide), planned as part of the Santa Clara River Trail Master Plan (considered a secondary objective of the Project), and a curb and gutter along the roadway. Where curb and gutter already exists, the floodwall would be offset by 16 feet. As with the proposed Project, a 15-foot-wide soil cement maintenance access road would be installed on the river side at the base of the floodwall to permit regular facility inspections. Sheet pile would be placed on the river side of the access road at depths of up to about 50 feet below ground. In some locations along the westerly end of the floodwall, a short slope would be constructed on the river side of the access road. Additionally, loose rock riprap would be placed on the slope to protect the floodwall from scour. The floodwall itself would include a concrete foundation with a concrete or masonry wall.

To provide flood protection until the SCR-1 levee improvements are completed (not part of this Project) a 13-foot-high flood gate would be installed across N. Ventura Road just downstream of the Highway 101 overpass. The flood gate is proposed to be a FloodBreak Automatic Floodgate system (or equal), similar to the flood gate under the proposed Project. Construction of the flood gate requires modifications to N. Ventura Road, construction of the concrete abutments on each side of the gate, and earthen fill to tie the abutment to the levee on the north side and to the Highway 101 embankment on the south side.

The installation of the flood gate in N. Ventura Road would require the relocation of numerous utilities under the roadway impacted by the gate. These utilities include existing gas, water, and sewer lines, as well as storm drains. In general, the utilities would be lowered to provide adequate room for installation of the flood gate. If the gate is used in the automatic mode, interconnected signals would be installed to close the street prior to the gate starting to rise. Once the flood waters recede, the gate would be lowered and the street re-opened. Following a flood event, it is anticipated that approximately one week could be required to clean any sediment and debris deposited on the roadway as a result of the flood event. Upon completion of the SCR-1 improvements, the flood gate would be removed or deactivated. It is anticipated that this flood gate would be in service for a number of years, as the SCR-1 levee improvements are not anticipated to be completed for approximately ten years.

To prepare the site for installation of the river side floodwall, approximately 2.5-acres of existing vegetation would be cleared along the alignment. Four high-pressure gas valves would also need to be relocated, as there is a high-pressure gas pipeline which runs along the north side of N. Ventura Road. Additionally, approximately 1,000 CY of riprap would be removed and replaced. The existing riprap is located within the western limits of the floodwall area and currently provides flood protection along N. Ventura Road. This riprap would be removed to

allow for the construction of the floodwall, footings, and sheet pile scour protection. The riprap would then be replaced where necessary after construction of the wall. Upon completion of the floodwall, approximately 200 feet of six-foot chain link fencing and a swing gate would be added at the tie-in to Reach 3 to restrict access to SCR-3.

This alternative provides for full flood protection for the areas downstream of Highway 101 along Reach 4 and would not impact the future SCR-1 levee improvements. The design in Reaches 1-3 would be identical to the proposed Project (either Option 1A or 1B).

Construction activities for Reach 4 would require the temporary use of noise-generating construction equipment similar to those presented in Appendix C, which shows the maximum noise levels for each item of equipment as well as the duration of use and usage factor (the percent of time operating at maximum level). Construction of Alternative 2 will extend the duration of Task 6 to 7, 9 and 12 to 13 by approximately 40% and eliminate Task 8 and 11.

Clearing and grubbing during weeks 5 and 6 would be the noisiest; however, much of this work would be on the river side of the levee away from noise sensitive receivers. Construction activities would last approximately 48 weeks. Table 12 - Hourly Leq at 50 feet During Construction in Reach 4 (Phase 2) shows the noise levels for each week of construction. Activities during weeks 18 through 38, when construction activities would include riverside floodwall construction activities, were selected for modeling.

Figure 11 shows the noise contours when activity is centered near the center of Reach 4 (construction site represented by hashed area in figure) during weeks 18 through 38. The unmitigated Leq(h) noise levels in the nearest backyards are up to 67 dBA. The ambient noise levels in the backyards nearest N. Ventura Road are in the range of 61 dBA as shown in Figure 7. The noise levels from construction are calculated to exceed the N-1 significance criteria (ambient of 61 dBA plus 3 dB) for the nearest six residences centered on the construction activities. The six residences would change as the center of the construction activity moves from Reach 4 to the UPRR overpass. Noise mitigation NM-1, Movable Construction Noise Barriers, should be implemented to reduce Leq(h) noise levels. An estimated 10-ft high movable barrier extending approximately 30 feet in both directions from the construction activity and located along the sidewalk would be required to reduce noise levels to below the N-1 significance criteria. Noise mitigation NM-2, monitoring in nearest residential backyards during the construction activities would determine if the N-1 significance criteria were exceeded and would be used to evaluate further noise mitigation as required.

Maximum noise levels can be estimated based upon the difference between Lmax and Leq(h) in Appendix C for the construction activities during weeks 18 through 38 (Task 7). The nosiest equipment are within 1 dB of the Leq(h). Therefore, the Leq(h) contours near the construction sites in are within 1 dB of the Lmax contours and all noise sensitive receivers remain below the N-2 impact criterion 75 dBA.

Alternative 3 – Reach 4: River Side/Land Side Floodwall Extending Up El Rio Drain

Similar construction activities would occur along N. Ventura Road as with the proposed Project. Figure 10 shows the noise contours during weeks 30 through 31 that are applicable to Alternative 3. This alternative differs from the Project in that the floodwall would extend up El Rio Drain to the Highway 101 crossing. The noise impacts would be similar to the Project.

Alternative 4 – Reach 4: East Slope Lining of the UPRR Embankment

Alternative 4 includes a river side/land side floodwall with a floodgate at the high point in N. Ventura Road, same as the proposed Project. However, instead of stopping with the earthen fill on the west side of the UPRR bridge, which assumes additional improvements to the north would be completed by the Wagon Wheel developer, this alternative would add concrete lining on the east side of the railroad embankment parallel to the El Rio Drain from N. Ventura Road to E. PCH/Oxnard Boulevard (approximately 0.7 mile), as shown in Figure 4-12. This alternative provides for full flood protection in the event the Wagon Wheel improvements do not occur. The design for Reaches 1-3 would be identical to the proposed Project (either Option 1A or 1B).

The east slope lining construction activities would occur on the east side of the UPPR embankment and noise levels associated with this activity would be similar to Task 21b in Table 12. The noise impacts along N Ventura Road would be similar to the Project.

Alternative 4 – No Project Alternative

Under the No Project Alternative, the proposed Project would not be constructed, no development would occur along SCR-3, and no construction noise would result.

Table 12 - Hourly Leq at 50 feet During Construction in Reach 4 (Phase 2)

		Week																																											
Task No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1	Mobilization	73	73	73	73																																										
2	Clearing and Grubbing					86	86																																								
3	Demolition and Removals					75	75																																								
4	Diversion & Control of Water					81																																									
5	Traffic Control				67	67																																									
6	Flood Wall Foundation Excavation																80	80	80	80																												
7	RC Flood Wall – Riverside																		87	87	87	87	87	87	87	87	87	87	87	87	87	87																
8	RC Flood Wall – Landside																														86	86	86	86	86	86	86	86	86	86								
9	Sheet Pile Wall & Scour Protection							80	80	80	80	80	80	80	80	80	80	80																													
10	UPRR Embankment Fill																																								81	81							
11	El Rio Drain Channel Modification																																								80	80	80						
12	Rock Riprap Removal & Replacement																																								81	81							
13	6' Chain Link Fence																																														78	
14	Chain Link Gate																																														80
15	Reinforced Concrete Drain Channel & Flap Gate																																										79				
16	HP Gas Valve Relocations																																							75								
17	Landscaping																																													75	
18	Concrete Trail																																											80	80		
19	CMB Access Road																																								83							
20	Soil Cement Access Road																																									84	84					
21a	Utility Relocations																																							75								
21b	Concrete Abutments																																								81	81						
21c	Flood Break Gate Installation																																									75					
21d	Street Modifications																																										83	83				
Total	Proposed Project	73	73	73	74	88	87	80	80	80	80	80	80	80	80	80	83	83	87	87	87	87	87	87	87	87	87	87	87	89	89	86	86	86	86	86	86	86	87	87	87	84	85	83	80	80	80	80
Total	Alternative 2	73	73	73	74	88	87	80	80	80	80	80	80	80	80	80	83	83	87	87	87	87	87	87	87	87	87	87	87	87	87	*	*	*	*	*	*	*	75	85	85	84	79	12	80	80	80	80
Total	Alternative 3	73	73	73	74	88	87	80	80	80	80	80	80	80	80	80	83	83	87	87	87	87	87	87	87	87	87	87	87	89	89	86	86	86	86	86	86	86	87	87	88	86	85	83	80	80	80	80
Total	Alternative 4	73	73	73	74	88	87	80	80	80	80	80	80	80	80	80	83	83	87	87	87	87	87	87	87	87	87	87	87	89	89	86	86	86	86	86	86	86	87	88	88	84	85	83	80	80	80	80
	* 87 dBA during these weeks for Flood Wall construction on riverside to 101 Freeway.																																														

Sources: DOT, 2006; VCWPD, 2015.

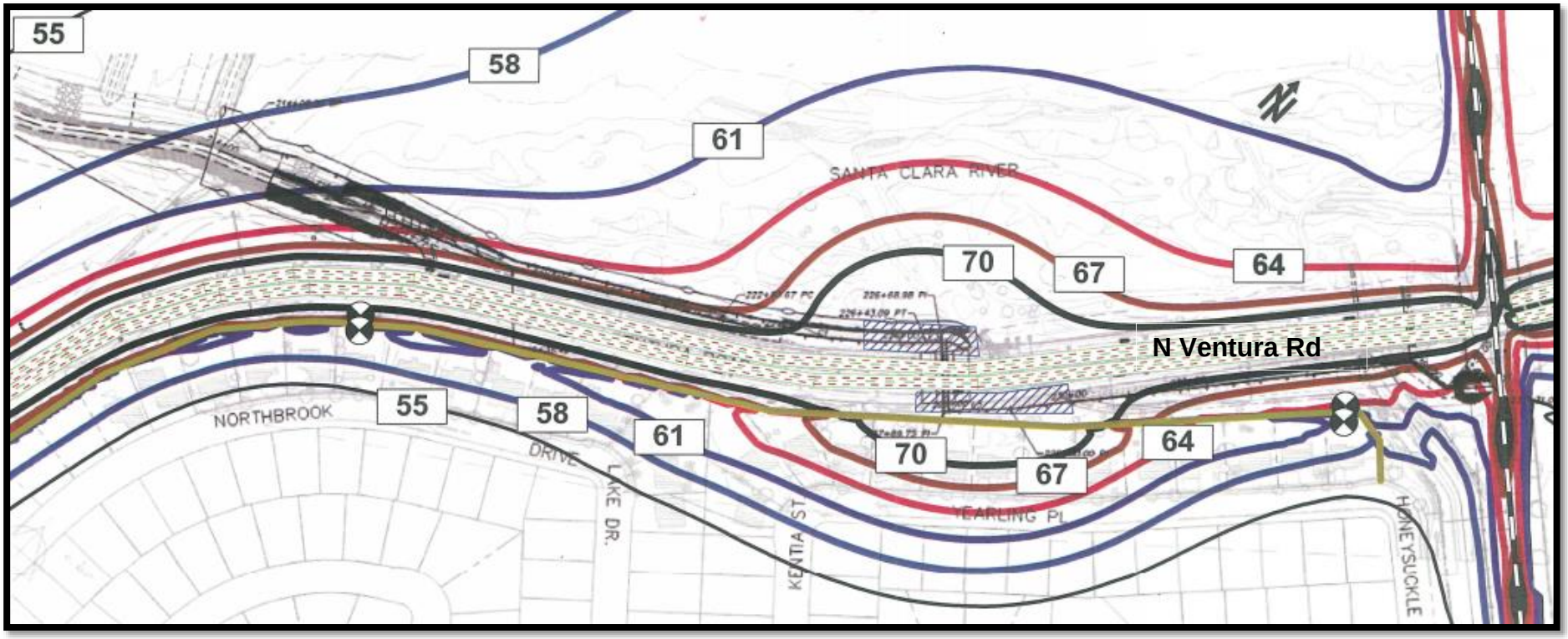


Figure 10 Construction Noise Contours for Proposed Project, Leq(h)

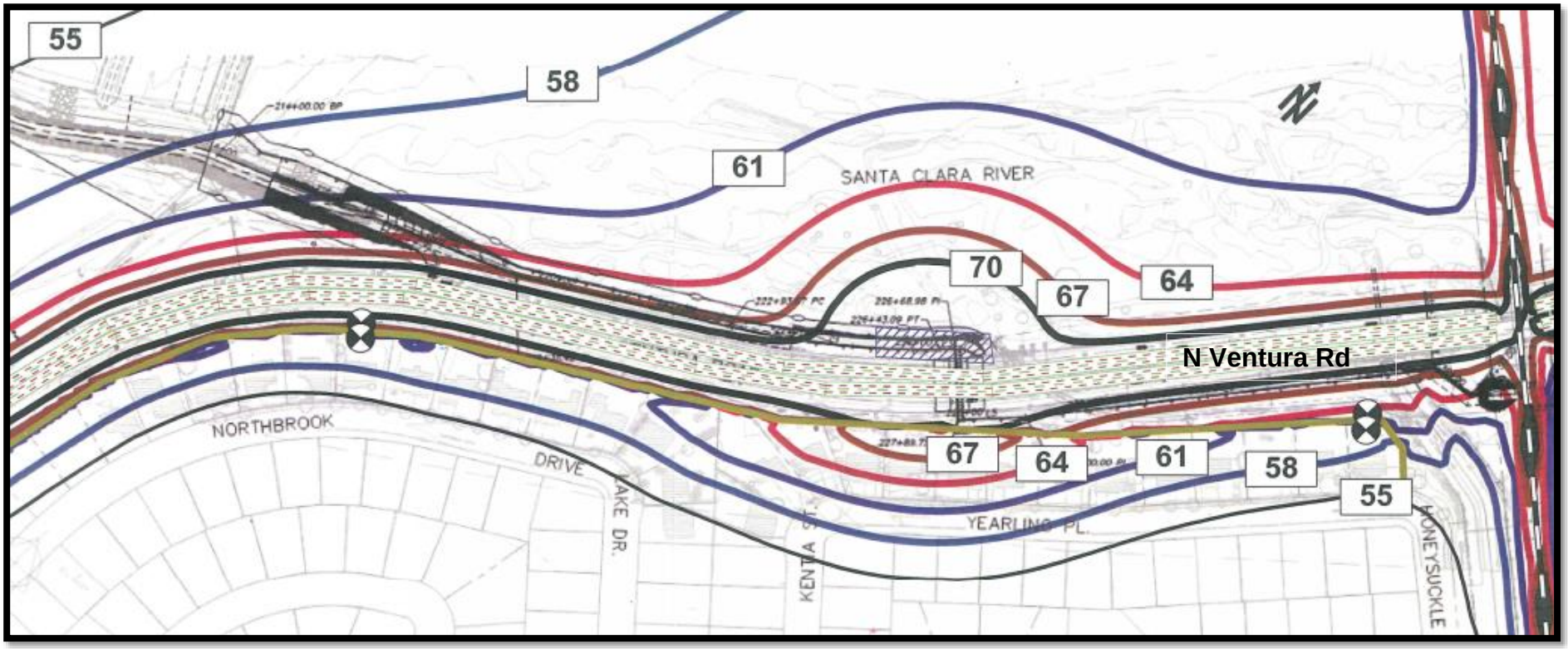
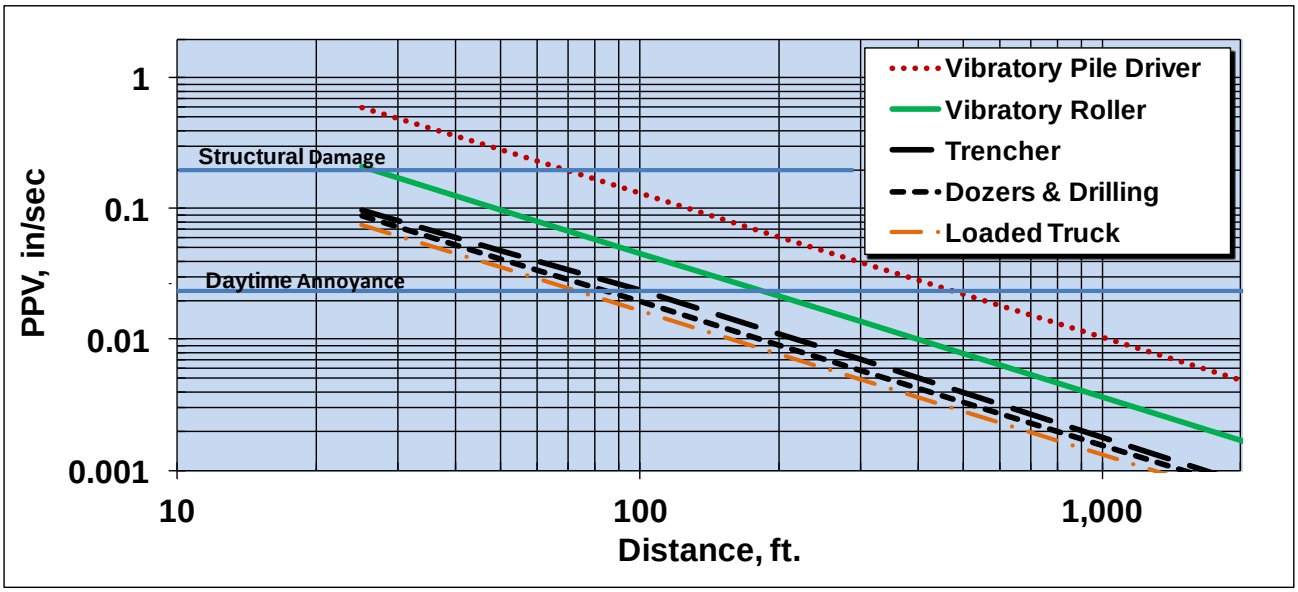


Figure 11 Construction Noise Contours for Alternative 2, Leq(h)

Vibration

Vibration concerns are related to structural damage as identified in Table 7. Construction Vibration Damage Criteria and to annoyance experienced by occupants within structures as identified in Table 8. Construction Vibration Annoyance Criteria. Figure 12 presents the typical levels of vibration from common construction equipment known to create vibrations. A vibratory pile driver and a vibratory roller produce the highest levels of ground vibration. A vibratory pile driver will be used when placing sheet pile and a vibratory roller is used to compact the earth. However, a concrete vibrator used during some construction tasks when concrete is being poured would produce less vibration than the equipment presented in Figure 12.



Source: Caltrans 2013

Figure 12 Construction Vibration Amplitudes

Reaches 1-3: Levee System with Landfill Tie-ins and Golf Course Protection.

The structural damage criterion is 0.2 inches/sec (Criterion N-4). Figure 12 shows that this criterion is exceeded when the distance to the vibratory pile driver is less than 70 feet, when the vibratory roller is less than 26 feet and when the dozer is less than 15 feet away. The eastern end of Reach 3 and along the riverside of Reach 4 is over 200 feet away from residences. Appendices A and B indicate the construction tasks when a vibratory roller or a vibratory pile driver is expected to be used (compactor roller usage is highlighted). Tasks include CMB Access Road and Concrete Retaining Wall for Option 1A, Concrete Headwall and CMB Access Road (applies to both Options 1A and 1B). Construction in Reaches 1-3 would occur over 200 feet from residences and No Impact to residential structures is anticipated.

The annoyance criteria are based upon values in terms of VdB. In terms of PPV, the nighttime criteria of 72 VdB (Criterion N-5) annoyance threshold for residences and buildings where people sleep corresponds to 0.0159 inches/sec and the daytime annoyance criterion of 75 VdB (Criterion N-6) corresponds to a PPV of 0.0225 inches/sec. Since construction activities would occur during daytime hours, only the daytime annoyance criterion applies (Criterion N-6). The vibration impacts resulting from the vibratory sheet pile driver are discussed below as part of the Proposed Project in Reach 4. Except for this activity on the eastern end of

Reach 3, No Impact resulting from annoyance to vibration is anticipated from construction activity in Reaches 1-3.

Reach 4

Appendix C indicates the construction tasks when a vibratory roller or a vibratory sheet pile driver is expected to be used (usage is highlighted). Vibratory roller tasks include UPRR Embankment Fill, CMB Access Road, and Soil Cement Access Road for Reach 4. The vibratory sheet pile driver will be used on the river side of N. Ventura Road starting approximately 400 feet in Reach 3 from Station 214+00 to 217+50 and continuing into Reach 4.

Proposed Project

The access road where the vibratory roller would be used is along the river side of N. Ventura Road, approximately 150 feet from residences, and No Impact to residential structures is anticipated from this activity. Sheet piles will be placed along the river side of the access road at distances over 150 feet from the nearest residential structures and No Impact to residential structures is anticipated from this activity (Criterion N-4).

The proposed Project also includes construction activities on the landside of N. Ventura Road that will be 0 to 50 feet from residential property lines. The residential structures are another 40 to 50 feet away. The use of a vibratory roller is not anticipated along the landside of the floodwall. Assuming the worst case scenario of 40 feet between construction activities and residential structures, the vibration amplitudes in Figure 12 are less than Criterion N-4 and no structural damage to residences is anticipated. The UPRR embankment fill is over 130 feet from the nearest residence and No Impact to residential structures (Criterion N-4) is anticipated from activity related to UPRR embankment fill.

The annoyance criteria are based upon values in terms of VdB. Since construction activities will occur during daytime hours, daytime annoyance criterion of 75 VdB (0.0225 inches/sec) (Criterion N-6) is appropriate. Criterion N-6 is exceeded within approximately 500 feet of the vibratory pile driver, which includes the first three rows of houses along N. Ventura Road. Criterion N-6 is exceeded within approximately 190 feet from the vibratory roller, which includes the first row of houses along N. Ventura Road. Criterion N-6 is exceeded within approximately 100 feet of most other construction equipment and impacts due to annoyance is not anticipated from the other construction activities. Noise mitigation NM-3, Community Notification, should be implemented to reduce annoyance.

In Reach 4, the UPRR embankment fill is over 130 feet from the nearest residence. Occupants in residences within approximately 190 feet from the vibratory roller (one residence) may experience vibration levels that exceed daytime annoyance criterion of 75 VdB (0.0225 inches/sec) (Criterion N-6). Noise mitigation NM-3, Community Notification, should be implemented for identified residential areas to reduce annoyance.

Alternative 1 – Reach 4: River Side Floodwall

The access road where the vibratory roller will be used and the floodwall where the vibratory sheet pile driver will be used is approximately 150 feet from residences along the riverside of N. Ventura Road and No Impact to residential structures is anticipated (Criterion N-4).

The annoyance criteria are based upon values in terms of VdB. The daytime annoyance criterion of 75 VdB (0.0225 inches/sec) (Criterion N-6) is exceeded within approximately 500 feet of the vibratory pile driver, which includes the first three rows of houses along N. Ventura Road. Criterion N-6 is exceeded within approximately 190 feet from the vibratory roller, which includes the first row of houses along N. Ventura Road. Noise

mitigation NM-3, Community Notification, should be implemented for identified residential areas to reduce annoyance.

Alternative 2 – Reach 4: River Side/Land Side Floodwall Extending Up El Rio Drain

In areas where the floodwall construction is along N Ventura Road the impacts would be as described for the proposed project.

Alternative 2 also includes construction of a floodwall on the residential side of El Rio Drain from N. Ventura Road to the SR 101 Freeway. The use of a vibratory sheet pile driver and a vibratory roller are not anticipated for this construction. Construction equipment would be within approximately 50 to 60 feet of the nearest residential structures and No Impact to residential structures is anticipated.

However, Vibration levels in residences within approximately 100 feet of most other construction equipment may experience vibration levels that exceed the daytime annoyance criterion of 75 VdB (0.0225 inches/sec) (Criterion N-6). Occupants in the first row of houses along El Rio Drain may experience vibration levels that exceed daytime annoyance criterion of 75 VdB (0.0225 inches/sec) (Criterion N-6). Noise mitigation NM-3, Community Notification, should be implemented for identified residential areas to reduce annoyance.

Alternative 3 – Reach 4: River Side/Land Side Floodwall Utilizing UPRR Embankment as a Flood Wall

Construction activities and the UPRR embankment fill along N Ventura Road would be similar to the Project and structural and annoyance impacts from vibration would be the same for this area.

The UPRR embankment work would be over 150 feet from the nearest residences south of the UPPR. The use of a vibratory sheet pile driver is not anticipated for this construction and No Impact to these residential structures is anticipated from activity related to construction on the UPRR embankment. Since the first row of houses along El Rio Drain is within 190 feet, vibration impact resulting from daytime annoyance (Criterion N-6) may occur. Noise mitigation NM-3, Community Notification, should be implemented for identified residential areas to reduce annoyance.

Operations and Maintenance

Operation and maintenance (O&M) of the proposed Project would include routine inspections and repair, as needed over the lifetime of the project (50 years). It is anticipated that the intensity of post-construction operations and maintenance activities would increase from pre-construction (existing) conditions. The VCWPD implements best management practices (BMPs) during routine maintenance activities. This includes utilizing the minimum size/type of equipment to complete the activity and keeping equipment and engine mufflers in good working condition to minimize potential impacts. Depending upon the nature of the maintenance activity, the noise levels would be as described in Appendix A, B and C for similar tasks. Representative task would include levee repair (levee embankment fill, 86 dBA at 50 feet followed by riprap, 81 dBA at 50 feet), vegetation thinning which is compared to existing gardening activities (84 dBA at 50 feet), or repair of fencing and gates (78 to 80 dBA at 50 feet). The majority of these activities would be on the river side and behind the flood wall in Reach 4. Noise levels from operation of the project would be below Criteria N-1 and N-2 at sensitive receptors.

O&M activities would mostly occur at least 170 feet from residential structures and the ground born vibration would neither adversely affect residential structures nor exceed the annoyance threshold for daytime activities (75 VdB, 0.0225 inches/sec).

There was concern expressed by the public that since there is an existing property wall on the land side of N. Ventura Road, the proposed floodwall on the river side could potentially reduce the acoustical performance of

the existing property wall. Evaluating the traffic noise in the backyard near Location 1 with and without the levee wall on the riverside resulted in a 0.5 dBA increase, which is considered insignificant.

Mitigation Measures

MN-1 Movable Construction Noise Barriers. During construction, install noise blanket shields with sound-absorptive surfaces facing the noise source. Height of shields shall be sufficient to meet the project noise limits.

MN-2 Monitor Noise Levels. Monitor noise levels during construction at noise sensitive receptors to determine compliance, and to determine if further mitigation is required.

MN-3 Community Notification. Notify identified residential areas that they may temporarily experience higher levels of noise and vibration during the construction activities.

Cumulative Impacts

Cumulative impacts have been assessed to determine if the project's incremental contribution would be considerable. EIR Table 3-1 provides a list and description of pending and recently approved projects from the City of Oxnard, the City of Ventura, and the County of Ventura. Since noise and vibration impacts are very distance sensitive, proximity to the proposed Project and the potential for coinciding construction times would have the greatest potential for contributing to cumulative impacts.

The Village (a.k.a. Wagon Wheel Development Project). This development project includes 120 housing units (1, 2 & 3 bedrooms), a recreation/meeting room, a tot lot (a park for small children), and landscaped pedestrian pathways. The proposed Reach 4 improvements would provide flood protection downstream of the UPRR bridge, but would not provide flood protection between the UPRR bridge and Highway 101. One affordable housing apartment complex has been built, and construction of additional buildings is expected to continue. The land side floodwall, UPRR embankment fill, and El Rio Drain Channel modification are activities where there may be some cumulative noise impact. These activities are scheduled to occur from week 33 through week 43. The Village is separated from the residences along Reach 4 by over 300 feet with two 6-foot high walls and the UPRR tracks. Cumulative vibration impacts are not anticipated. However, construction overlap during this 10-week period may result in cumulative noise impacts. VCWPD will work closely with The Village to ensure there are not conflicts with the proposed Project.

Olivas Drive Extension. The proposed Olivas Park Drive extension would connect Johnson Drive near Highway 101 to the existing terminus of Olivas Park Drive at Perkin Avenue within the City of Ventura. It is anticipated the levee/floodwall construction would coincide with the construction of Reach 4. However, this construction activity will be over 1,500 feet from the noise sensitive receivers near the proposed Project and will not create a cumulative noise or vibration impact.

Bailard Landfill Gas Field Project. This project is adjacent to Reach 1, and while the schedule for construction of this project is not known, it is possible it could be constructed at the same time as the proposed Project. It is noted that VCWPD will work closely with the VRSD to ensure there are no conflicts with the proposed Project.

All other projects listed in EIR Table 3-1 are at greater distances or did not overlap with the proposed Project construction schedule, such that cumulative impacts would not occur.

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Appendix A

Typical Noise Levels of Construction Equipment by Task – Reaches 1-3 Option 1A

Task No	Description	Equipment	HP	Model	Quantity	Hr/day	Days	Lmax @50 ft	Use Factor, %	Leq(1h) @50 ft
1	Mobilization	Delivery Truck			2	4	15	74	40	73
2	Clearing and Grubbing	Chainsaw	4	Stihl	4	6	10	84	20	86
		Wood Chipper	85	BC1200 XL	1	4	10	90	20	
		Dump Truck			1	4	10	76	40	
		Backhoe	87	416F2	1	4	10	78	40	
3	Demolition & Removals	Backhoe	87	416F2	1	6	10	78	40	76
		Dump Truck			1	6	10	76	40	
5	Traffic Control	Delivery Truck			2	4	15	74	40	73
6	Foundation Excavation	Grader	145	120M2	1	6	20	85	40	86
		Scraper	407	621K	2	8	20	84	40	
		Compactor	232	815F	1	6	20	83	20	
7	Levee Embankment Fill	Excavator	153	320E	1	8	60	81	40	86
		Grader	145	120M2	1	8	60	85	40	
		Dump Truck			10	8	60	76	40	
		Compactor	232	815F	1	8	60	83	20	
8	Landfill Tie-In	Loader	189	963D	1	4	5	79	40	81
		Excavator	153	320E	1	8	5	81	40	
		Dump Truck			1	8	60	76	40	
		Compactor	232	815F	1	4	5	83	20	
9	Riprap (1/4-Ton)	Loader	189	963D	1	8	15	79	40	81
		Dump Truck			2	8	60	76	40	
		Excavator	153	320E	1	8	15	81	40	
10	Concrete Retaining Wall	Generator	100		1	8	15	81	50	86
		Forklift	74	TH255C	1	4	15	81	40	
		Delivery Truck			2	4	15	74	40	
		Concrete Truck			1	4	15	79	40	

Task No	Description	Equipment	HP	Model	Quantity	Hr/day	Days	Lmax @50 ft	Use Factor, %	Leq(1h) @50 ft
		Concrete Vibrator	5	BP-35	1	4	15	87	50	
		Compactor Roller	102	CB44B	1	4	15	80	20	
11	Structural Excavation & Backfill	Excavator	153	320E	1	4	10	81	40	81
		Compactor	232	815F	1	4	10	83	20	
		Dump Truck			1	4	60	76	40	
		Backhoe	87	416F2	1	6	10	78	40	
12	Flap Gate – 24", 66"	Excavator	153	320E	1	6	5	81	40	79
		Delivery Truck			1	4	15	74	40	
		Backhoe	87	416F2	1	4	5	78	40	
13	Slide Gates	Excavator	153	320E	1	4	10	81	40	79
		Delivery Truck			1	4	10	74	40	
		Backhoe	87	416F2	1	4	10	78	40	
14	CMB Access Road	Grader	145	120M2	1	6	20	85	40	83
		Compactor Roller	102	CB44B	1	6	20	80	20	
		Dump Truck			1	6	60	76	40	
		Backhoe	87	416F2	1	4	20	78	40	
15	6' Chain Link Fence	Bobcat with Drill	61	S570	1	4	2	84	20	78
		Delivery Truck			1	4	10	74	40	
16	Chain Link Gate	Welder/Generator	50		1	4	1	81	50	80
		Bobcat	49	S450	1	4	1	79	40	
17	Hydroseeding (slopes)	Hydromulching Truck			1	4	1	76	40	72
18	Vegetation Thinning	Chainsaw	4	Stihl	4	6	5	84	20	84
		Dump Truck			1	6	5	76	40	
		Backhoe	87	416F2	1	4	5	78	40	

Sources: DOT 2006; VCWPD. 2015.

Appendix B

Typical Noise Levels of Construction Equipment by Task – Reaches 1-3 Option 1B

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Days	Lmax @50 ft	Use Factor %	Leq(h) @50 ft
1	Mobilization	Delivery Truck			2			74	40	73
2	Clearing and Grubbing	Chainsaw	4	Stihl	4	6	10	84	20	87
		Wood Chipper	85	BC1200XL	1	4	10	90	20	
		Dump Truck			1	4	10	76	40	
		Backhoe	87	416F2	1	4	10	78	40	
3	Demolition & Removals	Backhoe	87	416F2	1	6	10	78	40	76
		Dump Truck			1	4	10	76	40	
4	Diversion & Control of Water	Excavator	153	320E	1	6	5	76	40	79
		Backhoe	87	416F2	1	6	5	76	40	
		Dump Truck			1	4	10	76	40	
		Loader	189	963D	1	6	5	79	40	
5	Traffic Control	Delivery Truck			1	4	15	74	40	70
6	Foundation Excavation	Grader	145	120M2	1	6	10	85	40	86
		Scraper	407	621K	2	8	10	84	40	
		Compactor	232	815F	1	6	10	83	20	
7	Levee Embankment Fill	Excavator	153	320E	1	8	40	76	40	84
		Grader	145	120M2	1	8	40	85	40	
		Dump Truck			4	8	10	76	40	
		Compactor	232	815F	1	8	40	83	20	
8	Landfill Tie-In	Loader	189	963D	1	4	10	79	40	82
		Excavator	153	320E	1	8	10	81	40	
		Dump Truck			2	4	10	76	40	
		Compactor	232	815F	1	4	10	83	20	
9	Riprap (1/4-Ton)	Loader	189	963D	1	8	15	79	40	81
		Dump Truck			2	8	10	76	40	
		Excavator	153	320E	1	8	15	81	40	

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Days	Lmax @50 ft	Use Factor %	Leq(h) @50 ft
10	Golf Course Fill	Loader	189	963D	1	8	45	79	40	83
		Excavator	153	320E	1	4	45	81	40	
		Backhoe	87	416F2	1	4	45	76	40	
		Dump Truck			4	4	10	76	40	
		Compactor	232	815F	1	6	45	83	20	
11	66-inch RCP	Excavator	153	320E	1	4	10	81	40	81
		Compactor	232	815F	1	4	10	83	20	
		Delivery Truck			2	4	15	74	40	
		Backhoe	87	416F2	1	6	10	76	40	
12	Flap Gate – 24", 66"	Excavator	153	320E	1	6	5	81	40	79
		Delivery Truck			1	4	15	74	40	
		Backhoe	87	416F2	1	4	5	76	40	
13	Slide Gates	Excavator	153	320E	1	4	10	81	40	79
		Delivery Truck			1	4	15	74	40	
		Backhoe	87	416F2	1	4	10	76	40	
14	Concrete Headwall	Backhoe	87	416F2	1	6	5	76	40	85
		Compactor Roller	102	CB44B	1	4	5	80	20	
		Delivery Truck			1	4	15	74	40	
		Concrete Vibrator	5	BP-35	1	4	5	87	50	
15	CMB Access Road	Grader	145	120M2	1	6	10	85	40	83
		Compactor Roller	102	CB44B	1	6	10	80	20	
		Dump Truck			2	4	10	76	40	
		Backhoe	87	416F2	1	4	10	76	40	
16	6' Chain Link Fence	Bobcat with Drill	61	S570	1	4	2	84	20	78
		Delivery Truck			1	4	15	74	40	
17	Chain Link Gate	Welder/Generator	50		1	4	1	81	50	80
		Bobcat	49	S450	1	4	1	79	40	
18	Hydroseeding (slopes)	Hydromulching Truck			1	4	1	76	40	72

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Days	Lmax @50 ft	Use Factor %	Leq(h) @50 ft
19	Vegetation Thinning	Chainsaw	4	Stihl	4	6	5	84	20	84
		Dump Truck			1	4	10	76	40	
		Backhoe	87	416F2	1	4	5	78	40	

Sources: DOT 2006; VCWPD. 2015.

Appendix C

Typical Noise Levels of Construction Equipment by Task – Reach 4

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Duration	Lmax	Use Factor%	Leq(h)
1	Mobilization	Delivery Truck			2		4 weeks	74	40	73
2	Clearing and Grubbing	Chainsaw	4	Stihl	4	6	2 weeks	84	20	86
		Wood Chipper	85	BC1200XL	1	4		90	20	
		Dump Truck			1	4		76	40	
		Backhoe	87	416F2	1	4		78	40	
3	Demolition and Removals	Backhoe	87	416F2	1	4	2 weeks	78	40	75
		Delivery Truck			1	4		74	40	
4	Diversion & Control of Water	Excavator	153	320E	1	6	1 week	81	40	81
		Backhoe	87	416F2	1	4		78	40	
		Delivery Truck			2	4		74	40	
		Loader	189	963D	1	4		79	40	
5	Traffic Control	Delivery Truck			1	4	2 weeks	74	20	67
6	Flood Wall Foundation Excavation	Excavator	153	320E	1	8	4 weeks	81	40	80
		Dump Truck			1	4		76	40	
		Loader	189	963D	1	6		79	40	
7	RC Flood Wall – Riverside	Loader	189	963D	1	4	14 weeks	79	40	87
		Pump Truck			1	4		81	20	
		Concrete Truck			1	4		79	40	
		Delivery Truck			2	4		74	40	
		Backhoe	87	416F2	1	4		78	40	
		Concrete Vibrator	5	BP-35	1	4		87	50	
		Generator	100	0	1	4		81	50	
8	RC Flood Wall – Landside	Loader	189	963D	1	4	10 weeks	79	40	86
		Pump Truck			1	4		81	20	
		Concrete Truck			1	4		79	40	

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Duration	Lmax	Use Factor%	Leq(h)
		Delivery Truck			2	4		74	40	
		Backhoe	87	416F2	1	4		78	40	
		Concrete Vibrator	5	BP-35	1	4		87	50	
9	Sheet Pile Wall & Scour Protection	55 ton Crane	240	RT765E-2	1	4	11 weeks	81	16	80
		Delivery Truck			1	6		74	40	
		Excavator		345C	1	8		81	40	
		Vibratory driver		ESF 12M	1	8		75	40	
10	UPRR Embankment Fill	Backhoe	87	416F2	1	4	2 weeks	78	40	81
		Dozer	238	D7E	1	6		82	40	
		Dump Truck			1	4		76	40	
		Compactor Roller	102	CB44B	1	6		80	20	
11	El Rio Drain Channel Modification	Excavator	153	320E	1	4	3 weeks	81	40	80
		Concrete Truck			1	4		79	40	
		Backhoe	87	416F2	1	4		78	40	
12	Rock Riprap Removal & Replacement	Excavator	153	320E	1	8	2 weeks	81	40	81
		Dump Truck			1	8		76	40	
		Concrete Truck			1	8		79	40	
		Backhoe	87	416F2	1	4		78	40	
13	6' Chain Link Fence	Bobcat with Drill	61	S570	1	4	4 days	84	20	78
		Delivery Truck			1	4		74	40	
14	Chain Link Gate	Welder/Generator	50		1	4	2 days	81	50	80
		Bobcat	49	S450	1	4		79	40	
15	Reinforced Concrete Drain Channel & Flap Gate	Excavator	153	320E	1	8	2 days	81	40	79
		Delivery Truck			1	4		74	40	
		Backhoe	87	416F2	1	6		78	40	
16	HP Gas Valve Relocations	Backhoe	87	416F2	1	4	1 week	78	40	75
		Delivery Truck			1	4		74	40	
17	Landscaping	Backhoe	87	416F2	1	4	1 week	78	40	75

Task No	Task Description	Off-road Equipment	HP	Model	Quantity	Hr/day	Duration	Lmax	Use Factor%	Leq(h)
		Delivery Truck			1	4		74	40	
18	Concrete Trail	Excavator	153	320E	1	4	2 weeks	74	40	80
		Pump Truck			1	4		81	20	
		Concrete Truck			1	4		79	40	
		Backhoe	87	416F2	1	4		78	40	
19	CMB Access Road	Grader	145	120M2	1	6	1 week	85	40	83
		Compactor Roller	102	CB44B	1	4		80	20	
		Concrete Truck			1	4		79	40	
		Backhoe	87	416F2	1	4		78	40	
20	Soil Cement Access Road	Grader	145	120M2	1	6	2 weeks	85	40	84
		Soil Concrete Mixer - Excavator	153	320E	1	6		81	40	
		Concrete Truck			1	4		79	40	
		Compactor Roller	102	CB44B	1	4		80	20	
21a	Utility Relocations	Backhoe	87	416F2	1	4	1 week	78	40	75
		Material Truck			1			74	40	
21b	Concrete Abutments	Loader	189	963D	1	4	2 weeks	79	40	81
		Pump Truck			1	4		81	20	
		Concrete Truck			1	4		79	40	
		Delivery Truck			2	4		74	40	
		Backhoe	87	416F2	1	4		78	40	
21c	Flood Break Gate Installation	55 ton Crane	240	RT765E-2	1	4	1 week	81	16	75
		Delivery Truck			1	4		74	40	
21d	Street Modifications	Backhoe	87	416F2	1	4	2 weeks	78	40	83
		Grader	145	120M2	1	4		85	40	
		Concrete Truck			1	4		79	40	
		Paver	142	AP500E	1	6		77	50	

Sources: DOT 2006; VCWPD. 2015.