Environmental Noise & Vibration Assessment

Creekside Plaza Development

El Dorado County, California

BAC Job # 2021-046

Prepared for:

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BOLLARD
Acoustical Consultants

CEQA Checklist

NOISE AND VIBRATION – **Would the Project Result in:**	**Significant Impact**	**Potentially Significant Impact**	**Less than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			**X**		
b) Generation of excessive groundborne vibration or groundborne noise levels?				**X**	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?					**X**

Introduction

The Creekside Plaza development is located at the northwest quadrant of Missouri Flat Road and Forni Road in Placerville (El Dorado County), California. The project proposes the development of a combination convenience store (c-store)/fueling station, car wash tunnel and vehicle vacuum systems, and two retail buildings (one consisting of a combination retail/quick serve restaurant with drive-through services). Existing land uses within the immediate project vicinity include residential, school, and commercial. The project area with aerial imagery is shown in Figure 1. The preliminary site plans for the project components are presented in Figures 2 and 3.

The purposes of this assessment 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 project-generated noise or vibration levels would exceed applicable federal, state, or local (El Dorado County) standards at existing sensitive uses.

Noise and Vibration Fundamentals

Noise

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 provided in Appendix A.

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. Noise levels associated with common noise sources are provided in Figure 4.

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. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. 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.

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 noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}). The L_{eq} is the foundation of the day-night average noise descriptor, DNL (or L_{dn}), and shows very good correlation with community response to noise. DNL is based on the average noise level over a 24-hour day, with a +10-decibel weighting applied to noise occurring during nighttime hours (10:00 p.m. to 7:00 a.m.). The nighttime penalty is based on the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because DNL represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Vibration

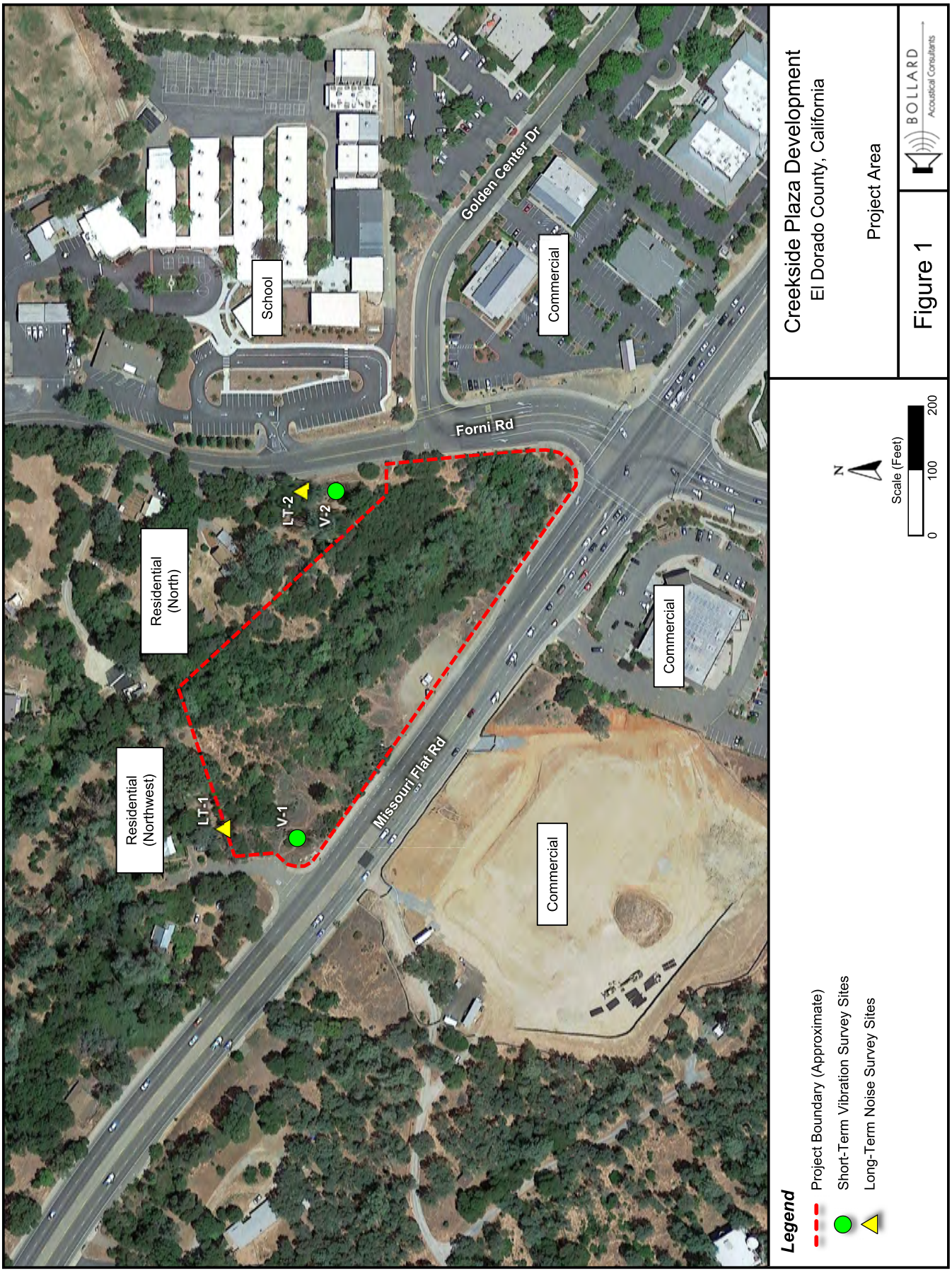
Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or 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.

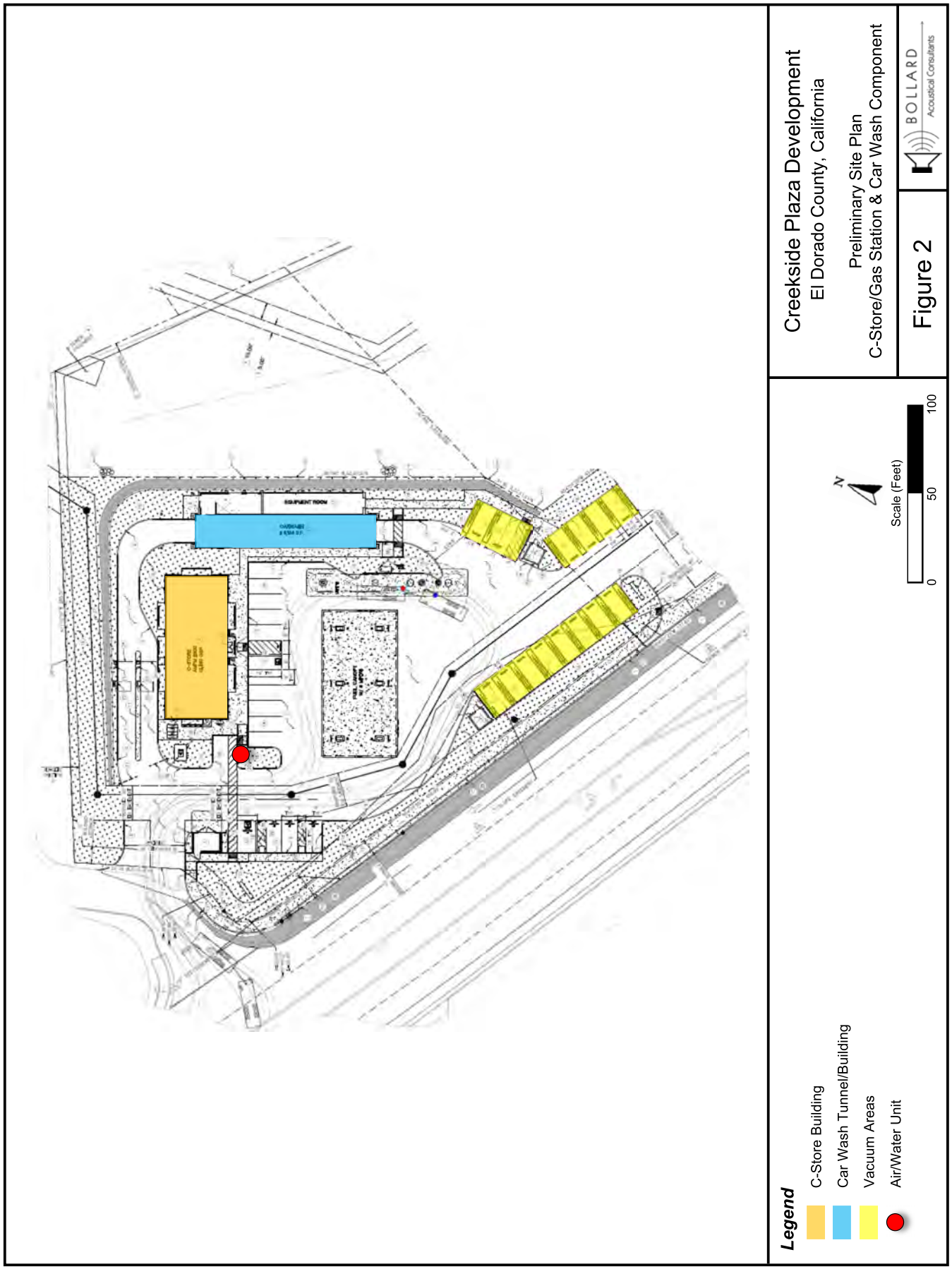
Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of velocity in inches per second peak particle velocity (IPS, PPV) or root-mean-square (VdB, RMS). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity as well as RMS velocities.

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.

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 frequency. 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. Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. However, traffic, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.


Creekside Plaza Development
El Dorado County, California
Project Area
Figure 1
BOLLARD Acoustical Consultants
Legend
Project Boundary (Approximate)
Short-Term Vibration Survey Sites
Long-Term Noise Survey Sites
N
Scale (Feet)
0
100
200
Golden Center Dr
Forni Rd
Missouri Flat Rd
School
Commercial
Commercial
Commercial
Residential (North)
Residential (Northwest)
LT-1
LT-2
V-1
V-2


Creekside Plaza Development
El Dorado County, California
Preliminary Site Plan
C-Store/Gas Station & Car Wash Component
Figure 2
BOLLARD
Acoustical Consultants
N
Scale (Feet)
0
50
100
Legend
C-Store Building
Car Wash Tunnel/Building
Vacuum Areas
Air/Water Unit

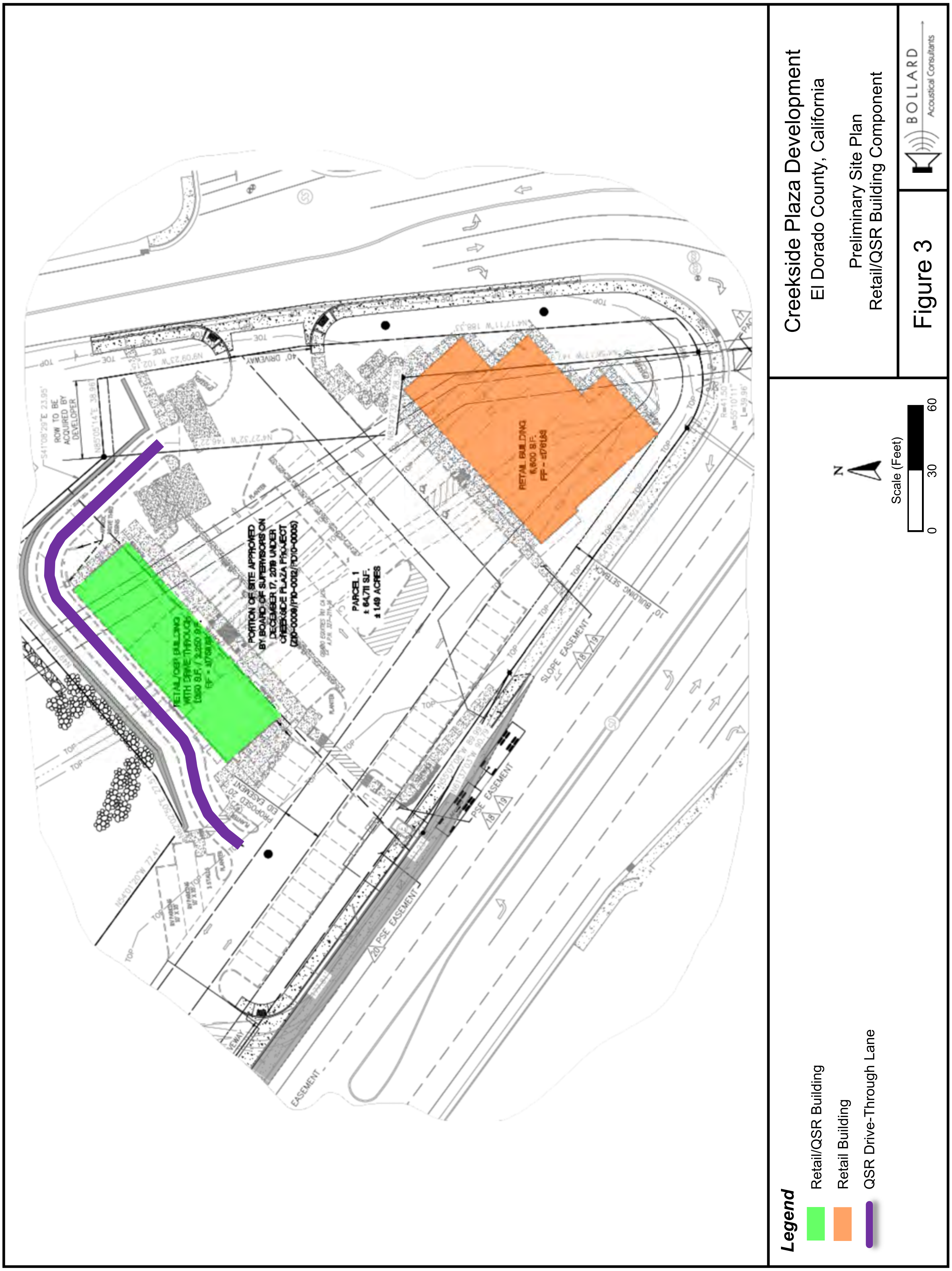
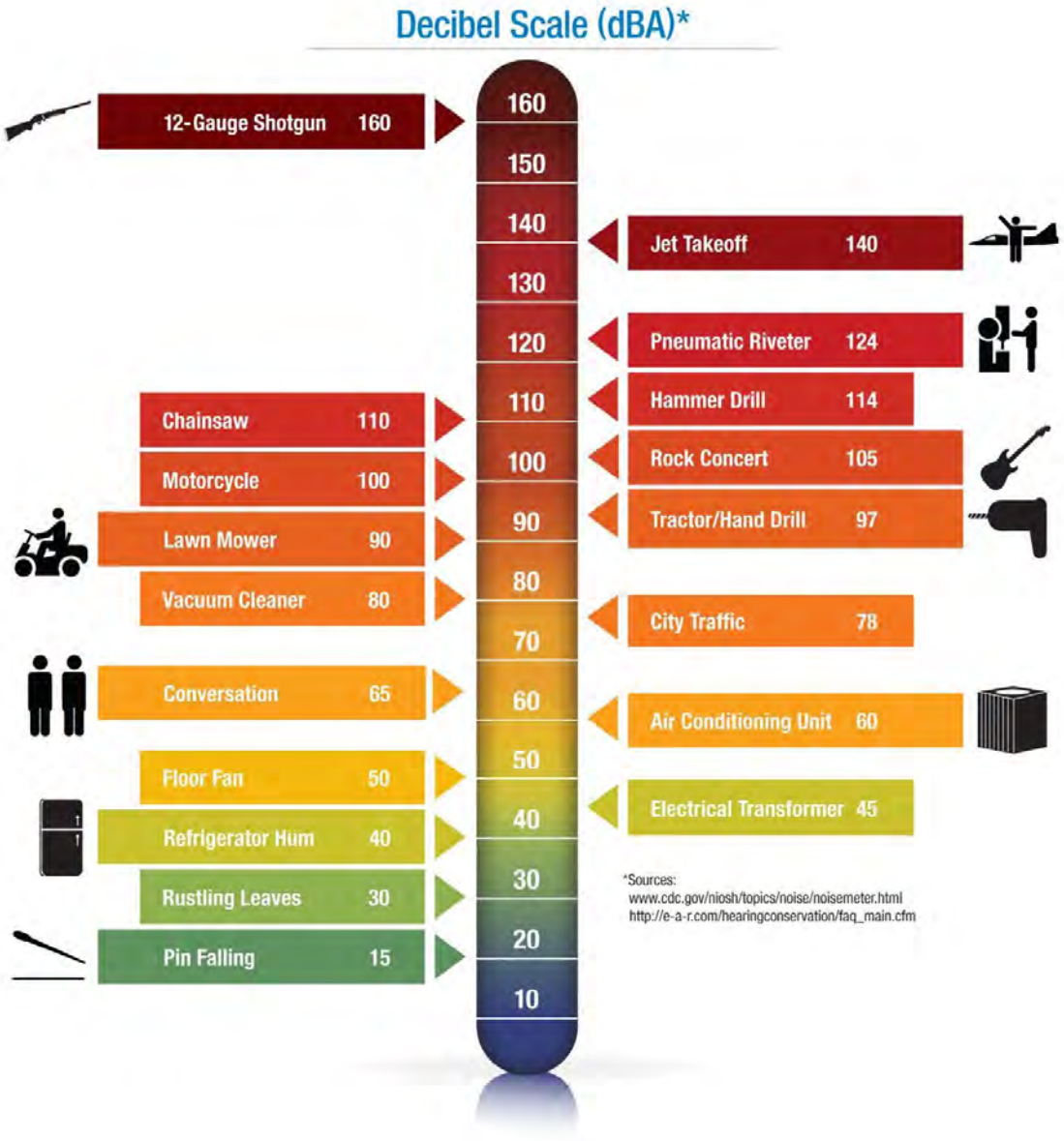

Creekside Plaza Development
El Dorado County, California
Preliminary Site Plan
Retail/QSR Building Component
Figure 3
BOLLARD
Acoustical Consultants
Scale (Feet)
0
30
60
N
Legend
Retail/QSR Building
Retail Building
QSR Drive-Through Lane

Figure 4
Noise Levels Associated with Common Noise Sources



Environmental Setting – Existing Ambient Noise and Vibration Environment

Noise-Sensitive Land Uses in the Project Vicinity

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the primary intended use of the land. Places where people live, sleep, recreate, worship, and study are generally considered to be sensitive to noise because intrusive noise can be disruptive to these activities. The nearest noise-sensitive land uses which would potentially be affected by the project consist of residential uses to the northwest and north of the project, as identified in Figure 1.

Existing Overall Ambient Noise Environment within the Project Vicinity

The existing ambient noise environment within the immediate project vicinity is defined primarily by traffic on Missouri Flat Road and Forni Road, and by operations at nearby commercial uses. To quantify existing ambient noise environment within the immediate project vicinity, BAC utilized the results from long-term (48-hour) ambient noise level surveys previously conducted for the project in March of 2021. The long-term noise survey locations are shown in Figure 1, identified as sites LT-1 and LT-2. BAC measurement sites LT-1 and LT-2 were selected to be representative of the ambient noise level environment at the nearest existing residential uses to the northwest and north of the project, respectively. Photographs of the noise survey locations are provided in Appendix B.

Larson Davis Laboratories (LDL) Model 820 and LxT precision integrating sound level meters were used to complete the long-term noise level surveys. The meters were calibrated immediately before use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all specifications of the American National Standards Institute requirements for Type 1 sound level meters (ANSI S1.4). The results of the long-term ambient noise survey are shown numerically and graphically in Appendices C and D (respectively) and are summarized in Table 1.

Table 1
Summary of Long-Term Ambient Noise Survey Results – March 24-25, 2021[1]

			Average Measured Hourly Noise Levels (dB)[3]					
			Daytime		Evening		Nighttime	
Site Description[2]	Date	CNEL (dB)	L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
LT-1: Northwest project boundary near residences	3/24/21	67	63	78	59	76	59	73
	3/25/21	67	63	77	60	79	60	75
LT-2: Northern project boundary near residences	3/24/21	63	60	78	58	82	55	70
	3/25/21	63	60	77	60	81	54	68

[1] Detailed summaries of the noise monitoring results are provided in Appendices C and D.
[2] Long-term ambient noise monitoring locations are identified in Figure 1.
[3] Daytime: 7:00 AM to 7:00 PM | Evening: 7:00 PM to 10:00 PM | Nighttime: 10:00 PM to 7:00 AM

Source: BAC 2021.

As shown in Table 1, measured community noise equivalent level (CNEL) and average measured hourly noise levels (L_{eq} and L_{max}) at each site were consistent throughout the monitoring period (i.e., relatively small range of measured values).

Existing Ambient Vibration Environment

During a site visit on March 23rd, 2021, vibration levels were below the threshold of perception at the project site. Nonetheless, to quantify existing vibration levels within the project vicinity, BAC conducted short-term (15-minute) vibration surveys at the locations identified in Figure 1 (sites V-1 and V-2). Photographs of the vibration survey locations are provided in Appendix B.

A Larson-Davis Laboratories Model LxT precision integrating sound level meter equipped with a vibration transducer was used to complete the measurements. The results are summarized below in Table 2.

Table 2
Summary of Ambient Vibration Monitoring Results – March 23, 2021

Measurement Site	Time	Average Measured Vibration Level, VdB[1]
V-1: Near northwest boundary of development	1:18 p.m.	33
V-2: Near northern boundary of development	1:47 p.m.	34
[1] RMS velocity in decibels (VdB) re 1 micro-inch/second.		

Source: BAC 2021.

Table 2 data indicate that average measured average vibration levels within the project vicinity were well below the 65 VdB threshold of human perception, which is consistent with the BAC staff observations.

Existing Traffic Noise Levels along Project Area Roadway Network

To predict traffic noise levels along existing roadway networks with multiple segments, modelling is commonly used rather than monitoring. The FHWA Traffic Noise Model (FHWA-RD-77-108) was used to quantify existing traffic noise levels at the existing sensitive land uses nearest to the project area roadway network. The Model was also used to quantify the distances to the 60, 65 and 70 dB DNL traffic noise contours for these roadways. The FHWA Model predicts hourly average (L_{eq}) values for free-flowing traffic conditions. Estimates of the hourly distribution of traffic for a typical 24-hour period were used to develop DNL values from L_{eq} values.

Existing traffic data in the form of AM and PM peak hour intersection turning movements were obtained from the traffic impact analysis prepared by the project transportation consultant (Flecker Associates). Those data were converted to Average Daily Traffic (ADT) segment volumes by applying a factor of 5 to the sum of AM and PM peak hour conditions. Other inputs were obtained from BAC observations and noise measurement data. The existing traffic noise levels at the distances representing the nearest sensitive land uses to the project area roadways and distances from the centerlines of selected roadways to the 60 dB, 65 dB and 70 dB DNL contours are summarized in Table 3. Appendix E-1 contains the FHWA Model inputs for existing conditions.

Table 3
Existing Traffic Noise Levels at Nearest Sensitive Receptors and Distances to DNL Contours

#	Roadway	Segment Description	DNL at Nearest Sensitive Receptor	Distance to Contour (ft)		
				70 dB DNL	65 dB DNL	60 dB DNL
1	Missouri Flat Rd	North of US 50 WB Ramps	63	51	109	235
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	54	61	131	282
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	54	64	139	299
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	65	71	154	332
5	Missouri Flat Rd	Road 2233 to Forni Rd	61	71	154	332
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	66	56	121	260
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	64	58	124	267
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	58	50	107	230
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	57	47	102	219
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	59	45	98	210
11	US 50 WB Ramps	West of Missouri Flat Rd	53	35	76	164
12	US 50 EB Ramps	East of Missouri Flat Rd	53	23	50	109
13	Mother Lode Dr	West of Missouri Flat Rd	60	23	49	106
14	Road 2233	East of Missouri Flat Rd	24	0	0	1
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	47	12	25	54
16	Forni Rd	North of Golden Center Dr	51	8	17	37
17	Forni Rd	West of Missouri Flat Rd	57	21	46	99
18	Golden Center Dr	West of Missouri Flat Rd	49	4	9	19
19	China Garden Rd	East of Missouri Flat Rd	56	12	25	55
20	China Garden Rd	West of Missouri Flat Rd	24	0	0	0
21	Industrial Dr	East of Missouri Flat Rd	29	1	1	2
22	Industrial Dr	West of Missouri Flat Rd	52	7	14	31
23	Enterprise Dr	East of Missouri Flat Rd	37	1	1	3
24	Enterprise Dr	West of Missouri Flat Rd	52	6	14	30
25	Pleasant Valley Rd	East of Missouri Flat Rd	65	24	51	109
26	Pleasant Valley Rd	West of Missouri Flat Rd	68	39	85	183
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	50	6	13	28

Source: FHWA-RD-77-108, Flecker Associates. Appendix E-1 contain FHWA Model inputs for existing conditions.

Regulatory Setting: Criteria for Acceptable Noise and Vibration Exposure

Federal

There are no federal noise or vibration criteria which would be directly applicable to this project. However, El Dorado County does not currently have adopted standards for groundborne vibration. As a result, the following federal vibration criteria was applied to the project.

Federal Transit Administration (FTA)

El Dorado County does not currently have adopted standards for groundborne vibration. As a result, the vibration impact criteria developed by the Federal Transit Administration (FTA) were applied to the project. The FTA criteria applicable to damage and annoyance from vibration typically associated with construction activities are presented in Tables 4 and 5.

Table 4
FTA Criteria for Assessing Vibration Damage to Structures

Building Category	Level (VdB)[1]
I. Reinforced-concrete, steel or timber (no plaster)	102
II. Engineered concrete and masonry (no plaster)	98
III. Non-engineered timber and masonry buildings	94
IV. Buildings extremely susceptible to vibration damage	90

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

Source: 2018 FTA Transit Noise and Vibration Impact Assessment Manual, Table 7.5.

Table 5
Groundborne Vibration Impact Criteria for General Assessment

	Impact Levels (VdB)		
Land Use Category	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where vibration would interfere with interior ops.	65[d]	65[d]	65[d]
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

a. "Frequent Events" is defined as more than 70 vibration events of the same source per day.
b. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
c. "Infrequent Events" is defined as fewer than 30 vibration events of the same source per day.
d. This criterion limit is based on levels that are acceptable for most moderately-sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels.

Source: 2018 FTA Transit Noise and Vibration Impact Assessment Manual, Table 6-3.

State of California

California Environmental Quality Act (CEQA)

The State of California has established regulatory criteria that are applicable to this assessment. Specifically, Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. According to Appendix G of the CEQA guidelines, the project would result in a significant noise or vibration impact if the following occur:

A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies?

B. Generation of excessive groundborne vibration or groundborne noise levels?

C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

It should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered significant according to CEQA. Because every physical process creates noise, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

Local

El Dorado County General Plan

The Public Health, Safety, and Noise Element of the El Dorado County General Plan contains the County's noise-related policies. The specific policies which are generally applicable to this project are reproduced below:

Policy 6.5.1.1 Where noise-sensitive land uses are proposed in areas exposed to existing or projected exterior noise levels exceeding the levels specified in Table 6 (General Plan Table 6-1) or the performance standards of Table 7 (General Plan Table 6-2), an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

Policy 6.5.1.2 Where proposed non-residential land uses are likely to produce noise levels exceeding the performance standards of Table 7 at existing or planned noise-sensitive uses, an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design.

Policy 6.5.1.3 Where noise mitigation measures are required to achieve the standards of Tables 6 and Table 7, the emphasis of such measures shall be placed upon site planning and project design. The use of noise barriers shall be considered a means of achieving the noise standards only after all other practical design-related noise mitigation measures have been integrated into the project and the noise barriers are not incompatible with the surroundings.

Policy 6.5.1.7 Noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of Table 7 for noise-sensitive uses.

Policy 6.5.1.8 New development of noise sensitive land uses will not be permitted in areas exposed to existing or projected levels of noise from transportation noise

sources which exceed the levels specified in Table 6 unless the project design includes effective mitigation measures to reduce exterior noise and noise levels in interior spaces to the levels specified in Table 6.

Policy 6.5.1.9 Noise created by new transportation noise sources, excluding airport expansion but including roadway improvement projects, shall be mitigated so as not to exceed the levels specified in Table 6 at existing noise-sensitive land uses.

Policy 6.5.1.11 The standards outlined in Tables 8, 9 and 10 (General Plan Tables 6-3, 6-4, 6-5) shall not apply to those activities associated with actual construction of a project as long as such construction occurs between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday, and 8:00 a.m. and 5:00 p.m. on weekends, and on federally-recognized holidays. Further, the standards outlined in Tables 8 through 10 shall not apply to public projects to alleviate traffic congestion and safety hazards.

Policy 6.5.1.12 When determining the significance of impacts and appropriate mitigation for new development projects, the following criteria shall be taken into consideration:

a) Where existing or projected future traffic noise levels are less than 60 dB L_{dn} at the outdoor activity areas of residential uses, an increase of more than 5 dBA L_{dn} caused by a new transportation noise source will be considered significant.

b) Where existing or projected future traffic noise levels range between 60 and 65 dBA L_{dn} at the outdoor activity areas of residential uses, an increase of more than 3 dBA L_{dn} caused by a new transportation noise source will be considered significant; and

c) Where existing or projected future traffic noise levels are greater than 65 dBA L_{dn} at the outdoor activity areas of residential uses, an increase of more than 1.5 dBA L_{dn} caused by a new transportation noise source will considered significant.

Policy 6.5.1.13 When determining the significance of impacts and appropriate mitigation for new development projects, the following criteria shall be taken into consideration:

a) In areas in which ambient noise levels are in accordance with the standards in Table 7, increases in ambient noise levels caused by new non-transportation noise sources that exceed 5 dBA shall be considered significant; and

b) In areas in which ambient noise levels are <u>not</u> in accordance with the standards in Table 6, increases in ambient noise levels caused by new non-

transportation noise sources that exceed 3 dBA shall be considered significant.

Table 6
Maximum Allowable Noise Exposure for Transportation Noise Sources

Land Use	Outdoor Activity Areas[1] DNL/CNEL, dB	Interior Spaces	
		DNL/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient Lodging	60[3]	45	--
Hospitals, Nursing Homes	60[3]	45	--
Theaters, Auditoriums, Music Halls	--	--	35
Churches, Meeting Halls, Schools	60[3]	--	40
Office Buildings	--	--	45
Libraries, Museums	--	--	45
Playgrounds, Neighborhood Parks	70	--	--

[1] In Community Regions and Rural Centers, where the location of outdoor activity areas is not clearly defined, the exterior noise level standard shall be applied to the property line of the receiving land use. For residential uses with front yards facing the identified noise source, an exterior noise level criterion of 65 dB DNL shall be applied at the building facade, in addition to a 60 dB DNL criterion at the outdoor activity area. In Rural Regions, an exterior noise level criterion of 60 dB DNL shall be applied at a 100 foot radius from the residence unless it is within Platted Lands where the underlying land use designation is consistent with Community Region densities in which case the 65 dB DNL may apply. The 100-foot radius applies to properties which are five acres and larger; the balance will fall under the property line requirement.

[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 60 dB DNL/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB DNL/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

Source: El Dorado County General Plan, Public Health & Safety Element, Table 6-1.

Table 7
Noise Level Performance Protection Standards for Noise-Sensitive Land Uses Affected by Non-Transportation Sources

	Daytime 7 am – 7 pm		Evening 7 pm – 10 pm		Nighttime 10 pm – 7 am	
Noise Level Descriptor	Community	Rural	Community	Rural	Community	Rural
Hourly, L_{eq}	55	50	50	45	45	40
Maximum, L_{max}	70	60	60	55	55	50

-Each of the noise levels specified above shall be lowered by five dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings).

-The County can impose noise level standards which are up to 5 dB less than those specified above based upon determination of existing low ambient noise levels in the vicinity of the project site.

-In Community Regions the exterior noise level standard shall be applied to the property line of the receiving property. In Rural Areas the exterior noise level standard shall be applied at a point 100' away from the residence. The above standards shall be measured only on property containing a noise-sensitive land use as defined in Objective 6.5.1.

Source: El Dorado County General Plan, Public Health & Safety Element, Table 6-2.

Table 8
Maximum Allowable Noise Exposure for Non-Transportation Noise Sources in Community Regions and Adopted Plan Areas – Construction Noise

Land Use Designation[1]	Time Period	Noise Level (dB)	
		L_{eq}	L_{max}
Higher-Density Residential (MFR, HDR, MDR)	7 am – 7 pm	55	75
	7 pm – 10 pm	50	65
	10 pm – 7 am	45	60
Commercial and Public Facilities (C, R&D, PF)	7 am – 7 pm	70	90
	10 pm – 7 am	65	75
Industrial (I)	Any Time	80	90

[1] Adopted Plan areas should refer to those land use designations that most closely correspond to the similar General Plan land use designations for similar development.

Source: El Dorado County General Plan, Public Health & Safety Element, Table 6-3.

Table 9
Maximum Allowable Noise Exposure for Non-Transportation Noise Sources in Rural Centers – Construction Noise

Land Use Designation	Time Period	Noise Level (dB)	
		L_{eq}	L_{max}
All Residential (MFR, HDR, MDR)	7 am – 7 pm	55	75
	7 pm – 10 pm	50	65
	10 pm – 7 am	40	55
Commercial and Public Facilities (C, TR, PF)	7 am – 7 pm	65	75
	10 pm – 7 am	60	70
Industrial (I)	Any Time	70	80
Open Space (OS)	7 am – 7 pm	55	75
	7 pm – 10 pm	50	65

Source: El Dorado County General Plan, Public Health & Safety Element, Table 6-4.

Table 10
Maximum Allowable Noise Exposure for Non-Transportation Noise Sources in Rural Regions and Adopted Plan Areas – Construction Noise

Land Use Designation	Time Period	Noise Level (dB)	
		L_{eq}	L_{max}
All Residential (LDR)	7 am – 7 pm	50	60
	7 pm – 10 pm	45	55
	10 pm – 7 am	40	50
Commercial and Public Facilities (C, TR, PF)	7 am – 7 pm	65	75
	10 pm – 7 am	60	70
Industrial (I)	Any Time	70	80
Rural Land, Natural Resources, Open Space, Agricultural Lands (RR, NR, OS, AL)	7 am – 7 pm	65	75
	7 pm – 10 pm	60	70

Source: El Dorado County General Plan, Public Health & Safety Element, Table 6-5.

According to Figure LU-1 of the El Dorado County General Plan (Land Use Diagram), the project property and adjacent properties are located within a community region of the county. As a result, the noise level limits and associated criteria applicable to community regions identified in Tables 7 and 8 would be applicable to the project.

Impacts and Mitigation Measures

Thresholds of Significance

For the purposes of this assessment, noise and vibration impacts are considered significant if the project would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies; or

- Generation of excessive groundborne vibration or groundborne noise levels; or

- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

The project site is not within the vicinity of a private airstrip, an airport land use plan, or within two miles of a public airport. Therefore, the last threshold listed above is not discussed further.

The following criteria based on standards established by the Federal Transit Administration (FTA) and El Dorado County General Plan were used to evaluate the significance of environmental noise and vibration resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the El Dorado County General Plan.

- A significant impact would be identified if off-site traffic or on-site commercial operations noise levels generated by the project would substantially increase noise levels at existing sensitive receptors in the vicinity. A substantial increase would be identified relative to the noise level increase significance criteria established in Policies 6.5.1.12 (transportation noise sources, applicable to project-generated off-site traffic) and 6.2.1.13 (non-transportation noise sources, applicable to on-site commercial operations) of the El Dorado County General Plan.

  In terms of determining the temporary noise increase due to project on-site construction activities at existing sensitive receptors in the vicinity, an impact would occur if those activities would noticeably increase ambient noise levels above background levels at those locations. The threshold of perception of the human ear is approximately 3 to 5 dB – a 5 dB change is considered to be clearly noticeable. For the analysis of project on-site

construction activity noise level increases at existing sensitive receptors, a noticeable increase in ambient noise levels is assumed to occur where those activities would result in an increase by 5 dB or more over existing ambient noise levels.

- A significant impact would be identified if project construction activities or proposed on-site operations would expose sensitive receptors to excessive groundborne vibration levels. Specifically, an impact would be identified if groundborne vibration levels due to these sources would exceed the FTA vibration impact criteria presented in this report.

Noise Impacts Associated with Project-Generated Increases in Off-Site Traffic

With development of the project, 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 at existing uses located along those roadways. The FHWA Model was used with traffic input data from the project transportation consultant (Flecker Associates) to predict project traffic noise level increases relative to existing and future project and no project conditions.

Impact 1: Increases in Existing Off-Site Traffic Noise Levels due to the Project

The FHWA Traffic Noise Model (FHWA-RD-77-108) was used to quantify increases in existing traffic noise levels at the existing sensitive land uses nearest to the project area roadway network. The FHWA Model predicts hourly L_{eq} values for free-flowing traffic conditions. Estimates of the hourly distribution of traffic for a typical 24-hour period were used to develop DNL values from L_{eq} values.

Traffic data in the form of peak hour intersection turning movements were obtained from the traffic impact analysis prepared by the project transportation consultant (Flecker Associates). Those data were converted to Average Daily Traffic (ADT) segment volumes by applying a factor of 5 to the sum of AM and PM peak hour conditions. Other inputs were obtained from BAC observations and noise measurement data. Appendices E-1 and E-2 contain the FHWA Model inputs for existing and existing plus project conditions, respectively. The existing and existing plus project traffic noise levels at the distances representing the nearest noise-sensitive land uses to the project area roadways are summarized in Table 11. Table 11 also shows the thresholds for determination of a significant traffic noise increase, whether the roadway segment contains sensitive uses, and whether or not significant noise impacts are identified for each segment.

It should be noted that the FHWA Model predictions presented in Table 11 are based on inputs that include weekday peak hour traffic volumes, day/night and truck type percentages (e.g., medium and heavy trucks), vehicle speed, and distance from roadway centerlines. The FHWA Model does not account for non-traffic ambient noise sources such as nearby wildlife (e.g., birds chipping) or other anthropogenic noise sources within an area (e.g., distant traffic from other roadways, recreational activities, commercial or industrial operations, etc.).

Table 11
Predicted Traffic Noise Level Increases at Existing Noise-Sensitive Receptors – Existing vs. Existing Plus Project Conditions

#	Roadway	Segment Description	Predicted DNL (dB)			Significance Threshold[1]	Threshold Exceeded?	Sensitive Receptors Present?[2]	Significant Impact Identified?[3]
			Existing	Existing +Project	Increase				
1	Missouri Flat Rd	North of US 50 WB Ramps	62.9	63.4	0.5	3.0	No	Yes	No
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	54.1	54.6	0.5	5.0	No	Yes	No
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	54.5	54.9	0.5	5.0	No	Yes	No
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	65.2	65.3	0.1	1.5	No	Yes	No
5	Missouri Flat Rd	Road 2233 to Forni Rd	60.7	60.7	0.1	3.0	No	Yes	No
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	66.2	66.3	0.1	1.5	No	No	No
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	63.8	63.9	0.1	3.0	No	Yes	No
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	58.3	58.4	0.1	5.0	No	Yes	No
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	57.0	57.1	0.1	5.0	No	Yes	No
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	58.9	59.0	0.1	5.0	No	Yes	No
11	US 50 WB Ramps	West of Missouri Flat Rd	52.7	52.8	0.0	5.0	No	Yes	No
12	US 50 EB Ramps	East of Missouri Flat Rd	53.4	53.5	0.1	5.0	No	Yes	No
13	Mother Lode Dr	West of Missouri Flat Rd	60.4	60.5	0.1	3.0	No	Yes	No
14	Road 2233	East of Missouri Flat Rd	67.0[4]	42.3	0.0	1.5	No	Yes	No
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	46.9	47.7	0.8	5.0	No	Yes	No
16	Forni Rd	North of Golden Center Dr	50.8	51.0	0.2	5.0	No	Yes	No
17	Forni Rd	West of Missouri Flat Rd	57.3	57.4	0.1	5.0	No	Yes	No
18	Golden Center Dr	West of Missouri Flat Rd	49.1	49.1	0.0	5.0	No	No	No
19	China Garden Rd	East of Missouri Flat Rd	56.1	56.1	0.1	5.0	No	Yes	No
20	China Garden Rd	West of Missouri Flat Rd	24.0	24.0	0.0	5.0	No	No	No
21	Industrial Dr	East of Missouri Flat Rd	29.5	29.5	0.0	5.0	No	Yes	No
22	Industrial Dr	West of Missouri Flat Rd	52.3	52.3	0.0	5.0	No	No	No
23	Enterprise Dr	East of Missouri Flat Rd	36.7	38.1	1.4	5.0	No	No	No
24	Enterprise Dr	West of Missouri Flat Rd	52.1	52.1	0.0	5.0	No	No	No
25	Pleasant Valley Rd	East of Missouri Flat Rd	65.1	65.2	0.1	1.5	No	Yes	No
26	Pleasant Valley Rd	West of Missouri Flat Rd	68.4	68.5	0.1	1.5	No	Yes	No
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	50.2	50.9	0.7	5.0	No	Yes	No

[1] Significance thresholds established in General Plan Policy 6.5.12.
[2] Sensitive receptors identified as existing residential and school uses.
[3] A significant impact is identified only along segments where the project-related traffic noise level increase would exceed threshold AND where sensitive receptors are present along the roadway segment.
[4] Based on the provided traffic data, an ADT of 20 vehicles is calculated on roadway segment 14 (Appendix E-1). Based on 20 ADT, the FHWA Model predicts a traffic noise level of approximately 24 dB DNL at the nearest existing sensitive receptor along the roadway segment (150 feet from centerline). However, the results from the ambient noise survey at BAC site LT-1 indicate an existing DNL of 67 dB near that same existing sensitive receptor along segment 14 (Table 1). Based on an existing measured ambient traffic noise level of 67 dB DNL at the existing receptor along segment 14 (Table 21), and a calculated existing plus project traffic noise level of 42.3 dB DNL (Table 11), no project-related increase in traffic noise levels would occur along this segment.

Source: FHWA-RD-77-108 with inputs from Flecker Associates. Appendices E-1 & E-2 contain FHWA Model inputs.

As stated previously, the FHWA Model does not account for non-traffic ambient noise sources such as nearby wildlife or other anthropogenic noise sources within an area. Consideration of such sources typically results in higher ambient noise levels (i.e., existing no project) than those predicted by the FHWA Model alone. Based on the analysis presented in Table 11, which includes consideration of measured existing ambient noise conditions within the project area (as footnoted in the table), off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Existing versus Existing Plus Project conditions) are identified as being ***less than significant***.

Impact 2: Increases in Future Off-Site Traffic Noise Levels due to the Project

The FHWA Traffic Noise Model (FHWA-RD-77-108) was used to quantify increases in existing traffic noise levels at the existing sensitive land uses nearest to the project area roadway network. The FHWA Model predicts hourly L_{eq} values for free-flowing traffic conditions. Estimates of the hourly distribution of traffic for a typical 24-hour period were used to develop DNL values from L_{eq} values.

Traffic data in the form of peak hour intersection turning movements were obtained from the traffic impact analysis prepared by the project transportation consultant (Flecker Associates). Those data were converted to Average Daily Traffic (ADT) segment volumes by applying a factor of 5 to the sum of AM and PM peak hour conditions. Other inputs were obtained from BAC observations and noise measurement data. Appendices E-3 and E-4 contain the FHWA Model inputs for future and future plus project conditions, respectively. The future and future plus project traffic noise levels at the distances representing the nearest noise-sensitive land uses to the project area roadways are summarized in Table 12. Table 12 also shows the thresholds for determination of a significant traffic noise increase, whether the roadway segment contains sensitive uses, and whether or not significant noise impacts are identified for each segment.

It should be noted that the FHWA Model predictions presented in Table 12 are based on inputs that include weekday peak hour traffic volumes, day/night and truck type percentages (e.g., medium and heavy trucks), vehicle speed, and distance from roadway centerlines. The FHWA Model does not account for non-traffic ambient noise sources such as nearby wildlife (e.g., birds chipping) or other anthropogenic noise sources within an area (e.g., distant traffic from other roadways, recreational activities, commercial or industrial operations, etc.).

Table 12
Predicted Traffic Noise Level Increases at Existing Noise-Sensitive Receptors – Future vs. Future Plus Project Conditions

#	Roadway	Segment Description	Predicted DNL (dB) Future	Future +Project	Increase	Significance Threshold[1]	Threshold Exceeded?	Sensitive Receptors Present?[2]	Significant Impact Identified?[3]
1	Missouri Flat Rd	North of US 50 WB Ramps	63.3	63.3	0.0	3.0	No	Yes	No
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	54.6	54.7	0.1	5.0	No	Yes	No
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	55.2	55.3	0.1	5.0	No	Yes	No
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	65.9	66.0	0.1	1.5	No	Yes	No
5	Missouri Flat Rd	Road 2233 to Forni Rd	61.2	61.3	0.1	3.0	No	Yes	No
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	67.1	67.2	0.1	1.5	No	No	No
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	64.9	65.0	0.1	3.0	No	Yes	No
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	58.5	58.5	0.1	5.0	No	Yes	No
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	57.0	57.1	0.1	5.0	No	Yes	No
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	58.7	58.8	0.1	5.0	No	Yes	No
11	US 50 WB Ramps	West of Missouri Flat Rd	53.1	53.3	0.1	5.0	No	Yes	No
12	US 50 EB Ramps	East of Missouri Flat Rd	53.9	53.9	0.0	5.0	No	Yes	No
13	Mother Lode Dr	West of Missouri Flat Rd	57.6	57.8	0.2	5.0	No	Yes	No
14	Road 2233	East of Missouri Flat Rd	70.0[4]	42.2	0.0	1.5	No	Yes	No
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	46.5	47.5	0.9	5.0	No	Yes	No
16	Forni Rd	North of Golden Center Dr	51.2	51.3	0.2	5.0	No	Yes	No
17	Forni Rd	West of Missouri Flat Rd	58.5	58.5	0.1	5.0	No	Yes	No
18	Golden Center Dr	West of Missouri Flat Rd	49.7	49.7	0.0	5.0	No	No	No
19	China Garden Rd	East of Missouri Flat Rd	55.5	55.5	0.0	5.0	No	Yes	No
20	China Garden Rd	West of Missouri Flat Rd	29.5	29.5	0.0	5.0	No	No	No
21	Industrial Dr	East of Missouri Flat Rd	29.6	29.6	0.0	5.0	No	Yes	No
22	Industrial Dr	West of Missouri Flat Rd	52.7	52.7	0.0	5.0	No	No	No
23	Enterprise Dr	East of Missouri Flat Rd	38.8	38.8	0.0	5.0	No	No	No
24	Enterprise Dr	West of Missouri Flat Rd	52.7	53.6	0.9	5.0	No	No	No
25	Pleasant Valley Rd	East of Missouri Flat Rd	64.8	64.8	0.0	3.0	No	Yes	No
26	Pleasant Valley Rd	West of Missouri Flat Rd	69.1	69.1	0.1	1.5	No	Yes	No
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	51.4	51.4	0.0	5.0	No	Yes	No
28	Diamond Springs Pkwy	East of Missouri Flat Rd	63.8	63.9	0.1	3.0	No	No	No
29	Missouri Flat Rd	North of Diamond Springs Pkwy	42.6	42.2	-0.4	5.0	No	No	No

[1] Significance thresholds established in General Plan Policy 6.5.12.
[2] Sensitive receptors identified as existing residential and school uses.
[3] A significant impact is identified only along segments where the project-related traffic noise level increase would exceed threshold AND where sensitive receptors are present along the roadway segment.
[4] Based on the provided traffic data, an ADT of 0 vehicles is calculated on roadway segment 14 (Appendix E-3). The results from the ambient noise survey at BAC site LT-1 indicate an existing DNL of 67 dB at the nearest existing sensitive receptor along segment 14 (Table 1). Assuming a future no project ambient noise level of 70 dB DNL (increase of 3 dB relative to measured existing conditions, representing a doubling of traffic on adjacent roadways), and a calculated future plus project traffic noise level of 42.2 dB DNL (Table 12), no project-related increase in traffic noise levels would occur along this segment.

Source: FHWA-RD-77-108 with inputs from Flecker Associates. Appendices E-3 & E-4 contain FHWA Model inputs.

As stated previously, the FHWA Model does not account for non-traffic ambient noise sources such as nearby wildlife or other anthropogenic noise sources within an area. Consideration of such sources typically results in higher ambient noise levels (i.e., future no project) than those predicted by the FHWA Model alone. Based on the analysis presented in Table 12, which includes consideration of an assumed future no project ambient traffic noise level based on measured existing ambient noise conditions within the project area (as footnoted in the table), off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Future versus Future Plus Project conditions) are identified as being ***less than significant***.

Off-Site Noise Impacts Associated with Project On-Site Operations

The project proposes the development of a combination convenience store (c-store)/fueling station, car wash tunnel and vehicle vacuum systems, and two retail buildings (one consisting of a combination retail/quick serve restaurant with drive-through services). Noise generated by those operations were quantified through a combination of reference noise level data and application of accepted noise modeling techniques.

The primary on-site noise sources associated with the car wash component of the project have been identified as the drying assembly (used for drying the vehicles at the end of the wash cycle) and vacuum system operations. The most significant on-site noise sources associated with the proposed c-store/fueling station and retail components of the project include on-site passenger vehicle circulation, delivery truck circulation (i.e., medium and heavy truck passbys), truck delivery activities (i.e., loading and unloading of product at convenience storefront), air/water unit, and mechanical equipment (HVAC). Finally, the most significant noise sources associated with quick serve restaurant (QSR) drive-through operations include the amplified menu speaker board and vehicle idling/passbys.

The following section includes impact discussions for each of the above-identified on-site project noise sources at the nearest identified existing noise-sensitive uses – residential to the northwest and north the project.

Impact 3: On-Site Vehicle Circulation Noise at Nearby Existing Noise-Sensitive Uses

According to the project site plan, passenger vehicle access points to the project property will be located off Missouri Flat Road and Forni Road. The locations of the passenger vehicle access points are shown in Figure 2. To quantify on-site traffic circulation noise levels at nearby noise-sensitive uses, BAC utilized the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) with trip generation data contained in the project transportation impact study prepared by Flecker Associates. According to that data, the c-store/fueling station and car wash component of the project is estimated to generate a total of 1,933 daily passby trips, with 120 AM peak hour trips and 134 PM peak hour trips. Assuming on-site passenger vehicle speeds of less than 20 mph, and reasonably assuming that 50% of worst-case estimated peak hour vehicle trips could occur at a project area access point nearest to a residential use during any hour of a given 24-hour period, project on-site passenger vehicle circulation noise exposure at nearby existing residential uses was calculated and the results of those calculations are presented in Tables 13 and 14.

Table 13
On-Site Vehicle Circulation Noise at Nearest Existing Residential Uses – Hourly L_{eq}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	41	**55**	**50**	**45**
Residential – North	38			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from nearest on-site circulation route to residential property line.

Source: BAC 2023.

Table 14
On-Site Vehicle Circulation Noise at Nearest Existing Residential Uses – Maximum L_{max}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{max} (dB)[2,3]	County Community Noise Standards, L_{max} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	41	**70**	**60**	**55**
Residential – North	38			

[1] Residential locations are shown in Figure 1.
[2] Predicted Lmax noise level projected from nearest on-site circulation route to residential property line.
[3] Predicted Lmax noise level conservatively assumed to be 10 dB higher that predicted hourly average noise level.

Source: BAC 2023.

As indicated in Tables 13 and 14, project on-site passenger circulation noise levels are predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the nearest residential uses.

Table 1 of this report contains the results from the BAC long-term ambient noise surveys at sites LT-1 and LT-2, which are believed to be representative of the existing ambient noise environment at the closest noise-sensitive uses (residential to northwest and north of the project). Using the lowest average measured hourly noise levels during the surveys, ambient plus project on-site passenger vehicle circulation noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to be less than 0.1 dB L_{eq}/L_{max}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from less than 0.1 to 0.1 dB L_{eq}/L_{max}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from less than 0.1 to 0.1 dB L_{eq}/L_{max}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project on-site passenger vehicle noise level exposure is predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average and maximum noise level standards at nearby existing residential uses, and because increases in ambient noise levels resulting from those activities are not expected to exceed the applicable

impact significance criteria contained in General Plan Policy 6.5.1.13 at those uses, this impact is identified as being ***less than significant***.

Impact 4: Vacuum System Noise at Nearby Existing Noise-Sensitive Uses

The project applicant proposes the installation of central vacuum piping systems offered by Vacutech (powered by turbine producers). According to the project site plan, at total of 14 vacuum bays are proposed south of the vehicle fueling area. The location of the vacuum area is identified in Figure 2.

The provided site plans indicate that the noise-generating vacuum turbine producers will be contained within 6-foot-tall solid masonry enclosures. Based on BAC's experience and field observations with similarly configured car washes, noise impacts due to the operation of the vacuum turbine producer are not expected due to the screening provided by the 6' solid masonry enclosures. As a result, no further analysis would be warranted for the vacuum turbine producers.

Based on noise level measurements conducted by BAC staff at recently completed car wash projects, the primary noise-generating aspects of central vacuum piping systems are use of the suction nozzles located at each of the stalls – specifically, noise associated with active suction nozzles hanging off nozzle hangers. Reference sound level data obtained from the proposed vacuum system manufacturer (Vacutech) is provided as Appendix F. The sound level data provided in Appendix F show measured and projected sound levels from 19 vacuum hoses off their respective nozzle hangers at distances ranging from 45 to 85 feet.

For the purposes of this analysis, it was conservatively assumed that all proposed vacuum suction nozzles would be in concurrent operation (worst-case noise exposure). Based on the manufacturer sound level data in Appendix F and the operations assumptions above, and assuming standard spherical spreading loss (-6 dB per doubling of distance from a stationary source), worst-case project vacuum equipment noise exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Table 15.

Table 15
Predicted Vacuum System Noise Levels at Nearest Existing Residential Uses

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	38	**55**	**50**	**45**
Residential – North	40			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from effective noise center of vacuum area to residential property line.

Source: BAC 2023.

Table 15 data indicate that project vacuum system noise levels are predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project vacuum system noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to be less than 0.1 dB L_{eq}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from less than 0.1 to 0.1 dB L_{eq}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from less than 0.1 to 0.2 dB L_{eq}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project vacuum system noise level exposure is predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average noise level standards at nearby existing residential uses, and because increases in ambient noise levels resulting from those activities are not expected to exceed the applicable impact significance criteria contained in General Plan Policy 6.5.1.13 at those uses, this impact is identified as being ***less than significant***.

Impact 5: Air/Water Unit Noise Levels at Nearby Existing Noise-Sensitive Uses

The project proposes the installation and operation of an air/water unit for patron usage. The location of the air/water unit is shown in Figure 2.

To quantify project air/water unit noise for the purpose of this analysis, noise measurements conducted by BAC of an existing unit at an ARCO AM/PM station located at 2998 Foothills Boulevard, Auburn, California on March 18, 2023 were utilized. The results of the BAC effort indicate that the air/water unit noise was measured to have a maximum noise level of approximately 65 dB L_{max} at distance of 10 feet from the equipment. For the purposes of this analysis, it was reasonably assumed that the project air/water unit could be in operation for 30 minutes during a given worst-case busy hour of operations. The resulting hourly average (L_{eq}) would be approximately 3 dB less than the measured maximum (L_{max}) noise level.

Given the operations assumption above, and assuming standard spherical spreading loss (-6 dB per doubling of distance), project air/water unit noise level exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Table 16.

Table 16
Predicted Air/Water Unit Noise Levels at Nearest Existing Residential Uses

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	41	**55**	**50**	**45**
Residential – North	28			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from air/water unit to residential property line.

Source: BAC 2023.

As indicated in Table 16, project air/water unit noise levels are predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average (L_{eq}) noise level standards at the property lines of the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project air/water unit noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to be less than 0.1 dB L_{eq}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from less than 0.1 to 0.1 dB L_{eq}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from less than 0.1 to 0.1 dB L_{eq}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project air water unit noise level exposure is predicted to satisfy the applicable El Dorado County General Plan daytime, evening, and nighttime hourly average noise level standards at nearby existing residential uses, and because increases in ambient noise levels resulting from those operations are not expected to exceed the applicable impact significance criteria contained in General Plan Policy 6.5.1.13 at those uses, this impact is identified as being ***less than significant***.

Impact 6: Car Wash Drying Assembly Noise at Nearby Existing Noise-Sensitive Uses

Based on the experience of Bollard Acoustical Consultants, noise levels generated by car washes are primarily due to the drying portion of the operation. It is the understanding of BAC that the project proposes the installation of twelve (12) Tech 21 (15 HP) dryers manufactured by MacNeil Wash Systems. According to manufacturer's noise specification data sheet (provided as Appendix G), an assembly equipped with twelve (12) dryers generates a noise level of approximately 76 dB L_{max} at a distance of 30 feet from the tunnel exit.

It is the experience of BAC in similarly configured car wash projects that the average car wash cycle is approximately 5 minutes in duration. The dryers would operate during the last 1 minute of the cycle. Therefore, during a worst-case busy hour, the car wash would go through 12 full cycles and the dryers would operate for approximately 12 minutes during that hour. Based on the above operations assumptions, the resulting hourly average (L_{eq}) dryer noise level is calculated to be 69 dB at a distance of 30 feet. For the purposes of this analysis, it was conservatively assumed that the blowers would be in operation for a full hour during a worst-case hour and, therefore, the maximum noise level (L_{max}) would be equivalent to the hourly L_{eq}.

The noise level generation of car wash drying assemblies vary depending on the orientation of the measurement position relative to the tunnel opening. Worst-case drying assembly noise levels occur at a position directly facing the car wash exit, considered to be 0 degrees off-axis. For car wash tunnels that are in excess of 100 feet in length, drying assembly noise levels at the car wash entrance are approximately 10 dB lower than those at the exit. At off-axis positions, the building facade provides varying degrees of noise level reduction. At positions 45 degrees off-axis relative to the facade of the car wash exit and entrance, drying assembly noise levels are

approximately 5 dB lower. At 90 degrees off-axis, drying assembly noise levels are approximately 10 dB lower.

Car wash drying assembly noise level exposure was calculated based on the orientation to tunnel entrance/exit. Noise attenuation due to distance was calculated based on standard spherical spreading loss from a point source (-6 dB per doubling of distance). Car wash drying assembly noise exposure was calculated at the property lines of the nearest existing residential uses and the results of those calculations are presented in Table 17.

Table 17
Predicted Car Wash Drying Assembly Noise Levels at Nearest Existing Residential Uses

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2,3]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	53	**55**	**50**	**45**
Residential – North	54			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from car wash drying assembly equipment to residential property line.
[3] Hourly average (Leq) based on 12 minutes of dryer operation during a worst-case busy hour of operations.

Source: BAC 2023.

Table 17 data indicate that project car wash drying assembly noise levels are predicted to satisfy the applicable El Dorado County General Plan daytime hourly average (L_{eq}) noise level standard at the property lines of the nearest residential uses, but would exceed the County's evening and nighttime hourly average noise level limits at those locations.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project car wash drying assembly noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to range from 0.5 to 1.0 dB L_{eq}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from 1.1 to 1.4 dB L_{eq}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from 1.1 to 2.9 dB L_{eq}. The calculated increases above would be below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project car wash drying assembly noise level exposure is predicted to exceed the County's evening and nighttime hourly average (L_{eq}) noise level standards at the property lines of the closest residential uses, this impact is identified as being **potentially significant**.

Mitigation Impact 6:

To satisfy the El Dorado County General Plan evening hourly average (L_{eq}) noise level standard at the property lines of the closest residential uses, and to reduce the potential for an exceedance of the General Plan nighttime hourly average (L_{eq}) noise level standard at those locations, implementation of the following noise mitigation measures would be required:

MM-6A: The construction of a solid noise barriers ranging from 6 to 7 feet-in-height (relative to base elevation of car wash tunnel) at the locations illustrated in Figures 5 and 6. The solid noise barriers could take the form of a masonry wall, earthen berm, or combination of the two. Other materials may be acceptable but should be reviewed by an acoustical consultant prior to construction.

MM-6B: All car wash tunnel operations shall be restricted during nighttime hours (10:00 p.m. to 7:00 a.m.).

After implementation of Mitigation Measure 6A (MM-6A), project car wash drying assembly noise levels are calculated to be reduced to 47 and 48 dB L_{eq} at the residential property lines to the northwest and north (respectively), and would satisfy the applicable General Plan evening hourly average (L_{eq}) noise level standard at those locations.

Significance of Impact after Implementation of MM-6A & MM-6B: ***Less than Significant***

Impact 7: QSR Drive-Through Operations Noise at Nearby Existing Sensitive Uses

According to the project site plan, the quick serve restaurant (QSR) will have drive-through services and an amplified menu speaker board. The locations of the QSR/retail building and drive-through lane are shown in Figure 2.

It is the understanding of BAC the specific make/model of amplified menu speaker board is not yet known. To quantify the noise emissions of proposed drive-through speaker usage BAC utilized noise measurement data for a commonly installed menu speaker post model. Specifically, BAC utilized sound level data from a HME SP10 speaker post for the purpose of this analysis. According to the manufacturers noise level data sheet, presented as Appendix H, the HME SP10 speaker post can incorporate automatic volume control (AVC), which adjusts outbound volume based on the ambient noise level environment. For example, assuming an outdoor ambient noise level of 45 dB, the speaker will adjust the volume of the system to 45 dB for a resulting calculated overall sound level of 48 dB at a distance of 4 feet. Assuming the same outdoor ambient noise level of 45 dB, the speaker reference noise level calculates to 72 dB at 4 feet without the AVC option enabled.

For the purpose of this analysis, it was assumed that the HME speaker post would have the AVC option enabled at all times. Because the AVC option output is dependent upon ambient noise level conditions, and because the County establishes noise level criteria during daytime, evening and nighttime hours, the ambient noise levels during those hours must be known or assumed. For the purpose of this analysis, the lowest average measured hourly daytime, evening and nighttime hourly average (L_{eq}) noise levels measured at BAC survey sites LT-1 and LT-2 were utilized as the daytime, evening and nighttime ambient noise levels for the AVC option. Finally, to quantify the noise emissions of the proposed drive-through vehicle passages, BAC utilized noise measurement data collected for similar drive-through operations in the Sacramento area in recent years. BAC file data indicates that drive-through vehicle passbys, including vehicle idling, have average noise levels of approximately 57 dB L_{eq} at a distance of 5 feet.

Using the BAC drive-through vehicle passby data and speaker manufacturer noise level measurements presented above, the provided project site plans (for scaling distances from source to receiver), and assuming standard spherical spreading loss (-6 dB per doubling of distance), project drive-through operations noise exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Tables 18 through 20.

Table 18
Predicted Drive-Through Operations Noise at Nearest Residential Uses – Daytime Hours

	Predicted Noise Level, L_{eq} (dB)[2]		County Community Noise Standard, L_{eq} (dB)
Noise-Sensitive Use[1]	**Speaker[3]**	**Vehicles**	**Daytime**
Residential – Northwest	26	19	**55**
Residential – North	49	47	

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from drive-through lane and speaker area to residential property line.
[3] Predicted Leq assumes AVC speaker option enabled, ambient daytime noise level of 63 dB Leq at Residential Northwest (site LT-1 data), and ambient daytime noise level of 60 dB Leq at Residential North (site LT-2 data).

Source: BAC 2023.

Table 19
Predicted Drive-Through Operations Noise at Nearest Residential Uses – Evening Hours

	Predicted Noise Level, L_{eq} (dB)[2]		County Community Noise Standard, L_{eq} (dB)
Noise-Sensitive Use[1]	**Speaker[3]**	**Vehicles**	**Evening**
Residential – Northwest	22	19	**50**
Residential – North	47	47	

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from drive-through lane and speaker area to residential property line.
[3] Predicted Leq assumes speaker AVC option enabled, ambient evening noise level of 59 dB Leq at Residential Northwest (site LT-1 data), and ambient evening noise level of 58 dB Leq at Residential North (site LT-2 data).

Source: BAC 2023.

Table 20
Predicted Drive-Through Operations Noise at Nearest Residential Uses – Nighttime Hours

	Predicted Noise Level, L_{eq} (dB)[2]		County Community Noise Standard, L_{eq} (dB)
Noise-Sensitive Use[1]	**Speaker[3]**	**Vehicles**	**Nighttime**
Residential – Northwest	22	19	**45**
Residential – North	43	47	

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from drive-through lane and speaker area to residential property line.
[3] Predicted Leq assumes speaker AVC option enabled, ambient nighttime noise level of 59 dB Leq at Residential Northwest (site LT-1 data), and ambient evening noise level of 54 dB Leq at Residential North (site LT-2 data).

Source: BAC 2023.

Tables 18 through 20 data indicate that project drive-through vehicle noise levels are predicted to satisfy the applicable El Dorado County General Plan daytime and evening hourly average (L_{eq}) noise level standards at the property lines of the nearest residential uses, but exceed the County's nighttime hourly average (L_{eq}) noise level limit at the nearest residential property line to the north. Tables 18 through 20 data also indicate that project drive-through speaker post noise levels are predicted to satisfy the General Plan daytime, evening and nighttime hourly average (L_{eq}) noise level standards at the closest residential property lines. The predicted drive-through speaker post compliance assumes the AVC option of the equipment is enabled.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project drive-through operations noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to range from less than 0.1 to 0.3 dB L_{eq}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from less than 0.1 to 0.4 dB L_{eq}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from less than 0.1 to 0.9 dB L_{eq}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

As mentioned above, project drive-through vehicle noise level exposure is predicted to exceed the County's nighttime hourly average (L_{eq}) noise level standard at the property line of the closest residential use to the north. Further, the predicted drive-through speaker post compliance with the General Plan daytime, evening and nighttime noise levels criteria assumes the AVC option of the equipment is enabled. However, should the equipment AVC option of the equipment not be enable during operations, it is possible that project drive-through speaker post noise level exposure could exceed General Plan daytime, evening and nighttime hourly average (L_{eq}) noise level criteria at the nearest residential property lines. Further, it is possible the project drive-through speaker post noise levels could result in significant increases in ambient noise levels at nearby residential uses without the AVC option enabled. Based on the analysis provided above, this impact is identified as being **potentially significant**.

Mitigation Impact 7:

To ensure for satisfaction of the El Dorado County General Plan daytime, evening and nighttime hourly average (L_{eq}) noise level standards at the property lines of the closest residential uses, and to reduce the potential for significant increases in ambient noise levels at those locations, implementation of the following noise mitigation measures would be required:

MM-7A: The drive-through site design should include the installation of the HME SP10 (or equivalent model) speaker post. Additionally, the automatic volume control (AVC) option shall be enabled at all times during speaker operation.

MM-7B: All drive-through operations shall be restricted during nighttime hours (10:00 p.m. to 7:00 a.m.).

Significance of Impact after Implementation of MM-7A & MM-7B: ***Less than Significant***

Impact 8: On-Site Truck Circulation Noise at Nearby Existing Noise-Sensitive Uses

It is the experience of BAC that deliveries of product to c-stores and retail/QSR buildings such as those proposed by the project occur at the front of the store with medium-duty vendor trucks/vans. However, the gas station component will also receive deliveries from heavy fueling trucks for the purpose of refilling the underground storage tanks.

On-site truck passbys are expected to be relatively brief and will occur at low speeds. To predict noise levels generated by on-site truck circulation, BAC utilized file data obtained from measurements conducted by BAC of heavy and medium duty truck passbys. According to BAC file data, single-event heavy truck passby noise levels are approximately 74 dB L_{max} and 83 dB SEL at a reference distance of 50 feet. BAC file data also indicate that single-event medium truck passby noise levels are approximately 66 dB L_{max} and 76 SEL at a reference distance of 50 feet.

For a conservative assessment of daily truck delivery noise levels at the proposed c-store/fueling station and retail/QSR uses, it was assumed that 2 heavy trucks and 4 medium duty trucks/vans could deliver products to the development on a typical busy day. To calculate hourly average (L_{eq}) noise level exposure from on-site truck circulation, it was assumed that the project could have 2 heavy truck and 2 medium duty truck deliveries during the same worst-case hour. Based on a conservative 2 heavy fueling truck and 2 medium truck and trips per hour, and SEL's of 83 and 76 dB SEL per passby, the hourly average noise level generated by project delivery truck circulation computes to 51 dB L_{eq} at a reference distance of 50 feet from the passby route during the worst-case hour of deliveries (maximum noise level of 74 dB L_{max}).

Based on the reference noise level data and operations assumptions above, project on-site truck circulation noise exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Tables 21 and 22.

Table 21
Predicted Truck Circulation Noise Levels at Nearest Existing Residential Uses – Hourly L_{eq}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	51	**55**	**50**	**45**
Residential – North	48			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from nearest on-site truck circulation route to residential property line.

Source: BAC 2023.

Table 22
Predicted Truck Circulation Noise Levels at Nearest Existing Residential Uses – Maximum L_{max}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{max} (dB)[2]	County Community Noise Standards, L_{max} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	74	**70**	**60**	**55**
Residential – North	71			

[1] Residential locations are shown in Figure 1.
[2] Predicted Lmax noise level projected from nearest on-site truck circulation route to residential property line.

Source: BAC 2023.

As shown in Tables 21 and 22, project on-site truck circulation noise levels are predicted to exceed applicable El Dorado County General Plan daytime, evening and nighttime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project on-site truck circulation noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to be 0.3 dB L_{eq} and range from 1.0 to 1.8 dB L_{max}. Additionally, project-generated increases in ambient evening noise levels are calculated to range from 0.4 to 0.7 dB L_{eq} and 0.4 to 2.1 dB L_{max}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from 0.7 to 1.0 dB L_{eq} and 3.5 to 4.8 dB L_{max}. The calculated increases in daytime and evening hourly average and maximum noise levels above would be below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards. However, calculated project-generated increases in nighttime maximum noise levels would exceed the applicable General Plan increase significance criterion of 3 dB.

Because project on-site truck circulation noise level exposure is predicted to exceed the County's daytime, evening and nighttime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the closest residential uses, and because increases in ambient nighttime maximum noise levels associated with those activities are calculated to exceed the applicable General Plan increase significance criterion at those sensitive uses, this impact is identified as being **potentially significant**.

Mitigation Impact 8:

To satisfy the El Dorado County General Plan hourly average (L_{eq}) and maximum (L_{max}) noise level standards at the property lines of the closest residential uses, and to satisfy the applicable General Plan Policy 6.5.1.13 increase significance criterion at those locations, implementation of the following noise mitigation measures would be required:

MM-8A: Implementation of **Mitigation Measure 6A (MM-6A)**, which contains the construction of a solid noise barriers ranging from 6 to 7' in height at the locations illustrated in Figures 5 and 6. The solid noise barriers could take the form of a

masonry wall, earthen berm, or combination of the two. Other materials may be acceptable but should be reviewed by an acoustical consultant prior to construction.

MM-8B: All truck deliveries within the development shall occur during daytime hours only (7:00 a.m. to 7:00 p.m.).

After implementation of Mitigation Measure 8A (MM-8A), project on-site truck circulation noise levels are calculated to be reduced to 45 and 42 dB L_{eq} and 68 and 65 dB L_{max} at the residential property lines to the northwest and north (respectively), and would satisfy the applicable General Plan daytime hourly average (L_{eq}) and maximum (L_{max}) noise level standards at those locations.

Significance of Impact after Implementation of MM-8A & MM-8B: ***Less than Significant***

Impact 9: Truck Delivery Activity Noise Levels at Nearby Existing Noise-Sensitive Uses

As mentioned previously, it is the experience of BAC that deliveries of product to c-stores and retail/QSR uses such as those proposed by the project occur at the front of the buildings with medium-duty vendor trucks/vans. The location of the c-store and QSR buildings are shown in Figure 2. The primary noise sources associated with delivery activities are trucks stopping (air brakes), trucks backing into position (back-up alarms), and pulling away from the loading/unloading area (revving engines).

For a conservative assessment of daily truck delivery noise levels at the project site, it was assumed that 4 medium duty trucks/vans would deliver products to the businesses on a typical busy day. For the purposes of predicting hourly average noise levels (L_{eq}), it was assumed that 2 medium duty trucks could have deliveries during the same worst-case hour.

BAC file data indicate that noise levels associated with medium-duty truck deliveries (including side-step vans) are approximately 76 dB SEL and 66 dB L_{max} at a distance of 100 feet. Based on 2 medium duty truck deliveries during any given hour and an SEL of 76 dB, the hourly average noise level computes to 43 dB L_{eq} at a reference distance of 100 feet during the worst-case busy hour of deliveries (maximum noise level of 66 dB L_{max}). Assuming standard spherical spreading loss (-6 dB per doubling of distance), project truck delivery noise level exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Tables 23 & 24.

Table 23
Predicted Truck Delivery Noise Levels at Nearest Existing Residential Uses – Hourly L_{eq}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	38	**55**	**50**	**45**
Residential – North	43			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from nearest truck delivery area to residential property line.

Source: BAC 2023.

Table 24
Predicted Truck Delivery Noise Levels at Nearest Existing Residential Uses – Maximum L_{max}

Noise-Sensitive Use[1]	Predicted Noise Level, L_{max} (dB)[2]	County Community Noise Standards, L_{max} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	60	**70**	**60**	**55**
Residential – North	66			

[1] Residential locations are shown in Figure 1.
[2] Predicted Lmax noise level projected from nearest truck delivery area to residential property line.

Source: BAC 2023.

Tables 23 and 24 data indicate that project truck delivery noise levels are predicted to exceed applicable El Dorado County General Plan evening and nighttime maximum (L_{max}) noise level standards at the property lines of the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project truck delivery noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to range from less than 0.1 dB to 0.1 L_{eq}/L_{max}. Similarly, project-generated increases in ambient evening noise levels are also calculated to range from less than 0.1 to 0.1 dB L_{eq}/L_{max}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from less than 0.1 to 0.6 dB L_{eq}/L_{max}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project truck delivery noise level exposure is predicted to exceed applicable El Dorado County General Plan evening and nighttime maximum (L_{max}) noise level standards at the property lines of the nearest residential uses, this impact is identified as being **potentially significant**.

Mitigation Impact 9:

To ensure for satisfaction of the El Dorado County General Plan evening and nighttime maximum (L_{max}) noise level standards at the property lines of the closest residential uses, implementation of the following noise mitigation measures would be required:

MM-9: Implementation of **Mitigation Measure 8B (MM-8B)**, which limits all truck deliveries within the development to daytime hours only (7:00 a.m. to 7:00 p.m.).

Significance of Impact after Implementation of MM-9: ***Less than Significant***

Impact 10: C-Store/Retail QSR Building HVAC Noise at Nearby Existing Sensitive Uses

Heating, ventilating, and air conditioning (HVAC) requirements for the proposed c-store and QSR buildings will most likely be met using packaged roof-mounted systems. To generally quantify project HVAC equipment noise exposure, BAC utilized reference file data collected for previous

studies. BAC reference file data for HVAC systems indicate that a 12.5-ton packaged unit can be expected to generate an A-weighted sound power level of 85 dB.

Based on the sound power data and operations assumptions above, and assuming standard spherical spreading loss (-6 dB per doubling of distance), project HVAC equipment noise exposure at the property lines of the nearest existing residential uses was calculated and the results of those calculations are presented in Table 25.

Table 25
Predicted HVAC Equipment Noise Levels at Nearest Existing Residential Uses

Noise-Sensitive Use[1]	Predicted Noise Level, L_{eq} (dB)[2]	County Community Noise Standards, L_{eq} (dB)		
		Daytime	Evening	Nighttime
Residential – Northwest	49	55	50	45
Residential – North	47			

[1] Residential locations are shown in Figure 1.
[2] Predicted Leq noise level projected from nearest building (c-store or retail/QSR) to residential property line.

Source: BAC 2023.

As indicated in Table 25, project HVAC noise levels are predicted to exceed applicable El Dorado County General Plan nighttime hourly average (L_{eq}) noise level standard at the property lines of the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus project HVAC equipment noise level increases were calculated at the closest residential uses. According to the results from that exercise, project-generated increases in ambient daytime noise levels are calculated to be 0.2 dB L_{eq}. Additionally, project-generated increases in ambient evening noise levels are calculated to be 0.4 dB L_{eq}. Finally, project-generated increases in ambient nighttime noise levels are calculated to range from 0.4 to 0.9 dB L_{eq}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because project HVAC equipment noise level exposure is predicted to exceed the County's nighttime hourly average (L_{eq}) noise level standard at the property lines of the closest residential uses, this impact is identified as being **potentially significant**.

Mitigation Impact 10:

To satisfy the El Dorado County General Plan nighttime hourly average (L_{eq}) noise level standard at the property lines of the closest residential uses, implementation of the following noise mitigation measure would be required:

MM-10: Implementation of **Mitigation Measure 6A (MM-6A)**, which contains the construction of a solid noise barriers ranging from 6 to 7' in height at the locations illustrated in Figures 5 and 6. The solid noise barriers could take the form of a

masonry wall, earthen berm, or combination of the two. Other materials may be acceptable but should be reviewed by an acoustical consultant prior to construction.

After implementation of Mitigation Measure 10 (MM-10), project HVAC equipment noise levels are calculated to be reduced to 43 and 41 dB L_{eq} at the residential property lines to the northwest and north (respectively), and would satisfy the applicable General Plan nighttime hourly average (L_{eq}) noise level standard at those locations.

Significance of Impact after Implementation of MM-10: ***Less than Significant***

Impact 11: Cumulative (Combined) Operations Noise at Nearby Existing Sensitive Uses

The calculated cumulative (combined) noise levels from analyzed on-site operations at the property lines of the nearest existing residential uses are presented in Tables 26 through 28. It should be noted that due to the logarithmic nature of the decibel scale, the sum of two noise values which differ by 10 dB equates to an overall increase in noise levels of 0.4 dB. When the noise sources are equivalent, the sum would result in an overall increase in noise levels of 3 dB.

Table 26
Calculated Cumulative On-Site Operations Noise Levels at Nearest Existing Noise-Sensitive Uses – Daytime Hourly L_{eq}

	Predicted Noise Levels, L_{eq} (dB)[1]								
Noise Sensitive Use	On-Site Vehicle Circ.	Vacuum Nozzles	Air/Water Unit	Car Wash Dryers	Drive-Thru[2]	On-Site Truck Circ.	Truck Deliveries	Calculated Cumulative, L_{eq} (dB)[3]	County Community Daytime Noise Standard, L_{eq} (dB)
Residential – NW	35	32	35	47	20	45	32	51	**55**
Residential – N	32	40	22	48	43	42	37	52	

[1] Predicted noise levels include implementation of all mitigation measures identified in this report.
[2] Highest predicted Leq from drive-through operations.
[3] Calculated cumulative (combined) hourly average noise levels from analyzed on-site operations.

Source: BAC 2023.

Table 27
Calculated Cumulative On-Site Operations Noise Levels at Nearest Existing Noise-Sensitive Uses – Evening Hourly L_{eq}

	Predicted Noise Levels, L_{eq} (dB)[1]								
Noise Sensitive Use	On-Site Vehicle Circ.	Vacuum Nozzles	Air/Water Unit	Car Wash Dryers	Drive-Thru[2]	On-Site Truck Circ.	Truck Deliveries	Calculated Cumulative, L_{eq} (dB)[3]	County Community Evening Noise Standard, L_{eq} (dB)
Residential – NW	35	32	35	47	16	--	--	49	**50**
Residential – N	32	40	22	48	41	--	--	51	

[1] Predicted noise levels include implementation of all mitigation measures identified in this report.
[2] Highest predicted Leq from drive-through operations.
[3] Calculated cumulative (combined) hourly average noise levels from analyzed on-site operations.

Source: BAC 2023.

Table 28
Calculated Cumulative On-Site Operations Noise Levels at Nearest Existing Noise-Sensitive Uses – Nighttime Hourly L_{eq}

	Predicted Noise Levels, L_{eq} (dB)[1]								
Noise Sensitive Use	On-Site Vehicle Circ.	Vacuum Nozzles	Air/Water Unit	Car Wash Dryers	Drive-Thru[2]	On-Site Truck Circ.	Truck Deliveries	Calculated Cumulative, L_{eq} (dB)[3]	County Community Nighttime Noise Standard, L_{eq} (dB)
Residential – NW	35	32	35	--	37	--	--	44	**45**
Residential – N	32	40	22	--	37	--	--	47	

[1] Predicted noise levels include implementation of all mitigation measures identified in this report.
[2] Highest predicted Leq from drive-through operations.
[3] Calculated cumulative (combined) hourly average noise levels from analyzed on-site operations.

Source: BAC 2023.

As shown in Table 25, combined noise level exposure from project on-site operations is calculated to satisfy the applicable El Dorado County General Plan daytime hourly average (L_{eq}) noise level standard at the property lines of the nearest residential uses. The calculated compliance includes consideration of implementation of all mitigation measures identified in this report. However, the data contained in Tables 27 and 28 indicate that calculated (mitigated) combined noise level exposure from project on-site operations would exceed the applicable El Dorado County General Plan evening and nighttime hourly average (L_{eq}) noise level standards at the property line of the nearest residential use to the north.

The highest predicted maximum (L_{max}) noise levels from (mitigated) analyzed on-site operations are calculated to range from 65 to 68 dB L_{max} during daytime hours at the nearest residential uses. During evening and nighttime hours, the highest predicted maximum (L_{max}) noise levels from analyzed (mitigated) on-site operations are calculated to range from 42 to 45 dB L_{max} at those sensitive uses. The highest predicted maximum (L_{max}) noise levels from (mitigated) on-site operations above would satisfy the applicable General Plan daytime, evening and nighttime maximum noise level standards at the nearest residential uses.

Using the lowest average measured hourly noise levels during the BAC noise surveys at sites LT-1 and LT-2, ambient plus combined (mitigated) project operations noise level increases were calculated at the closest residential uses. According to the results from that exercise, combined project-generated increases in ambient daytime noise levels are calculated to range from 0.2 to 0.6 dB L_{eq}. Additionally, combined project-generated increases in ambient evening and nighttime noise levels are calculated to range from 0.1 to 0.7 dB L_{eq}. Finally, the increases in ambient daytime, evening and nighttime noise levels associated with highest predicted maximum noise levels from on-site operations are calculated to range from less than 0.1 to 0.5 dB L_{max}. The calculated increases above would be well below the General Plan Policy 6.5.1.13 increase significance criterion of 3 dB, applicable to areas in which ambient noise levels are not in accordance with the Table 7 standards.

Because combined noise level exposure from (mitigated) project on-site operations is calculated to exceed the County's evening and nighttime hourly average (L_{eq}) noise level standards at the property line of the closest residential use to the north, consideration of additional mitigation measures would be warranted. As result, this impact is identified as being **potentially significant**.

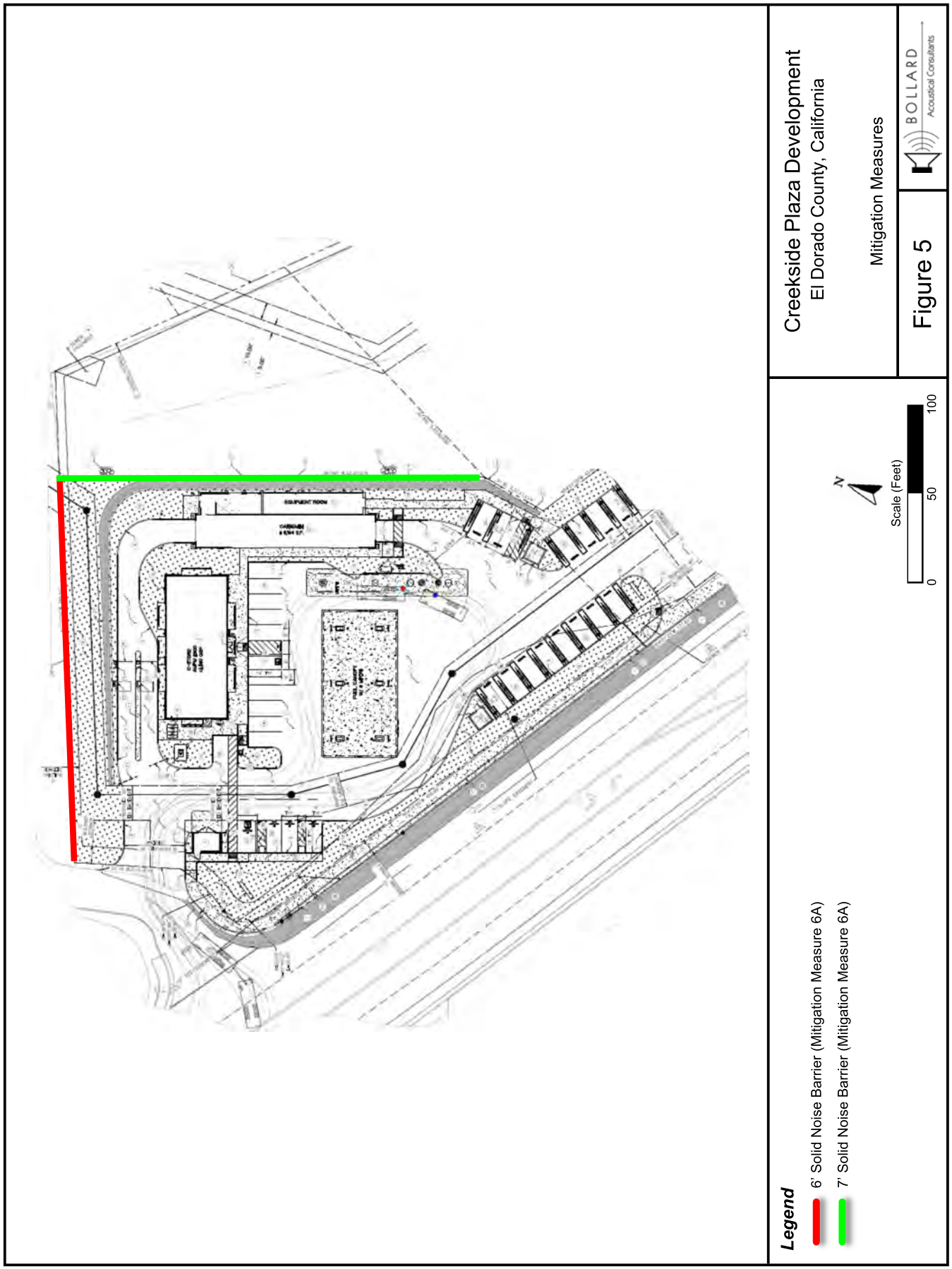
Mitigation Impact 11:

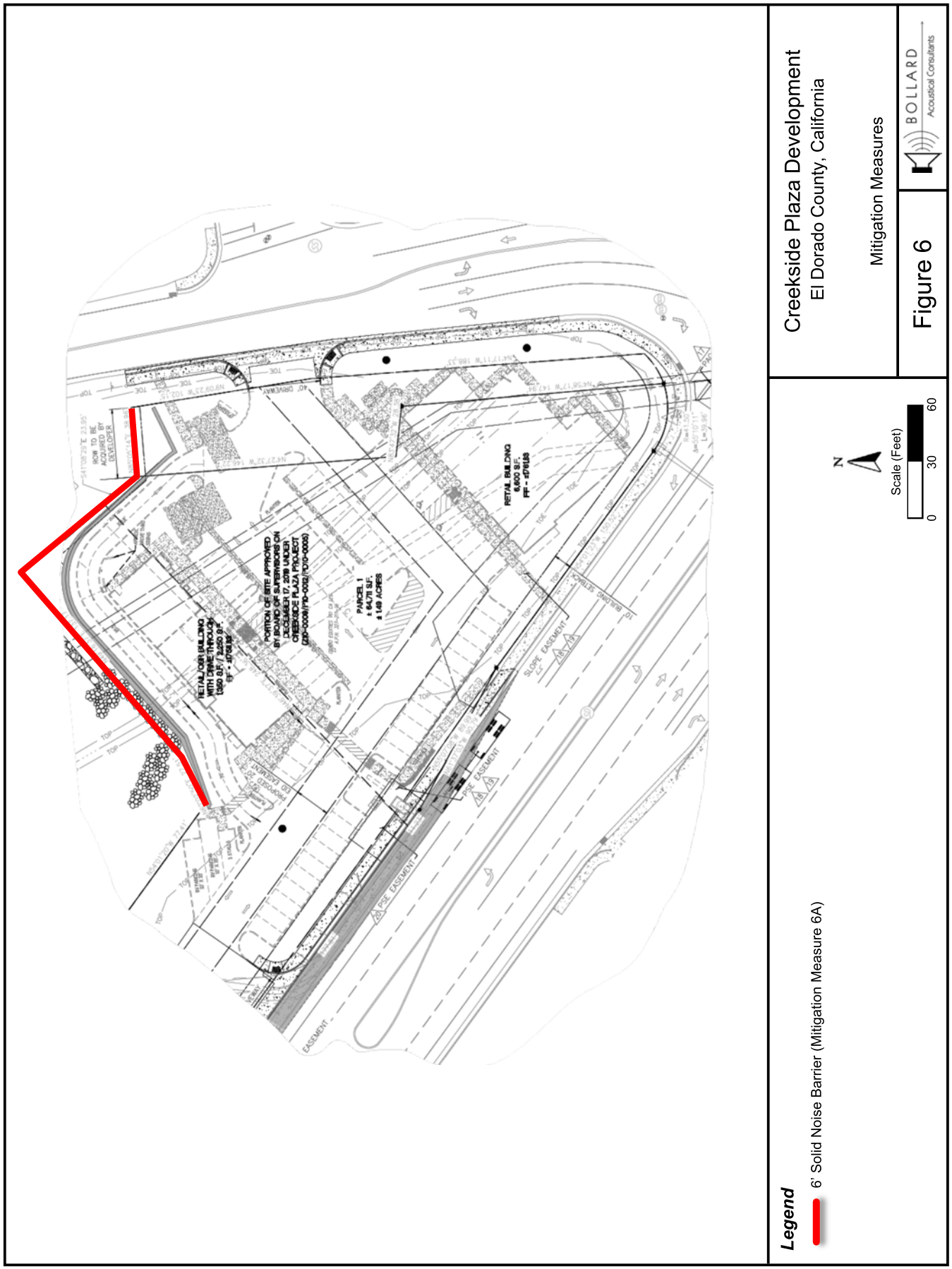
To satisfy the El Dorado County General Plan evening and nighttime hourly average (L_{eq}) noise level standards at the property line of the closest residential use to the north, implementation of the following noise mitigation measure would be required:

MM-11: Project vacuum operations shall be restricted during nighttime hours (10:00 p.m. to 7:00 a.m.).

After implementation of Mitigation Measure 11 (MM-11), combined noise level exposure from on-site operations is calculated to be reduced to 45 dB L_{eq} at the residential use to the north, and would satisfy the General Plan evening and nighttime L_{eq} noise level standards at that location.

Significance of Impact after Implementation of MM-11: ***Less than Significant***


Creekside Plaza Development
El Dorado County, California
Mitigation Measures
Figure 5
BOLLARD
Acoustical Consultants
N
Scale (Feet)
0
50
100
Legend
6' Solid Noise Barrier (Mitigation Measure 6A)
7' Solid Noise Barrier (Mitigation Measure 6A)


Creekside Plaza Development
El Dorado County, California
Mitigation Measures
Figure 6
BOLLARD
Acoustical Consultants
N
Scale (Feet)
0
30
60
Legend
6' Solid Noise Barrier (Mitigation Measure 6A)

Noise Impacts Associated with Project On-Site Construction Activities

Impact 12: On-Site Construction Noise Levels at Nearby 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. Noise levels would vary depending on the type of equipment used, how it is operated, and how well it is maintained. Noise exposure at any single point outside the project work area would also vary depending upon the proximity of equipment activities to that point.

Table 29 includes the range of maximum noise levels for equipment commonly used in general construction projects at full-power operation at a distance of 50 feet. It should be noted that not all of these construction activities would be required of this project. Table 29 data also include predicted maximum equipment noise levels at the property lines of the nearest existing residential uses, which assumes a standard spherical spreading loss of 6 dB per doubling of distance.

Table 29
Reference and Projected Noise Levels for Typical Construction Equipment

Equipment Description	Reference Noise Level at 50 Feet, L_{max} (dB)	Predicted Equipment Noise Level, L_{max} (dB)[1]	
		Residential – Northwest (35 ft)	Residential – North (25 ft)
Air compressor	80	83	86
Backhoe	80	83	86
Ballast equalizer	82	85	88
Ballast tamper	83	86	89
Compactor	82	85	88
Concrete mixer	85	88	91
Concrete pump	82	85	88
Concrete vibrator	76	79	82
Crane, mobile	83	86	89
Dozer	85	88	91
Excavator	85	88	91
Generator	82	85	88
Grader	85	88	91
Impact wrench	85	88	91
Loader	80	83	86
Paver	85	88	91
Pneumatic tool	85	88	91
Pump	77	80	83
Saw	76	79	82
Scarifier	83	86	89
Scraper	85	88	91
Shovel	82	85	88
Spike driver	77	80	83
Tie cutter	84	87	90
Tie handler	80	83	86
Tie inserter	85	88	91
Truck	84	87	90
	Low	79	82
	High	88	91
	Average	85	88

Source: 2018 FTA Transit Noise and Vibration Impact Assessment Manual, Table 7-1.

As noted in the Regulatory Setting Section of this report, Policy 6.5.1.11 of the El Dorado County General Plan exempts noise sources associated with construction provided such activities take place between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday, and 8:00 a.m. and 8:00 p.m. on weekends, and on federally recognized holidays. For the purposes of this analysis, it is reasonably assumed that all noise-generating on-site project construction equipment and activities would occur pursuant to General Plan Policy 6.5.1.11 and would thereby be exempt from County noise level criteria applicable to construction activities.

In terms of determining the temporary noise increase due to project-related construction activities, an impact would occur if construction activity would noticeably increase ambient noise levels above background levels. The threshold of perception of the human ear is approximately 3 to 5 dB – a 5 dB change is considered to be clearly noticeable. For this analysis, a noticeable increase in ambient noise levels is assumed to occur where noise levels increase by 5 dB or more over existing ambient noise levels.

Appendices C & D contains the results from the BAC long-term ambient noise surveys at sites LT-1 and LT-2, which are believed to be representative of the existing ambient noise environments at the closest existing residential uses to the northwest and north (respectively). Using the highest measured hourly daytime maximum noise levels at those sites during the hours in which construction noise is exempted by General Plan Policy 6.5.1.11, and the highest predicted construction equipment maximum noise levels shown in Table 29, ambient plus project construction equipment noise level increases were calculated at the property lines of the closest residential uses. The results of those calculations indicate that the temporary increases in ambient maximum noise levels from project construction activities would range from 4.3 to 4.4 dB L_{max} at the property lines of the closest residential uses. The calculated range of ambient daytime maximum noise level increases is below the applied increase significance criterion of 5 dB.

Based on the analysis provided above, project construction activities are not calculated to result in generation of a substantial temporary or permanent increase in ambient noise levels at the closest existing noise-sensitive uses to the project site. As a result, this impact is identified as being ***less than significant***. Nonetheless, to reduce the potential for annoyance at nearby existing noise-sensitive uses, the following measures should be incorporated into project on-site construction operations:

- All on-site noise-generating construction activities shall occur within the hours and days identified in Policy 6.5.1.11 of the El Dorado County General Plan.
- All noise-producing project equipment and vehicles using internal-combustion engines shall be equipped with manufacturers-recommended mufflers and be maintained in good working condition.
- All mobile or fixed noise-producing equipment used on the project site that are regulated for noise output by a federal, state, or local agency shall comply with such regulations while in the course of project activity.
- Electrically powered equipment shall be used instead of pneumatic or internal-combustion-powered equipment, where feasible.

- Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from noise-sensitive uses.
- Project area and site access road speed limits shall be established and enforced during the construction period.
- Nearby noise-sensitive uses shall be notified of construction schedules so that arrangements can be made, if desired, to limit their exposure to short-term increases in ambient noise levels.

Vibration Impacts Associated with the Project

Impact 13: Vibration Generated by Project Construction and On-Site Operations

During project construction, heavy equipment would be used for grading, excavation, paving, and building construction, which would generate localized vibration in the immediate vicinity of those activities. Table 30 includes the range of vibration levels for equipment commonly used in general construction projects at a distance of 25 feet. Table 30 data also include projected equipment vibration levels at the nearest existing structures to the project area (i.e., residences).

Table 30
Reference and Projected Vibration Source Amplitudes for Construction Equipment

Equipment	Reference Maximum Vibration Level at 25 feet, VdB (rms)	Projected Maximum Vibration Level, VdB (rms)[1]	
		Residence – Northwest (125 ft)	Residence – North (150 ft)
Vibratory Roller	94	69	65
Hoe Ram	87	61	60
Large bulldozer	87	61	60
Caisson drilling	87	61	60
Loaded trucks	86	60	59
Jackhammer	79	58	57
Small bulldozer	58	<55	<55

[1] RMS velocity in decibels (VdB) re 1 micro-inch/second.

Source: 2018 FTA Transit Noise and Vibration Impact Assessment Manual and BAC calculations.

As shown in Table 30, vibration levels generated from on-site construction activities are below the FTA threshold for damage to engineered structures (98 VdB) at a reference distance of 25 feet from those activities. In addition, the construction-related vibration levels shown in Table 30 are projected to range from below the human threshold of perception (65 VdB) to slightly above that threshold (69 VdB) at the nearest residences. However, the highest projected equipment vibration level of 69 VdB at the closest residence is below the strictest FTA criterion of 72 VdB applicable to residential buildings contained in Table 5 of this report. for Based on the analysis provided above, on-site construction within the project area is not expected to result in excessive groundborne vibration levels at nearby existing residences.

During BAC site visits (March 2021), measured vibration levels were below the 65 VdB threshold of perception within the project area (Table 2 of this report). Therefore, it is expected that the

project would not result in the exposure of persons to excessive groundborne vibration levels at proposed uses of the development. Additionally, the project proposes the development of commercial uses. It is the experience of BAC that those uses do not typically have equipment that generates appreciable vibration.

Because vibration levels due to and upon the proposed project are expected to satisfy the applicable FTA groundborne impact vibration criteria, this impact is considered to be ***less than significant***.

This concludes BAC's noise and vibration assessment for the Creekside Plaza ARCO AM/PM Car Wash in El Dorado County, California. Please contact BAC at (916) 663-0500 or dariog@bacnoise.com if you have any comments or questions regarding this report.

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound. A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
IIC	Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition's impact generated noise insulation performance. The field-measured version of this number is the FIIC.
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
STC	Sound Transmission Class (STC): A single-number representation of a partition's noise insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.

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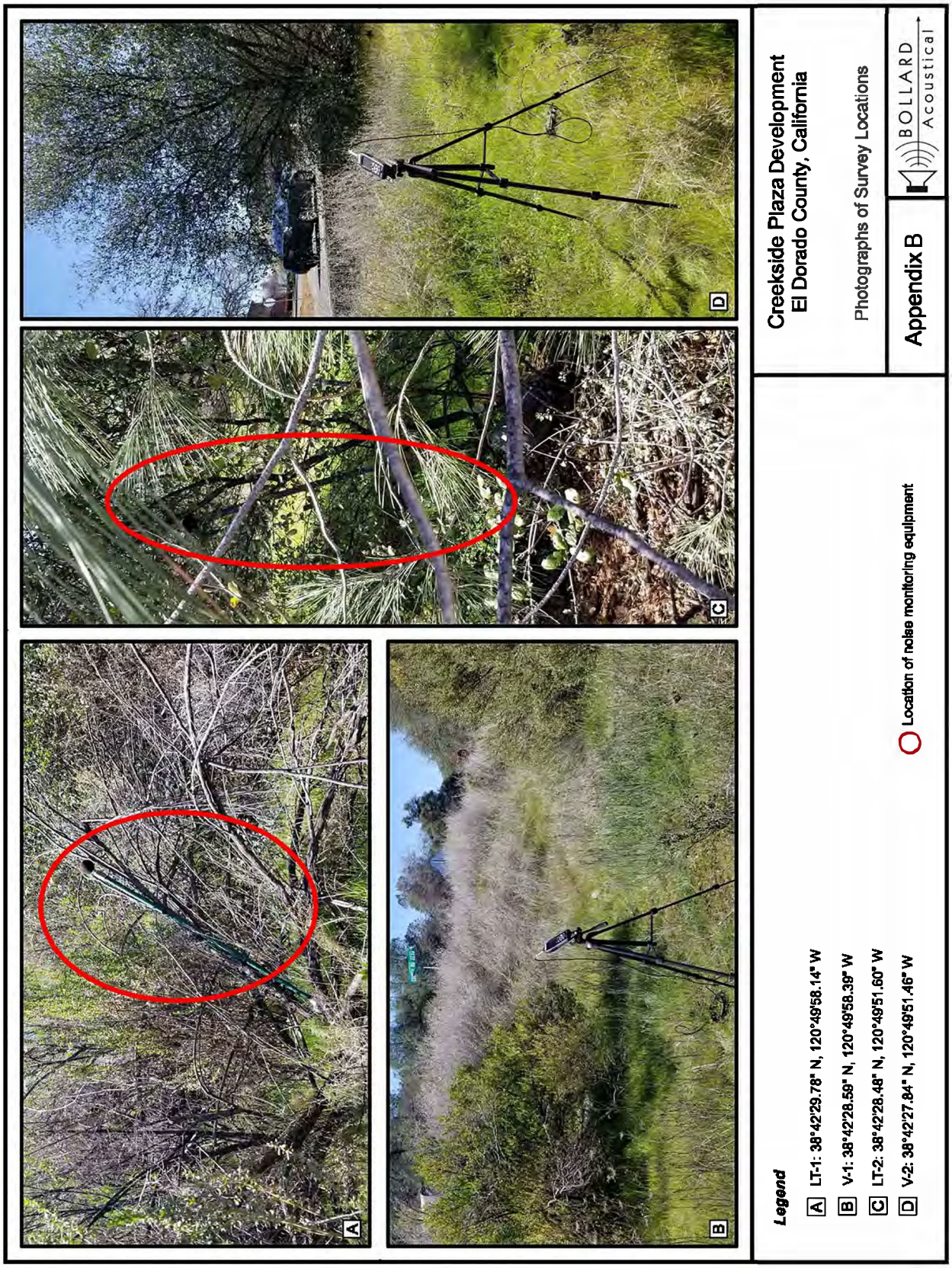
A
B
C
D
Legend
A LT-1: 38°42'29.78" N, 120°49'58.14" W
B V-1: 38°42'28.59" N, 120°49'58.39" W
C LT-2: 38°42'28.48" N, 120°49'51.60" W
D V-2: 38°42'27.84" N, 120°49'51.46" W
Location of noise monitoring equipment
Creekside Plaza Development
El Dorado County, California
Photographs of Survey Locations
Appendix B
BOLLARD Acoustical

Appendix C-1
Long-Term Ambient Noise Monitoring Results - Site LT-1
Creekside Plaza Development - El Dorado County, California
Wednesday, March 24, 2021

Hour	Leq	Lmax	L50	L90
12:00 AM	51	70	40	34
1:00 AM	51	69	38	32
2:00 AM	55	73	44	33
3:00 AM	58	78	51	42
4:00 AM	61	73	58	48
5:00 AM	63	76	62	54
6:00 AM	65	83	64	56
7:00 AM	64	73	63	56
8:00 AM	63	73	62	55
9:00 AM	63	82	62	55
10:00 AM	62	77	61	53
11:00 AM	62	76	61	54
12:00 PM	62	74	61	54
1:00 PM	63	77	62	55
2:00 PM	63	75	63	56
3:00 PM	64	83	63	55
4:00 PM	64	78	63	57
5:00 PM	63	79	61	55
6:00 PM	62	84	61	54
7:00 PM	61	80	59	52
8:00 PM	59	78	56	49
9:00 PM	57	70	54	43
10:00 PM	54	67	48	36
11:00 PM	51	69	42	31

	Statistical Summary								
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	64	62	63	61	57	59	65	51	59
Lmax (Maximum)	84	73	78	80	70	76	83	67	73
L50 (Median)	63	61	62	59	54	56	64	38	50
L90 (Background)	57	53	55	52	43	48	56	31	41

Computed CNEL, dB	67
% Daytime Energy	70%
% Evening Energy	7%
% Nighttime Energy	23%

GPS Coordinates	38°42'29.79"N
	120°49'58.13"W

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Appendix C-2
Long-Term Ambient Noise Monitoring Results - Site LT-1
Creekside Plaza Development - El Dorado County, California
Thursday, March 25, 2021

Hour	Leq	Lmax	L50	L90
12:00 AM	52	80	37	29
1:00 AM	52	70	38	29
2:00 AM	53	71	42	32
3:00 AM	56	71	49	36
4:00 AM	61	74	58	47
5:00 AM	64	80	62	54
6:00 AM	65	86	64	55
7:00 AM	65	86	64	57
8:00 AM	64	75	64	58
9:00 AM	64	73	63	57
10:00 AM	64	75	63	56
11:00 AM	63	77	62	56
12:00 PM	63	72	62	54
1:00 PM	63	81	62	54
2:00 PM	62	73	61	55
3:00 PM	63	74	62	55
4:00 PM	64	85	62	55
5:00 PM	62	75	61	53
6:00 PM	62	78	60	52
7:00 PM	61	83	59	52
8:00 PM	59	76	57	49
9:00 PM	58	79	54	45
10:00 PM	55	71	49	38
11:00 PM	52	67	44	36

	Statistical Summary								
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	65	62	63	61	58	60	65	52	60
Lmax (Maximum)	86	72	77	83	76	79	86	67	75
L50 (Median)	64	60	62	59	54	57	64	37	49
L90 (Background)	58	52	55	52	45	49	55	29	40

Computed CNEL, dB	67
% Daytime Energy	71%
% Evening Energy	7%
% Nighttime Energy	22%

GPS Coordinates	38°42'29.79"N
	120°49'58.13"W

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Appendix C-3
Long-Term Ambient Noise Monitoring Results - Site LT-2
Creekside Plaza Development - El Dorado County, California
Wednesday, March 24, 2021

Hour	Leq	Lmax	L50	L90
12:00 AM	48	70	43	37
1:00 AM	46	64	41	36
2:00 AM	48	65	40	34
3:00 AM	51	69	45	34
4:00 AM	54	72	51	43
5:00 AM	58	70	56	49
6:00 AM	62	83	58	54
7:00 AM	63	87	60	56
8:00 AM	60	73	58	54
9:00 AM	59	80	56	52
10:00 AM	58	72	56	52
11:00 AM	58	78	56	52
12:00 PM	60	89	56	52
1:00 PM	59	79	57	53
2:00 PM	60	76	58	54
3:00 PM	60	72	58	54
4:00 PM	60	77	58	54
5:00 PM	60	82	58	55
6:00 PM	59	76	57	53
7:00 PM	61	92	55	51
8:00 PM	56	75	53	49
9:00 PM	56	80	52	48
10:00 PM	51	67	49	43
11:00 PM	49	67	47	37

	Statistical Summary								
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	63	58	60	61	56	58	62	46	55
Lmax (Maximum)	89	72	78	92	75	82	83	64	70
L50 (Median)	60	56	57	55	52	54	58	40	48
L90 (Background)	56	52	53	51	48	49	54	34	41

Computed CNEL, dB	63
% Daytime Energy	69%
% Evening Energy	13%
% Nighttime Energy	18%

GPS Coordinates	38°42'28.49"N
	120°49'51.59"W

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Appendix C-4
Long-Term Ambient Noise Monitoring Results - Site LT-2
Creekside Plaza Development - El Dorado County, California
Thursday, March 25, 2021

Hour	Leq	Lmax	L50	L90
12:00 AM	45	58	41	34
1:00 AM	47	69	38	30
2:00 AM	47	64	39	31
3:00 AM	48	65	42	33
4:00 AM	52	67	48	38
5:00 AM	56	73	54	48
6:00 AM	60	77	57	53
7:00 AM	62	80	59	54
8:00 AM	61	77	59	55
9:00 AM	61	80	58	54
10:00 AM	60	74	58	54
11:00 AM	60	74	58	54
12:00 PM	60	81	58	54
1:00 PM	61	79	58	53
2:00 PM	60	84	57	53
3:00 PM	59	74	58	53
4:00 PM	60	76	58	54
5:00 PM	60	72	57	54
6:00 PM	58	74	56	52
7:00 PM	59	74	57	52
8:00 PM	63	94	55	51
9:00 PM	55	74	53	48
10:00 PM	53	69	50	44
11:00 PM	51	69	48	39

	Statistical Summary								
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	62	58	60	63	55	60	60	45	54
Lmax (Maximum)	84	72	77	94	74	81	77	58	68
L50 (Median)	59	56	58	57	53	55	57	38	46
L90 (Background)	55	52	54	52	48	51	53	30	39

Computed CNEL, dB	63
% Daytime Energy	69%
% Evening Energy	19%
% Nighttime Energy	12%

GPS Coordinates	38°42'28.49"N
	120°49'51.59"W

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Appendix E-1
FHWA Highway Traffic Noise Prediction Model Inputs
Creekside Plaza Development
File Name: 01 Existing
Run Date: 10/17/2023

#	Roadway	Description	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance to Receptor	Offset (dB)
1	Missouri Flat Rd	North of US 50 WB Ramps	15,655	83	17	2	2	45	150	0
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	20,625	83	17	2	2	45	700	0
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	22,505	83	17	2	2	45	700	0
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	26,350	83	17	2	2	45	150	0
5	Missouri Flat Rd	Road 2233 to Forni Rd	26,340	83	17	2	2	45	300	0
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	18,260	83	17	2	2	45	100	0
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	19,050	83	17	2	2	45	150	0
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	15,240	83	17	2	2	45	300	0
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	14,165	83	17	2	2	45	350	0
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	13,305	83	17	2	2	45	250	0
11	US 50 WB Ramps	West of Missouri Flat Rd	5,730	83	17	2	2	55	500	0
12	US 50 EB Ramps	East of Missouri Flat Rd	3,095	83	17	2	2	55	300	0
13	Mother Lode Dr	West of Missouri Flat Rd	3,720	83	17	2	2	50	100	0
14	Road 2233	East of Missouri Flat Rd	20	83	17	1	1	15	150	0
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	4,650	83	17	2	2	25	400	0
16	Forni Rd	North of Golden Center Dr	2,640	83	17	2	2	25	150	0
17	Forni Rd	West of Missouri Flat Rd	7,370	83	17	2	2	35	150	0
18	Golden Center Dr	West of Missouri Flat Rd	955	83	17	2	2	25	100	0
19	China Garden Rd	East of Missouri Flat Rd	3,640	83	17	2	1	35	100	0
20	China Garden Rd	West of Missouri Flat Rd	10	83	17	2	1	15	100	0
21	Industrial Dr	East of Missouri Flat Rd	155	83	17	2	1	15	270	0
22	Industrial Dr	West of Missouri Flat Rd	1,270	83	17	2	2	35	100	0
23	Enterprise Dr	East of Missouri Flat Rd	115	83	17	2	2	15	100	0
24	Enterprise Dr	West of Missouri Flat Rd	1,230	83	17	2	2	35	100	0
25	Pleasant Valley Rd	East of Missouri Flat Rd	13,585	83	17	2	2	25	50	0
26	Pleasant Valley Rd	West of Missouri Flat Rd	10,770	83	17	2	2	45	50	0
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	2,405	83	17	2	1	25	125	0

Appendix E-2
FHWA Highway Traffic Noise Prediction Model Inputs
Creekside Plaza Development
File Name: 02 Existing+Project
Run Date: 10/17/2023

#	Roadway	Description	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance to Receptor	Offset (dB)
1	Missouri Flat Rd	North of US 50 WB Ramps	17,515	83	17	2	2	45	150	0
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	23,185	83	17	2	2	45	700	0
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	24,995	83	17	2	2	45	700	0
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	27,250	83	17	2	2	45	150	0
5	Missouri Flat Rd	Road 2233 to Forni Rd	26,690	83	17	2	2	45	300	0
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	18,775	83	17	2	2	45	100	0
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	19,555	83	17	2	2	45	150	0
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	15,675	83	17	2	2	45	300	0
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	14,600	83	17	2	2	45	350	0
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	13,740	83	17	2	2	45	250	0
11	US 50 WB Ramps	West of Missouri Flat Rd	5,785	83	17	2	2	55	500	0
12	US 50 EB Ramps	East of Missouri Flat Rd	3,170	83	17	2	2	55	300	0
13	Mother Lode Dr	West of Missouri Flat Rd	3,810	83	17	2	2	50	100	0
14	Road 2233	East of Missouri Flat Rd	1,330	83	17	1	1	15	150	0
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	5,635	83	17	2	2	25	400	0
16	Forni Rd	North of Golden Center Dr	2,740	83	17	2	2	25	150	0
17	Forni Rd	West of Missouri Flat Rd	7,550	83	17	2	2	35	150	0
18	Golden Center Dr	West of Missouri Flat Rd	955	83	17	2	2	25	100	0
19	China Garden Rd	East of Missouri Flat Rd	3,710	83	17	2	1	35	100	0
20	China Garden Rd	West of Missouri Flat Rd	10	83	17	2	1	15	100	0
21	Industrial Dr	East of Missouri Flat Rd	155	83	17	2	1	15	270	0
22	Industrial Dr	West of Missouri Flat Rd	1,270	83	17	2	2	35	100	0
23	Enterprise Dr	East of Missouri Flat Rd	160	83	17	2	2	15	100	0
24	Enterprise Dr	West of Missouri Flat Rd	1,230	83	17	2	2	35	100	0
25	Pleasant Valley Rd	East of Missouri Flat Rd	13,790	83	17	2	2	25	50	0
26	Pleasant Valley Rd	West of Missouri Flat Rd	11,010	83	17	2	2	45	50	0
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	2,820	83	17	2	1	25	125	0

Appendix E-3
FHWA Highway Traffic Noise Prediction Model Inputs
Creekside Plaza Development
File Name: 03 Future
Run Date: 10/17/2023

#	Roadway	Description	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance to Receptor	Offset (dB)
1	Missouri Flat Rd	North of US 50 WB Ramps	16,925	83	17	2	2	45	150	0
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	23,225	83	17	2	2	45	700	0
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	26,575	83	17	2	2	45	700	0
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	31,125	83	17	2	2	45	150	0
5	Missouri Flat Rd	Road 2233 to Forni Rd	30,075	83	17	2	2	45	300	0
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	22,425	83	17	2	2	45	100	0
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	24,700	83	17	2	2	45	150	0
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	15,855	83	17	2	2	45	300	0
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	14,225	83	17	2	2	45	350	0
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	12,835	83	17	2	2	45	250	0
11	US 50 WB Ramps	West of Missouri Flat Rd	6,280	83	17	2	2	55	500	0
12	US 50 EB Ramps	East of Missouri Flat Rd	3,450	83	17	2	2	55	300	0
13	Mother Lode Dr	West of Missouri Flat Rd	1,950	83	17	2	2	50	100	0
14	Road 2233	East of Missouri Flat Rd	0	83	17	1	1	15	150	0
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	4,275	83	17	2	2	25	400	0
16	Forni Rd	North of Golden Center Dr	2,850	83	17	2	2	25	150	0
17	Forni Rd	West of Missouri Flat Rd	9,675	83	17	2	2	35	150	0
18	Golden Center Dr	West of Missouri Flat Rd	1,100	83	17	2	2	25	100	0
19	China Garden Rd	East of Missouri Flat Rd	3,200	83	17	2	1	35	100	0
20	China Garden Rd	West of Missouri Flat Rd	35	83	17	2	1	15	100	0
21	Industrial Dr	East of Missouri Flat Rd	160	83	17	2	1	15	270	0
22	Industrial Dr	West of Missouri Flat Rd	1,385	83	17	2	2	35	100	0
23	Enterprise Dr	East of Missouri Flat Rd	190	83	17	2	2	15	100	0
24	Enterprise Dr	West of Missouri Flat Rd	1,390	83	17	2	2	35	100	0
25	Pleasant Valley Rd	East of Missouri Flat Rd	12,725	83	17	2	2	25	50	0
26	Pleasant Valley Rd	West of Missouri Flat Rd	12,400	83	17	2	2	45	50	0
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	3,175	83	17	2	1	25	125	0
28	Diamond Springs Pkwy	East of Missouri Flat Rd	10,350	83	17	2	2	45	100	0
29	Missouri Flat Rd	North of Diamond Springs Pkwy	300	83	17	2	1	25	100	0

Appendix E-4
FHWA Highway Traffic Noise Prediction Model Inputs
Creekside Plaza Development
File Name: 04 Future+Project
Run Date: 10/17/2023

#	Roadway	Description	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance to Receptor	Offset (dB)
1	Missouri Flat Rd	North of US 50 WB Ramps	17,015	83	17	2	2	45	150	0
2	Missouri Flat Rd	US 50 WB Ramps to US 50 EB Ramps	23,730	83	17	2	2	45	700	0
3	Missouri Flat Rd	US 50 EB Ramps to Mother Lode Dr	27,215	83	17	2	2	45	700	0
4	Missouri Flat Rd	Mother Lode Dr to Road 2233	32,030	83	17	2	2	45	150	0
5	Missouri Flat Rd	Road 2233 to Forni Rd	30,540	83	17	2	2	45	300	0
6	Missouri Flat Rd	Forni Rd to Golden Center Dr	22,940	83	17	2	2	45	100	0
7	Missouri Flat Rd	Golden Center Dr to China Garden Rd	25,225	83	17	2	2	45	150	0
8	Missouri Flat Rd	China Garden Rd to Industrial Dr	16,120	83	17	2	2	45	300	0
9	Missouri Flat Rd	Industrial Dr to Enterprise Dr	14,490	83	17	2	2	45	350	0
10	Missouri Flat Rd	Enterprise Dr to Pleasant Valley Rd	13,100	83	17	2	2	45	250	0
11	US 50 WB Ramps	West of Missouri Flat Rd	6,455	83	17	2	2	55	500	0
12	US 50 EB Ramps	East of Missouri Flat Rd	3,450	83	17	2	2	55	300	0
13	Mother Lode Dr	West of Missouri Flat Rd	2,040	83	17	2	2	50	100	0
14	Road 2233	East of Missouri Flat Rd	1,315	83	17	1	1	15	150	0
15	Forni Rd	Missouri Flat Rd to Golden Center Dr	5,295	83	17	2	2	25	400	0
16	Forni Rd	North of Golden Center Dr	2,955	83	17	2	2	25	150	0
17	Forni Rd	West of Missouri Flat Rd	9,855	83	17	2	2	35	150	0
18	Golden Center Dr	West of Missouri Flat Rd	1,100	83	17	2	2	25	100	0
19	China Garden Rd	East of Missouri Flat Rd	3,200	83	17	2	1	35	100	0
20	China Garden Rd	West of Missouri Flat Rd	35	83	17	2	1	15	100	0
21	Industrial Dr	East of Missouri Flat Rd	160	83	17	2	1	15	270	0
22	Industrial Dr	West of Missouri Flat Rd	1,385	83	17	2	2	35	100	0
23	Enterprise Dr	East of Missouri Flat Rd	190	83	17	2	2	15	100	0
24	Enterprise Dr	West of Missouri Flat Rd	1,705	83	17	2	2	35	100	0
25	Pleasant Valley Rd	East of Missouri Flat Rd	12,755	83	17	2	2	25	50	0
26	Pleasant Valley Rd	West of Missouri Flat Rd	12,640	83	17	2	2	45	50	0
27	Golden Center Dr	Forni Rd to Missouri Flat Rd	3,185	83	17	2	1	25	125	0
28	Diamond Springs Pkwy	East of Missouri Flat Rd	10,585	83	17	2	2	45	100	0
29	Missouri Flat Rd	North of Diamond Springs Pkwy	275	83	17	2	1	25	100	0

Appendix F

VACUTECH

February 10th, 2016

Re: Vacutech Sound Study Projections for Bella Terra Car Wash in Huntington Beach, CA

To: Chase Russell – Owner of Bella Terra Car Wash 16061 Beach Blvd. Huntington Beach, CA

The chart below shows a cumulative average of that data taken from express car washes of this type and size. It is presented in an incremental form based on the worst case scenario of the vacuum hoses being off the hook, so to speak. Based on the collective average of the 45' reading to the 85' reading and is presented in the chart below:

Vacutech Noise Study Projections	
Average of all 19 hoses off and in use	
Average @ 45'	52.3 db
Average @ 55'	54.6 db
Average @ 65'	52.1 db
Average @ 75'	49.2 db
Average @ 85'	49.0 db

SOUND LEVEL METER USED: SIMPSON MODEL #40003 – MSHA APPROVED. MEETS OSHA AND WALSH-HEALY REQUIREMENTS FOR NOISE CONTROL. CONFORMS TO ANSI S1.4 1983, IEC 651 SPECS FOR METER TYPE.

NOTE: Typical outside vacuum system with 1.5" x 15' vacuum nozzles (4" wide by ¾" opening) in use with customer vacuuming.

Appendix G

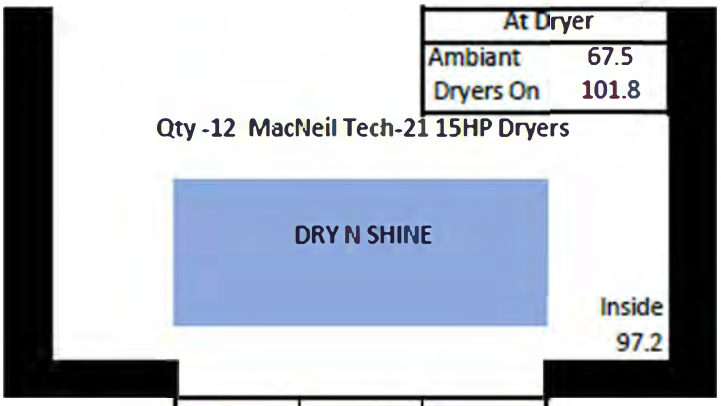
Sound Data

Scrub Bot Express Wash

3965 W. Ray Rd. Chandler Az. 85226

DRYERS

QTY-12 MACNEIL TECH 21 15HP DRYERS



Ambiant	78.9	0'
Dryers	93.1	

Ambiant	74.5	10'
ers	85.3	

Ambiant	70.8	20'
ers	79.1	

Ambiant	65.7	30'
ers	76	

All sound measurements below were taken with a VLIKE Model - VL6708 digital sound level meter.
Settings were as follows: 40 ~ 90 dB range, "A" weighting mode, FAST (High Speed) mode

Appendix H
Drive-Through Speaker Reference Noise Level Data

HME

Customer Driven

Memo

Re: Drive-Thru Sound Pressure Levels From the Menu Board or Speaker Post

The sound pressure levels from the menu board or speaker post are as follows:

1. Sound pressure level (SPL) contours (A weighted) were measured on a typical HME SPP2 speaker post. The test condition was for pink noise set to 84 dBA at 1 foot in front of the speaker. All measurements were conducted outside with the speaker post placed 8 feet from a non-absorbing building wall and at an oblique angle to the wall. These measurements should not be construed to guarantee performance with any particular speaker post in any particular environment. They are typical results obtained under the conditions described above.

2. The SPL levels are presented for different distances from the speaker post:

Distance from the Speaker (Feet)	SPL (dBA)
1 foot	84 dBA
2 feet	78 dBA
4 feet	72 dBA
8 feet	66 dBA
16 feet	60 dBA
32 feet	54 dBA

3. The above levels are based on factory recommended operating levels, which are preset for HME components and represent the optimum level for drive-thru operations in the majority of the installations.

Also, HME incorporates automatic volume control (AVC) into many of our Systems. AVC will adjust the outbound volume based on the outdoor, ambient noise level. When ambient noise levels naturally decrease at night, AVC will reduce the outbound volume on the system. See below for example:

Distance from Outside Speaker	Decibel Level of standard system with 45 dB of outside noise without AVC	Decibel level of standard system with 45 dB of outside noise with AVC active
1 foot	84 dBA	60 dBA
2 feet	78 dBA	54 dBA
4 feet	72 dBA	48 dBA
8 feet	66 dBA	42 dBA
16 feet	60 dBA	36 dBA

If there are any further questions regarding this issue please contact HME customer service at 1-800-848-4468.

Thank you for your interest in HME's products.

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