3820 Chiles Road EIR

City of Davis, California

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Prepared for:

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NOISE AND VIBRATION

INTRODUCTION

This section describes the existing noise environment in the area of the proposed Chiles Road residential project (Proposed Project) in the City of Davis, California, and the potential of the Proposed Project to be a source of noise which may adversely affect the noise and vibration environment, or be exposed to noise and vibration levels exceeding the City of Davis' applicable standards.

LOCATION

The project site is located at 3820 Chiles Road. The Proposed Project is bordered by Interstate 80 (I-80) to the north, Merryhill Preschool and multi-family residential units to the south, Days Inn and Kelly-Moore Paints to the east, and La Vida Way to the west. The Union Pacific Railroad (UPRR) track is located on the north side of I-80.

Figure 1 shows the project location.

PROJECT DESCRIPTION

The Proposed Project (Preferred Site Plan) is a total of three multi-family residential buildings, 3 courtyard areas, a tot-lot and a pool area. There is a total of 222 rental units, and a total of 345 bedrooms. The Alternative Site Plan B proposes approximately 188 apartment units for a total of 300 bedrooms. In addition, the western portion of the site which is adjacent to La Vida Way includes five detached single family homes. Alternative B also includes a pool and courtyard area with a clubhouse.

Figures 2 and 3 show the project site plans.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE AND VIBRATION

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures.

Table 1 lists several examples of the noise levels associated with common situations. Appendix A provides a summary of acoustical terms used in this report.

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Figure 1: Noise Monitoring Locations

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Legend

A : Continuous (24-hr) Noise Measurement Site

: Short Term Noise Measurement Site

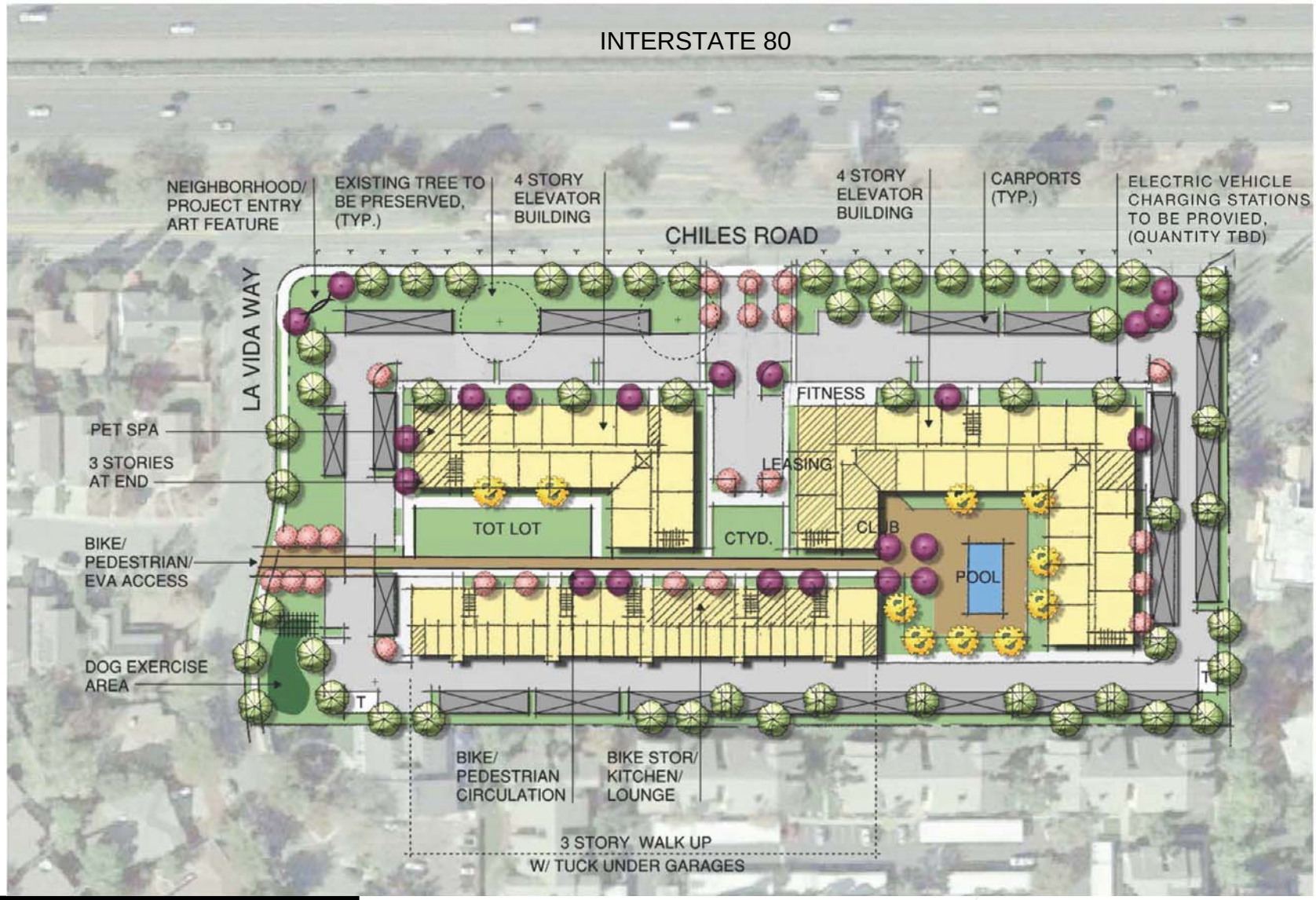

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Figure 2: Conceptual Site Plan A

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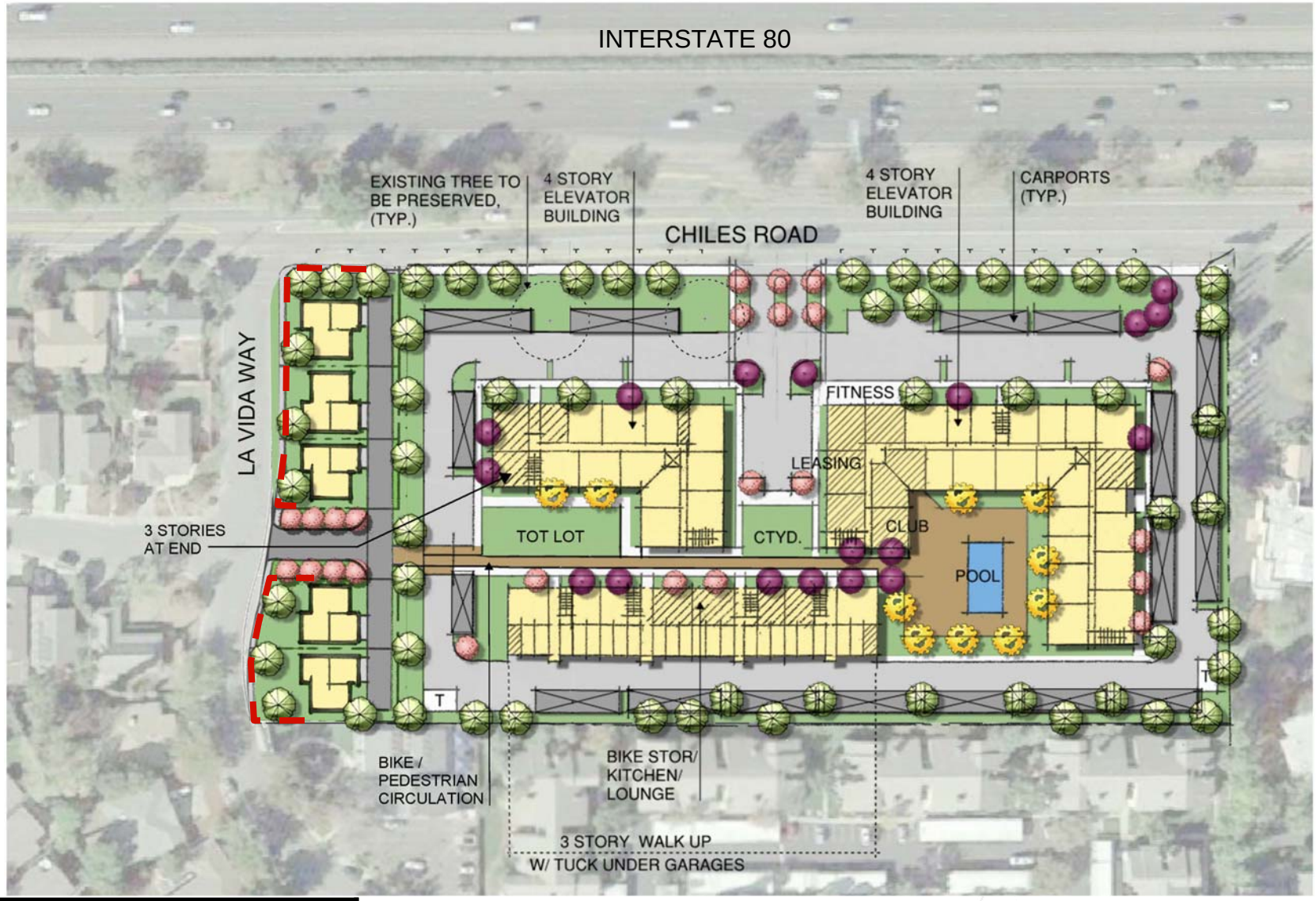

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Figure 3: Conceptual Site Plan B

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Single Family Development Backyard Barrier Locations

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft)	--100--	
Gas Lawn Mower at 1 m (3 ft)	--90--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--80--	Food Blender at 1 m (3 ft) Garbage Disposal at 1 m (3 ft)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area Heavy Traffic at 90 m (300 ft)	--60--	Normal Speech at 1 m (3 ft)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. November 2009.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6 dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING CONDITIONS

Existing Noise Receptors

Some land uses are considered more sensitive to ambient noise levels than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise. Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved.

In the immediate vicinity of the project site, sensitive land uses include Merryhill Preschool and multi-family residential uses to the south, the Days Inn hotel to the east, and single-family residential uses located west of La Vida Way. These land uses could potentially experience noise impacts associated with project construction, and/or increased roadway traffic associated with the project.

Existing Ambient Noise Levels

On February 22nd and 23rd, 2018, j.c. brennan & associates, Inc. staff conducted short-term noise level measurements and continuous 24-hour noise level measurements on the project site to quantify the existing ambient noise environment in the project vicinity. The noise measurement locations are shown on Figure 1. The noise level measurement survey results are provided in Table 2. Appendix B provides the complete results of the continuous noise level measurement survey and the short-term noise level measurements.

Larson Davis Laboratories (LDL) Model 820 and Model 824 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

TABLE 2: MEASURED AMBIENT NOISE LEVELS
(FEBRUARY 22ND - 23RD, 2018)

Continuous 24-hour Noise Measurement Site								
		Average Measured Hourly Noise Levels, dBA						
			Daytime (7:00 am – 10:00 pm)			**Nighttime (10:00 pm -7:00 am)**		
Site	**Location**	**L_{dn}**	**L_{eq}**	**L_{50}**	**L_{max}**	**L_{eq}**	**L_{50}**	**L_{max}**
A	Center of Project Site	69	65	64	76	62	60	75

Short-Term Noise Measurement Sites						
Site	**Location**	**Time**	**L_{eq}**	**L_{50}**	**L_{max}**	**Notes**
1	Adjacent to Days Inn	4:10 pm	60.0	57.9	69.4	Train Passby 63 dB to 65 dB Lmax. I-80 is the dominant noise source.
2	Adjacent to Mary Hill	4:30 pm	59.1	56.8	62.9	Train Passby 60 dB to 63 dB Lmax. I-80 is the dominant noise source.

Source: j.c. brennan & associates, Inc., 2018

Based upon field observations and noise measurement data described above, the existing noise environment at the project site is defined by roadway traffic associated with I-80. Additional discussions on traffic noise, based upon the noise measurement data, are included later in this report.

Existing Roadway Noise Levels

Traffic volumes for existing conditions were obtained from the project traffic consultant. Truck percentages and vehicle speeds on the local area roadways were estimated from field observations and Caltrans counts.

Traffic noise levels are generally predicted at 75-feet from the centerline along each project-area roadway segment. I-80 traffic noise levels were predicted at a distance representative of the project site. Sensitive receptors may be located at distances which vary from the assumed calculation distance and may experience shielding from intervening barriers or sound walls. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the project-area roadway segments analyzed in this report.

Table 4 shows the existing traffic noise levels in terms of L_{dn} along each roadway segment. This table also shows the distances to existing traffic noise contours. A complete listing of the FHWA Model input data is contained in Appendix C.

The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, grade, shielding from local topography or structures, elevated roadways, or elevated receivers. The distances reported in Table 3 are generally considered to be conservative estimates of noise exposure along the project-area roadways.

TABLE 3: PREDICTED EXISTING TRAFFIC NOISE LEVELS

Roadway	Segment	Ldn, dBA	Contour Noise Levels (Ldn, dBA)			
			Distance (feet)	Distance to Contours (feet)		
				70	65	60
I-80	Adjacent to Project Site	70	350	325	701	1511
Cowell Blvd.	Pole Line Rd to Chiles Rd / Drummond Ave.	63	75	24	52	112
Cowell Blvd.	Chiles Rd / Drummond Ave to Ensenada Dr	59	75	14	29	63
Chiles Rd.	Cowell Blvd to Project Site	63	75	24	51	110
Chiles Rd.	Project Site to Mace Blvd	64	75	32	69	148
La Vida Way	Chiles Rd to Cowell Blvd	58	75	12	27	57

[1] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: [kd Anderson], j.c. brennan & associates, Inc. - 2018

Existing Railroad Noise Levels

While at the project site it was noted that railroad operations along the UPRR track was audible, but that the I-80 traffic noise levels were the dominant source. Based upon the 24-hour noise level measurements conducted on the site, and shown in Appendix B, the hourly Leq and L50 data were generally within 1 or 2 dB of each other. This indicates steady-state noise level which were not influenced by the train passbys.

REGULATORY CONTEXT

FEDERAL

There are no federal regulations related to noise that apply to the Proposed Project.

State

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines, Appendix G, indicate that a significant noise impact may occur if a project exposes persons to noise levels in excess of local general plans or noise ordinance standards, or cause a substantial permanent or temporary increase in ambient noise levels.

California State Building Codes

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room.

Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

LOCAL

City of Davis General Plan

Policy NOISE 1.1 Minimize vehicular and stationary noise sources, and noise emanating from temporary activities.

Standards

a. The City shall strive to achieve the “normally acceptable” exterior noise levels shown in Table 4 (Table 19 of the General Plan) and the target interior noise levels in Table 5 (Table 20 of the General Plan) in future development areas and in currently developed areas.

b. New development shall generally be allowed only in areas where exterior and interior noise levels consistent with Table 4 (Table 19 of the General Plan) and Table 5 (Table 20 of the General Plan) can be achieved.

c. New development and changes in use shall generally be allowed only if they will not adversely impact attainment within the community of the exterior and interior noise standards shown in Table 4 (Table 19 of the General Plan) and Table 5 (Table 20 of the

General Plan). Cumulative and project specific impacts by new development on existing residential land uses shall be mitigated consistent with the standards in Table 4 (Table 19 of the General Plan) and Table 5 (Table 20 of the General Plan).

d. Required noise mitigation measures for new and existing housing shall be provided with the first stage and prior to completion of new developments or the completion of capacity-enhancing roadway changes wherever noise levels currently exceed or are projected within 5 years to exceed the normally acceptable exterior noise levels in Table 4 (Table 19 of the General Plan).

TABLE 4: EXTERIOR NOISE LEVEL STANDARDS
(CITY OF DAVIS GENERAL PLAN TABLE 19)

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE LDN OR CNEL, DBA			
	NORMALLY ACCEPTABLE	CONDITIONALLY ACCEPTABLE	UNACCEPTABLE	CLEARLY UNACCEPTABLE
Residential	Under 60	60-70*	70-75	Above 75
Transient Lodging - Motels, Hotels	Under 60	65-75	75-80	Above 80
Schools, Libraries, Churches, Hospitals, Nursing Homes	Under 60	60-70	70-80	Above 80
Auditoriums, Concert Halls, Amphitheaters	Under 50	50-70	NA	Above 70
Sports Arenas, Outdoor Spectator Sports	NA	Under 75	NA	Above 75
Playgrounds, Neighborhood Parks	Under 70	NA	70-75	Above 75
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Under 70	NA	70-80	Above 80
Office Buildings, Business Commercial and Professional	Under 65	65-75	Above 75	NA
Industrial, Manufacturing, Utilities, Agriculture	Under 65	70-80	Above 80	NA

Normally Acceptable: *Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without special noise insulation requirements.*
Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is conducted, and needed noise attenuation features are included in the construction or development.
Normally Unacceptable: *New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be conducted and needed noise attenuation features shall be included in the construction or development.*
Clearly Unacceptable: *New construction or development shall not be undertaken.*
NA: *Not applicable*
** The City Council shall have discretion within the "conditionally acceptable" range for residential use to allow levels in outdoor spaces to go up to 65 dBA if cost effective or aesthetically acceptable measures are not available to reduce noise levels in outdoor spaces to the "normally acceptable" levels. Outdoor spaces which are designed for visual use only (for example, street-side landscaping in an apartment project), rather than outdoor use space may be considered acceptable up to 70 dBA.*

Source: City of Davis, 2010

TABLE 5: STANDARDS FOR INTERIOR NOISE LEVELS (CITY OF DAVIS GENERAL PLAN TABLE 20)

Use	Noise Level (dBA)
Residences, schools through grade 12, hospitals and churches	45
Offices	55

Source: City of Davis, 2010

Policy NOISE 1.2 Discourage the use of sound walls whenever alternative mitigation measures are feasible, while also facilitating the construction of sound walls where desired by the neighborhood and there is no other way to reduce noise to acceptable exterior levels shown in Table 4 (Table 19 of the General Plan).

Standards

a. Where sound walls are built, they should include dense landscaping along them to mitigate their visual impact, as illustrated in Figure 38 (of the General Plan).

b. Where sound walls are built, they should provide adequate openings and visibility from surrounding areas to increase safety and access, as illustrated in Figure 38 (Of the General Plan). Openings should be designed so as to maintain necessary noise attenuation.

c. Review sound walls and other noise mitigations through the design review process.

GOAL NOISE 2. Provide for indoor noise environments that are conducive to living and working.

Policy NOISE 2.1 Take all technically feasible steps to ensure that interior noise levels can be maintained at the levels shown in Table 5 (Table 20 of the General Plan)

Standards

a. New residential development or construction shall include noise attenuation measures necessary to achieve acceptable interior noise levels shown in Table 5 (Table 20 of the General Plan).

b. Existing areas that will be subjected to noise levels greater than the acceptable noise levels shown in Table 8 (Table 20 of the General Plan) as a result of increased traffic on existing city streets (including streets remaining in existing configurations and streets being widened) shall be mitigated to the acceptable levels in Table 8 (Table 20 of the General Plan). If traffic increases are caused by specific projects, then the City shall be the lead agency in implementing cumulative noise mitigation projects. Project applicants shall pay their fair share for any mitigation.

City of Davis Noise Ordinance

Section 24 of the City of Davis City Code establishes a maximum noise level standard of 55 dB during the hours of 7:00 a.m. to 9:00 p.m., and 50 dB during the hours of 9:00 p.m. to 7:00 a.m. The ordinance defines maximum noise level as the "maximum continuous sound level or repetitive peak level produced by a sound source or group of sources. For the purposes of this analysis, j.c. brennan & associates, Inc. interprets this definition to be equivalent to the average noise level descriptor, Leq. The City Code makes exemptions for certain typical activities which may occur within the city. These exemptions are listed in Article 24.02.040, Special Provisions, and are summarized below:

a) Normal operation of power tools for non-commercial purposes are typically exempted between the hours of 8 am and 8 pm unless the operation unreasonably disturbs the peace and quiet of any neighborhood.

b) Construction or landscape operations would be exempt during the hours of 7am to 7 pm Mondays through Fridays and between the hours of 8 am to 8 pm Saturdays and Sundays assuming that the operations are authorized by valid city permit or business license, or carried out by employees or contractors of the city and one of the following conditions apply (conditions summarized, please see section 24.02.040 of the City Code for the full text):

    1) No piece of equipment produces a noise level exceeding 83 dBA at 25-feet.

    2) The noise level at any point outside the property plane of the project shall not exceed 86 dBA.

    3) Requires that impact equipment and tools be fitted with the best available silencing equipment.

    4) Limits individual powered blowers to a noise level of 70 dBA at 50 feet.

    5) Prohibits more than one blower from simultaneously operating within 100 feet of another blower.

    6) On single-family residential property, the 70 dBA at 50 feet requirement would not apply to blowers operated on single-family residential property.

c) The City Code also exempts air conditioners, pool pumps, and similar equipment from the noise regulations, provided that they are in good working order.

d) Work related to public health and safety is exempt from the noise requirements.

e) Safety devices are exempt from the noise requirements.

f) Emergencies are exempt from the noise requirements.

The noise standards applicable to the project include the relevant portions of the City of Davis General Plan, the City of Davis Noise Ordinance described in the Regulatory Framework section above (Section 3.11.2), and the following standards. Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to severe noise levels. In practice, more specific professional standards have been developed. These standards state that a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following:

- A 3-dB change is barely perceptible,
- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

A limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project-noise conditions. Table 6 is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the Ldn.

Table 6: Significance of Changes in Noise Exposure

Ambient Noise Level Without Project, Ldn	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the Table 6 data, an increase in the traffic noise level of 1.5 dB or more would be significant where the pre-project noise level exceeds 65 dB Ldn. Extending this concept to higher noise levels, an increase in the traffic noise level of 1.5 dB or more may be significant where the pre-project traffic noise level exceeds 75 dB Ldn. The rationale for the Table 6 criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

CRITERIA FOR ACCEPTABLE VIBRATION

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common

practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

The City of Davis does not contain specific policies pertaining to vibration levels. However, vibration levels associated with construction activities are discussed in this report.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 7, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 7 indicates that the threshold for architectural damage to structures is 0.20 in/sec p.p.v. and continuous vibrations of 0.10 in/sec p.p.v., or greater, would likely cause annoyance to sensitive receptors.

TABLE 7: EFFECTS OF VARIOUS VIBRATION LEVELS ON PEOPLE AND BUILDINGS

Vibration Level (Peak Particle Velocity)*		Human Reaction	Effect on Buildings
mm/s	in/sec		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage.

Source: Transportation Related Earthborne Vibrations, Caltrans Experiences. Technical Advisory: TAV-02-01-R9601. February 20, 2002.

IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels conflict with adopted environmental standards or plans or if noise generated by the project would substantially increase existing noise levels at sensitive receivers on a permanent or temporary basis. Significance criteria for noise impacts are drawn from CEQA Guidelines Appendix G (Items XI [a-f]).

Additional thresholds included in the General Plan EIR also are shown.

Would the project:

a. Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b. Expose persons to, or generate, excessive groundborne vibration or groundborne noise levels;

c. Cause a substantial permanent increase in ambient noise levels in the project vicinity above existing levels without the project;

d. Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing levels without the project;

e. Expose persons residing or working in the project area to excessive noise levels if located within an airport land use plan or where such a plan has not been adopted within 2 miles of a public airport or public use airport; or

f. Expose persons residing or working in the project area to excessive noise levels if located within the vicinity of a private airstrip.

The proposed project is not located within two miles of a public or private airport, therefore items “e” and “f” are not discussed any further in this study.

PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

Impact 1 Construction Noise at Sensitive Receptors

Construction of the Proposed Project would temporarily increase noise levels during construction. This would be a ***potentially significant*** impact.

The new development, maintenance of roadways, installation of public utilities, and infrastructure improvements associated with the project will require construction activities. These activities include the use of heavy equipment and impact tools. Table 8 provides a list of the types of equipment which may be associated with construction activities and the associated noise levels.

Table 8: Construction Equipment Noise

Type of Equipment	Predicted Noise Levels, Lmax dB				Distances to Noise Contours (feet)	
	Noise Level At 20'	Noise Level at 50'	Noise Level at 100'	Noise Level at 200'	70 dB Lmax contour	65 dB Lmax contour
Backhoe	86	78	72	66	126	223
Compactor	91	83	77	71	223	397
Compressor (air)	86	78	72	66	126	223
Concrete Saw	98	90	84	78	500	889
Dozer	90	82	76	70	199	354
Dump Truck	84	76	70	64	100	177
Excavator	89	81	75	69	177	315
Generator	89	81	75	69	177	315
Jackhammer	97	89	83	77	446	792
Pneumatic Tools	93	85	79	73	281	500

Source: Roadway Construction Noise Model User's Guide. Federal Highway Administration. FHWA-HEP-05-054. January 2006. j.c. brennan & associates, Inc. 2016.

Activities involved in project construction would typically generate maximum noise levels ranging from 76 to 90 dB at a distance of 50 feet. The nearest sensitive receptor would be located approximately 85-feet to the west, and 20 feet to the south. At 20 feet, construction related activities are predicted to generate maximum noise levels ranging between 86-98 dB L_{max}.

Construction could result in periods of elevated ambient noise levels and the potential for annoyance. However, the City of Davis Noise Ordinance establishes allowable hours of operation and noise limits for construction activities as follows:

24.02.040 Special provisions

(b) Construction and landscape maintenance equipment. Notwithstanding any other provision of this chapter, between the hours of 7:00 a.m. and 7:00 p.m. on Mondays through Fridays, and between the hours of 8:00 a.m. and 8:00 p.m. on Saturdays and Sundays, construction, alteration, repair or maintenance activities which are authorized by valid city permit or business license, or carried out by employees of contractors of the city shall be allowed if they meet at least one of the following noise limitations:

(1) No individual piece of equipment shall produce a noise level exceeding eighty-three dBA at a distance of twenty-five feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to twenty feet from the equipment as possible.

(2) The noise level at any point outside of the property plane of the project shall not exceed eighty-six dBA.

(3) The provisions of subdivisions (1) and (2) of this subsection shall not be applicable to impact tools and equipment; provided, that such impact tools and equipment shall have intake and exhaust mufflers recommended by manufacturers thereof and approved by the director of public works as best accomplishing maximum noise attenuation, and that pavement breakers and jackhammers shall also be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers thereof and approved by the director of public works as best accomplishing maximum noise attenuation. In the absence of manufacturer's recommendations, the director of public works may prescribe such means of accomplishing maximum noise attenuation as he/she may determine to be in the public interest.

Construction projects located more than two hundred feet from existing homes may request a special use permit to begin work at six a.m. on weekdays from June 15th until September 1st. No percussion type tools (such as ramsets or jackhammers) can be used before 7:00 a.m. The permit shall be revoked if any noise complaint is received by the police department.

(4) No individual powered blower shall produce a noise level exceeding seventy dBA measured at a distance of fifty feet.

(5) No powered blower shall be operated within one hundred feet radius of another powered blower simultaneously.

(6) On single-family residential property, the seventy dBA at fifty feet restriction shall not apply if operated for less than ten minutes per occurrence.

Because all construction activities are expected to exceed the requirements of the City of Davis Municipal Code Section 24.02.040 this is a **significant impact**. The following mitigation measures shall reduce construction noise to a **less than significant** impact.

Mitigation Measure for Impact 1:

MM 1-1 In order to comply with the Municipal Code, the following mitigation measures are required:

1) Comply with the hours of operations between 7:00 a.m. and 7:00 p.m. on Mondays through Fridays, and between the hours of 8:00 a.m. and 8:00 p.m. on Saturdays and Sundays;
2) Impact tools and equipment shall have intake and exhaust mufflers recommended by manufacturers;
3) All equipment shall not exceed 86 dBA outside of the property line. Based upon Table 8, compactors, dozers and excavators shall maintain a distance of 50-feet from the property lines. Concrete saws and jackhammers shall maintain a distance of 100-feet from the nearest property line. If any equipment listed cannot provide either a housing or muffler, or other type of noise suppression equipment to reduce noise levels to 86 dBA or less outside of the property line, then it will require approval by the director of public works.

Impact 2: Construction Vibration.

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural. Table 9 shows the typical vibration levels produced by construction equipment.

The primary vibration-generating activities associated with the project would occur when the infrastructure such as grading, utilities, and foundations are constructed. The most significant source of ground-borne vibrations during the project construction would occur from the use of vibratory compactors. Vibratory compactors would generate typical vibration levels of 0.210 in/sec at a distance of 25 feet. The closest residential buildings to the project site where construction activities could include vibratory compactors is at a distance of approximately 20 feet. Table 7, above, indicates that the threshold for architectural damage to buildings is 0.20 in/sec. Therefore, based upon Table 9 data, vibratory compactors could generate vibration levels exceeding safe levels at these distances, therefore mitigation measures would be required. This is a ***significant impact.***

The following mitigation measures will reduce construction vibration to a **less than significant** level.

Mitigation Measure for Impact 2:

MM 2-1 In order to prevent significant vibration levels due to construction, vibratory compactors should maintain a minimum distance of 35-feet from any structures, and where possible, use rolling compactors or hand compacting within 50-feet from any structures.

TABLE 9: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity @ 25 feet (inches/second)	Peak Particle Velocity @ 50 feet (inches/second)
Large Bulldozer	0.089	0.029
Loaded Trucks	0.076	0.025
Pile Driving (Sonic)	0.734	0.50
Small Bulldozer	0.003	0.000
Auger/drill Rigs	0.089	0.029
Jackhammer	0.035	0.011
Vibratory Hammer	0.070	0.023
Vibratory Compactor/roller	0.210	0.070

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Guidelines*, May 2006

Impact 3 Project Generated Traffic Noise at Existing Sensitive Receptors

Traffic generated by the Proposed Project could generate traffic noise increases exceeding the substantial increase criteria, as outlined above. This is a **less than significant** impact.

Traffic noise levels are predicted at locations that are assumed to be typical residential outdoor use areas along each project-area roadway segment. The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, grade, shielding from local topography or structures, elevated roadways, or elevated receivers. The distances reported in Tables 10 and 11 are generally considered to be conservative estimates of noise exposure along the project-area roadways.

Table 10 shows the predicted traffic noise level increases on the local roadway network for the "Existing", "Existing Plus Project", Existing Plus Approved Projects (EPAP), and the EPAP Plus Project scenarios. Table 11 shows the predicted traffic noise level increases on the local roadway network for the "Cumulative", Cumulative Plus Project" and the Scenario 2 / Super Cumulative scenarios. Appendix C provides the complete inputs and results of the FHWA traffic noise modeling.

TABLE 10: EXISTING - EXISTING + PROJECT - EPAP - EPAP + PROJECT TRAFFIC NOISE LEVELS

Roadway	Segment	Traffic Noise Levels (Ldn, dB)						
		Distance (feet)	Existing	Existing + Project	Δ Change	EPAP	EPAP + Project	Δ Change
Cowell Blvd.	Pole Line Rd to Chiles Rd / Drummond Ave.	75	63	63	0	64	64	0
Cowell Blvd.	Chiles Rd / Drummond Ave to Ensenada Dr	75	59	59	0	59	59	0
Chiles Rd.	Cowell Blvd to Project Site	75	63	63	0	63	63	0
Chiles Rd.	Project Site to Mace Blvd	75	64	65	+1	65	65	0
La Vida Way	Chiles Rd to Cowell Blvd	75	58	58	0	58	58	0

[1] Distances to traffic noise contours are measured in feet from the centerlines of the Roadways.
[2] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: kd Anderson - j.c. brennan & associates, Inc. - 2018

TABLE 11: CUMULATIVE, CUMULATIVE + PROJECT & SCENARIO 2 (SUPER CUMULATIVE) PROJECT TRAFFIC NOISE LEVELS

Roadway	Segment	Traffic Noise Levels (Ldn, dB)						
		Distance (feet)	Cumulative	Cumulative + Project	Δ Change	Cumulative	Super Cumulative	Δ Change
Cowell Blvd.	Pole Line Rd to Chiles Rd / Drummond Ave.	75	63	63	0	63	63	0
Cowell Blvd.	Chiles Rd / Drummond Ave to Ensenada Dr	75	61	61	0	61	62	+1
Chiles Rd.	Cowell Blvd to Project Site	75	63	64	+1	63	64	+1
Chiles Rd.	Project Site to Mace Blvd	75	65	65	0	65	65	0
La Vida Way	Chiles Rd to Cowell Blvd	75	59	59	0	59	59	0

[1] Distances to traffic noise contours are measured in feet from the centerlines of the Roadways.
[2] Traffic noise levels do not account for shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.
Source: kd Anderson - j.c. brennan & associates, Inc. - 2018

Based upon Tables 10 and 11, the project will result in changes in traffic noise levels between 0 dBA and 1 dBA Ldn.

This would be a ***less than significant*** impact.

Mitigation Measure for Impact 3:

None Required

Impact 4: Alternative B Generated Traffic Noise at Existing Sensitive Receptors Along La Vida Way

Traffic generated by the Proposed Project could generate traffic noise increases exceeding the substantial increase criteria, as outlined above. This is a **less than significant** impact.

The Alternative B scenario has an overall decrease in the traffic trip generation, as compared to the proposed project (Alternative A). However, the Alternative B contains five single family homes which have access to the project site on La Vida Way.

Under the Existing vs. Existing Plus Project scenarios, the Alternative A increases overall traffic by approximately 40 trips per day, from 2,240 trips to 2,280 trips along La Vida Way. Under the Alternative B scenario, there would be approximately 50 additional daily trips (2,330 trips) along La Vida Way. The overall increase in traffic noise levels from 2,240 trips to 2,330 trips, results in an overall increase in traffic noise levels of 0.17 dB Ldn. This is less than significant.

Under the Cumulative vs. Cumulative Plus Project scenarios, the Alternative A increases overall traffic by approximately 30 trips per day, from 2,470 trips to 2,500 trips along La Vida Way. Under the Alternative B scenario, there would be approximately 50 additional daily trips (2,550 trips) along La Vida Way. The overall increase in traffic noise levels from 2,470 trips to 2,550 trips, results in an overall increase in traffic noise levels of 0.14 dB Ldn. This is less than significant.

Impact 5: Compliance with the City of Davis Traffic Noise Levels at New Sensitive Receptors

The proposed project will need to comply with the City of Davis exterior and interior noise level standards. Although this is not a CEQA requirement, The project will be required to comply with the General Plan noise level criteria.

Exterior Traffic Noise Levels:

Under the Super Cumulative scenario, the project site will be exposed to exterior traffic noise levels of 70 dB Ldn at first floor residences, and up to 73 dB Ldn at upper floor locations. The dominant traffic noise source is I-80.

Proposed Project (Alternative A)

Under the Alternative A site plan, the project proposes to include a club house, courtyard, pool area and tot-lot.

The courtyard, pool area, and tot-lot are considered the common outdoor areas, and are centrally located and shielded by the building facades. These areas will have a minimum noise level reduction of 10 dB. Therefore, the courtyard, pool area and tot-lot will comply with the City exterior noise level standard of 60 dB Ldn/CNEL.

Alternative B

Under the Alternative B site plan, the project proposes to include a club house, courtyard, pool area and tot-lot for the multi-family portion of the site.

The single family portion of the project site has backyards that face La Vida Way. The backyards are considered to be the outdoor activity areas for the single family development.

The courtyard, pool area, and tot-lot are considered the common outdoor area of the multi-family development, and are centrally located and shielded by the building facades. These areas will have a minimum noise level reduction of 10 dB, and will comply with the City exterior noise level standard of 60 dB Ldn/CNEL.

The back yards of the single family development are the outdoor activity areas for that portion of the development, and will exceed the 60 dB Ldn/CNEL exterior noise level standard. Barriers will be required to achieve the exterior noise level standard for the single family portion of the project site. Table 12 shows the required barrier heights to achieve the "Normally Acceptable" exterior noise level standard of 60 dB Ldn, and the "Conditionally Acceptable" exterior noise level standard between 60 dB Ldn and 70 dB Ldn. See Figure 3 for the barrier locations.

TABLE 12: SINGLE FAMILY PROJECT SITE REQUIRED TRAFFIC NOISE BARRIER HEIGHTS

Exterior Traffic Noise Level	Barrier Height	Resulting Noise Level
70 dB Ldn	Not Required	70 dB Ldn
	6-feet	65 dB Ldn
	7-feet	65 dB Ldn
	8-feet	64 dB Ldn
	9-feet	63 dB Ldn
	10-feet	62 dB Ldn
	11-feet	61 dB Ldn
	12-feet	60 dB Ldn
Source: j.c. brennan & associates, Inc. - 2018		

Based upon Table 12, a barrier height of 12-feet would be required to achieve the exterior noise level standard of 60 dB Ldn/CNEL. This is not considered to be practical. A typical barrier height of 6-feet would be required to achieve an exterior noise level standard of 65 dB Ldn / CNEL, and would break line-of-sight to the noise sources. Although noise levels up to 70 dB Ldn / CNEL are considered "conditionally acceptable" per the City of Davis, and allowing levels up to 70 dB at the single family back yards would not require would not require a sound wall, it is not recommended that such noise levels be allowed for single family backyard areas.

As an alternative to typical block walls, we have included a sample of an ECO Stone

prefabricated sound wall, by Simtek Fence (www.simtekfence.com).

Interior Traffic Noise Levels:

Modern construction typically provides a 25 dB exterior-to-interior noise level reduction with windows closed. Therefore, sensitive receptors exposed to exterior noise of 70 dB Ldn, or less, will typically comply with the City's 45 dB CNEL/Ldn interior noise level standard. Exterior noise levels over 70 dB Ldn will generally require specific upgrades to the building facades such as upgraded STC rated windows, or details on wall construction improvements. The predicted future traffic noise levels do not exceed 70 dB CNEL/Ldn at the first floors of the nearest residential buildings. Therefore, the first floor rooms will comply with the interior noise level standard of 45 dB Ldn. However, upper floors are expected to be exposed to traffic noise levels of approximately 73 dB Ldn. The project will be required to comply with the interior noise level standard of 45 dB Ldn. Typical improvements to upper floor building facades would include STC rated windows, with ratings up to an STC 35. Other improvements may be needed, or substituted. These improvements can be calculated when floor plans, building elevations, and wall construction details are available. Since the project is not at that level of detail, interior noise levels and prescribed mitigation measures should be conducted when construction details and detailed site plans are available.

Mitigation Measure for Impact 5:

MM 5-1 Under Alternative B, the City may require sound walls for the single family residential portion of the project site. A typical barrier height of 6-feet would be required to achieve an exterior noise level standard of 65 dB Ldn / CNEL, and would break line-of-sight to the noise sources.

MM 5-2 Retain an expert noise consultant to perform a focused noise analysis to evaluate interior noise levels taking into consideration final building materials, and adjustments to building locations, facade construction, etc. to determine if the final site and building plans will result in interior noise levels with the potential to exceed the standard of 45 dB CNEL/Ldn.

If the final site and building plans result in interior noise levels with the potential to exceed the standard of 45 dB CNEL/Ldn within one or more residential units, then windows facing I-80 for all such residential units shall include recommended improvements to the building facades. Improvements can include upgraded STC rated windows, or other construction-related facade improvements.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

The cumulative context for noise impacts associated with the Proposed Project consists of the existing and future noise sources that could affect the project or surrounding uses. Noise generated by construction would be temporary, and would not add to the permanent noise environment or be considered as part of the cumulative context.

Impact 6 Cumulative Noise

The cumulative context for noise impacts associated with the Proposed Project consists of the existing and future noise sources that could affect the project or

surrounding uses. Noise generated by construction would be temporary, and would not add to the permanent noise environment or be considered as part of the cumulative context. The total noise impact of the Proposed Project would be fairly small and would not be a substantial increase to the existing future noise environment. Thus, the Proposed Project would result in a ***less than significant cumulative impact.***

Traffic

Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to the Proposed Project. Based upon the previous analysis, increases in traffic noise due to the Proposed Project are no more than 1 dB Ldn. The cumulative exterior noise levels will not result in a significant impact.

Non-Traffic Noise

The Proposed Project is a multi-family residential development similar to surrounding land uses. Typical noise sources would include lawn maintenance, people conversing and on-site circulation. The cumulative noise levels will not result in a significant impact.

Construction activities would comply with the requirements of the City of Davis with respect to hours of operation and muffling of noise-generating equipment.

Cumulative Conclusion

The combination of traffic and non-traffic noise from the Proposed Project would not produce noise levels that would exceed City standards or produce isolated events that could disrupt sleep. Consequently, the total noise impact of the Proposed Project would not be a substantial increase to the future noise environment. The Proposed Project would result in a **less than significant** cumulative impact.

Mitigation for Impact 6

None required

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_{(n)}$	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L_{50} is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the AMaximum@ level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is s rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B
3820 Chiles Road
24hr Continuous Noise Monitoring - Site A
February 22-23, 2018

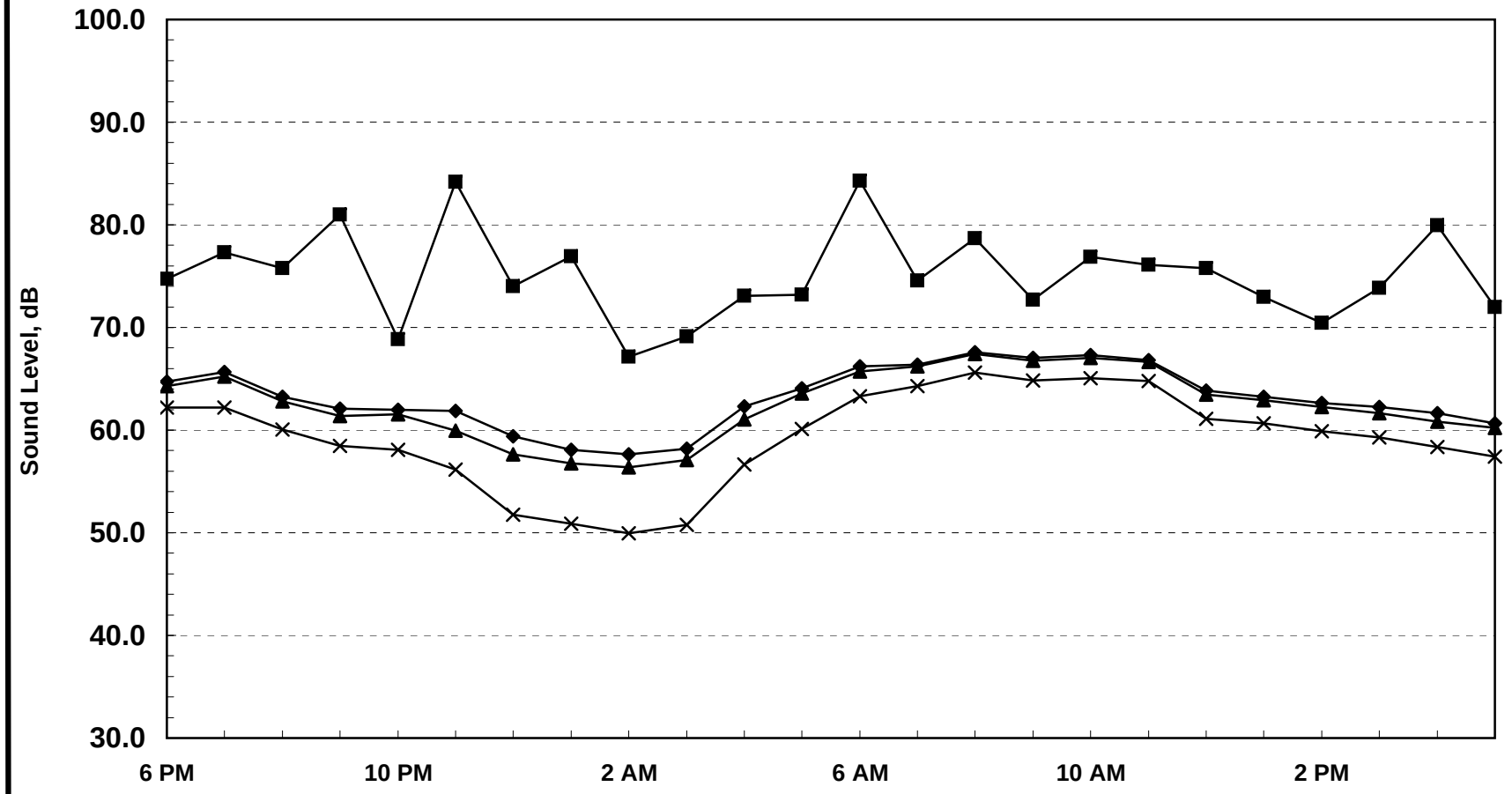
Hour	Leq	Lmax	L50	L90
18:00:00	64.7	74.7	64.3	62.2
19:00:00	65.7	77.3	65.2	62.2
20:00:00	63.2	75.8	62.8	60.1
21:00:00	62.1	81.0	61.4	58.5
22:00:00	62.0	68.8	61.5	58.1
23:00:00	61.9	84.2	59.9	56.2
0:00:00	59.4	74.0	57.6	51.8
1:00:00	58.1	76.9	56.8	50.9
2:00:00	57.7	67.1	56.4	49.9
3:00:00	58.2	69.1	57.1	50.8
4:00:00	62.3	73.1	61.0	56.7
5:00:00	64.1	73.2	63.6	60.1
6:00:00	66.2	84.3	65.7	63.3
7:00:00	66.4	74.6	66.2	64.3
8:00:00	67.6	78.7	67.4	65.6
9:00:00	67.0	72.7	66.8	64.9
10:00:00	67.3	76.9	67.0	65.1
11:00:00	66.8	76.1	66.7	64.8
12:00:00	63.8	75.8	63.4	61.1
13:00:00	63.3	72.9	62.9	60.7
14:00:00	62.7	70.5	62.3	59.9
15:00:00	62.3	73.9	61.7	59.3
16:00:00	61.7	79.9	60.8	58.4
17:00:00	60.7	72.0	60.2	57.4

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	68	61	65	66	58	62
Lmax (Maximum)	81	70	76	84	67	75
L50 (Median)	67	60	64	66	56	60
L90 (Background)	66	57	62	63	50	55

Computed Ldn, dB	69
% Daytime Energy	76%
% Nighttime Energy	24%

j.c. brennan & associates
consultants in acoustics

Appendix B
3820 Chiles Road
24hr Continuous Noise Monitoring - Site A
February 22-23, 2018



Ldn = 69 dB

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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	112,490	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	6,110	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	2,590	83		17	1	1	45	75	
4	Chiles	Cowell to Project	6,020	83		17	1	1	45	75	
5	Chiles	Project of Mace	9,350	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,240	83		17	1	1	45	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	67.1	58.4	64.9	70
2	Cowell Blvd	Pole Line to Chiles	61.6	49.9	54.4	63
3	Cowell Blvd	Chiles to Ensanada	57.9	46.2	50.7	59
4	Chiles	Cowell to Project	61.5	49.9	54.3	63
5	Chiles	Project of Mace	63.4	51.8	56.3	64
6	La Vida Way	Chiles to Cowell	57.2	45.6	50.1	58

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	151	325	701	1511	3255
2	Cowell Blvd	Pole Line to Chiles	11	24	52	112	240
3	Cowell Blvd	Chiles to Ensanada	6	14	29	63	136
4	Chiles	Cowell to Project	11	24	51	110	238
5	Chiles	Project of Mace	15	32	69	148	319
6	La Vida Way	Chiles to Cowell	6	12	27	57	123

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	112,490	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	7,620	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	2,890	83		17	1	1	45	75	
4	Chiles	Cowell to Project	6,560	83		17	1	1	45	75	
5	Chiles	Project of Mace	9,890	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,240	83		17	1	1	45	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	67.1	58.4	64.9	70
2	Cowell Blvd	Pole Line to Chiles	62.5	50.9	55.4	64
3	Cowell Blvd	Chiles to Ensanada	58.3	46.7	51.2	59
4	Chiles	Cowell to Project	61.9	50.2	54.7	63
5	Chiles	Project of Mace	63.7	52.0	56.5	65
6	La Vida Way	Chiles to Cowell	57.2	45.6	50.1	58

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	151	325	701	1511	3255
2	Cowell Blvd	Pole Line to Chiles	13	28	60	129	278
3	Cowell Blvd	Chiles to Ensanada	7	15	31	68	146
4	Chiles	Cowell to Project	12	25	54	117	252
5	Chiles	Project of Mace	15	33	71	154	331
6	La Vida Way	Chiles to Cowell	6	12	27	57	123

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	112,490	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	7,930	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	2,890	83		17	1	1	45	75	
4	Chiles	Cowell to Project	6,980	83		17	1	1	45	75	
5	Chiles	Project of Mace	10,590	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,280	83		17	1	1	45	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	67.1	58.4	64.9	70
2	Cowell Blvd	Pole Line to Chiles	62.7	51.0	55.5	64
3	Cowell Blvd	Chiles to Ensanada	58.3	46.7	51.2	59
4	Chiles	Cowell to Project	62.2	50.5	55.0	63
5	Chiles	Project of Mace	64.0	52.3	56.8	65
6	La Vida Way	Chiles to Cowell	57.3	45.6	50.1	58

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Existing Plus Approved Projects + Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	151	325	701	1511	3255
2	Cowell Blvd	Pole Line to Chiles	13	29	62	133	286
3	Cowell Blvd	Chiles to Ensanada	7	15	31	68	146
4	Chiles	Cowell to Project	12	26	57	122	263
5	Chiles	Project of Mace	16	35	75	161	347
6	La Vida Way	Chiles to Cowell	6	12	27	58	125

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	140,620	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	6,790	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	4,200	83		17	1	1	45	75	
4	Chiles	Cowell to Project	7,300	83		17	1	1	45	75	
5	Chiles	Project of Mace	10,490	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,470	83		17	1	1	45	75	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	68.1	59.4	65.9	70
2	Cowell Blvd	Pole Line to Chiles	62.0	50.4	54.9	63
3	Cowell Blvd	Chiles to Ensanada	60.0	48.3	52.8	61
4	Chiles	Cowell to Project	62.4	50.7	55.2	63
5	Chiles	Project of Mace	63.9	52.3	56.8	65
6	La Vida Way	Chiles to Cowell	57.6	46.0	50.5	59

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Cumulative No Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	175	378	814	1753	3777
2	Cowell Blvd	Pole Line to Chiles	12	26	56	120	258
3	Cowell Blvd	Chiles to Ensanada	9	19	40	87	187
4	Chiles	Cowell to Project	13	27	58	126	271
5	Chiles	Project of Mace	16	34	74	160	344
6	La Vida Way	Chiles to Cowell	6	13	28	61	131

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	140,620	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	7,000	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	4,200	83		17	1	1	45	75	
4	Chiles	Cowell to Project	7,600	83		17	1	1	45	75	
5	Chiles	Project of Mace	11,600	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,500	83		17	1	1	45	75	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	68.1	59.4	65.9	70
2	Cowell Blvd	Pole Line to Chiles	62.2	50.5	55.0	63
3	Cowell Blvd	Chiles to Ensanada	60.0	48.3	52.8	61
4	Chiles	Cowell to Project	62.5	50.9	55.4	64
5	Chiles	Project of Mace	64.4	52.7	57.2	65
6	La Vida Way	Chiles to Cowell	57.7	46.0	50.5	59

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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	175	378	814	1753	3777
2	Cowell Blvd	Pole Line to Chiles	12	26	57	122	263
3	Cowell Blvd	Chiles to Ensanada	9	19	40	87	187
4	Chiles	Cowell to Project	13	28	60	129	278
5	Chiles	Project of Mace	17	37	79	171	368
6	La Vida Way	Chiles to Cowell	6	13	29	61	132

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2017-184
Description: 3820 Chiles Road Scenario 2 - Super Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	I-80	At Site	140,620	70		30	3	6	65	350	-3
2	Cowell Blvd	Pole Line to Chiles	7,490	83		17	1	1	45	75	
3	Cowell Blvd	Chiles to Ensanada	5,300	83		17	1	1	45	75	
4	Chiles	Cowell to Project	7,980	83		17	1	1	45	75	
5	Chiles	Project of Mace	11,800	83		17	1	1	45	75	
6	La Vida Way	Chiles to Cowell	2,660	83		17	1	1	45	75	
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FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2017-184
Description: 3820 Chiles Road Scenario 2 - Super Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	I-80	At Site	68.1	59.4	65.9	70
2	Cowell Blvd	Pole Line to Chiles	62.5	50.8	55.3	63
3	Cowell Blvd	Chiles to Ensanada	61.0	49.3	53.8	62
4	Chiles	Cowell to Project	62.7	51.1	55.6	64
5	Chiles	Project of Mace	64.4	52.8	57.3	65
6	La Vida Way	Chiles to Cowell	58.0	46.3	50.8	59

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2017-184
Description: 3820 Chiles Road Scenario 2 - Super Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

			-------- Distances to Traffic Noise Contours --------				
Segment	Roadway Name	Segment Description	75	70	65	60	55
1	I-80	At Site	175	378	814	1753	3777
2	Cowell Blvd	Pole Line to Chiles	13	28	59	128	275
3	Cowell Blvd	Chiles to Ensanada	10	22	47	101	219
4	Chiles	Cowell to Project	13	29	62	133	287
5	Chiles	Project of Mace	17	37	80	173	373
6	La Vida Way	Chiles to Cowell	6	14	30	64	138

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Memorandum

Date: June 9, 2018

To: Nick Pappani

Organization: Raney Planning & Management

From: Jim Brennan

Re: Unit Increase for 3820 Chiles Road Project

Dear Mr. Pappani,

It is our understanding that the 3820 Chiles Road project in the City of Davis will increase the number of units from 222 to 225. Trip generation for this project is based upon a particular rate per unit. A simple means of determining the overall increase in traffic noise levels is to take the 10 times the logarithmic increase in units as follows:

dBA Increase = 10 * Logarithm of (225 / 222).

The overall change in traffic noise levels is 0.05 dBA Ldn. This is considered to be a conservative estimate, while assuming the increase in vehicles will occur on all roadways. This will result in a less than significant increase in traffic noise levels, and will not result in an exceedance of the City of Davis noise level criteria.

If you have any questions, please contact me at 530-823-0960.

File: 2017-184 - Chiles Road Memorandum - June 2018