This section provides a general description of the existing noise sources in the project vicinity, a discussion of the regulatory setting, and identifies potential noise impacts associated with The Cannery project. Project impacts are evaluated relative to applicable noise level criteria and to the existing ambient noise environment. Mitigation measures have been identified for significant noise-related impacts. The analysis in this section was prepared with assistance from j.c. brennan & associates, Inc.

During the NOP comment period for the EIR, a comment was received verbally from Mary French during the EIR scoping meeting on March 27, 2012 related to potential noise impacts from the at-grade emergency vehicle access. This issue is addressed in this section.

3.11.1 ENVIRONMENTAL SETTING

KEY TERMS

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given area 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 noise.
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, defined as ten times the logarithm of the ratio of the sound pressure squared over the reference pressure squared.
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 (10 p.m. to 7 a.m.) weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic acoustic signal, expressed in cycles per second (Hertz.)
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	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 L50 is the sound level exceeded 50 percent of the time during the one hour period.

Loudness A subjective term for the sensation of the magnitude of sound.

Noise Unwanted sound.

SEL Sound exposure levels. A 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.

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 (Leq), 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 Leq is the foundation of the composite noise descriptor, Ldn, and shows very good correlation with community response to noise.

The day/night average level (Ldn) 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. Because Ldn represents a 24-hour average, it tends to disguise short-term variations in the noise environment. CNEL is similar to Ldn, but includes a +5 dB penalty for evening noise. Table 3.11-1 lists several examples of the noise levels associated with common situations.

TABLE 3.11-1: 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; and
- 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 NOISE LEVELS

Traffic Noise Levels

The FHWA Highway Traffic Noise Prediction Model (FHWA-RD 77-108) was used to develop Ldn (24-hour average) noise contours for the primary project-area roadways. The model is based upon the CALVENO noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model predicts hourly Leq values for free-flowing traffic conditions, and is generally considered to be accurate within 1.5 dB. To predict Ldn values, it is necessary to determine the hourly distribution of traffic for a typical 24-hour period.

Existing traffic volumes were obtained from the traffic study prepared for the project (Fehr & Peers, September 2012). Day/night traffic distributions were based upon continuous hourly noise measurement data collected and file data for similar roadways. Using these data sources and the FHWA traffic noise prediction methodology, traffic noise levels were calculated for existing

conditions. Table 3.11-2 shows the results of this analysis. Appendix J provides the complete inputs and results for the FHWA traffic noise modeling.

Traffic noise levels are predicted at the sensitive receptors located at the closest typical setback distance along each project-area roadway segment. In some locations 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.

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 3.11-2 are generally considered to be conservative estimates of noise exposure along the project-area roadways.

TABLE 3.11-2: PREDICTED EXISTING TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	NOISE LEVEL AT CLOSEST RECEPTORS (LDN)	DISTANCES TO TRAFFIC NOISE CONTOURS, LDN (FEET)		
			70 DB	65 DB	60 DB
Anderson Rd.	North of Covell Blvd.	59.9	11	23	49
Anderson Rd.	South of Covell Blvd.	63.0	17	37	80
Covell Blvd.	West of Shasta Dr.	62.3	38	83	178
Covell Blvd.	Shasta Dr. to Sycamore Ln.	63.5	33	71	153
Covell Blvd.	Sycamore Ln. to Anderson Rd.	64.9	30	64	139
Covell Blvd.	Anderson Rd. to Oak Ave.	64.3	29	63	136
Covell Blvd.	Oak Ave. to F St.	64.8	32	68	146
Covell Blvd.	F St. to J St.	62.9	34	73	157
Covell Blvd.	J St. to L St.	60.3	34	72	156
Covell Blvd.	L St. to Pole Line Rd.	62.7	33	70	151
Covell Blvd.	East of Pole Line Rd.	63.4	27	59	126
F St.	North of Covell Blvd.	62.4	15	33	72
F St.	South of Covell Blvd.	60.6	14	31	66
J St.	South of Covell Blvd.	56.8	7	14	31
L St.	South of Covell Blvd.	56.8	7	14	30
Oak Ave.	South of Covell Blvd.	58.7	9	19	41
Pole Line Rd.	North of Covell Blvd.	65.6	38	83	178
Pole Line Rd.	South of Covell Blvd.	58.8	13	29	62
Shasta Dr.	South of Covell Blvd.	61.0	13	27	58

NOTES: DISTANCES TO TRAFFIC NOISE CONTOURS ARE MEASURED IN FEET FROM THE CENTERLINES OF THE ROADWAYS.
SOURCE: FEHR & PEERS TRANSPORTATION ENGINEERS AND J.C. BRENNAN & ASSOCIATES, INC., 2012.

Railroad Noise Levels

Railroad activity occurs on the Union Pacific Railroad (UPRR) line which parallels the west side of the project site. The line extends from the Union Pacific Railroad (UPRR) junction in Davis to the UPRR junction in Tehama. Operations on the line are conducted by the California Northern Railroad Company (CFNR) under a lease agreement with the UPRR.

The CFNR line is used to haul lumber, beverage products, food products, steel pipe, agricultural products, and construction material.

In order to quantify noise exposure from existing train operations, a continuous (24-hour) noise level measurement survey was conducted. The purpose of the noise level measurements was to determine typical SELs for railroad line operations, while accounting for the effects of travel speed, warning horns, and other factors which may affect noise generation. In addition, the noise measurement equipment was programmed to identify individual train events, so that the typical number of train operations could be determined.

Locations of continuous noise monitoring sites are shown on Figure 3.11-1. Table 3.11-3 shows a summary of the continuous noise measurement results for the CFNR line.

TABLE 3.11-3: RAILROAD NOISE MEASUREMENT RESULTS

MEASUREMENT LOCATION	RAILROAD TRACK	GRADE CROSSING/ WARNING HORN	TRAIN EVENTS PER 24-HR PERIOD	DISTANCE TO CL	AVERAGE SEL
LT-2	CFNR	No	6 (5 day / 1 night)	75’	93 dB

SOURCE: J.C. BRENNAN & ASSOCIATES, INC - 2012

Noise measurement equipment consisted of a Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter equipped with a LDL ½" microphone. The measurement system was calibrated using a LDL Model CAL200 acoustical calibrator before and after testing. The measurement equipment meets all of the pertinent requirements of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters.

Based upon the noise level measurements shown in Table 3.11-3, the average SEL for train operations along the CFNR line was 93 dB at a distance of 75 feet from the track centerline, with approximately 5 train events occurring during daytime (7:00 am – 10:00 pm) hours and one nighttime (10:00 pm – 7:00 am) train event.

It should be noted that based upon the results of the railroad noise measurements, train warning horns are not currently used during train passages along the project site. The proposed project would create a new emergency vehicle access crossing through the F Street Corridor/Channel. The proposed emergency vehicle access would create a new at-grade railroad crossing and would most likely cause trains to sound their warning horns as they approach the new crossing.

Based upon noise monitoring data for the CFNR line in Colusa County, j.c. brennan & associates, Inc. estimates that with use of warning horns, the average SEL for train passages would increase to 107 dB at a distance of 75 feet.

To determine the distances to the day/night average (Ldn) railroad contours, it is necessary to calculate the Ldn for typical train operations. This was done using the SEL values and above-described number and distribution of daily freight train operations. The Ldn may be calculated as follows:

$$Ldn = SEL + 10 \log N_{eq} - 49.4 \text{ dB, where:}$$

SEL is the mean Sound Exposure Level of the event, Neq is the sum of the number of daytime events (7 a.m. to 10 p.m.) per day, plus 10 times the number of nighttime events (10 p.m. to 7 a.m.) per day, and 49.4 is ten times the logarithm of the number of seconds per day.

Based upon the above-described noise level data, number of operations and methods of calculation, the Ldn value for railroad line operations have been calculated, and the distances to the Ldn noise level contours are shown in Table 3.11-4. The table presents data for train operations with and without use of warning horns.

TABLE 3.11-4: APPROXIMATE DISTANCES TO THE RAILROAD NOISE CONTOURS

LDN AT MEASUREMENT SITE	DISTANCE TO LDN CONTOUR		
	60 DB	65 DB	70 DB
UPRR LINE			
55 dB @ 75 feet – No Warning Horns	35’	16’	8’
69 dB @ 75 feet – With Warning Horns	316’	146’	68’

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2012.

Fixed Noise Sources

CITY OF DAVIS WELL SITE #33

The City of Davis maintains a well site located at the southwest corner of the project site. The well site includes pumping and electrical equipment in addition to a 300 kW backup generator. Based upon discussions with the City of Davis Public Works staff, the backup generator is exercised approximately once per week during daytime hours to ensure proper operation. Table 3.11-5 shows the results of noise measurements conducted for the well site operations.

TABLE 3.11-5: WELL STATION #33 NOISE LEVELS

DISTANCE , FEET	NOISE LEVEL	
	LEQ	LDN*
50’ – Pump Operation Only	59 dB	65 dB
50’ – Pump and Generator Operation	69 dB	75 dB

** ASSUMES CONTINUOUS OPERATION FOR 24-HOURS.*

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2012

Based upon the data contained in Table 3.11-5, the 55 dB Leq noise contour would be located approximately 80 feet from the well site, assuming that the backup generator is not operating and

250 feet with the backup generator operating. Long-term operation of the backup generator would only occur under emergency conditions and would therefore not be subject to the City of Davis exterior noise level standards. Weekly exercising of the generator would occur for limited times during daytime hours, and would not be subject to the City of Davis 55 dB Leq daytime exterior noise level standard, as this activity is exempted from this standard.

COMMUNITY NOISE SURVEY

A community noise survey was conducted to document existing ambient noise levels at the project site. Continuous 24-hour noise monitoring was conducted at three sites to record day-night statistical noise level trends. The data collected included the hourly average (Leq), median (L50), and the maximum level (Lmax) during the measurement period. Noise monitoring sites and the measured noise levels at each site are summarized in Table 3.11-6. Figure 3.11-1 shows the locations of the noise monitoring sites. Appendix J provides the completed 24-hr noise monitoring results.

Community noise monitoring equipment included Larson Davis Laboratories (LDL) Model 820 and Model 824 precision integrating sound level meters equipped with LDL ½" microphones. The measurement systems were calibrated using a LDL Model CAL200 acoustical calibrator before and after testing. The measurement equipment meets all of the pertinent requirements of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters.

TABLE 3.11-6: EXISTING CONTINUOUS 24-HOUR AMBIENT NOISE MONITORING RESULTS

SITE	LOCATION	LDN (DBA)	MEASURED HOURLY NOISE LEVELS, DBA					
			DAYTIME (7:00 AM - 10:00 PM)			NIGHTTIME (10:00 PM – 7:00 AM)		
			LEQ	L50	LMAX	LEQ	L50	LMAX
LT-1	Southeast corner of project site – 120 feet to centerline of Covell Blvd.	61	57-63	48-52	70-89	47-57	39-48	62-77
LT-2	West side of project site – 75 feet to centerline of UPRR railroad line	55	46-63	47-54	54-82	44-49	43-48	53-64
LT-3	East side of project site, adjacent to existing agricultural property	54	38-50	35-49	54-73	44-51	44-49	51-72

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. - 2012

The results of the community noise survey shown in Table 3.11-6 indicate that existing transportation noise sources were the major contributor of noise observed during daytime hours. Site observations indicated that agricultural activities, including crop dusting planes, contributed to ambient noise levels at the north and east sides of the project site.

3.11.2 REGULATORY FRAMEWORK

STATE

Governor's Office of Planning and Research (OPR)

The *State of California General Plan Guidelines* (State of California 1998), published by OPR provides guidance for the acceptability of projects within specific CNEL contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

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 19 [Table 3.11-7] and the target interior noise levels in Table 20 [Table 3.11-8] 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 19 [Table 3.11-7] and Table 20 [Table 3.11-8] 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 19 [Table 3.11-7] and Table 20 [Table 3.11-8]. Cumulative and project specific impacts by new development on existing residential land uses shall be mitigated consistent with the standards in Table 19 [Table 3.11-7] and Table 20 [Table 3.11-8].

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 19 [Table 3.11-7].

TABLE 3.11-7: STANDARDS FOR EXTERIOR NOISE EXPOSURE (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, streetside landscaping in an apartment project), rather than outdoor use space may be considered acceptable up to 70 dBA.*

SOURCE: CITY OF DAVIS, 2010

TABLE 3.11-8: 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 19.

See the separate General Plan policy interpretation document titled "Major Arterial Landscaping, Noise Attenuation Design and Greenstreets".

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 City's 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. 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 20 [Table 3.11-8].

Standards

a. New residential development or construction shall include noise attenuation measures necessary to achieve acceptable interior noise levels shown in Table 20 [Table 3.11-8].

b. Existing areas that will be subjected to noise levels greater than the acceptable noise levels shown in Table 20 [Table 3.11-8] 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 20 [Table 3.11-8]. 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.

3.11.3 IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Consistent with Appendix G of the CEQA Guidelines, the project will have a significant impact related to noise if it will result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without project;
- For a project located within 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, expose people residing or working in the project area to excessive noise levels within two miles of a public airport or public use airport; or
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

The proposed project is not located within two miles of a public or private airport or airstrip. Therefore, airport and airstrip noise is not discussed further in this analysis.

NOISE STANDARDS

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 3.11-9 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 3.11-9: 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 3.11-9 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 3.11-9 criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

VIBRATION STANDARDS

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 have specific policies pertaining to vibration levels. However, vibration levels associated with construction activities and railroad operations are addressed as potential noise impacts associated with project implementation.

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 3.11-10 indicates that the threshold for damage to structures ranges from 2 to 6 peak particle velocity in inches per second (in/sec p.p.v). One-half this minimum threshold or 1 in/sec p.p.v. is considered a safe criterion that would protect against architectural or structural damage. The general threshold at which human annoyance could occur is noted as 0.1 in/sec p.p.v.

TABLE 3.11-10: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS			
PEAK PARTICLE VELOCITY INCHES/SECOND	PEAK PARTICLE VELOCITY MM/SECOND	HUMAN REACTION	EFFECT ON BUILDINGS
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: CALTRANS. TRANSPORTATION RELATED EARTHBORNE VIBRATIONS. TAV-02-01-R9601 FEBRUARY 20, 2002.

IMPACTS AND MITIGATION MEASURES

Impact 3.11-1: The proposed project may generate unacceptable traffic noise levels at existing receptors (Less than Significant)

To describe future noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. Direct inputs to the model included traffic volumes provided by Fehr and Peers Transportation Consultants. The FHWA model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly Leq values for free-flowing traffic conditions. To predict Ldn/CNEL values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Table 3.11-11 shows the noise levels associated with traffic on the local roadway network under the existing and existing plus project traffic conditions. As indicated by Table 3.11-11, the related noise level increases under development of the proposed project are predicted to range between 0.1 to 1.5 dB.

Tables 3.11-2 and 3.11-11 indicate that some noise sensitive receptors located along the project-area roadways are currently exposed to exterior traffic noise levels exceeding the City of Davis 60 dB Ldn exterior noise level standard for residential uses. These receptors will continue to experience elevated exterior noise levels with implementation of the proposed project.

The project's contribution to existing and cumulative traffic noise increases is predicted to be 1.5 dB, or less. The proposed project is not predicted to cause increased noise levels exceeding the City of Davis 60 dB Ldn exterior noise level standard at existing noise-sensitive residential receptors. Additionally, these increases do not exceed the FICON standards shown in Table 3.11-10. Traffic associated with the proposed project is not anticipated to result in exposure of persons to traffic noise levels in excess of the City's standards nor would project traffic result in a substantial increase in ambient noise levels. Therefore, this impact is **less than significant**.

TABLE 3.11-11: EXISTING TRAFFIC NOISE LEVELS VS. EXISTING PLUS PROJECT TRAFFIC NOISE LEVELS

ROADWAY	SEGMENT	NOISE LEVELS (LDN, DB)			DISTANCE TO EXITING + PROJECT TRAFFIC NOISE CONTOURS, FEET[1]		
		EXISTING	EXISTING + PROJECT	CHANGE (DB)	70 DB LDN	65 DB LDN	60 DB LDN
Anderson Rd.	North of Covell Blvd.	59.9	60.0	0.1	11	23	50
Anderson Rd.	South of Covell Blvd.	63.0	63.2	0.2	18	38	82
Covell Blvd.	West of Shasta Dr.	62.3	62.4	0.1	39	84	182
Covell Blvd.	Shasta Dr. to Sycamore Ln.	63.5	63.8	0.4	35	75	163
Covell Blvd.	Sycamore Ln. to Anderson Rd.	64.9	65.4	0.5	32	69	150
Covell Blvd.	Anderson Rd. to Oak Ave.	64.3	65.1	0.7	33	71	152
Covell Blvd.	Oak Ave. to F St.	64.8	65.5	0.7	35	76	164
Covell Blvd.	F St. to J St.	62.9	63.6	0.7	38	81	174
Covell Blvd.	J St. to L St.	60.3	60.9	0.6	37	80	171
Covell Blvd.	L St. to Pole Line Rd.	62.7	63.2	0.5	35	76	164
Covell Blvd.	East of Pole Line Rd.	63.4	63.7	0.3	28	61	131
F St.	North of Covell Blvd.	62.4	62.5	0.2	16	34	74
F St.	South of Covell Blvd.	60.6	60.9	0.3	15	32	69
J St.	South of Covell Blvd.	56.8	58.3	1.5	8	18	38
L St.	South of Covell Blvd.	56.8	57.2	0.4	7	15	32
Oak Ave.	South of Covell Blvd.	58.7	58.9	0.2	9	20	42
Pole Line Rd.	North of Covell Blvd.	65.6	65.8	0.2	40	85	184
Pole Line Rd.	South of Covell Blvd.	58.8	59.2	0.4	14	31	66
Shasta Dr.	South of Covell Blvd.	61.0	61.2	0.2	13	28	61

[1] *Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Actual distances may vary due to shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.*

SOURCE: J.C. BRENNAN & ASSOCIATES, INC. 2012 (FHWA-RD-77-108 WITH INPUTS FROM FEHR AND PEERS TRANSPORTATION CONSULTANTS).

Impact 3.11-2: Construction of the project may generate significant noise (Less than Significant)

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 3.11-12 provides a list of the types of equipment which may be associated with construction activities and the associated noise levels.

TABLE 3.11-12: CONSTRUCTION EQUIPMENT NOISE

TYPE OF EQUIPMENT	PREDICTED NOISE LEVELS, LMAX DB				DISTANCES TO NOISE CONTOURS (FEET)	
	NOISE LEVEL AT 50'	NOISE LEVEL AT 100'	NOISE LEVEL AT 200'	NOISE LEVEL AT 400'	70 DB LMAX CONTOUR	65 DB LMAX CONTOUR
Backhoe	78	72	66	60	126	223
Compactor	83	77	71	65	223	397
Compressor (air)	78	72	66	60	126	223
Concrete Saw	90	84	78	72	500	889
Dozer	82	76	70	64	199	354
Dump Truck	76	70	64	58	100	177
Excavator	81	75	69	63	177	315
Generator	81	75	69	63	177	315
Jackhammer	89	83	77	71	446	792
Pneumatic Tools	85	79	73	67	281	500

SOURCE: ROADWAY CONSTRUCTION NOISE MODEL USER'S GUIDE. FEDERAL HIGHWAY ADMINISTRATION. FHWA-HEP-05-054. JANUARY 2006. J.C. BRENNAN & ASSOCIATES, INC. 2012.

Activities involved in project construction would typically generate maximum noise levels ranging from 85 to 90 dB at a distance of 50 feet. The nearest residential receptors would be located 200 feet or more from on-site construction activities. At this distance, construction related activities are predicted to generate maximum noise levels ranging between 64-78 dB Lmax. Off-site improvements to Covell Blvd at the J Street intersection would place construction activity within approximately 100 feet from residential receptors. Maximum noise levels would range between 70-84 dB L_{max} at this distance.

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 will be subject to the requirements of the City of Davis Municipal Code Section 24.02.040 with respect to limits on construction noise, this would be a **less than significant** impact.

Impact 3.11-3: Construction of the project may result in vibration impacts (Less than Significant)

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are located approximately 100-200 feet or further from the project site. At this distance construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

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 3.11-13 shows the typical vibration levels produced by construction equipment.

Table 3.11-13: Vibration Levels for Varying Construction Equipment

TYPE OF EQUIPMENT	PEAK PARTICLE VELOCITY @ 25 FEET (INCHES/SECOND)	PEAK PARTICLE VELOCITY @ 100 FEET (INCHES/SECOND)
Large Bulldozer	0.089	0.011
Loaded Trucks	0.076	0.010
Small Bulldozer	0.003	0.000
Auger/drill Rigs	0.089	0.011
Jackhammer	0.035	0.004
Vibratory Hammer	0.070	0.009
Vibratory Compactor/roller	0.210	0.026

SOURCE: FEDERAL TRANSIT ADMINISTRATION, TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT GUIDELINES, MAY 2006

The Table 3.11-13 data indicate that construction vibration levels anticipated for the project are less than the 0.2 in/sec p.p.v. threshold of damage to buildings and less than the 0.1 in/sec threshold of annoyance criteria at distances of 100 feet. Therefore, construction vibrations are not predicted to cause damage to existing buildings or cause annoyance to sensitive receptors. Therefore, this impact would be considered **less than significant.**

Impact 3.11-4: The project may result in transportation noise at sensitive receptors (Significant and Unavoidable)

Development of The Cannery project would result in new noise receptors, specifically residential, park, business commercial, office, and professional uses. The City of Davis General Plan Noise Element specifies an acceptable exterior transportation noise level of 60 dB Ldn for exterior areas of residential uses, including common use areas, 70 dB Ldn for parks, and 65 dB Ldn for office buildings, business commercial and professional uses. These standards are applied to both traffic and railroad noise sources.

Table 3.11-11 identifies the distances to the 60, 65, and 70 dB Ldn noise contours associated with traffic noise. Railroad noise contour distances are shown in Table 3.11-4. Figures 3.11-2 and 3.11-3 show the predicted traffic and railroad noise contours, for on-site uses. Figure 3.11-4 shows the off-site railroad noise contours with and without warning horn usage.

SUMMARY OF TRAFFIC NOISE IMPACTS

Based upon review of the noise contours identified in Table 3.11-11 and shown on Figures 3.11-2 and 3.11-3, the 60 dB Ldn exterior traffic noise contour would extend into the first row of buildings located along the East Covell Blvd. frontage. If these uses included exterior use areas (patio/balcony), they may be exposed to exterior noise levels exceeding 60 dB Ldn. New parks and outdoor recreation areas would not be exposed to noise levels in excess of 70 dB Ldn for parks. Office buildings, business commercial, and professional uses would not be exposed to exterior noise levels exceeding 65 dB Ldn.

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 of Davis 45 dB Ldn interior noise level standard. Based upon review of Figure 3.11-2 and 3.11-3, no new sensitive receptors are predicted to be exposed to exterior noise levels exceeding 65 dB Ldn from traffic noise.

SUMMARY OF RAILROAD NOISE IMPACTS

Based upon review of the noise contours identified in Table 3.11-4 and shown on Figure 3.11-3, the 60 dB Ldn exterior railroad noise contour would extend to a distance of approximately 316 feet from the centerline of the CFNR railroad line, with warning horn usage. New residential uses are proposed to be located approximately 150 feet from the railroad centerline. Therefore, these sensitive receptors would be exposed to exterior noise levels exceeding 60 dB Ldn. However, exterior noise levels are predicted to be less than the City's conditionally acceptable 65 dB Ldn exterior noise level standard, as shown on Figure 3.11-3 and 3.11-4.

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 of Davis 45 dB Ldn interior noise level standard. Based upon review of Figure 3.11-3 and Figure 3.11-4, no existing or new sensitive receptors are predicted to be exposed to exterior noise levels exceeding 65 dB Ldn.

Although the predicted railroad noise levels would comply with the City's conditionally acceptable 65 dB Ldn exterior noise level standard at new sensitive receptors, increased railroad noise due to warning horn usage would be significant at existing receptors located along the CNFR railroad line. Based upon the Table 3.11-4 data, existing receptors located along F Street, north of Covell Blvd. are currently exposed to exterior traffic noise levels of approximately 62.4 dB Ldn. These receptors are located approximately 185 feet from the CNFR railroad centerline. At this distance railroad noise levels are predicted to be 63.5 dB Ldn. This would result in a combined exterior traffic and railroad noise level of 66.0 dB Ldn, an increase of 3.6 dB. This would exceed the project's significance criteria of 3 dB where existing noise levels are between 60 and 65 dB Ldn. Additionally, because individual warning horn soundings would result in clear and substantial temporary increases in ambient noise levels, the potential for adverse public reaction would exist, particularly during nighttime hours. This would be a **significant** impact.

The project could expose new and existing sensitive receptors to exterior transportation noise levels in excess of established standards. Additionally, the proposed project may results in a substantial temporary or periodic increase in transportation noise levels associated with railroad warning horn usage. Therefore, this impact is **significant**.

As described above, the greatest potential for noise impacts to occur as a result of project implementation would be related to train warning horns during both daytime and nighttime hours as trains approach the proposed at-grade emergency vehicle crossing that would connect the project site to F Street. The City of Davis and the project applicant have explored opportunities to provide alternative emergency vehicle access to the Cannery site. However, it has been determined that a crossing at the F Street Channel is the only viable option that would provide adequate emergency access to the site. As described below, Mitigation Measure 3.11-2 requires the City of Davis and the project applicant to pursue the establishment of a "Quiet Zone" for the UPRR railroad corridor adjacent to the project site.

Based on federal rule, local government agencies may restrict the usage of train horns at railroad crossings which meet specified criteria. The crossings are then considered to be within a "Quiet Zone". On approach to such crossings train locomotives are NOT required to sound their horns. The California Public Utility Commission's Rail Crossings Engineering Section (RCES) reviews notices of intent, establishment or continuation of Quiet Zones, and provides written comments to local authorities, focusing on safety concerns related to the potential for collisions between trains and the public.

In general terms, a Quiet Zone may be established after implementing safety improvements that provide the same level of risk reduction as would otherwise be provided by the train horn. A Quiet Zone can be one crossing in a community, or several consecutive crossings in one or more communities. A Quiet Zone can be created along corridors shared by both railroad and rail transit.

The Federal Railroad Administration (FRA) Train Horn Rule (49 CFR Part 222) became effective on June 24, 2005. This rule provides a step-by-step process to determine what can be done to offset the lack of a train horn, to calculate the risk reduction associated with potential improvements, to formally document the silencing of the train horns and officially establish a Quiet Zone.

A Quiet Zone does not require state approval, and any crossings meeting the safety criteria established by the federal Train Horn Rule will qualify. Although the federal Train Horn Rule does not require state authority to establish a Quiet Zone, RCES is required to receive and evaluate all notices of intent, establishment or continuation of Quiet Zones, and provide written comments. The evaluation requires research and verification of data submitted under the rule, as well as a field diagnostic review of the crossings.

Under the Train Horn Rule, RCES is required to participate in diagnostic reviews of crossings in the proposed Quiet Zone and makes recommendations for safety enhancements in lieu of the train's sounding of their horn. Some crossings will require improvements be implemented before the crossing will qualify for inclusion in a Quiet Zone. Some may qualify as currently configured, however, RCES or the other parties involved in the Quiet Zone review (railroads, FRA, roadway authority) may recommend

further improvements be implemented before establishing the Quiet Zone. Cities and Counties decide whether to implement the additional recommended improvements, but the crossing must meet the minimum requirements of the Train Horn Rule before a Quiet Zone can be established.

MITIGATION MEASURES

Mitigation Measure 3.11-1: *Sensitive exterior areas (patio/balcony) associated with the residential mixed uses shall be located outside of the 60 dB Ldn exterior traffic noise contour, as shown on Figure 3.11-3 to the greatest extent feasible. If sensitive receptors are to be located within the 60 dB Ldn exterior noise contour, outdoor activity areas should be shielded from the noise source using site design measures such as building orientation or sound walls.*

Mitigation Measure 3.11-2: *The project applicant shall work in conjunction with the City of Davis to establish a Quiet Zone with the Federal Railroad Administration for the proposed emergency vehicle access. The application and procedural steps to establish a Quiet Zone adjacent to the project site shall commence concurrent with the start of initial site grading activities. The project applicant shall fund all studies associated with the application for the establishment of the Quiet Zone. The installation and construction of alternative safety measures associated with the Quiet Zone (including, but not limited to: signage, gates, etc.) shall be funded by the project applicant.*

SIGNIFICANCE AFTER MITIGATION

The proposed mitigation measures would bring the project into consistency with the City's noise standards. However, the establishment of a railroad corridor Quiet Zone adjacent to the project site requires approval from the Federal Railroad Authority. The City of Davis cannot fully guarantee that the establishment of a Quiet Zone would be approved by the FRA. Additionally, even if a Quiet Zone were established adjacent to the project site, some train operators may still elect to sound their warning horns as they cross the at-grade emergency vehicle access road adjacent to the site. The implementation of Mitigation Measure MM 3.11-2 has the potential to greatly reduce noise impacts from train warning horns, if a Quiet Zone is successfully established. However, the City cannot guarantee that this effort would be successful, nor can the City guarantee that all train operators would not sound their warning horns. Therefore, this impact would remain **significant and unavoidable**.

Impact 3.11-5: The project may restul in stationary noise at proposed receptors (Less than Significant with Mitigation)

The proposed project would create new noise-sensitive receptors which will be exposed to stationary noise from the existing Well Station #33 and future activities associated with vehicular circulation, park activities, and HVAC mechanical equipment. The following is a discussion of potential noise impacts associated with these stationary noise sources:

WELL SITE #33

As discussed earlier, the 55 dB Leq noise level contour for the City of Davis Well Site #33 would extend to a distance of 80 feet without operation of the backup generator and 250 feet during operation of the backup generator.

The proposed project would locate high-density residential uses approximately 390 feet north of the existing well site. At this distance, well site noise levels would not exceed the City of Davis 55 dB Leq exterior noise level standard.

COMMERCIAL AND OFFICE LAND USES

Commercial and office land use activities can produce noise levels which affect adjacent sensitive land uses. These noise sources can be continuous and may contain tonal components which may be annoying to individuals who live in the nearby vicinity. In addition, noise generation from fixed noise sources may vary based upon climatic conditions, time of day and existing ambient noise levels. The primary noise sources generally include truck deliveries, trash pickup, parking lot use, and HVAC equipment operation. These sources may result in noise levels in excess of the City's standards at nearby receptors.

MECHANICAL EQUIPMENT

Heating, air conditioning, and ventilation equipment can be a primary noise source associated with commercial or office uses. These types of equipment are often mounted on roof tops, located on the ground, or located within mechanical rooms. The noise sources can take the form of fans, pumps, air compressors, chillers, or cooling towers. Noise levels from these types of equipment can vary significantly. Noise levels from these types of sources generally range between 45 dB to 70 dB at a distance of 50 feet and could exceed City standards at nearby receptors.

URBAN FARM

The on-site urban farm would be a teaching/entrepreneurial type farm with small 0.25 to 1 acre plots, so use of heavy farming equipment is not expected on a regular basis but rather occasional use of lighter agricultural equipment. These activities could result in intermittent periods of elevated noise levels. The duration of noise generation is expected to be brief; therefore, City thresholds are not expected to be exceeded. Maximum noise levels generated by agricultural equipment could, however, be considered a nuisance if residents living adjacent to the farm were unaware that such activities occur on a regular basis.

MEASURES TO REDUCE NOISE EXPOSURE

Use of Setbacks

Noise exposure may be reduced by increasing the distance between the noise source and receiving use. Setbacks can take the form of open space, frontage roads, recreational areas, etc. The available noise attenuation from this technique is limited by the characteristics of the noise source, but is generally 3 to 6 dB per doubling of distance from the source. The rule-of-thumb is that most traffic and railroad noise levels will decrease or increase by approximately 4.5 dB per doubling, or halving of distance, respectively. Noise from point sources, such as HVAC equipment, will generally attenuate at 6 dB per doubling of distance.

Use of Barriers

Noise reduction can be accomplished by placing walls, berms or other structures, such as buildings, between the noise source and the receiver. In addition, intervening topography can be an effective

barrier for noise control. The effectiveness of a barrier depends upon blocking line-of-sight between the source and receiver, and is improved with increases in distance the sound must travel to pass over the barrier as compared to a straight line from source to receiver. The difference between the distance over a barrier and a straight line between source and receiver is called the "path length difference," and is the basis for calculating barrier noise reduction.

In general, barriers are most effective when placed close to either the receiver or the source. An intermediate barrier location yields a smaller path length difference for a given increase in barrier height than does a location closer to either source or receiver.

Site Design, Building Locations, and Building Orientations

Buildings can be placed on a project site to shield other structures or areas, to remove them from noise-impacted areas, and to prevent an increase in noise levels caused by reflections. As an example, carports or garages can be used to form or complement a barrier, or shield an outdoor activity area. Placement of outdoor activity areas on the opposite side of the building facades from the noise source, or within the shielded portion of a building complex, such as a central courtyard, can also be an effective method of providing a quiet retreat in an otherwise noisy environment.

MITIGATION MEASURES

Mitigation Measure 3.11-3: Where commercial, business professional, industrial, office, or similar uses abut residential uses or where loading docks or truck circulation routes face residential areas, the following mitigation measures shall be included in the project design:

- All heating, cooling and ventilation equipment shall be located within mechanical rooms where possible or shielded with solid barriers;
- Emergency generators shall comply with the City's noise criteria at the nearest noise-sensitive receivers;
- Delivery/loading activities shall comply with the City of Davis noise ordinance standards.

SIGNIFICANCE AFTER MITIGATION

The preceding mitigation measure is required for the proposed project to minimize noise impacts resulting from on-site noise sources. Implementation of MM 3.11-3 would reduce potential noise impacts associated with the commercial and office activities to a less than significant level through ensuring proper site design and noise attenuation requirements. The proposed mitigation measure would bring the project into consistency with the City's noise standards and would reduce this impact to **less than significant**.

Impact 3.11-6: The project may be exposed to railroad vibrations at proposed receptors (Less than Significant)

Based upon Table 3.11-7, vibration levels of 0.1 inches per second in Peak Particle Velocity (PPV) is the threshold where people become annoyed, but there is below the threshold of any structural damage. To determine the existing vibration levels on the project site due to train passbys, j.c. brennan & associates, Inc. conducted vibration measurements at the project boundary closest to the railroad tracks. The measurements were conducted using a Larson Davis HVM100 vibration meter, equipped with a PCB Shear Model 353B51 accelerometer. The results of the measurements indicated that the PPV vibration levels on the ground ranged between 0.0365 and 0.065 (inches/second). Therefore, the new uses are not expected to be exposed to structural vibration which would be in excess of normally acceptable criteria for vibration levels. Therefore, this impact is **less than significant**.

Impact 3.11-7: The project may result in cumulative noise impacts (Cumulatively Considerable)

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 construction noise impact of the Proposed Project would be fairly small and would not be a substantial increase to the existing future noise environment.

TRAFFIC

Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to the proposed project and other projects within the area. Tables 3.11-14 and 3.11-15 show cumulative traffic noise levels with and without the proposed project. Cumulative noise impacts for the project are based on two different cumulative scenarios. Under the first cumulative scenario, the Covell Village site (located east of the project site) would be developed as residential under cumulative conditions. Under the second cumulative scenario, the Covell Village site would be developed as light industrial under cumulative conditions. The use of these two cumulative scenarios is described in greater detail in Section 3.14- Transportation and Circulation. Table 3.11-14 shows the cumulative noise levels comparing cumulative no project conditions (with Covell Village developed) as residential to cumulative conditions that include development of the proposed project. Table 3.11-15 shows the cumulative noise levels comparing cumulative no project conditions (with Covell Village developed as light industrial) to cumulative conditions that include development of the proposed project.

Under cumulative conditions, there would not be significant increases in noise levels compared to the no project conditions. However, the 60, 65 and 70 dB Ldn contours would extend farther under cumulative conditions and potentially impact additional sensitive receptors. Specifically, the 60 dB Ldn traffic noise contours may expand by 1-18 feet under cumulative plus project conditions. However, as shown, the proposed project would contribute no more than 1.1 dB Ldn to noise levels on roadways fronting residential uses along the study area roadways. These increases are less than the FICON test of significance outlined in Table 3.11-9.

Additionally, the project would not cause new exceedances of the City of Davis 60 dB Ldn exterior noise level standard. Therefore, the project would have a **less than cumulatively considerable** contribution to potentially significant cumulative traffic noise impacts.

TABLE 3.11-14: CUMULATIVE NO PROJECT (WITH DEVELOPMENT OF COVELL VILLAGE AS RESIDENTIAL VS. CUMULATIVE PLUS PROJECT

Roadway	Segment	Noise Levels (Ldn, dB)			Distance to Cumulative + Project Traffic Noise Contours, feet[1]		
		Cumulative No Project	Cumulative + Project	Change (dB)	70 dB Ldn	65 dB Ldn	60 dB Ldn
Anderson Rd.	North of Covell Blvd.	60.2	60.3	0.1	11	24	52
Anderson Rd.	South of Covell Blvd.	63.3	63.5	0.1	18	40	85
Covell Blvd.	West of Shasta Dr.	63.0	63.1	0.1	44	94	202
Covell Blvd.	Shasta Dr. to Sycamore Ln.	65.3	65.5	0.2	45	98	210
Covell Blvd.	Sycamore Ln. to Anderson Rd.	66.2	66.8	0.6	40	86	185
Covell Blvd.	Anderson Rd. to Oak Ave.	66.1	66.5	0.5	41	88	190
Covell Blvd.	Oak Ave. to F St.	66.7	67.2	0.5	45	98	210
Covell Blvd.	F St. to J St.	64.8	65.4	0.5	49	106	228
Covell Blvd.	J St. to L St.	62.1	62.5	0.5	48	103	222
Covell Blvd.	L St. to Pole Line Rd.	64.1	64.5	0.4	43	93	200
Covell Blvd.	East of Pole Line Rd.	65.3	65.5	0.2	38	81	174
F St.	North of Covell Blvd.	63.3	63.5	0.1	18	40	85
F St.	South of Covell Blvd.	61.9	62.1	0.2	18	38	82
J St.	South of Covell Blvd.	59.0	60.0	0.9	11	23	50
L St.	South of Covell Blvd.	61.1	61.2	0.2	13	28	60
Oak Ave.	South of Covell Blvd.	61.0	61.1	0.1	13	28	59
Pole Line Rd.	North of Covell Blvd.	67.0	67.2	0.1	49	105	226
Pole Line Rd.	South of Covell Blvd.	59.6	59.9	0.3	16	34	74
Shasta Dr.	South of Covell Blvd.	62.7	62.9	0.2	17	36	78

[1] *Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Actual distances may vary due to shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.*

SOURCE: FHWA-RD-77-108 WITH INPUTS FROM FEHR AND PEERS TRANSPORTATION CONSULTANTS AND J.C. BRENNAN & ASSOCIATES, INC. 2012.

TABLE 3.11-15: CUMULATIVE NO PROJECT (WITH DEVELOPMENT OF COVELL VILLAGE AS LIGHT INDUSTRIAL VS. CUMULATIVE PLUS PROJECT

Roadway	Segment	Noise Levels (Ldn, dB)			Distance to Cumulative + Project Traffic Noise Contours, feet[1]		
		Cumulative No Project	Cumulative + Project	Change (dB)	70 dB Ldn	65 dB Ldn	60 dB Ldn
Anderson Rd.	North of Covell Blvd.	60.3	60.4	0.1	11	25	53
Anderson Rd.	South of Covell Blvd.	63.3	63.4	0.1	18	39	84
Covell Blvd.	West of Shasta Dr.	63.1	63.2	0.1	44	95	204
Covell Blvd.	Shasta Dr. to Sycamore Ln.	65.4	65.6	0.2	46	99	214
Covell Blvd.	Sycamore Ln. to Anderson Rd.	66.5	66.9	0.3	40	87	187
Covell Blvd.	Anderson Rd. to Oak Ave.	65.8	66.3	0.5	40	86	185
Covell Blvd.	Oak Ave. to F St.	66.6	67.1	0.5	45	97	208
Covell Blvd.	F St. to J St.	65.0	65.5	0.5	50	108	233
Covell Blvd.	J St. to L St.	62.3	62.7	0.4	49	106	227
Covell Blvd.	L St. to Pole Line Rd.	64.2	64.5	0.4	43	93	201
Covell Blvd.	East of Pole Line Rd.	65.3	65.5	0.2	37	81	174
F St.	North of Covell Blvd.	63.6	63.7	0.1	19	41	89
F St.	South of Covell Blvd.	61.4	61.6	0.2	17	36	77
J St.	South of Covell Blvd.	58.2	59.4	1.1	10	21	46
L St.	South of Covell Blvd.	60.7	60.9	0.2	12	27	57
Oak Ave.	South of Covell Blvd.	61.2	61.4	0.1	13	29	62
Pole Line Rd.	North of Covell Blvd.	66.8	67.0	0.1	47	102	219
Pole Line Rd.	South of Covell Blvd.	59.3	59.6	0.3	15	33	71
Shasta Dr.	South of Covell Blvd.	62.8	62.9	0.2	17	36	78

[1] *Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Actual distances may vary due to shielding from existing noise barriers or intervening structures. Traffic noise levels may vary depending on actual setback distances and localized shielding.*

Source: FHWA-RD-77-108 with inputs from Fehr and Peers Transportation Consultants and j.c. brennan & associates, Inc. 2012.

NON-TRAFFIC NOISE

The proposed project is not expected to create substantial non-traffic noise, other than train warning horn noise, which is discussed separately below. Non-traffic noise includes increased pedestrian activity from the additional residential and business uses of the site. The number of people walking and interacting on surrounding roads would increase. This could raise noise levels on these streets slightly, as more people utilize amenities in the area. This is not expected to substantially influence interior or exterior noise levels at nearby receptors. Mechanical equipment installed for heating, cooling, ventilation, and power supply would be placed indoors or shielded by mechanical barriers and/or rooftop parapets, as required by Mitigation Measure 3.11-3. Any noise from this equipment is not likely to generate substantial amounts of noise off the project site. Consequently, this would not add to any cumulative noise levels and would result in a **less than cumulatively considerable** contribution to cumulative stationary noise levels.

TRAIN WARNING HORN NOISE

As discussed under Impact 3.11-4, although the predicted railroad noise levels would comply with the City's conditionally acceptable 65 dB Ldn exterior noise level standard at new sensitive receptors, increased railroad noise due to warning horn usage would be significant at existing receptors located along the CNFR railroad line. Based upon the Table 3.11-4 data, existing receptors located along F Street, north of Covell Blvd. are currently exposed to exterior noise levels of approximately 62.4 dB Ldn. These receptors are located approximately 185 feet from the CNFR railroad centerline. At this distance railroad noise levels are predicted to be 63.5 dB Ldn. This would result in a combined exterior traffic and railroad noise level of 66.0 dB Ldn, an increase of 3.6 dB. This would exceed the project's significance criteria of 3 dB where existing noise levels are between 60 and 65 dB Ldn. Additionally, because individual warning horn soundings would result in clear and substantial temporary increases in ambient noise levels, the potential for adverse public reaction would exist, particularly during nighttime hours. The implementation of Mitigation Measure 3.11-2 has the potential to reduce this impact. However, as described previously in this chapter, the City cannot fully guarantee this measure. Therefore, this is considered to be a **cumulatively considerable and significant and unavoidable impact.**

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Figure 3.11-1: Noise Monitoring Locations

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Legend:

△ : Continuous Noise Monitoring Location

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February 1, 2012

0' 100' 200' 300'
Scale 1"=100'-0"

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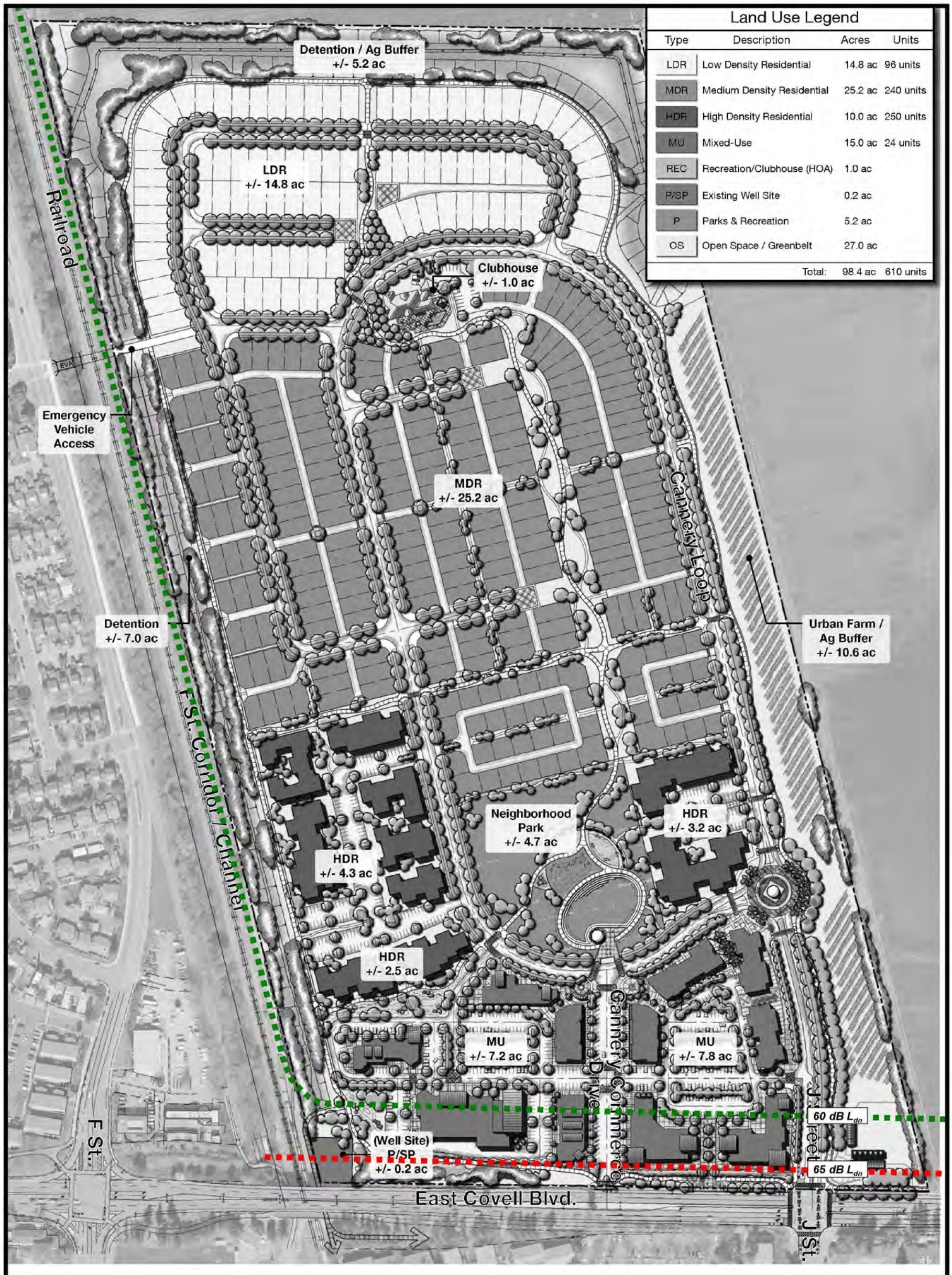

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Figure 3.11-2: Transportation Noise Contours (Without Railroad Warning Horns)

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Legend:

: 65 dB L_{dn}

: 60 dB L_{dn}

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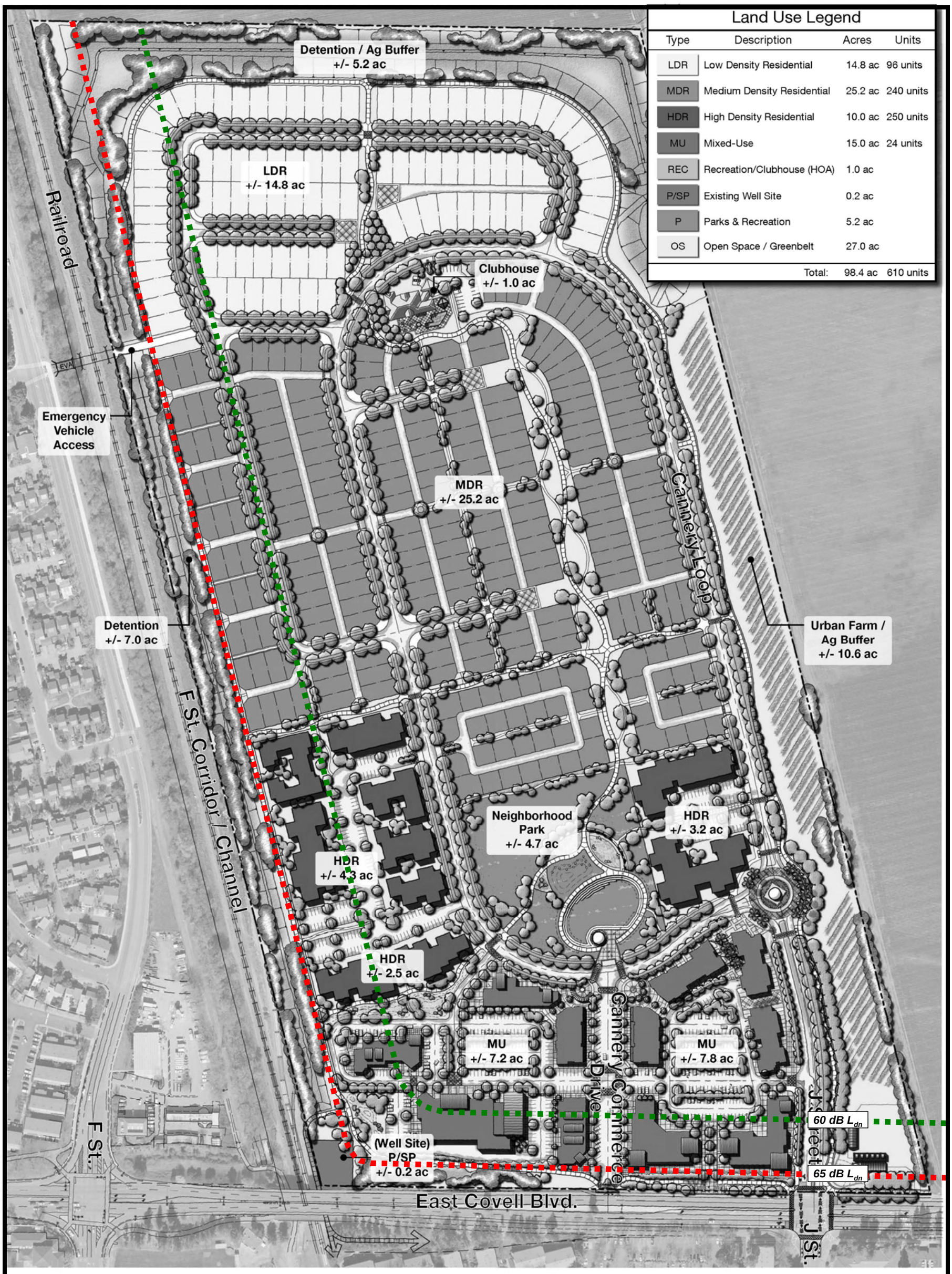

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Figure 3.11-3: Transportation Noise Contours (With Railroad Warning Horns)

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Legend:

: 65 dB L_{dn}

: 60 dB L_{dn}

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0' 100' 200' 300'
Scale 1"=100'-0"

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Figure 3.11-4: Off-Site Railroad Noise Contours (With and Without Warning Horn Usage)

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consultants in acoustics

Legend:

- : 65 dB L_{dn} without Horns
- : 60 dB L_{dn} without Horns
- : 65 dB L_{dn} with Horns
- : 60 dB L_{dn} with Horns

Rev. 1/15/13

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