IV. ENVIRONMENTAL IMPACT ANALYSIS
K. NOISE

INTRODUCTION

The proposed Stonegate Subdivision (project) is a 313-acre mixed-use development located along the east and west side of Bruce Road, between East 20th Street and Skyway Road in Chico, CA. Specifically, the project proposes to subdivide the project site into a combination of open space, public right-of-way, park, single- and multi-family residential lots, and commercial uses. Figure IV.K-1 shows the project area and Figure IV.K-2 shows the site plan.

The purposes of this analysis are to quantify the existing noise and vibration environments, identify potential noise and vibration impacts resulting from the project, identify appropriate mitigation measures, and provide a quantitative and qualitative analysis of impacts associated with the project. Specifically, impacts are identified if project-related activities would cause a substantial increase in ambient noise or vibration levels at existing sensitive land uses in the project vicinity, or if traffic or project generated noise or vibration levels would exceed applicable City of Chico standards at the residences proposed within this development.

ENVIRONMENTAL SETTING

Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard, and are designated as sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, or Hertz (Hz). Definitions of acoustical terminology are shown in Appendix H-1. Figure IV.K-3 shows common noise levels associated with various sources.

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 of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared to the 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. Another useful aspect of the decibel scale is that changes in decibel levels 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 filtering the

frequency response of a sound level meter by means of the standardized A-weighting network. As a result, all sound levels reported in this study are in terms of A-weighted decibels.

Effects of Noise on People

The effects of noise on people can be divided into three categories:

1. Subjective effects of annoyance, nuisance, dissatisfaction;
2. Interference with activities such as speech, sleep, and learning; and
3. 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 third 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.

Generally, most noise is generated by transportation systems, primarily motor vehicles, aircraft, and railroads. Poor urban planning may also give rise to noise pollution, since juxtaposing industrial and residential land uses, for example, often adversely affects the residential acoustic environment. Prominent sources of indoor noise are office equipment, factory machinery, appliances, power tools, lighting hum, and audio entertainment systems. An important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment (or ambient noise) to which one has adapted. 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 (Caltrans, 2013):

- Under controlled conditions in an acoustics laboratory, the trained healthy human ear is able to discern changes in sound levels of 1 dBA;
- Outside such controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise;
- It is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dBA;
- A change in level of 5 dBA is a readily perceptible increase in noise level; and
- A 10-dBA change is recognized as twice as loud as the original source.

Legend

- # Long-Term Noise Measurement Sites
- A Short-Term Noise Measurement Sites
- Project Area

Figure IV.K-1. Noise Measurement Locations

Stonegate Vesting Tenative Subdivision
Map and GPA/Rezone
City of Chico, California

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Data Source: Bollard Acoustical Consultants

Legend

STC-32: Upper-Floors

Proposed Solid Noise Barrier*

*Recommended 6-feet tall in height relative to building pad elevation.

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Figure IV.K-2. Noise Site Plan

Stonegate Vesting Tenative Subdivision
Map and GPA/Rezone
City of Chico, California

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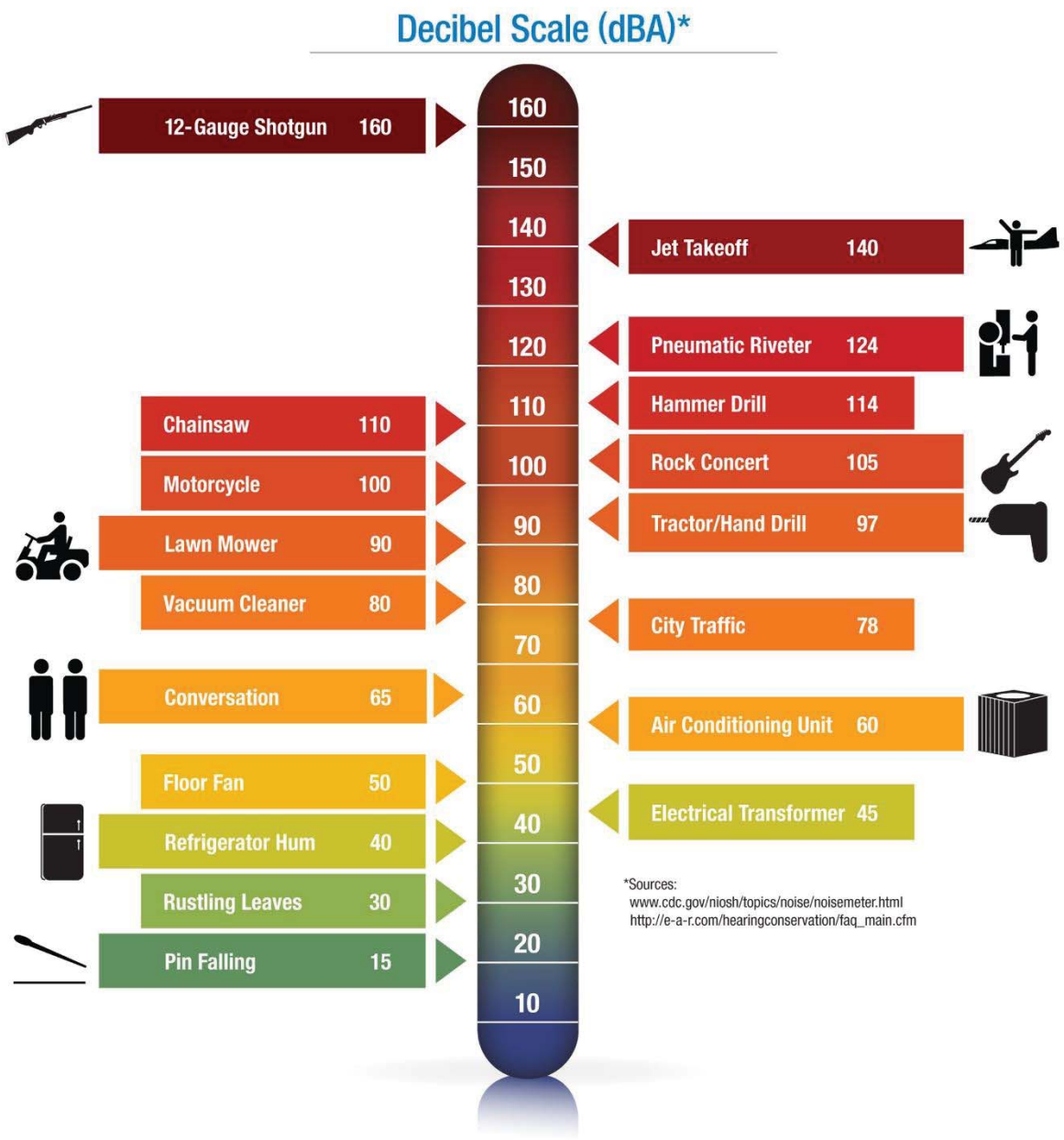
Data Source: Bollard Acoustical Consultants

Figure IV.K-3
Noise Levels Associated with Common Noise Sources



These relationships occur in part because of the logarithmic nature of sound and the decibel system. Noise levels are measured on a logarithmic scale, instead of a linear scale. On a logarithmic scale, the sum of two noise sources of equal loudness is 3 dBA greater than the noise generated by only one of the noise sources (e.g., a noise source of 60 dBA plus another noise source of 60 dBA generate a composite noise level of 63 dBA). To apply this formula to a specific noise source, in areas where existing levels are dominated by traffic, a doubling in traffic volume will increase ambient noise levels by 3 dBA. Similarly, a doubling in heavy equipment use, such as the use of two pieces of equipment where one formerly was used, would also increase ambient noise levels by 3 dBA. A 3 dBA increase is the smallest change in noise level detectable to the average person. A change in ambient sound of 5 dBA can begin to create concern. A change in sound of 7 to 10 dBA typically elicits extreme concern and/or anger.

Noise Attenuation over Distance

Stationary "point" sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of approximately 6+ dBA per doubling of distance from the source, depending upon environmental conditions (i.e., atmospheric conditions and noise barriers, either vegetative or manufactured, etc.). Widely distributed noises, such as a large industrial facility, spread over many acres or a street with moving vehicles (a "line" or "moving point" source), would typically attenuate at a lower rate, approximately 4 to 6 dBA per doubling distance from the source (also dependent upon environmental conditions) (Caltrans, 2013). Noise from large construction sites (with heavy equipment moving dirt and trucks entering and exiting the site daily) would have characteristics of both "point" and "line" sources, so attenuation would generally range between 4.5 and 7.5 dBA per doubling of distance. Atmospheric absorption of sound varies depending on temperature and relative humidity, as well as the frequency content of the noise source. In general, "average day" atmospheric conditions result in attenuation at a rate of approximately 1.5 dB per thousand feet of distance (SAE ARP 866A, 1975).

Vibration Fundamentals

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 noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or structures. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities (inches/second). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate, or velocity of particle movement, is the commonly accepted descriptor of the vibration "strength".

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does the frequency of the event. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases.

According to the Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, June 2004), operation of construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage (e.g., crack plaster). Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. However, traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.

Existing Overall Ambient Noise Environment at the Project Site

The existing noise environment at the project site is primarily defined by traffic on Skyway Road, East 20th Street, and Bruce Road. Operations at the Franklin Construction asphalt plant to the southeast also contribute to the local noise environment, but to a lesser extent. To quantify existing noise levels at the project site, Bollard Acoustical Consultants, Inc. (BAC) conducted long-term (48-hour) noise level surveys at three (3) locations on and near the project site from July 19-21, 2016. The noise measurement sites are shown on Figure IV.K-1, identified as Sites 1-3.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used to conduct the noise level surveys. The meters were calibrated before 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 results of the measurements are shown numerically and graphically in Appendices H-2 through H-13, and are summarized in Table IV.K-1.

Table IV.K-1: Summary of Long-Term Ambient Noise Monitoring Results

Location[1]	Date	L_{dn}, dB	Average Measured Hourly Noise Levels (dB)					
			Daytime (7 a.m. to 10 p.m.)			Nighttime (10 p.m. to 7 a.m.)		
			L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
Site 1 – Southern end of project site, approximately 350' from centerline of Skyway Road	7/19 – 7/20	60	55	53	66	53	47	62
	7/20 – 7/21	59	54	53	66	52	48	63
Site 2 – Northeast of project site, approximately 75' from centerline of East 20th Street	7/19 – 7/20	55	53	44	70	47	39	69
	7/20 – 7/21	55	52	43	69	47	40	68
Site 3 –Southwestern end of project site, approximately 75' from centerline of Bruce Road	7/19 – 7/20	64	62	58	75	56	42	72
	7/20 – 7/21	63	61	57	75	55	44	71

Notes:

1 Long-term ambient noise monitoring locations are shown on Figure IV.K-1.

Source: Bollard Acoustical Consultants, Inc. (2016)

As shown in Table IV.K-1, measured average noise levels were lowest at Site 2. This was most likely due to the relatively low traffic volumes in comparison to Skyway Road and Bruce Road. Conversely, the highest average measured noise levels at Site 3 were due to a combination of higher traffic volumes and proximity of that site to Bruce Road. The noise level measurements conducted at Sites 1-3 on the project site were intended to quantify the existing general ambient noise environment, including the noise generation of traffic on Skyway Road, Bruce Road and East 20th Street.

Existing Traffic Noise Environment

To allow the evaluation of relative changes in off-site traffic noise levels which would result from a project, the existing traffic noise environment must be quantified. The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used with the Calveno vehicle noise emission curves to quantify existing traffic noise levels on the project area roadways.

The FHWA Model was used with existing traffic data prepared by Fehr & Peers to predict existing traffic noise levels on the project area roadways. Table IV.K-2 shows the predicted existing traffic noise levels in terms of L_{dn} at a reference distance of 100 feet from the roadway centerlines. This table also shows the distances to existing traffic noise contours. A complete listing of the FHWA Model input data for existing conditions are provided in Appendix H-14.

Table IV.K-2: Existing Traffic Noise Levels and Distances to Traffic Noise Contours

Roadway	Segment	Ldn @ 100 feet	L_{dn} Contour (feet)		
			70	65	60
East 20th Street	West of SR-99 SB Ramps	61	24	53	113
East 20th Street	SR-99 NB Ramps to Chico Mall	62	29	63	135
East 20th Street	Chico Mall to Forest Ave.	62	27	59	126
East 20th Street	Forest Ave. to Huntington Dr.	60	21	44	96
East 20th Street	Huntington Dr. to Notre Dame Blvd.	59	18	39	85
East 20th Street	Notre Dame Blvd. to Bruce Rd.	58	17	36	78
East 20th Street	East of Bruce Rd.	52	7	15	31
Skyway Road	West of SR-99 SB Ramps	65	45	98	211
Skyway Road	SR-99 NB Ramps to Norte Dame Blvd.	65	50	107	232
Skyway Road	Norte Dame Blvd. to Forest Ave.	66	58	124	267
Skyway Road	Forest Ave. to Bruce Rd.	66	54	116	251
Notre Dame Boulevard	East of Bruce Rd.	66	58	125	270
Notre Dame Boulevard	East 20th St. to Parkhurst St.	52	7	14	31
Notre Dame Boulevard	Parkhurst St. to Jasper Dr.	52	6	13	29
Notre Dame Boulevard	Jasper Dr. to Webster Dr.	52	7	14	30
Notre Dame Boulevard	Webster Dr. to Forest Ave.	52	7	14	31
Notre Dame Boulevard	Forest Ave. to Skyway Road	60	21	45	97
Notre Dame Boulevard	South of Skyway Road	57	13	29	62
Bruce Road	North of East 20th St.	63	33	70	151
Bruce Road	East 20th St. to Webster Dr.	66	57	122	264
Bruce Road	Webster Dr. to Raley Blvd.	66	57	122	263
Bruce Road	Raley Blvd. to Skyway Road	57	13	28	61
Bruce Road	South of Skyway Road	50	5	10	22
Webster Drive	Notre Dame Blvd. to Bruce Rd.	47	3	6	13

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers & BAC analysis

Franklin Construction Asphalt Plant Noise Levels

To quantify the noise generated from asphalt plant processing operations, BAC conducted short-term (15-minute) noise level measurements on the northern end of Franklin Skyway Asphalt Plant property on November 22, 2017. Figure IV.K-1 shows the location of the short-term measurement site, identified as Site C. The results from the noise measurement survey indicate that asphalt plant processing noise levels from the Franklin facility had a measured average noise level of 52 dB L_{eq} at a distance of 530 feet from the facility burner equipment, excluding traffic noise from nearby Skyway Road.

REGULATORY SETTING

Federal Regulations

There are no Federal noise level standards which would be directly applicable to this project.

State of California Regulations

The California Department of Transportation (Caltrans) publication *Transportation and Construction Vibration Guidance Manual*, September 2013, contains criteria for the assessment of human response to vibration. Those criteria are provided in Table IV.K-3.

Table IV.K-3: Human Response to Transient Vibration

Human Response	Peak Particle Velocity (in/sec)
Severe	2.0
Strongly Perceptible	0.9
Distinctly Perceptible	0.24
Barely Perceptible	0.035

Source: Caltrans Transportation and Construction Vibration Guidance Manual, September 2013

As shown in Table IV.K-3, a vibration level of 0.24 in/sec PPV is the level at which vibration becomes distinctly perceptible. As a result, this level is considered to be a conservative benchmark against which project vibration levels are evaluated in this assessment.

Local Regulations

City of Chico General Plan

The Noise Element of the City of Chico General Plan contains goals, policies and actions to ensure that City residents are not subjected to noise beyond acceptable levels. Noise impacts associated with this project would occur if projected future traffic noise levels exceed City noise standards at proposed residences within the project site, or if the project would result in a substantial increase in traffic noise levels at existing residences in the immediate project vicinity. The City General Plan goals, policies and actions which are applicable to these to potential impacts are reproduced below:

GOAL N-1: To benefit public health, welfare and the local economy, protect noise-sensitive uses from uses that generate significant amounts of noise.

Policy N-1.1 (New Development and Transportation Noise) - New development of noise-sensitive land uses will not be permitted in areas exposed to existing or planned transportation noise sources that exceed the levels specified in Table N-1, unless the project design includes measures to reduce exterior and interior noise levels to those specified in Table N-1.

Policy N-1.2 (New Development and Non-Transportation Noise) - New development of noise-sensitive land uses will not be permitted in areas exposed to existing non-transportation noise sources that exceed the levels specified in Table N-2, unless the project design includes measures to reduce exterior noise levels to the unadjusted levels specified in Table N-2.

Policy N-1.3 (Acoustical Analysis) - Where proposed projects are likely to expose noise-sensitive land uses to noise levels exceeding the City's standards, require an acoustical analysis as part of environmental review so that noise mitigation measures may be identified and included in the project design. The requirements for the content of an acoustical analysis are outlined in Table N-3.

Policy N-1.6 (Construction Activity) - Maintain special standards in the Municipal Code to allow temporary construction activity to exceed the noise standards established in this element, with limits on the time of disturbance to nearby noise-sensitive uses.

GOAL N-2: Encourage noise attenuation methods that support the goals of the General Plan.

Policy N-2.1 (Well-Designed Noise Mitigation) - Utilize effective noise attenuation measures that complement the Community Design Element's Goals.

> *Action N-2.1.1 (Noise Control Measures)* - Limit noise exposure through the use of insulation, building design and orientation, staggered operating hours, and other techniques. Utilize physical barriers such as landscaped sound walls only when other solutions are unable to achieve the desired level of mitigation.

TABLE N-1
MAXIMUM ALLOWABLE NOISE LEVELS FROM TRANSPORTATION NOISE SOURCES

Land Use	Outdoor Activity Areas[1] Ldn/CNEL, dB	Interior Spaces	
		Ldn/CNEL, dB	Leq, dB[2]
Residential	65 [3]	45	--
Transient Lodging	--	45	--
Hospitals, Nursing Homes	65 [3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls	65 [3]	--	40
Office Buildings	--	--	45
Schools, Libraries, Museums	65 [3]	--	45
Playgrounds, Neighborhood Parks	70	--	--

Notes:
1. Noise standards are to be applied at outdoor activity areas with the greatest exposure to the noise source. When it is not practical to mitigate exterior noise levels at the patios or balconies of multi-family dwellings, a common area or onsite park may be designated as the outdoor activity area. For noise-sensitive land uses that do not include outdoor activity areas, only the interior noise standard shall apply.
2. As determined for a typical worst-case hour during periods of use.
3. Where it is not possible to reduce noise in outdoor activity areas to 65 dB L_{dn}/CNEL or less using all feasible noise reduction measures, an exterior noise level of up to 70 dB L_{dn}/CNEL may be allowed provided that interior noise levels are in compliance with this table.

TABLE N-2
MAXIMUM ALLOWABLE EXTERIOR NOISE LEVELS FROM NON-TRANSPORTATION SOURCES

Noise Level Descriptor (dBA)	Exterior Noise Level (dBA)	
	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Average-Hourly Noise Level (L_{eq})	55	50
Intermittent Noise Level ($L_{2\ or}\ L_{max}$)	75	65

Notes:
1. Noise levels are for planning purposes and may vary from the standards of the City's Noise Ordinance, which are for enforcement purposes.
2. Noise levels shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Noise level standards do not apply to mixed-use residential units established in conjunction with industrial or commercial uses provided interior noise levels remain below 45 dB L_{dn}/CNEL.
3. In areas where the existing ambient noise level exceeds the established daytime or nighttime standard, the existing level shall become the respective noise standard and an increase of 3 dBA or more shall be significant. Noise levels shall be reduced 5 dBA if the existing ambient hourly L_{eq} is at least 10 dBA lower than the standards.
4. Noise standards are to be applied at outdoor activity areas with the greatest exposure to the noise source. When it is not practical to mitigate exterior noise levels at patio or balconies of multi-family dwellings, a common area or onsite park may be designated as the outdoor activity area.

TABLE N-3
REQUIREMENTS FOR AN ACOUSTICAL ANALYSIS

An acoustical analysis prepared pursuant to the Noise Element shall:
A. Be the financial responsibility of the applicant.
B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.
C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and the predominant noise sources.
D. Estimate existing and projected cumulative (20 years) noise levels in terms of L_{dn}, CNEL, and the standards of **Table N-1** or **Table N-2**, as applicable, and compare those levels to the adopted policies of the Noise Element. Where the noise source consists of intermittent single events, address the impact on sleep disturbance.
E. Recommend appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element, giving preference to site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.
F. Estimate noise exposure after the prescribed mitigation measures have been implemented.
G. Describe a post-project assessment program which could be used to evaluate the effectiveness of the proposed mitigation measures.

City of Chico Municipal Code

Policy N-1.6 of the City of Chico General Plan references maintaining special standards in the Municipal Code applicable to temporary construction activities. Specifically, Section 9.38.060 of the City of Chico Municipal Code (Categorical Exemptions) identifies noise exemptions and special standards for certain activities and noise sources. The following noise criteria is applicable to the project:

9.38.060 Categorical exemptions.

B. Construction and Alteration of Structures.

1. Notwithstanding any other provision of this chapter, between the hours of 10:00 a.m. and 6:00 p.m. on Sundays and holidays, and 7:00 a.m. and 9:00 p.m. on other days, construction, alteration or repair of structures shall be subject to one of the following limits:

    a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.

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

2. Notwithstanding any other provision of this chapter, including but not limited to subsection B.1 of this section, for new residential development projects, or construction,

alteration or repairs taking place in commercial or industrial zones between June 15-September 15, of each calendar year, and 6:00 a.m. and 9:00 p.m. on other days. Construction, alteration or repairs of structures shall be subject to one of the following limits:

a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.

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

ENVIRONMENTAL IMPACTS

Thresholds of Significance

Based on the Appendix G of the State CEQA Guidelines, a project could have a significant noise impact if it would cause any of the following to conditions to occur:

a. 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;

b. Exposure of persons to or generation of excessive groundborne vibration or noise levels;

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

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

e. For a project located within an ALUP or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, the project would expose people residing or working in the project area to excessive noise levels;

f. For a project within the vicinity of a private airstrip, the project would expose people residing or working in the project area to excessive noise levels.

Because this project is not located in an area which is impacted by aircraft noise, items e) and f) listed above would not apply. In addition, no appreciable sources of existing vibration were identified in the project area and the project operations would not introduce any substantive sources of vibration to the immediate project area. As a result, an analysis of groundborne vibration is not warranted for this project.

Thresholds of Significance for Project-Related Noise Level Increases

Table IV.K-4 is based upon recommendations made in August 1992 by 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 noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these criteria have been applied to other sources of noise similarly described in terms of cumulative noise exposure metrics such as the L_{dn}.

Table IV.K-4: Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project, L_{dn}	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)

According to the FICON criteria, an increase in noise from similar sources of 5 dB or more would be noticeable where the ambient level is less than 60 dB. Where the ambient level is between 60 and 65 dB, an increase in noise of 3 dB or more would be noticeable, and an increase of 1.5 dB or more would be noticeable where the ambient noise level exceeds 65 dB L_{dn}. The rationale for these criteria is that, as ambient noise levels increase, a smaller increase in noise resulting from a project is sufficient to cause annoyance.

Project Impacts and Mitigation Measures

For this project, noise impacts both due to and upon the proposed Stonegate Subdivision are assessed. Noise impacts due to (resulting from) the proposed project would occur if project-generated traffic or commercial operations causes a substantial increase in noise levels at existing noise-sensitive land uses in the immediate project vicinity.

Noise impacts upon the proposed project would result if projected future traffic noise exposure or noise from proposed commercial uses at the residences within the Stonegate Subdivision project site would exceed City of Chico noise standards at either the outdoor activity areas (backyards) or interior spaces of individual residences.

The following sections separately evaluate noise impacts due to, and upon, the project development.

Off-Site Traffic Noise Impacts

To assess noise impacts due to the project, existing and future traffic noise levels are predicted for the local area roadways, both with and without traffic generated by the proposed project. The project and no-project noise levels are compared and the noise level increases resulting from the project are assessed relative to the FICON criteria (Table IV.K-4).

Impact NOISE-1: Increases in Day-Night Traffic Noise Levels at Existing Residences

With development within the project area as a whole, traffic volumes on the local roadway network will increase. Those increases in daily traffic volumes will result in a corresponding increase in traffic noise levels. The FHWA Model was used with traffic input data provided by the project transportation consultant (Fehr & Peers) to predict existing, existing plus, cumulative, and cumulative plus project traffic noise levels and associated noise level increases. Results of the traffic noise analyses are summarized in Tables IV.K-5 and IV.K-6 for existing and future (cumulative) conditions, respectively. Appendices H-14 through H-17 contain the FHWA Model input data for all scenarios.

Table IV.K-5: Existing Vs. Existing Plus Project Traffic Noise Levels

Roadway	Segment	L_{dn} @ 100 feet		Individual Roadway Increase, dB	Substantial Increase?
		E	E+P		
East 20th Street	West of SR-99 SB Ramps	60.8	61.0	0.2	No
East 20th Street	SR-99 NB Ramps to Chico Mall	62.0	62.4	0.2	No
East 20th Street	Chico Mall to Forest Ave.	61.5	62.1	0.6	No
East 20th Street	Forest Ave. to Huntington Dr.	59.7	61.0	1.3	No
East 20th Street	Huntington Dr. to Notre Dame Blvd.	58.9	60.7	1.8	No
East 20th Street	Notre Dame Blvd. to Bruce Rd.	58.4	60.1	1.7	No
East 20th Street	East of Bruce Rd.	52.4	53.5	1.1	No
Skyway Road	West of SR-99 SB Ramps	64.9	65.0	0.1	No
Skyway Road	SR-99 NB Ramps to Norte Dame Blvd.	65.5	65.7	0.2	No
Skyway Road	Norte Dame Blvd. to Forest Ave.	66.4	66.8	0.4	No
Skyway Road	Forest Ave. to Bruce Rd.	66.0	66.6	0.0	No
Notre Dame Boulevard	East of Bruce Rd.	66.5	66.5	0.0	No
Notre Dame Boulevard	East 20th St. to Parkhurst St.	52.4	52.0	-0.4	No
Notre Dame Boulevard	Parkhurst St. to Jasper Dr.	51.8	51.4	-0.4	No
Notre Dame Boulevard	Jasper Dr. to Webster Dr.	52.2	51.8	-0.4	No
Notre Dame Boulevard	Webster Dr. to Forest Ave.	52.4	53.1	0.7	No
Notre Dame Boulevard	Forest Ave. to Skyway Road	59.8	59.6	-0.2	No
Notre Dame Boulevard	South of Skyway Road	56.9	56.8	-0.1	No
Bruce Road	North of East 20th St.	62.7	62.9	0.2	No
Bruce Road	East 20th St. to Webster Dr.	66.3	63.4	0.1	No
Bruce Road	Webster Dr. to Raley Blvd.	66.3	63.3	-3.0	No
Bruce Road	Raley Blvd. to Skyway Road	56.8	58.5	1.7	No
Bruce Road	South of Skyway Road	50.1	50.6	0.5	No
Webster Drive	Notre Dame Blvd. to Bruce Rd.	46.7	49.6	2.9	No

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers & BAC analysis

Table IV.K-6: Cumulative Vs. Cumulative Plus Project Traffic Noise Levels

Roadway	Segment	L_{dn} @ 100 feet		Individual Roadway Increase, dB	Substantial Increase?
		C	C+P		
East 20th Street	West of SR-99 SB Ramps	62.5	62.6	0.1	No
East 20th Street	SR-99 NB Ramps to Chico Mall	64.1	64.4	0.3	No
East 20th Street	Chico Mall to Forest Ave.	64.1	64.3	0.2	No
East 20th Street	Forest Ave. to Huntington Dr.	62.7	63.1	0.4	No
East 20th Street	Huntington Dr. to Notre Dame Blvd.	62.9	63.3	0.4	No
East 20th Street	Notre Dame Blvd. to Bruce Rd.	63.6	63.9	0.3	No
East 20th Street	East of Bruce Rd.	58.4	58.6	0.2	No
Skyway Road	West of SR-99 SB Ramps	65.0	66.1	1.1	No
Skyway Road	SR-99 NB Ramps to Norte Dame Blvd.	65.6	65.7	0.1	No
Skyway Road	Norte Dame Blvd. to Forest Ave.	66.4	66.8	0.3	No
Skyway Road	Forest Ave. to Bruce Rd.	66.0	66.3	0.3	No
Notre Dame Boulevard	East of Bruce Rd.	67.5	67.6	0.1	No
Notre Dame Boulevard	East 20th St. to Parkhurst St.	54.7	54.6	-0.1	No
Notre Dame Boulevard	Parkhurst St. to Jasper Dr.	54.5	54.1	-0.4	No
Notre Dame Boulevard	Jasper Dr. to Webster Dr.	54.2	54.0	-0.2	No
Notre Dame Boulevard	Webster Dr. to Forest Ave.	54.4	54.5	0.1	No
Notre Dame Boulevard	Forest Ave. to Skyway Road	60.9	60.8	-0.1	No
Notre Dame Boulevard	South of Skyway Road	56.4	56.3	0.1	No
Bruce Road	North of East 20th St.	65.7	65.8	0.1	No
Bruce Road	East 20th St. to Webster Dr.	66.3	66.3	0.0	No
Bruce Road	Webster Dr. to Raley Blvd.	66.3	66.3	0.0	No
Bruce Road	Raley Blvd. to Skyway Road	60.1	60.9	0.8	No
Bruce Road	South of Skyway Road	50.3	51.6	1.5	No
Webster Drive	Notre Dame Blvd. to Bruce Rd.	46.7	48.1	1.4	No

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers & BAC analysis

As mentioned previously, the criteria for determination of a substantial project-related increase in traffic noise levels is as follows:

- 5 dB increase where baseline levels are below 60 dB L_{dn}.
- 3 dB increase where baseline levels are between 60 – 65 dB L_{dn}.
- 1.5 dB increase where baseline levels exceed 65 dB L_{dn}.

The results from the analysis of 24 roadway segments shown in Tables IV.K-4 and IV.K-5 indicate that the project-related increases in traffic noise levels on the local roadway network would not exceed the standards of significance. As a result, off-site traffic noise impacts resulting from the development of the Stonegate Subdivision are considered to be ***less-than-significant*** and no mitigation measures would be required.

Noise Impacts Resulting from Future Commercial Uses

The project proposes commercial areas at the southern, western, and eastern portions of the project area, as indicted on Figure IV.K-1. According to the project description, the commercial areas will likely include medical office buildings (southern area, Lot 472), an outdoor retail center (western area, Lot 471), and a gas station (eastern area, Lot 474). The primary noise sources commonly associated with these types of commercial operations include parking lot movements, on-site delivery truck circulation, and loading dock operations. Due to the location of the proposed commercial areas of the development, it is possible that noise from future commercial operations could exceed the applicable City of Chico noise standards at the nearest existing and future noise-sensitive uses (single-family residences).

As noted in the Regulatory Framework section of this report, the City of Chico requires that noise levels from non-transportation sources, such as those proposed by the above mentioned noise sources, not exceed 55 dB L_{eq} and 75 dB L_{max} during daytime hours (7:00 a.m. to 10:00 p.m.), or 50 dB L_{eq} and 65 dB L_{max} during nighttime hours (10:00 p.m. to 7:00 a.m.). These noise standards are to be applied at the outdoor activity areas of noise-sensitive uses.

Impact NOISE-2: Commercial Parking Area Noise at Noise-Sensitive Uses

Although the project materials include illustrative site plans depicting possible configurations of the planned commercial areas within the development, the exact configurations for the buildings and parking areas are currently unknown. Detailed development plans for all commercial and multi-family residential lots within the project will be reviewed at a future date as part of the City's discretionary Site Design and Architectural Review process. As a result, the following section provides a generalized assessment of commercial parking area noise exposure at nearby residentially-zoned properties based upon conservative estimates of future parking area capacities.

As a means of determining potential noise exposure due to commercial area parking lot activities, Bollard Acoustical Consultants, Inc. (BAC) utilized specific parking lot noise level measurements conducted by BAC. Specifically, a series of individual noise measurements were conducted of multiple vehicle types arriving and departing a parking area, including engines starting and stopping, car doors opening and closing, and persons conversing as they entered and exited the vehicles. The results of those measurements revealed that individual parking lot movements generated mean noise levels of 65 dB SEL at a reference distance of 50 feet.

For a conservative assessment of commercial parking area noise generation, it was assumed that individual parking lot areas (of which there could be more than one) could accommodate up to 100 vehicles. It was also assumed that a parking area could fill or empty during a peak hour of business operations. During hours of operation, it is likely that parking area activity would be more spread out. Parking area noise exposure was determined using the following equation:

$$\text{Peak Hour } L_{eq} = 65+10*\log (N) - 35.6$$

Where 65 is the SEL for a single automobile parking operation at a reference distance of 50 feet, N is the number of parking area operations in a peak hour, and 35.6 is 10 times the logarithm of the number of seconds in an hour.

Using BAC parking lot noise measurement data and the equation provided above, parking lot noise exposure computes to approximately 50 dB L_{eq} and 65 dB L_{max} at a distance of 50 feet from the effective noise center of a parking lot. These results indicate that parking lot activity noise would be satisfactory with the City of Chico's 50 dB L_{eq} and 65 dB L_{max} nighttime noise level standards provided the effective noise center of the parking area is located at least 50 feet from noise-sensitive receptor locations. Due to the spatial requirements of new commercial parking lots (spaces must be 8-9 feet in width, 16-20 feet in depth, with drive aisles 13-24 feet in width), it is not likely feasible that a 100-space parking area would have an effective noise center less than 50 feet from its edge. However, since the future configuration of parking areas on the commercial lots within the project cannot be predicted at this time, there remains a slight potential that parking lot noise exposure could exceed the City's nighttime noise level standards. This impact is considered ***potentially significant***.

Mitigation Measure NOISE-2: Commercial Parking Area Noise at Existing Noise-Sensitive Uses

To satisfy the City of Chico's noise level standards at noise-sensitive uses near commercial lots within the project, commercial parking areas within the project shall be designed such that no residentially-zoned property would have 100 or more parking spaces within 100 feet, unless a solid noise barrier of 6 feet in height is included at the interface of the commercial parking area and the residential property.

Impact NOISE-3: On-Site Commercial Truck Circulation Noise at Noise-Sensitive Uses

Although the project materials include illustrative site plans depicting possible configurations of the planned commercial areas within the development, the exact configurations for the buildings and future delivery truck circulation routes are currently unknown. Detailed development plans for all commercial and multi-family residential lots within the project will be reviewed at a future date as part of the City's discretionary Site Design and Architectural Review process. As a result, the following section provides a generalized assessment of commercial truck circulation noise exposure based upon conservative estimates of future delivery truck volumes.

Because the City's noise standards are provided in terms of both individual maximum noise levels and hourly average noise levels, it is necessary to identify the number of truck movements occurring during a typical busy hour of operations to assess compliance with the L_{eq}-based standards. For the purposes of predicting hourly average noise levels for comparison against the City's noise standards, it was assumed that 2 heavy trucks could have store deliveries during the same worst-case hour.

Heavy truck arrivals and departures, and on-site truck circulation, will occur at low speeds. According to BAC file data, single-event truck passby noise levels are approximately 74 dB L_{max} and 83 dB SEL at a reference distance of 50 feet. Based on a conservative estimate of 2 heavy truck trips per hour, and an SEL of 83 dB SEL per passby, the hourly average noise level generated by on-site circulation computes to 50 dB L_{eq} at a reference distance of 50 feet from the passby route. Thus, depending upon the location of the truck passby routes relative to outdoor activity areas of nearby residences, noise exposure from single-event truck passbys could exceed the City's daytime and nighttime noise standards. This impact is considered ***potentially significant***.

Mitigation Measure NOISE-3: On-Site Commercial Truck Circulation Noise at Noise-Sensitive Uses

To satisfy the City of Chico's noise level standards at noise-sensitive uses near commercial lots within the project, commercial development on Lots 471 and 474 shall be designed to maintain on-site delivery truck circulation routes a minimum distance of 50 feet from property lines shared with existing or future noise-sensitive residences in the project vicinity. Alternatively, a future acoustic study prepared by a qualified professional and based on the specific commercial site design may be used to demonstrate that a lesser separation would meet the City's noise level standards. Such future acoustic study shall state all assumptions, including specifications for a noise barrier as appropriate, and be subject to review and approval by the Chico Community Development Director.

Impact NOISE-4: On-Site Commercial Loading Dock Noise at Noise-Sensitive Uses

In addition to noise generated by on-site truck circulation, noise could also be generated at delivery truck loading docks. The primary noise sources associated with loading dock operations are heavy trucks stopping (air brakes), backing into the loading docks (back-up alarms), and pulling out of the loading docks (revving engines). Once trucks have backed into a loading dock, they are unloaded from the inside of the store using a fork lift or hand cart, and most of that unloading noise is contained within the building and truck trailer.

To quantify the noise generated by truck loading dock operations, BAC utilized noise level data obtained from BAC field measurements of a commercial loading dock facility. According to BAC measurement data, loading dock average and maximum noise levels are approximately 63 dB L_{eq} and 75 dB L_{max} at a reference distance of 50 feet. Thus, depending upon the location of the loading docks relative to outdoor activity areas of nearby residences, noise exposure from loading dock operations could exceed the City's daytime and nighttime noise standards. As a result, this impact is considered to be ***potentially significant***.

Mitigation Measure NOISE-4: On-Site Commercial Loading Dock Noise at Noise-Sensitive Uses

To satisfy the City of Chico's noise level standards at residentially-zoned properties nearest Lots 471, 472 and 474, the future commercial development on these commercial lots shall be designed to locate all loading docks a minimum distance of 125 feet from property lines abutting residentially-zoned properties. Alternatively, a future acoustic study prepared by a qualified professional and based on the specific commercial site design, may be used to demonstrate that a lesser separation would meet the City's noise level standards. Such future acoustic study shall state all assumptions, including specifications for a noise barrier as appropriate, and be subject to review and approval by the Chico Community Development Director.

Off-Site Noise Impacts Resulting from Project Construction

Impact NOISE 5: Project Construction Noise at Existing Noise-Sensitive Uses

During project construction, heavy equipment would be used for grading excavation, paving, and building construction, which would increase ambient noise levels when in use. Activities involved in typical construction would generate maximum noise levels, as indicated in Table IV.K-7, ranging from 70 to 90 dB at a distance of 50 feet. Not all of these construction activities would be required of this project.

It should be noted that because project construction activities would not include pile driving or other substantial sources of vibration, and because vibration levels dissipate rapidly from earthmoving equipment uses for site grading, no vibration-related impacts are identified at any of the nearest sensitive receptors to the project site during project construction.

Table IV.K-7: Typical Construction Equipment Noise

Equipment	Typical Noise Level (dBA) 50 feet from Source		Distance to Noise Contours, L_{eq} (dBA)		
	L_{max}	L_{eq}	70	65	60
Air compressor	76	80	105	187	334
Auger/rock drill	85	78	133	236	420
Backhoe/front-end loader	80	76	105	187	334
Boring hydraulic jack/ power unit	80	77	118	210	374
Compactor (ground)	80	73	74	133	236
Concrete batch plant	83	75	94	167	297
Concrete mixer truck	85	81	187	334	594
Concrete mixer truck (vibratory)	80	73	74	133	236
Concrete pump truck	82	75	94	167	297
Concrete saw	90	83	236	420	748
Crane	85	77	118	210	374
Dozer/grader/excavator/scraper	85	81	187	334	594
Drill rig truck	84	77	118	210	374
Generator	82	79	149	265	472
Gradall	85	81	187	334	594
Hydraulic break ram	90	80	167	297	529
Jackhammer	85	78	133	236	420
Impact hammer	90	83	236	420	748
Pavement scarifier/roller	85	78	133	236	420
Paver	85	82	210	374	667
Pneumatic tools	85	82	210	374	667
Pumps	77	74	83	149	265
Truck (dump/flat bed)	84	80	167	297	529

Source: City of Chico General Plan Update DEIR (2010)

Depending on the distances from the construction areas to nearby existing noise-sensitive uses, construction activities associated with the project could result in temporary and periodic increases in ambient noise levels at nearby receptors.

Policy N-1-6 of the City of Chico General Plan references maintaining special standards in the Municipal Code applicable to temporary construction activities. Specifically, Section 9.38.060 of the Municipal Code (Categorical Exemptions) states that construction-related activities that occur between the hours of 10:00 a.m. and 6:00 p.m. on Sunday and holidays, and 7:00 a.m. and 9:00 p.m. on weekdays, shall comply with the following limitations:

a. No individual device or piece of equipment shall produce a noise level exceeding 83 dBA at a distance of 25 feet from the source. If the device or equipment is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close as possible to 25 feet from the equipment.

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

Due to the short-term nature of construction noise, the intermittent frequency of construction noise, and the required compliance with the construction noise standards established in Section 9.38.060 of the City of Chico Municipal Code, construction activities are not anticipated to result in substantial temporary or periodic increases in ambient noise levels in the project vicinity. As a result, the impact of construction noise exposure at existing residences is considered to be ***less-than-significant*** and no mitigation measures would be required.

Noise Impacts upon the Stonegate Subdivision

The project proposes the creation of 316 single-family residential lots and two larger multi-family residential lots. As noted in the Regulatory Section of this report, the City of Chico requires that future traffic noise levels in new residential developments not exceed 65 dB L_{dn} at outdoor activity areas and 45 dB L_{dn} inside residences. As indicated in the City of Chico General Plan, a common area (e.g., parks, pools, courtyards, etc.) may be designated as the outdoor activity areas in multi-family residential developments.

Additionally, the City of Chico requires that noise levels from non-transportation sources not exceed 55 dB L_{eq} and 75 dB L_{max} during daytime hours (7:00 a.m. to 10:00 p.m.), or 50 dB L_{eq} and 65 dB L_{max} during nighttime hours (10:00 p.m. to 7:00 a.m.) at residential uses. These standards are applicable to noise levels generated from proposed commercial operations within the development, as well as for existing uses in the project area affecting the proposed residences of the development.

On-Site Traffic Noise Impacts

Traffic Noise Prediction Model Calibration

The FHWA Model provides reasonably accurate traffic noise predictions under “ideal” roadway conditions. Ideal conditions are generally considered to be long straight roadway segments with uniform vehicle speeds, a flat roadway surface, good pavement conditions, a statistically large volume of traffic, and an unimpeded view of the roadway from the receiver location. Such

conditions appeared to be in effect at the project site. Nonetheless, BAC conducted a calibration of the FHWA Model through site-specific traffic noise level measurements and concurrent traffic counts along Bruce Road and Skyway Road.

The calibration process was performed at two (2) locations on the project site on July 19, 2016. The measurements were conducted at a height of 5 feet above existing grade to quantify traffic noise levels at the future outdoor activity areas of residences proposed nearest to Bruce Road and Skyway Road. The traffic noise measurements were conducted at short-term measurement Sites A and B, shown on Figure IV.K-1. Detailed results of this procedure are provided in Appendix H-18 & H-19.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used to conduct the traffic calibration noise level surveys. The meters were calibrated before 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).

As indicated in Appendix H-18, the FHWA Model was found to accurately predict Bruce Road traffic noise levels (within 0.5 dB). The data in Appendix H-19 also indicate that the FHWA Model over-predicted Skyway Road traffic noise levels by 2.4 dB. Nonetheless, no calibration offset was applied to the model in order to provide a conservative assessment of future Skyway Road traffic noise levels at the project site.

Impact NOISE-6: Future Exterior Traffic Noise Levels at Proposed Residences

Single-Family Residential Lots

The FHWA Model was used with future (Cumulative plus Project) traffic data obtained from the project traffic study (Fehr and Peers) to predict future traffic noise levels from East 20th Street, Bruce Road, and Skyway Road at the project site. The FHWA Model inputs and predicted future traffic noise levels at the project site are shown in Appendix H-20 through H-22. The results are summarized in Table IV.K-8.

The predicted future traffic noise levels at the first-floor facades and outdoor activity areas of the residences proposed along Bruce Road take into consideration the shielding provided by the proposed solid noise barrier, as indicated on Figure IV.K-2. Barrier insertion loss calculation worksheets are provided as Appendix H-23 & H-24. No shielding was taken into consideration for upper-floor building facades of these proposed residences.

Table IV.K-8: Predicted Future Exterior Traffic Noise Levels[1]

Roadway	Residential Lot(s)	Location	Distance from Centerline (ft)[2]	Offset (dB)[3]	L_{dn} (dB)[4]
East 20th Street	37, 38, 97, 98 121-130	Outdoor activity areas	50		63
		First-floor facades	60		61
		Upper-floor facades	60	+3	64
Bruce Road	5-18, 181-189 218-231	Outdoor activity areas	75		62
		First-floor facades	90		61
		Upper-floor facades	90	+9	70
Skyway Road	428, 429	Outdoor activity areas	265		63
		First-floor facades	285		63
		Upper-floor facades	285	+3	66

Notes:

[1] A complete listing of FHWA Model inputs and results are provided in Appendix H-14 through H17.

[2] Distances measured from indicated location to the centerline of the roadways.

[3] A +9 dB offset was applied to the upper-floor facades due to reduced ground absorption at elevated floor levels (+3 dB), and lack of shielding provided by the proposed noise barrier (+6 dB).

[4] Predicted future traffic noise levels at first-floor building facades and outdoor activity areas of residences proposed along Bruce Road take into the consideration the shielding provided by the proposed solid noise barrier along the property boundaries, as indicated on Figure IV.K-2. Barrier insertion loss calculation worksheets are provided in Appendix H-23 & H-24. No shielding was taken into consideration for upper-floor building facades of these residences.

Source: Bollard Acoustical Consultants, Inc. (2017)

The Table IV.K-7 data, which represent predicted future (cumulative plus project) traffic noise levels within the project area, indicate that traffic noise levels are predicted to satisfy the City of Chico 65 dB L_{dn} exterior noise standard at the proposed outdoor activity areas (backyards) of the residences proposed nearest to East 20th Street and Skyway Road. In addition, future Bruce Road traffic noise levels are also predicted to satisfy the City's 65 dB L_{dn} exterior noise standard provided that the proposed solid noise barrier is a minimum of 6-feet in height relative to graded backyard elevations (the sound wall along Bruce Road is proposed to be seven feet in height). With the proposed noise barrier along Bruce Road, this impact is considered to be ***less-than-significant***.

Multi-Family Residential Lots

In addition to the construction of approximately 316 single-family residential lots, the project also proposes the development of two larger multi-family residential lots. As indicated in Figure IV.K-1, both multi-family residential lots are proposed to be located adjacent to Bruce Road. Although the project site plans contain the general locations of the proposed multi-family lots, the locations of the buildings and common outdoor activity area(s) are currently unknown.

The FHWA Model and future (Cumulative Plus Project) traffic data to predict future traffic noise levels from Bruce Road at the proposed multi-family residential lots. The results from that analysis indicate that future Bruce Road exterior traffic noise levels are predicted to be 65 dB L_{dn} at a distance of 130 feet from the centerline of Bruce Road. Thus, future Bruce Road traffic noise exposure would exceed the City of Chico 65 dB L_{dn} exterior noise level standard should the common outdoor activity areas of the proposed multi-family residential lots be located within 130 feet from the centerline of Bruce Road. This impact is considered ***potentially significant***.

Mitigation Measure NOISE-6: Future Exterior Traffic Noise Levels at Proposed Residences

To satisfy the City of Chico's exterior noise level standard at the common outdoor areas of the proposed multi-family residential lots within the development (Lots 470 and 473), these future common outdoor areas shall be designed to: (1) maintain a minimum setback distance of 130 feet from the centerline of Bruce Road, (2) be shielded by the proposed structures to completely block the common outdoor area(s) from view of Bruce Road, or (3) include a solid noise barrier meeting specifications outlined in a supporting acoustic study prepared by a qualified professional, subject to review and approval by the Community Development Director.

Impact NOISE-7: Future Interior Traffic Noise Levels at Proposed Residences

Single-Family Residential Lots

The worst-case traffic noise exposure within this development would occur at the lots proposed closest to East 20th Street, Bruce Road, and Skyway Road. According to Table IV.K-8, the predicted future L_{dn} value at the first-floor facades of the residences nearest to these roadways would range from 61-63 dB L_{dn}, including the shielding from the proposed noise barrier as indicated on Figure IV.K-2.

Due to reduced ground absorption at elevated positions, upper-level traffic noise levels from East 20th Street and Skyway Road would approach 64 and 66 dB L_{dn}, respectively. In addition, because upper-level locations along Bruce Road would not necessarily benefit from the proposed noise barriers, future traffic noise levels along this roadway are predicted to be approximately 70 dB L_{dn} at upper-floor locations. In order to satisfy the City of Chico 45 dB L_{dn} interior noise level standard within all floors of buildings closest to these roadways, a minimum noise reduction of at least 25 dB would be required of the building facades.

Standard residential construction (wood or stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof), results in an exterior to interior noise reduction of at least 25 dB with windows closed and approximately 15 dB with windows open. Therefore, standard construction would be acceptable for all residences constructed adjacent to East 20th Street, Bruce Road, and Skyway Road. As a result, this impact is considered ***less-than-significant***.

Multi-Family Residential Lots

As mentioned previously, multi-family residential lots are proposed to be located adjacent to Bruce Road. Although the project materials include illustrative site plans depicting possible configurations for development on the proposed multi-family lots, the exact locations of the buildings are currently unknown. Detailed development plans for all commercial and multi-family residential lots within the project will be reviewed at a future date as part of the City's Site Design and Architectural Review process.

According to the FHWA Model, future exterior traffic noise levels from Bruce Road are predicted to be approximately 67 dB L_{dn} at a distance of 90 feet from the centerline of Bruce Road. Due to reduced ground absorption at elevated positions, upper-level traffic noise levels from Bruce Road would approach 70 dB L_{dn} at this same distance.

Based on the aforementioned noise level reduction achieved from standard residential construction (at least 25 dB with windows closed), predicted interior traffic noise levels within multi-family residences proposed at least 90 feet from the centerline of Bruce Road would satisfy the City of Chico 45 dB L_{dn} interior noise level standard without the need for additional mitigation measures. However, should multi-family residential buildings be proposed within 90 feet from the centerline of Bruce Road, predicted interior traffic noise levels from Bruce Road could exceed the City's 45 dB L_{dn} interior noise level standard at the upper-levels of proposed multi-family residential buildings. This impact is considered ***potentially significant***.

Mitigation Measure NOISE-7: Future Traffic Noise Levels at Proposed Residences

Should the building facades of the future multi-family residences be proposed within 90 feet of the centerline of Bruce Road, all upper floor windows of the residential structures located within that setback distance and within line-of-sight of Bruce Road shall be upgraded to STC-32.

Impact NOISE-8: Existing Asphalt Processing Plant Noise Levels at Proposed Residences

As indicated in Figure IV.K-1, an existing asphalt processing plant (Franklin Skyway Asphalt Plant) is located southeast of the proposed development across Skyway Road. Due to the location of the asphalt plant, it is possible that noise generation associated from facility operations could exceed the City's noise standards at residences proposed within the development.

As noted in the Regulatory Framework section of this report, the City of Chico requires that noise levels from non-transportation sources, such as those from the Franklin Skyway Asphalt Plant, not exceed 55 dB L_{eq} and 75 dB L_{max} during daytime hours (7:00 a.m. to 10:00 p.m.), or 50 dB L_{eq} and 65 dB L_{max} during nighttime hours (10:00 p.m. to 7:00 a.m.). These noise standards are to be applied at the outdoor activity areas of noise-sensitive uses. Because processing equipment used at asphalt plants are considered to be steady state noise sources (i.e., continuous noise sources that typically do not fluctuate by more than 5 dB), it is appropriate to apply the City's daytime and nighttime noise level standards of 55 and 50 dB L_{eq} (respectively) to this analysis.

Primary noise sources commonly associated with asphalt processing plants are the burners and dryer drum equipment. To quantify the noise generated from asphalt plant processing operations, BAC conducted short-term (15-minute) noise level measurements on the northern end of Franklin Skyway Asphalt Plant property on November 22, 2017. Figure IV.K-1 shows the location of the short-term measurement site, identified as Site C. The results from the noise measurement survey are summarized in Table IV.K-9.

Table IV.K-9: Summary of Short-Term Noise Measurement Survey for Franklin Construction Asphalt Plant, November 22, 2017

	Measured Noise Level (dB)[2,3]	
Location[1]	**L_{eq}**	**L_{max}**
Site C – Northern end of asphalt plant site, approximately 530' from facility burner equipment	52	56

Notes:

[1] Noise level measurement location is shown on Figure IV.K-1.

[2] Measured noise levels exclude traffic noise Skyway Road, approximately 80 feet from roadway centerline.

[3] Short-term noise level measurement was 15 minutes in duration.

Source: Bollard Acoustical Consultants, Inc. (2017)

As indicated in Table IV.K-9, asphalt plant processing noise levels from the Franklin facility had a measured average noise level of 52 dB L_{eq} at a distance of 530 feet from the facility burner equipment, excluding traffic noise from nearby Skyway Road. According to BAC staff observations, the burner equipment was in operation during the noise measurement survey. When projected to the outdoor activity area (backyard) of the nearest proposed residence of the development (single-family residential Lot 429, approximately 900 feet to the north of the

asphalt plant site), noise levels from asphalt plant processing operations are predicted to be approximately 47 dB L_{eq}. Based on the analysis and results presented above, noise levels from operations at the Franklin Skyway Asphalt Plant are predicted to satisfy the City of Chico daytime and nighttime noise level standards at the nearest outdoor activity areas (backyards) proposed within the development. As a result, this impact is considered to be ***less-than-significant***. However, disclosure statements should be provided to residences nearest to the asphalt plant (Lots 425-429) notifying them of the potential for elevated noise levels during asphalt plant hours of operation.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

All project impacts related to Noise are ***less than significant*** after implementation of *Mitigation Measures NOISE-2* through *NOISE-7*.