

4.10.1 INTRODUCTION

This section analyzes the noise impacts of the proposed Scott Ranch project (proposed project) at the project site. It presents the fundamentals of environmental noise and vibration, the existing noise conditions at the project site and in its vicinity, the regulations that govern noise in the project area, the methodology used to conduct the noise impact analysis for the proposed project, and the potential stationary and mobile source noise impacts of the proposed Scott Ranch project during its construction and occupancy. It also presents potential impacts to noise from the construction and operation of the proposed regional park trail that would extend from the western boundary of the Scott Ranch project site to the existing Ridge Trail on Helen Putnam Regional Park (see **Section 4.10.4.4** below).

The analysis in this section is based on noise data collected by Christopher A. Joseph Associates and the traffic data prepared for the traffic analysis in **Section 4.13, Transportation**, of this RDEIR. The noise data is included in **Appendix 4.10** of this Draft EIR. The traffic analysis is detailed in **Section 4.13**.

4.10.2 FUNDAMENTALS OF NOISE AND VIBRATION

4.10.2.1 Noise

Noise is usually defined as unwanted sound. It is an undesirable by-product of society's normal day-to-day activities. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm, and/or when it has adverse effects on health. The definition of noise as unwanted sound implies that it has an adverse effect on people and their environment.

Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). The human ear does not respond uniformly to sounds at all frequencies; for example, it is less sensitive to low and high frequencies than it is to the medium frequencies that more closely correspond to human speech. In response to the sensitivity of the human ear to different frequencies, the A-weighted noise level (or scale), which corresponds more closely with people's subjective judgment of sound levels, has been developed. This A-weighted sound level, referenced in units of dBA, is measured on a logarithmic scale such that a doubling of sound energy results in a 3.0 dBA increase in noise level. In general, changes in a noise level of less than 3.0 dBA are not typically noticed by the human ear (US Department of Transportation 1980). Changes in noise ranging from 3.0 to 5.0 dBA may be noticed by some individuals who are extremely sensitive to changes in noise. A greater than 5.0 dBA increase is readily noticeable, while the human ear perceives a 10.0 dBA increase in sound level to be a doubling of sound.

Noise sources occur in two forms: (1) point sources, such as stationary equipment or individual motor vehicles; and (2) line sources, such as a roadway with a large number of point sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically “hard” sites and 7.5 dB at acoustically “soft” sites (US Department of Transportation 1980a).¹ For example, a 60 dBA noise level measured at 50 feet from a point source at an acoustically hard site would be 54 dBA at 100 feet from the source and 48 dBA at 200 feet from the source. Sound generated by a line source typically attenuates at a rate of 3.0 dBA and 4.5 dBA per doubling of distance from the source to the receptor for hard and soft sites, respectively (US Department of Transportation 1980a).

Sound levels can be attenuated by man-made or natural barriers (e.g., sound walls, berms, ridges), as well as elevational differences. Sound levels may also be attenuated 3.0 to 5.0 dBA by a first row of houses and 1.5 dBA for each additional row of houses (FHWA 1978).

In addition, typical building construction attenuates outside noise by 17 to 30 decibels, depending on whether the windows are open or closed. The minimum noise attenuation provided by typical building construction in California is provided in **Table 4.10-1, Outside to Inside Noise Attenuation (dBA)**.

**Table 4.10-1
Outside to Inside Noise Attenuation (dBA)**

Building Type	Open Windows	Closed Windows
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/Convalescent Homes	17	25
Offices	17	25
Theaters	20	30
Hotels/Motels	17	25

Source: Transportation Research Board, National Research Council, Highway Noise: A Design Guide for Highway Engineers, National Cooperative Highway Research Program Report 117.

When assessing community reaction to noise, there is an obvious need for a scale that averages varying noise exposures over time and that quantifies the result in terms of a single number descriptor. Several scales have been developed that address community noise level. Those that are applicable to this analysis

¹ Examples of “hard” or reflective sites include asphalt, concrete, and compacted and sparsely vegetated soils. Examples of acoustically “soft” or absorptive sites include soft, sand, plowed farmland, grass, crops, and densely vegetated ground cover, etc.

are the Equivalent Noise Level (Leq), the Day-Night Noise Level (Ldn), and the Community Noise Equivalent Level (CNEL).

- Leq is the average A-weighted sound level measured over a given time interval. Leq can be measured over any period, but is typically measured for 1-minute, 15-minute, 1-hour, or 24-hour periods.
- Ldn is a 24-hour Leq with a “penalty” of 10 decibels added during the nighttime hours (10:00 PM to 7:00 AM), which is normally sleeping time.
- CNEL is another average A-weighted sound level measured over a 24-hour period. However, the CNEL noise scale is adjusted to account for some individuals’ increased sensitivity to noise levels during the evening as well as the nighttime hours. A CNEL noise measurement is obtained after adding a “penalty” of 5 decibels to sound levels occurring during the evening from 7:00 PM to 10:00 PM, and 10 decibels to sound levels occurring during the nighttime from 10:00 PM to 7:00 AM.²

4.10.2.2 Vibration

Vibration of the air is called sound when it is within the frequency audible to the human ear, while vibration of materials other than air is called simply “vibration.” Vibration that travels through the earth is referred to as groundborne vibration. Airborne vibration is caused by low-frequency sound (less audible to the human ear) that can excite building components and create a feeling of vibration.

Vibration may be composed of a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating, measured in hertz (Hz). Most environmental vibrations consist of a composite, or “spectrum” of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most perceptible vibration generally ranges from a low frequency of less than 1 Hz to a high of about 200 Hz.

Vibration is often measured in terms of the peak particle velocity (PPV)³ in inches per second (in/sec) and referenced as vibration decibels (VdB). The PPV descriptor is used in this RDEIR to evaluate the potential for construction-generated vibrations to result in property damage.

² The logarithmic effect of adding these penalties to the peak-hour Leq measurement results in a CNEL measurement that is within approximately 3 dBA (plus or minus) of the peak-hour Leq. California Department of Transportation, Technical Noise Supplement; A Technical Supplement to the Traffic Noise Analysis Protocol, October 1998, pp. N51-N54.

³ Particle velocity is the velocity of a particle (real or imagined) in a medium as it transmits a wave.

Table 4.10-2, Construction Vibration Damage Criteria, presents the criteria used by the Department of Transportation for property damage.

**Table 4.10-2
Construction Vibration Damage Criteria**

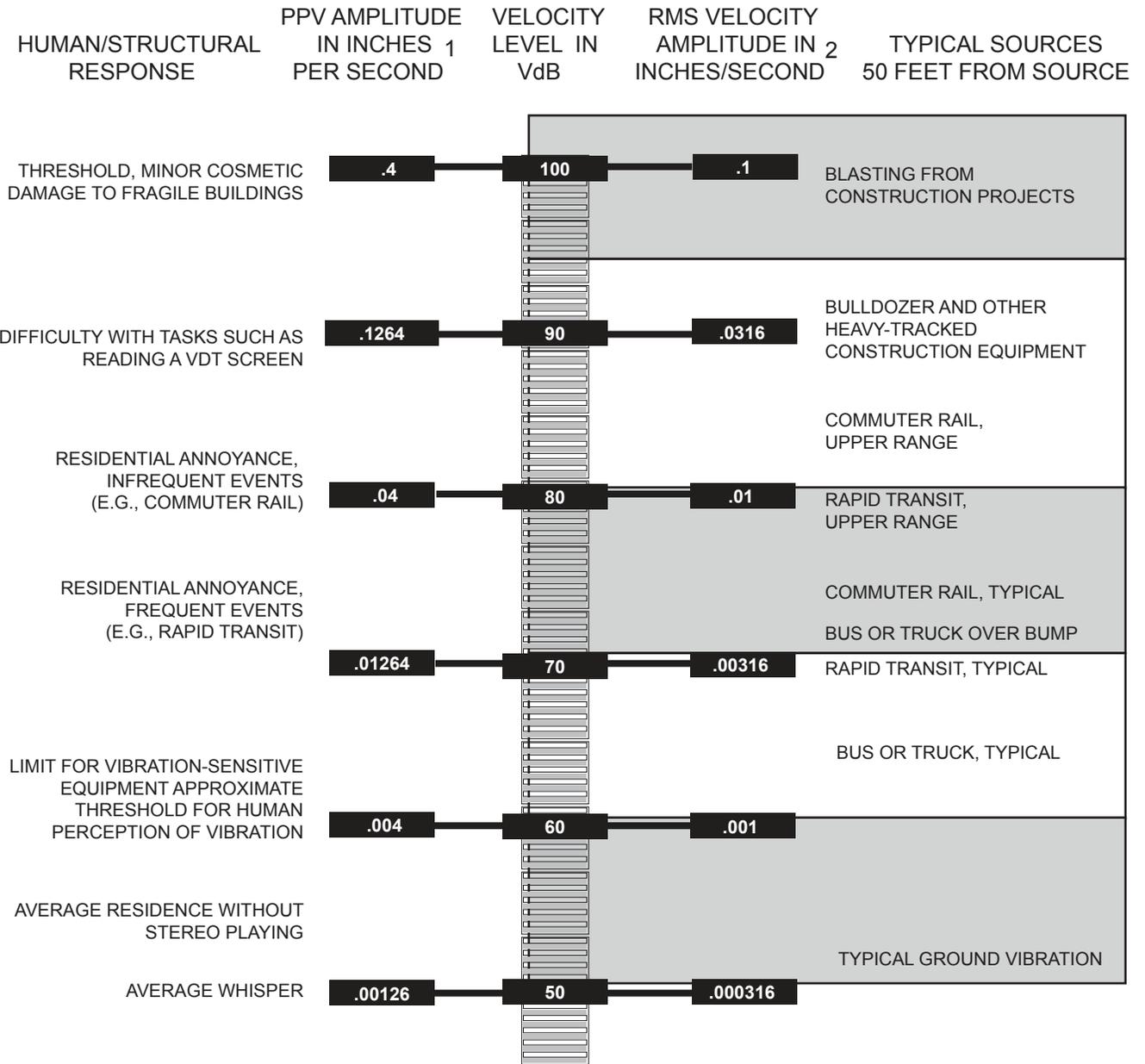
Building Category	PPV (in/sec)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: Caltrans. 2013. Transportation and Construction Vibration Guidance Manual.

For structural damage, the California Department of Transportation uses a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards; 0.2 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern; and a conservative limit of 0.08 in/sec PPV for older buildings or buildings that are documented to be structurally weakened.

The vibration descriptor of VdB is used in this RDEIR to evaluate the potential for construction vibrations to result in strong human annoyance and complaints. The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the groundborne vibration from traffic is barely perceptible. **Figure 4.10-1, Typical Levels of Groundborne Vibration**, identifies the typical groundborne vibration levels in VdB and human response to different levels of vibration.

The FTA has adopted standards associated with human annoyance for groundborne vibration impacts for the following three land-use categories: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional. The FTA defines Category 1 as buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations.



¹ PPV is typically a factor 1.7 to 6 times greater than RMS vibration velocity. A factor of 4 was used to calculate noise levels.

² Vibration levels in terms of velocity levels are defined as: $V=20 \times \log_{10} (a/r)$
 V=velocity levels in decibels
 a=RMS velocity amplitude
 r=reference amplitude (accepted reference quantities for vibration velocity are 1×10^{-6} inches/second in the United States)

FIGURE 4.10-1

Typical Levels of Groundborne Vibration

Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference. The groundborne vibration thresholds for these three land-use categories are shown in **Table 4.10-3, Human Annoyance Groundborne Vibration Thresholds (VdB)**.

**Table 4.10-3
Human Annoyance Groundborne Vibration Thresholds (VdB)**

Frequency of Events	Groundborne Vibration Threshold (VdB)		
	Category 1	Category 2	Category 3
Infrequent	65	80	83
Occasional	65	75	78
Frequent	65	72	75

Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment Manual*.

Notes:

“Infrequent events” is defined by the Federal Transit Administration as being fewer than 30 vibration events of the same kind per day.

“Occasional events” is defined by the Federal Transit Administration as between 30 and 70 vibration events of the same source per day.

“Frequent events” is defined by the Federal Transit Administration as over 70 vibration events of the same kind per day.

4.10.3 ENVIRONMENTAL SETTING

4.10.3.1 Project Site and Surrounding Land Uses

The barn complex and other structures at the site are not currently occupied. In the vicinity of the project site, noise-sensitive receptors include single-family homes to the north in The Summit above Petaluma subdivision, to the northwest in the Victoria subdivision, and to the east of D Street in the Pinnacle Heights subdivision. Large-lot rural residences are located to the south of the project site.

Sources of noise audible on the project site include vehicular traffic along Windsor Drive and D Street, as well as activities at existing residences to the north, northwest, and east.

4.10.3.2 Existing Noise Environment

As noted above, land uses near the project site are mostly residential subdivisions or large-lot rural residences. The primary source of noise at and around the project site is vehicular traffic on D Street. **Table 4.10-4, 2009 Roadway Noise Levels Off-Site**, shows average daily noise levels along five roadway segments of D Street in 2009 at the time of the preparation of the noise analysis for the residential

development previously proposed for the project site. The roadway segments selected for analysis were those expected to be most directly impacted by project-related traffic. As shown in **Table 4.10-4**, in 2009 ambient noise levels along D Street exceeded 60 dBA CNEL at all five roadway segments (Christopher A. Joseph Associates 2009). Considering that traffic volumes have remained generally the same or slightly increased between 2009 and 2019, ambient noise levels at all five roadway segments still exceed 60 dBA CNEL at the present time (Christopher A. Joseph Associates 2009; Fehr and Peers 2019).

Table 4.10-4
2009 Roadway Noise Levels Off-Site

Roadway	Roadway Segment	Existing Land Uses	dBA CNEL ¹
		Located Along Roadway Segment	
D Street	North of Petaluma Blvd	Commercial	65.5
	Between Petaluma Blvd and 6th Street	Residential and Commercial	64.9
	Between 6th Street and El Rose Dr/Sunny Slope Ave	Residential	63.8
	Between El Rose Dr/Sunny Slope Ave and Windsor Dr/Pinnacle Dr	Residential	62.0
	South of Windsor Dr/Pinnacle Dr	Open Space and Residential	60.8

Source: Christopher A. Joseph Associates 2009. Calculation data and results are provided in **Appendix 4.9**.

Notes:

Compared to traffic volumes at these roadway segments at the time of noise data collection in 2009, current traffic volumes in the project area are generally similar or slightly higher. Therefore, current noise levels are estimated to be similar or higher than the 2009 ambient noise levels

¹ Values represent noise levels at 50 feet from the centerline of each roadway.

The only sources of groundborne vibration in the project site vicinity are heavy-duty vehicles (e.g., refuse trucks, delivery trucks, and transit buses) traveling on local roadways. Trucks and buses typically generate groundborne vibration velocity levels of around 63 VdB, and these levels could reach 72 VdB where trucks and buses pass over bumps in the road (DOT 2006). In terms of PPV levels, a heavy-duty vehicle traveling at a distance of 50 feet can result in a vibration level of approximately 0.001 inch per second.

4.10.4 REGULATORY CONSIDERATIONS

4.10.4.1 State Regulations

Title 24, California Code of Regulations

The California Noise Insulation Standards of 1988 (California Code of Regulations Title 24, Section 3501 et seq.) require that interior noise levels from the exterior sources not exceed 45 dBA Ldn/community noise

equivalent level (CNEL)⁴ in any habitable room of a multi-residential use facility (e.g., hotels, motels, dormitories, long-term care facilities, and apartment houses and other dwellings, except detached single-family dwellings) with doors and windows closed.⁵ Where exterior noise levels exceed 60 dBA CNEL/Ldn, an acoustical analysis is required to show that the building construction achieves an interior noise level of 45 dBA CNEL/Ldn or less.

In noise environments where ambient levels exceed 60 dBA, additional noise insulation features, such as extra batting or resilient channels in exterior walls, double-paned windows, air conditioners to enable occupants to keep their windows closed without compromising their comfort, solid wood doors, and noise baffles on exterior vents are typically needed to provide acceptable interior noise levels. The best type of noise insulation is based on detailed acoustical analyses that identify all practical noise insulation features and that confirm their effectiveness.

4.10.4.2 Local Plans and Policies

City of Petaluma General Plan 2025

The Community Health and Safety element of the *General Plan 2025* includes the following policies with respect to noise:

Chapter 10: Health and Safety

- Policy 10-P-3:** Protect public health and welfare by eliminating or minimizing the effects of existing noise problems, and by minimizing the increase of noise levels in the future.
- A. Continue efforts to incorporate noise considerations into land use planning decisions, and guide the location and design of transportation facilities to minimize the effects of noise on adjacent land uses.
 - B. Discourage location of new noise-sensitive uses, primarily homes, in areas with projected noise levels greater than 65 dB CNEL. Where such uses are permitted, require incorporation of mitigation measures to ensure that interior noise levels do not exceed 45 dB CNEL.

⁴ Measurements are based on Ldn or CNEL.

⁵ The standards note that for detached single-family homes, the governing body may impose noise insulation standards on a case by case basis, if the governing body determines that such standards are necessary due to substantial noise generated by airports, roadways, or commercial and industrial activities immediately surrounding or adjacent to such proposed dwellings. Any local noise insulation standards adopted for single-family detached dwellings shall not exceed comparable standards for multifamily housing.

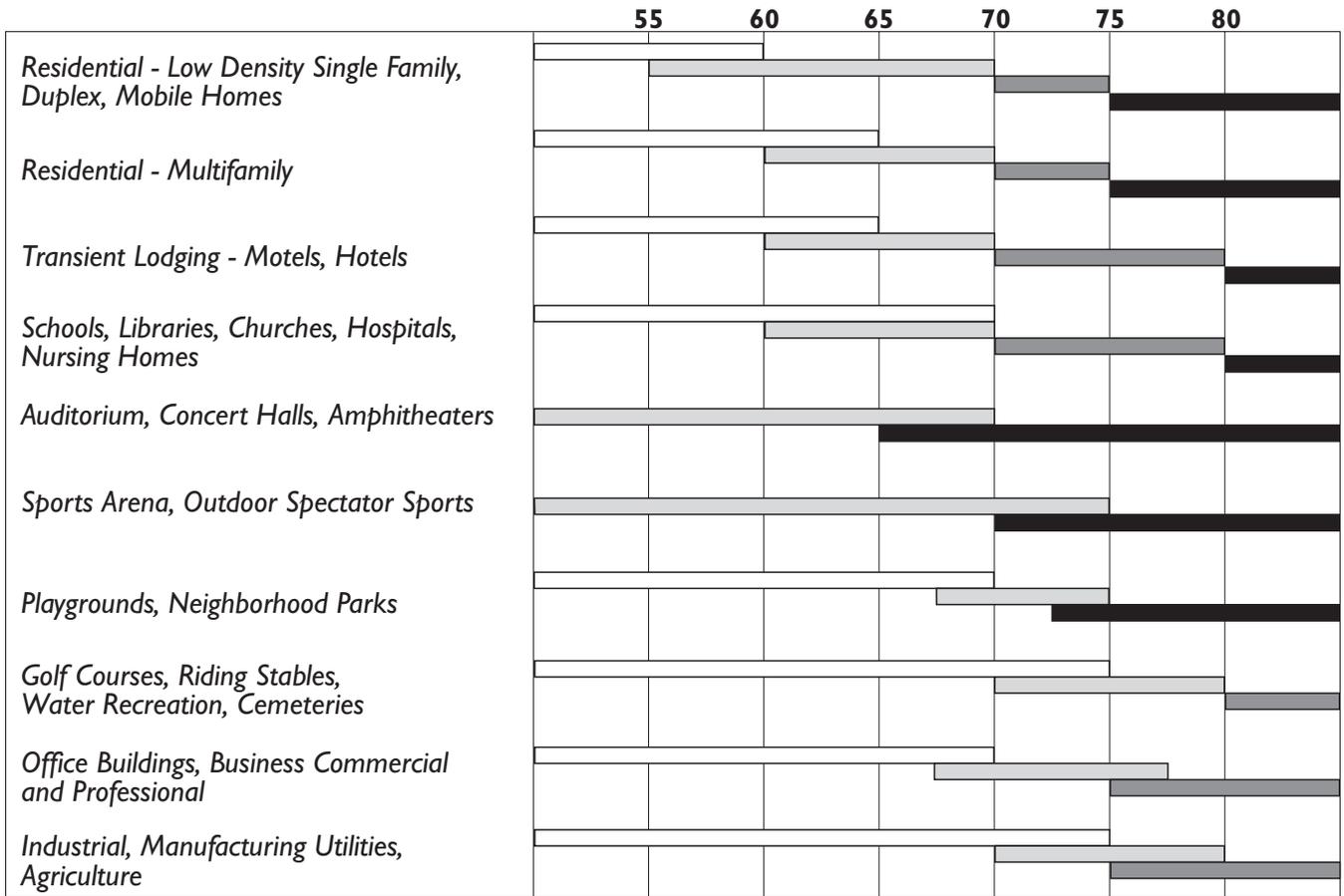
- C. Ensure that the City's Noise Ordinance and other regulations:
- Require that applicants for new noise-sensitive development in areas subject to noise levels greater than 65 dB CNEL obtain the services of a professional acoustical engineer to provide a technical analysis and design of mitigation measures.
 - Require placement of fixed equipment, such as air conditioning units and condensers, inside or in the walls of new buildings or on roof-tops of central units in order to reduce noise impacts on any nearby sensitive receptors.
 - Establish appropriate noise-emission standards to be used in connection with the purchase, use, and maintenance of City vehicles.
- D. Continue to require control of noise or mitigation measures for any noise-emitting construction equipment or activity.
- E. As part of development review, use Figure 10-2: Land Use Compatibility Standards to determine acceptable uses and installation requirements in noise-impacted areas. (shown below as **Figure 4.10-2, Land Use Compatibility Standards for the City of Petaluma**, in this Draft EIR).
- F. Discourage the use of sound walls anywhere except along Highway 101 and/or along the NWPRRA corridor [now owned and dispatched by the Sonoma Marin Area Rail Transit (SMART)], without findings that such walls will not be detrimental to community character. When sound walls are deemed necessary, integrate them into the streetscape.
- G. In making a determination of impact under the California Environmental Quality Act (CEQA), consider an increase of four or more dBA to be "significant" if the resulting noise level would exceed that described as normally acceptable for the affected land use in Figure 10-2: Land Use Compatibility Standards.

City of Petaluma Implementing Zoning Ordinance (IZO)

The Petaluma Municipal Code regulates noise levels that can occur throughout the City. Per Section 22-301 of the IZO, noise generating activities such as construction are limited to the hours of 7:00 AM to 10:00 PM on weekdays and 9:00 AM to 10:00 PM on weekends and holidays.

For daily operational noise, the Noise Ordinance generally establishes an hourly average level of 60 dBA Leq as the maximum that may be generated on one land use that would be affecting another land use, and the allowable levels are adjusted to account for the ambient noise level. The maximum exterior noise exposure levels allowed by IZO are presented in **Table 4.10-5** below.

COMMUNITY NOISE EXPOSURE L_{dn} or CNEL, dB



INTERPRETATION:



NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.



CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.



NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.



CLEARLY UNACCEPTABLE

New construction or development should generally not be undertaken.

SOURCE: City of Petaluma General Plan

FIGURE 4.10-2

**Table 4.10-5
Maximum Exterior Noise Exposure (Leq, dBA)**

	Time: 10 PM to 7 AM M-F 10 PM to 8 AM. S, S and Holidays	Time: 7 AM to 10 PM M-F 8 AM to 10 PM S, S and Holidays
General Plan Ambient	60	60
Cumulative period of 15 minutes or more in one hour	65	70
Cumulative period of 5 minutes or more in one hour	70	75
Cumulative period of 1 minutes or more in one hour	75	80

Source: City of Petaluma IZO, Table 21.1, 2008

4.10.5 IMPACTS AND MITIGATION MEASURES

4.10.5.1 Significance Criteria

The impacts of the proposed project related to noise would be considered significant if they would exceed any of the following Standards of Significance, in accordance with Appendix G of the *California Environmental Quality Act (CEQA) Guidelines*:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project site in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generation of excessive groundborne vibration or groundborne noise levels; and
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

To evaluate the project's noise and vibration impacts, the following thresholds are used in this RDEIR.

City Noise Standards

The noise standards adopted by the City of Petaluma are discussed above. These standards would apply to the single-family uses that would be constructed on the project site. Specifically, noise levels within the exterior activity areas (e.g., front and back yards) of the proposed residential uses may not exceed 60 dBA CNEL under the General Plan 2025.

Permanent Increase in Noise Levels

The *State CEQA Guidelines* do not define what noise level increase would be considered substantial. The City of Petaluma General Plan Policy 10-P-3 (G) states that “when making a determination of impact under the California Environmental Quality Act (CEQA), consider an increase of four or more dBA to be “significant” if the resulting noise level would exceed that described as normally acceptable for the affected land use in Figure 10-2: Land Use Compatibility Standards. Land uses that could be affected by traffic generated by the proposed project include single-family homes along D Street. As noted in **Table 4.10-2**, the existing noise levels along D Street exceed 60 dBA CNEL. Therefore, consistent with the General Plan, this RDEIR uses an increase of 4 or more dBA as the criterion to evaluate the significance of any permanent increases in noise levels at residential receptors along D Street as a result of project-related traffic.

Temporary or Periodic Increase in Noise

The *State CEQA Guidelines* do not define the levels at which a temporary increase in noise is considered “excessive.” The City of Petaluma has not adopted any specific numeric threshold for the evaluation of temporary increases in noise such as those that could result from a project’s construction activities. For purposes of this RDEIR, where noise from construction activities exceeds 60 dBA Leq and the ambient noise environment by 5 dBA Leq or more at nearby residential land uses for a period of more than one year, the impact would be considered significant.

Groundborne Vibration

The *State CEQA Guidelines* do not define the levels at which groundborne vibration or groundborne noises are considered “excessive.” In addition, the City of Petaluma has not adopted any thresholds for groundborne vibration impacts. For purposes of this RDEIR, the groundborne vibration levels generated by project construction activities would be considered excessive if they exceeded 75 VdB at the nearest residential receptor (vibration at this level would be perceptible to residents and could generate a complaint). Groundborne vibrations that exceed 0.5 in/sec PPV at the nearest building of recent construction would be considered significant as they could result in architectural damage. With respect to structures that are greater than 50 years old, groundborne vibrations that exceed 0.08 in/sec PPV would be considered significant as they could result in architectural damage.

4.10.5.2 Methodology

As noted under **Section 4.10.3.2, Existing Noise Environment**, vehicular traffic is the primary source of ambient noise near the project site. Therefore, the analysis of noise impact, presented below, is based on the changes in traffic volumes. Ambient noise levels at five roadway segments of D Street were collected

in 2009 as part of the analysis of noise impact of the residential development previously proposed at the project site. To estimate existing ambient noise level, traffic volumes in 2009 were compared to existing traffic volumes (2019). As discussed in **Section 4.10.3.2, Existing Noise Environment**, because traffic volume remained generally the same or have slightly increased, ambient noise level at the five roadway segments still exceed 60 dBA L_{eq} at the present time. To estimate noise increase from project-related noise during the operation, the level of noise generated by the additional vehicle trips of the proposed project associated with the Davidon (28-lot) Residential Project component and Putnam Park Extension Project component and the cumulative projects was quantified. The analysis assessed noise impact resulting from the increase in vehicle trips.

4.10.5.3 Issues Not Discussed Further

The project site is not located within the vicinity of a private airstrip or a public/public use airport. The project site is located approximately 3.3 miles from the Petaluma Municipal Airport and is located outside the 55- to 75-decibel (dB) CNEL noise contours for the facility (City of Petaluma 2006; Sonoma County 2008). Therefore, implementation of the proposed project would neither impact nor be affected by significant aircraft noise. This issue is not discussed further in the analysis below.

4.10.5.4 Project Impacts and Mitigation Measures

Impact NOISE-1: **Noise generated by construction activities on the project site would result in a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (*Potentially Significant; Less than Significant with Mitigation*)**

Construction of the proposed project would require demolition of the mobile home and collapsed farmhouse, grading and excavation, installation of utilities, drainage facilities, and roadways, widening of existing service vehicle entrance, construction and finishing of the houses, amphitheater, trail network, parking lots, infiltration basins, playground, and picnic areas. Construction activities would also include the relocation and restoration of the barn complex. These activities typically involve the use of heavy equipment such as tractors, loaders, pavers, skid steers, dozers, and concrete mixers. Trucks would be used to deliver equipment, building, and pavement materials, and to haul away waste materials. Smaller equipment, such as jack hammers, pneumatic tools, saws, and hammers, would also be used throughout the project site during the construction phase. During each stage of construction, there would be a different mix of equipment operating and noise levels would vary based on the number of equipment operating and the location of the activity. The equipment would generate both temporary steady state and episodic noise

that would be heard both on and off the project site. Site clearing, grading, and trenching for the Davidon (28-lot) Residential Project component is anticipated to last for nine months, while construction of the residences is expected to take about 21 months, for an overall construction period of approximately 30 months. Construction of the Putnam Park Extension Project component is estimated to last approximately 17 months and is assumed conservatively to occur simultaneously with the construction of the Davidon (28-lot) Residential Project component.

The U.S. EPA has compiled data regarding the noise generating characteristics of specific types of construction equipment and typical construction activities. Typical noise ranges of construction equipment, without the use of noise reducing design features, are presented in **Table 4.10-6, Noise Range of Typical Construction Equipment**.

Table 4.10-6
Noise Range of Typical Construction Equipment

Construction Equipment	Noise Level in dBA Leq at 50 Feet ¹
Loader	80
Trucks	84
Cranes (moveable)	83
Cranes (derrick)	88
Saw	76
Pneumatic Tool	85
Jackhammers	88
Pumps	77
Generators	82
Compactor	82
Air Compressors	80
Concrete Mixers	85
Concrete Pumps	82
Backhoe	80
Scraper/Grader	85
Paver	85

Source: Federal Transit Administration. 2018. Transit Noise and Vibration Impact Assessment Manual

Notes:

¹ *Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of noise emissions as that shown in this table.*

The noise levels shown in **Table 4.10-7, Typical Outdoor Construction Noise Levels**, represent composite noise levels associated with typical construction activities (with standard use of mufflers), which take into account both the number and spacing of heavy construction equipment that are typically used during each

phase of construction. As shown in **Table 4.10-7**, on average construction noise can reach a maximum of approximately 86 dBA L_{eq} when measured at a reference distance of 50 feet from the construction activities. Noise levels such as these would be generated at the project site during the construction phases of the proposed development. These noise levels would diminish with distance from the construction site at a rate of approximately 6 dBA to 7.5 dBA per doubling of distance for acoustically hard and soft sites, respectively.

Table 4.10-7
Typical Outdoor Construction Noise Levels

Construction Phase	Noise Levels at 50 Feet (dBA Leq)	Noise Levels at 50 Feet with Mufflers (dBA Leq)
Ground Clearing	84	82
Excavation, Grading	89	86
Foundations	78	77
Structural	85	83
Finishing	89	86

Source: United States Environmental Protection Agency, Noise from Construction Equipment and Operations, Building Equipment and Home Appliances, PB 206717, 1971.

Existing residences and other sensitive receptors located adjacent to the project site with direct line-of-sight to construction activities would be affected by the project's construction noise. Noise from the construction of the installation utilities (e.g., water, gas, electrical, etc.) bordering the project site and the roundabout, sidewalk and trail section along D Street could also affect neighboring properties. Potential construction noise impacts would vary with distance and shielding provided by existing buildings.

The nearest and most notable sensitive receptors to the project site are the residents located approximately 50 feet to the north and northwest of the project site. Additional nearby sensitive receptors are the residences within the Pinnacle Heights Subdivision located across D Street, approximately 300 feet east of the project site. Based on the information presented above, construction activities on the northern parcel would result in noise levels in excess of 60 dBA L_{eq} at the nearest existing residences to the north, although the noise levels would be lower when construction is occurring in other portions of the project site. Similar noise levels would occur at receptors to the northwest of the project site when construction is underway near the northwestern property line. Receptors in the Pinnacle Heights Subdivision would be affected by similar noise levels during the construction of the roundabout, amphitheater and relocation of the barn complex, the trail network near the barn complex, the lower parking lot, and the retention basin in the northeast corner of the project site.

The increase in noise levels at the nearby locations during construction at the project site would be temporary in nature and would not generate continuously high noise levels, although occasional single-event disturbances from construction are possible. Additionally, the majority of the construction activities would take place at distances greater than 50 feet from the residences to the north and northwest. In the later phases of project construction (during interior building construction), noise levels are typically reduced due to the newly erected physical structures that interrupt noise transmission from the project to off-site receptors.

Nonetheless, because construction near the northern and northwestern boundaries of the project could take more than a year to complete, the temporary or periodic increases in noise that would result when grading or construction activities occur near the northern, eastern and northwestern portions of the site would be significant. As a result of the stay-at-home guidelines due to the COVID pandemic, a major portion of the work force has been working from home; therefore, under these conditions, noise resulting from construction activities would more adversely affect the nearby sensitive receptors. A number of corporations are developing plans for more work-from-home options beyond the pandemic. Based on a recent survey, the share of working days spent at home is expected to increase from pre-COVID levels, from 5 percent to 20 percent.⁶ In addition, should the project be constructed in phases, and the first phases are occupied when construction on the later phase is underway, on-site sensitive receptors could be exposed to noise levels above 60 dBA Leq for a period greater than one year. **Mitigation Measure NOISE-1** shall be implemented to reduce impacts associated with construction activities to a less than significant level.

Mitigation Measures:

- NOISE-1** The proposed project shall implement the following control measures during construction.
- a. Noise-generating construction activities shall be limited to daytime, weekday hours (7 AM to 6 PM) and 9 AM to 5 PM on weekends and holidays. When construction is occurring within 100 feet of existing residences, then construction shall occur between 9 AM and 5 PM and shall be prohibited on Sundays and Holidays.
 - b. High noise-producing activities, such as excavation and grading and construction finishing, shall be scheduled between the hours of 8 AM and 5 PM to minimize disruption on sensitive uses.
 - c. All stationary noise generating equipment that generates noise levels in excess of 65 dBA Leq shall be located as far as possible from sensitive receptors. If re-locating stationary equipment is not feasible, the equipment shall be shielded from noise

⁶ Wong, May. 2020. Stanford research provides a snapshot of a new working-from-home economy. Available at: <https://news.stanford.edu/2020/06/29/snapshot-new-working-home-economy/>. Accessed: December 10, 2020.

sensitive receptors by using temporary walls, sound curtains, or other similar devices to reduce noise levels at nearby sensitive receptors to less than 65 dBA Leq.

- d. The construction contractor shall implement feasible noise controls to minimize equipment noise impacts on nearby sensitive receptors. Feasible noise controls include improved mufflers, use of intake silencers, ducts, engine enclosures, and acoustically-attenuating shields or shrouds.
- e. Equipment used for project construction shall be hydraulically or electrically powered impact tools (e.g., jack hammers) wherever possible to avoid noise associated with compressed air exhaust from pneumatically-powered tools. Where use of pneumatically-powered tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. A muffler could lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible; this could achieve a reduction of five dBA. Quieter procedures shall be used (such as drilling rather than impact equipment) wherever feasible.
- f. The construction contractor shall implement appropriate additional noise reduction measures that include shutting off idling equipment after 5 minutes (as feasible) and notifying adjacent residences (at least one time) in advance of construction work.
- g. The construction contractor shall not stage equipment within 200 feet of the existing residences adjacent to the project site.
- h. The contractor shall minimize use of vehicle backup alarms. A common approach to minimizing the use of backup alarms is to design the construction site with a circular flow pattern that minimizes backing up of trucks and other heavy equipment. Another approach to reducing the intrusion of backup alarms is to require all equipment on the site to be equipped with ambient sensitive alarms. With this type of alarm, the alarm sound is automatically adjusted based on the ambient noise.
- i. Construction worker's radios shall be controlled so as to be inaudible beyond the limits of the project site boundaries.
- j. Heavy equipment, such as paving and grading equipment, shall be stored on-site whenever possible to minimize the need for extra heavy truck trips on local streets.
- k. Two weeks prior to the commencement of construction, notification in writing must be provided to residents within 300 feet of the project site, disclosing the construction schedule, including the various types of activities that would be occurring throughout the duration of the construction period.
- l. The construction contractor shall designate a city-approved "disturbance coordinator" who shall be responsible for responding to any local complaints about construction noise. The disturbance coordinator shall determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and shall require that reasonable measures warranted to correct the problem be implemented. The construction contractor shall conspicuously post a telephone number for the disturbance coordinator at the

construction site and include it in the notice sent to neighbors regarding the construction schedule.

Significance after Mitigation: Implementation of **Mitigation Measure NOISE-1** would reduce the impact related to exposure of sensitive receptors to excessive noise during construction to a less-than-significant level.

Impact NOISE-2: **Construction of the proposed project would result in the generation of excessive groundborne vibration or groundborne noise levels. (Potentially Significant; Less than Significant with Mitigation)**

Construction activities that would occur on the project site would include demolition of the mobile home and collapsed farm house, grading and excavation, installation of utilities, drainage facilities, and roadways, widening of existing service vehicle entrance, construction and finishing of the houses, amphitheater, trail network, parking lots, infiltration basins, playground, and picnic areas. Construction activities would also include the relocation and restoration of the barn complex. **Table 4.10-8, Vibration Source Levels for Construction Equipment**, identifies various PPV and vibration velocity (in VdB) levels for the types of construction equipment that would operate during the construction of the proposed project. Based on the information presented in **Table 4.10-8**, vibration velocities could reach as high as approximately 0.031 inches per second PPV at 50 feet from the source activity. This corresponds to 78 VdB at 50 feet from the source activity.

Table 4.10-8
Vibration Source Levels for Construction Equipment

Equipment	Approximate PPV (in/sec)					Approximate Vibration Velocity (VdB)				
	25 Feet	50 Feet	60 Feet	75 Feet	100 Feet	25 Feet	50 Feet	60 Feet	75 Feet	100 Feet
Large Bulldozer	0.089	0.031	0.024	0.017	0.011	87	78	76	73	69
Caisson Drilling	0.089	0.031	0.024	0.017	0.011	87	78	76	73	69
Loaded Trucks	0.076	0.027	0.020	0.015	0.010	86	77	75	72	68
Jackhammer	0.035	0.012	0.009	0.007	0.004	79	70	68	65	61
Small Bulldozer	0.003	0.001	0.0008	0.0006	0.0004	58	49	47	44	40
Vibratory Roller	0.210	0.098	0.056		0.030	94				

Source: DOT 2006.

Note:

in/sec = inches per second.

Vibrations from general construction activities associated with the project would have the potential to affect the nearest off-site sensitive receptors and existing structures, which would include the residents/residences approximately 50 feet to the north and northwest of the project site. The velocity level of 78 VdB could exceed the occasional residential vibration exposure (human annoyance) threshold of 75 VdB. This would occur when heavy construction equipment operates within about 60 feet of an occupied residential unit when people are trying to sleep (generally during the nighttime hours of 10:00 PM to 7:00 AM). Construction activities in the City of Petaluma are limited to daytime hours beginning at 7 AM and occurring no later than 10 PM. As discussed above **Mitigation Measure Noise-1** further restricts construction activities to reduce noise levels at nearby sensitive receptors. In the event that heavy duty equipment were to operate in close proximity to existing sensitive receptors, groundborne vibration may be perceptible and could result in disturbance to occupants, particularly during the quieter hours early in the morning. The impact would be potentially significant. **Mitigation Measure NOISE-2a** is set forth below to minimize this impact.

With respect to the potential for architectural damage from project-related vibrations, construction activities would generate up to 0.27 in/sec PPV at 20 feet from the source activity, which is the distance to the nearest homes (I&R 2019). This maximum vibration level is well below the threshold of 0.5 in/sec PPV that is used as the level above which vibrations can result in architectural damage to reinforced-concrete, steel or lumber buildings such as the existing homes in the vicinity of the project site. The impact would be less than significant.

Although construction of the residences would be more than 300 feet away from the barn complex, other construction activities would occur within 20 feet of the barn complex, such as grading associated with drainage improvements, construction of the trail network, pavement of the area between the barn complex and the vehicle service entrance, widening of the vehicle service entrance, and construction of the amphitheater activities. The potential vibration levels at 25 feet would be 0.210 PPV which is above 0.08 PPV threshold that is used for buildings extremely susceptible to vibration damage. Considering the age of the barn complex (late 19th and early 20th century) and the conditions of the foundation and the overall structure that may require stabilization, the use of vibratory rollers near the barn complex would have the potential to result in vibrations that could cause some architectural damage. This would be a significant impact. To minimize vibration impacts on the barn complex, the proposed project would implement **Mitigation Measure NOISE-2b**, detailed below. With implementation of **Mitigation Measure NOISE-2b**, project's impact related to vibration would be less than significant.

Mitigation Measures:

NOISE-2a Heavy construction equipment shall be prohibited from operating within 100 feet of an existing residence between the hours of 5:00 PM and 9:00 AM and on holidays.

NOISE-2b Operation of heavy equipment shall be prohibited within 20 feet of the barn complex. Temporary reinforcements/stabilization measures shall be installed at the barn structures, as needed, to minimize vibration damage.

Significance after Mitigation: Implementation of the **Mitigation Measures NOISE-2a** and **NOISE-2b** would reduce the impact related to exposure of sensitive receptors and structures to excessive groundborne vibration during construction to a less than significant level.

Impact NOISE-3: **Noise generated by project operation would not result in generation of a substantial permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (*Less than Significant*)**

Following the buildout of the proposed project and occupancy, locations in the vicinity of the project site would experience a slight increase in noise resulting from the users of the project site and additional traffic generated by the proposed project, as described under **Section 4.10.5.2, Methodology**. Noise would be added from future trail users and park amenities would be a negligible increase as compared to the existing noise environment. As a result, the primary source of noise impact during operation would be associated with vehicle trips to the future residences and the Putnam Park Extension Project component including the parking lots. Estimated noise levels during operation, presented in **Table 4.10-9**, represent a worst-case scenario. As shown, the traffic generated by the proposed Davidon (28-lot) Residential Project component and Putnam Park Extension Project component on the project site in combination to the traffic generated by the pipeline projects would increase local roadway noise levels by a maximum of 1.3 dBA over existing noise levels. The traffic generated by the proposed project alone would increase local roadway noise levels by a maximum of 0.3 dBA. Both increase in noise level would be imperceptible to most people and would not exceed the identified threshold of significance of 4 decibel increase. The impact related to a substantial permanent increase in ambient noise levels at sensitive receptors as a result of the proposed project would be less than significant.

**Table 4.10-9
Estimated Noise Levels Increases at Off-site Locations**

Roadway Segment	Existing Land Uses Along Roadway Segment	Existing Traffic Volumes	Pipeline Traffic Volumes Without Project	Noise Increase above Existing without Project (dBA)	Pipeline Traffic Volumes with Project	Noise Increase above Existing with Project (dBA)	Significance Threshold
D St, North of Petaluma Blvd.	Commercial	1,184	1,543	1.2	1,581	1.3	4.0
D St, between Petaluma Blvd and 6th St	Residential and Commercial	1,172	1,214	0.2	1,263	0.3	4.0
D St, between 6th St and El Rose Dr	Residential	960	984	0.1	1,041	0.4	4.0
D St, between El Rose Dr and Windsor Dr	Residential and Commercial	975	983	0.0	1,042	0.3	4.0
D St, south of Windsor Dr	Open Space and Residential	986	992	0.0	1,018	0.1	4.0

Source: Appendix 4.10

Mitigation Measures: No mitigation measures are required.

Non-CEQA Compatibility Review⁷

Noise generated by project operation would not result in generation of a substantial temporary or permanent increase in ambient noise levels at future residences on the project site. Vehicle traffic primarily on D Street and Windsor Drive would be the primary noise source in the project vicinity that could affect the future residents of the project site. As discussed previously, the exterior-to-interior noise reduction of new residential units in California is more than 25 dBA. With this standard noise reduction, **Table 4.10-10**

⁷ Under recent CEQA case law, an exceedance of a noise standard on the project site would arguably not be a CEQA impact, because it does not constitute an impact of the project on the existing environment. Nonetheless this analysis is provided for informational purposes to assess the City's General Plan, which sets forth noise standards that apply to the proposed project.

indicates that future exterior and interior noise levels associated with roadway traffic would not exceed City standards on the project site. Thus, there would be no conflict with City policies.

**Table 4.10-10
Predicted Future Roadway Noise Levels at the Project Site**

Roadway Segment	Proposed Land Use	Noise Levels in dBA CNEL				
		Future Exterior Noise Level	City Exterior Noise Standards	Assumed Exterior-to-Interior Reduction	Future Interior Noise Level	City Interior Noise Standard
D St, south of Windsor Dr.	Residential	58.8	60.0 ¹	-25.0	<45.0	45.0

Source: Christopher A. Joseph Associates 2009. *Appendix 4.9*

Notes:

¹ City of Petaluma 1987 General Plan exterior noise standard.

Heating, ventilation, and air conditioning (HVAC) systems would be installed for the new single-family homes within the project site. Residential HVAC systems result in noise levels that average between 40 and 50 dBA Leq at 50 feet from the equipment. These noise levels would not exceed the City's exterior noise standards. Thus, new residents would not be exposed to noise level that exceed an established standard and the proposed project would be consistent with the City noise standards.

Mitigation Measures: No mitigation measures are required.

4.10.5.5 Regional Park Trail Impacts and Mitigation Measures

Environmental Setting

The ambient noise levels along the proposed regional park trail alignment are low because the trail alignment is located within Helen Putnam Regional Park on an undeveloped hillside. The nearest potential noise source is traffic along Windsor Drive more than 1,000 feet to the north. The nearest noise sensitive receptors are located on Oxford Court approximately 300 feet north of the trail alignment.

Impacts and Mitigation Measures

RPT Impact NOI-1: Construction and operation of the proposed regional park trail project would not increase noise levels at existing residential uses in the vicinity nor expose persons to excessive groundborne vibration. The proposed regional park trail

would not expose persons on-site to excessive noise levels nor generate traffic which would substantially increase noise levels. (*Less than Significant*)

Construction Noise

Noise generated by construction activities for the proposed regional park trail would be temporary and minimal due to the small size and number of equipment needed to construct the trail and related infrastructure improvements and the short duration of construction. Trail dozers may be used for initial grading and excavation and mostly small construction equipment such as power wheel barrows and bob cats would be used for the remaining construction activities. Construction of the trail section would take up to four months to complete and would not be continuous during the overall construction period. Therefore, noise levels associated with construction activities of the proposed regional park trail would be limited in extent and duration. As shown in **Table 4.10-7**, on average construction noise can reach a maximum of approximately 86 dBA L_{eq} when measured at a reference distance of 50 feet from the construction activities. These noise levels would diminish with distance from the construction site at a rate of approximately 6 dBA to 7.5 dBA per doubling of distance for acoustically hard and soft sites, respectively. As such, construction activities would not substantially increase noise levels at nearby residential uses, such as along Oxford Court (located at 50 feet), nor along the Ridge Trail that would continue to be used by Helen Putnam Regional Park visitors. Construction noise impacts would be less than significant.

Groundborne Vibration

Construction activities and equipment for the regional park trail would be minimal. Furthermore, the nearest homes are at least 300 feet from the trail alignment and too far to be affected by the limited vibrations. Except for the segment of the proposed trail that would connect to the Ridge Trail (**Figure 3.0-12, Helen Putnam Regional Park Trail Section**), most of the construction activities associated with regional park trail would be at least 100 feet away from the visitors of the Regional Helen Putnam Park. In addition, besides grading activities to create a shelf for the trail that would occur over a relatively short period, the remaining construction activities would use small equipment that would have limited vibration effects that would be imperceptible beyond 50 feet of the construction site. No impacts from groundborne vibration would occur.

Exceedance of Noise Standards

The proposed regional park trail would not construct any homes and thus would not expose project site residents to excessive noise levels. The Noise Element of the Sonoma County General Plan indicates that exterior noise exposures for non-transportation noise sources should not exceed 55 dBA during daytime

hours and 50 dBA for nighttime hours for over a period of 15 minutes within an hour. If ambient noise levels are above these limits, then a maximum of 5 dBA above ambient levels is allowed (Sonoma County 2012). As described above, the maximum construction noise level can reach approximately 86 dBA L_{eq} when measured at a reference distance of 50 feet from the construction activities. Construction of the regional park trail would only occur during day time and the level of construction noise would be well below 50 dBA near the closest residential area to the regional park trail. Therefore, construction noise impact of the regional park trail would be less than significant.

Permanent Increase in Noise Levels

Due to the nature of the regional park trail project, operation of the trail would not create substantial noise. However, noise would be added to existing ambient noise levels from future trail users and potential bird calls; however, this would be a negligible increase as compared to the existing noise environment. Any additional traffic noise associated with the trailhead parking lots on the Scott Ranch project site is accounted for in the analysis above **under Impact Noise-3**. As that analysis shows, the traffic associated with the Scott Ranch project, including the traffic to the trailhead parking lots, would not cause a substantial permanent increase in noise levels. The impact would be less than significant.

Mitigation Measures: No mitigation measures are required.

4.10.5.6 Cumulative Impacts and Mitigation Measures

The geographic scope of the cumulative impact analysis for the evaluation of potential cumulative noise impacts in the vicinity of the Scott Ranch project site, study area roadways, and regional park trail alignment. This study area was selected because only local sources of noise that are proximate to the Scott Ranch project site and regional park trail alignment have the potential to have an additive noise effect, along with the proposed project and regional park trail, on nearby sensitive receptors. This study area includes one approved project – Sunnyslope II Project which has not been constructed at this time. See **Section 4.0, Environmental Impact Analysis**, for specific information on the project. In addition, major roadway improvements from buildout of the General Plan included in this cumulative impact analysis include: Highway 101 Widening, Rainier Avenue Extension and Interchange Project, and the North Petaluma Boulevard Grid. These three roadway improvement projects are over 2-mile away from the project site and would not contribute to cumulative noise impact with the proposed project.

Cumulative Impact NOISE-1: The proposed Scott Ranch project and the regional park trail project, in conjunction with other past, present and reasonably foreseeable future

**development, would not result in a significant cumulative noise impact.
(Less than Significant)**

Construction Phase Cumulative Impacts

The construction noise and vibration impacts of the proposed Scott Ranch project would have the potential to cumulate with those from other projects under construction at the same time. Only one other project, Sunnyslope II project, is located approximately 17,800 feet to the east of the project site. It is not known whether the Sunnyslope II project would be under construction the same time as the proposed project. However, even if the construction of that project were to occur concurrently with the construction of the proposed project, construction noise and vibration from both projects would not combine to affect the same receptors due to the intervening distance between the two projects as well as the presence of existing homes that are located between the two project sites. In regard to the proposed regional park trail, although it is unlikely that the construction of the proposed regional park trail would overlap with the construction of the proposed Scott Ranch project or other trails or improvements at the Helen Putnam Regional Park, to the extent that it does occur at the same time, the regional park trail project would involve limited equipment use and therefore would minimally increase noise levels at the nearest receptors. Construction noise from the Scott Ranch project would be minimized by the implementation of the proposed mitigation measures. Therefore, the proposed Scott Ranch project and the regional park trail project would not result in a significant cumulative construction noise impact.

Operational Cumulative Impacts

During operation, the proposed project and the regional park trail would result in noise impact during associated with future users of the trails. However, as discussed above, this be a negligible increase as compared to the existing noise environment. Cumulative operational noise impacts would occur primarily as a result of increased traffic on local roadways due to the proposed project and related projects within the study area. Therefore, cumulative traffic-generated noise impacts were assessed based on the contribution of the project to the future cumulative base traffic volumes on the roadway segments in the project vicinity. Noise level increases associated with existing traffic volumes and future traffic volumes associated with the development analyzed in the 2017 Draft EIR are presented in **Table 4.10-11**. As noted above, the proposed project trip generation is significantly reduced as compared to the development presented in the 2017 Draft EIR. As a result, the traffic noise estimates presented in **Table 4.10-11** are considered a worst-case scenario.

Table 4.10-11
Estimated Noise Levels Increases at Off-site Locations

Roadway Segment	Existing Land Uses Along Roadway Segment	Existing Traffic Volumes	Cumulative Traffic Volumes Without Project	Noise Increase above Existing without Project (dBA)	Cumulative Traffic Volumes with Project	Noise Increase above Existing with Project (dBA)	Significance Threshold
D St, North of Petaluma Blvd.	Commercial	1,184	1,500	1.0	1,530	1.1	4.0
D St, between Petaluma Blvd and 6th St	Residential and Commercial	1,172	1,180	0.0	1,230	0.2	4.0
D St, between 6th St and El Rose Dr	Residential	960	1,020	0.3	1,080	0.5	4.0
D St, between El Rose Dr and Windsor Dr	Residential and Commercial	975	1,070	0.4	1,120	0.6	4.0
D St, south of Windsor Dr	Open Space and Residential	986	1,080	0.4	1,100	0.5	4.0

Source: Appendix 4.9

As shown in the table, traffic associated with cumulative development including the proposed project would increase local noise levels on D Street by a maximum of 1.1 dBA, which would be imperceptible to most people and would not exceed the identified threshold of significance. Therefore, the cumulative impact associated with traffic noise would be less than significant.

Mitigation Measures: No mitigation measures are required.

4.10.6 REFERENCES

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