Environmental Noise & Vibration Assessment

Fairway Oaks Residential Development

Galt, California

BAC Job # 2019-196

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February 27, 2020

CEQA Checklist

NOISE AND VIBRATION – **Would the Project Result in:**	**NA – Not Applicable**	**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 Fairway Oaks Residential Development (project) is a single-family residential development located west of State Route 99 (SR 99) and south of Glendale Avenue in Galt, California. The project proposes the development of approximately 169 residential lots on currently undeveloped land. The project area and vesting tentative map are shown on Figures 1 and 2, respectively.

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 traffic or project generated noise or vibration levels would exceed applicable City of Galt standards at the residences proposed within this development.

Environmental Setting

Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are designated as sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or Hertz (Hz). Definitions of acoustical terminology are 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 3.

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, L_{dn}, and shows very good correlation with community response to noise.

The day/night average sound level (L_{dn}) is based on the average noise level over a 24-hour day, with a +10 decibel weighting applied to noise occurring during nighttime (10:00 PM to 7:00 AM) hours. 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 L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. For this reason, the City of Pinole utilizes performance standards for non-transportation noise sources.

Vibration Fundamentals and Terminology

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. The maximum rate, or velocity of particle movement, is the commonly accepted descriptor of the vibration "strength".

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

Legend

- Fairway Oaks Development Boundary (Approximate)
- Long-Term Noise Survey Location
- Traffic Calibration Survey Locations

N

Scale (Feet)

0 150 300

Fairway Oaks Residential Development
Galt, California

Project Area

Figure 1

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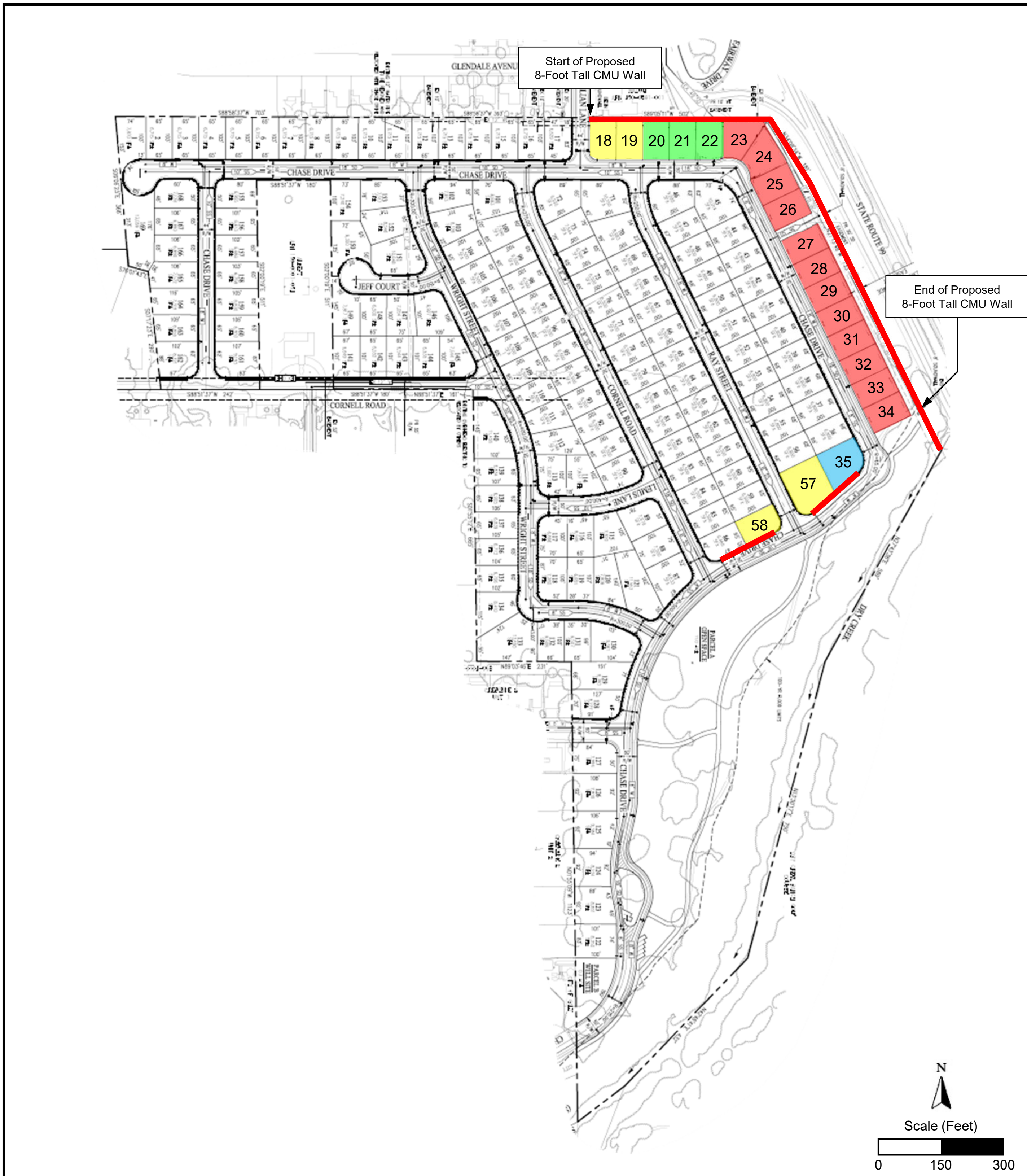

Legend

Recommended Traffic Noise Barriers

STC 32: Upper-Floors Only

STC 34: Upper-Floors Only

STC 37: Upper-Floors
STC 32: First-Floors

STC 42: Upper-Floors
STC 32: First-Floors

Fairway Oaks Residential Development
Galt, California

Vesting Tentative Map

Figure 2

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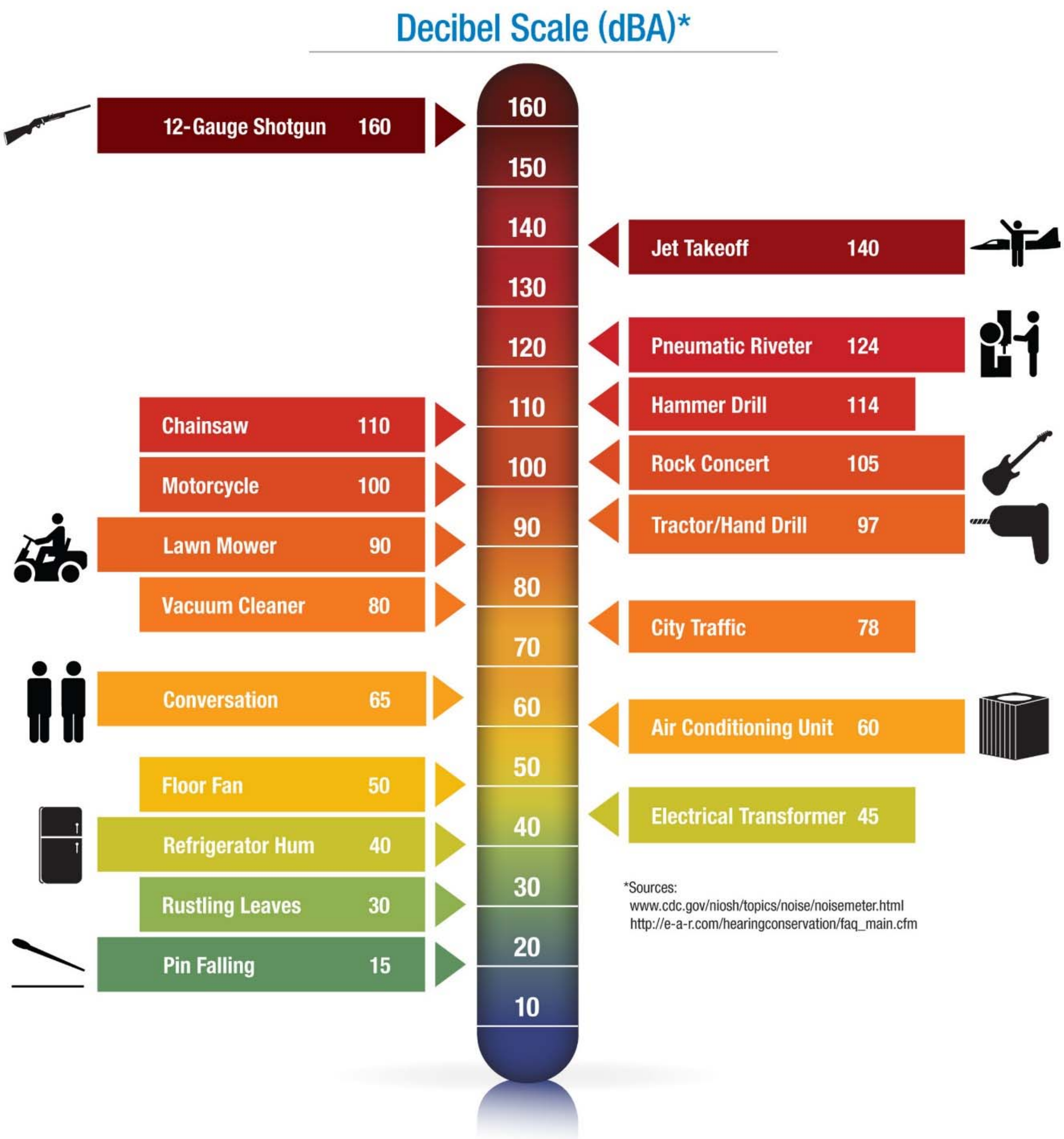
Figure 3
Noise Levels Associated with Common Noise Sources



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 noise-sensitive land uses which would potentially be affected by the project consist of residential uses. Specifically, single-family residential land uses are located to the north and west of the project site.

Existing Traffic Noise Levels along Project Area Roadway Network

The FHWA Traffic Noise Model (FHWA-RD-77-108) was used to develop existing noise contours expressed in terms of L_{dn} for major roadways within the project study area. 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 L_{dn} values from L_{eq} values.

Traffic data in the form of AM and PM peak hour movements for existing conditions were obtained from the client (prepared by GHD, Inc.). Average daily traffic volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions. Using these data and the FHWA Model, traffic noise levels were calculated. The traffic noise level at 100 feet from the roadway centerline and distances from the centerlines of selected roadways to the 60 dB, 65 dB, and 70 dB L_{dn} contours are summarized in Table 1.

In many cases, the actual distances to noise level contours may vary from the distances predicted by the FHWA Model. Factors such as roadway curvature, roadway grade, shielding from local topography or structures, elevated roadways, or elevated receivers may affect actual sound propagation.

It is also recognized that existing sensitive land uses within the project vicinity are located varying distances from the centerlines of the local roadway network. The 100 foot reference distance is utilized in this analysis to provide a reference position at which changes in existing and future traffic noise levels resulting from the project can be evaluated. Appendix B contains the FWHA Model inputs for existing conditions.

Table 1
Existing Traffic Noise Modeling Results

				Distance to Contour (feet)		
Seg.	**Intersection**	**Direction**	**L_{dn} 100 Feet from Roadway**	**70 dB L_{dn}**	**65 dB L_{dn}**	**60 dB L_{dn}**
1	Lincoln Way / Kost Road	North	57	14	30	66
2		South	62	32	68	146
3		East	--	--	--	--
4		West	58	15	33	70
5	Lincoln Way / Ranch Road	North	60	23	49	105
6		South	57	14	30	65
7		East	49	4	8	18
8		West	--	--	--	--
9	Lincoln Way / Cornell Road	North	57	13	29	62
10		South	60	23	50	107
11		East	40	1	2	5
12		West	--	--	--	--
13	Lincoln Way / C Street	North	57	13	29	62
14		South	57	13	29	63
15		East	59	17	37	80
16		West	54	8	18	38
17	Glendale Avenue / SR 99 SB Ramps	North	52	7	14	31
18		South	53	7	16	35
19		East	--	--	--	--
20		West	48	3	7	16
21	Fairway Drive / C Street	North	60	20	44	94
22		South	59	18	39	85
23		East	62	30	64	137
24		West	61	24	53	113
25	A Street / SR 99 SB Off-Ramp	North	59	18	39	85
26		South	58	17	36	77
27		East	59	18	38	82
28		West	61	24	51	110
29	C Street / SR 99 NB Off-Ramp	North	59	20	42	91
30		South	58	16	35	76
31		East	60	23	49	105
32		West	63	33	71	152
33	A Street / SR 99 NB Off-Ramp	North	55	10	20	44
34		South	61	26	55	119
35		East	58	16	34	73
36		West	57	13	28	59

Note: Blank entries are roadway segments for which no traffic data was provided.
Source: FHWA-RD-77-108 with inputs from GHD, Inc. Appendix B contains the FHWA Model inputs.

Existing Overall Ambient Noise Environment at the Project Site

The existing ambient noise environment at the project site is defined primarily by noise from traffic on SR 99. To generally quantify existing ambient noise environment at the nearest existing sensitive uses to the project site, BAC utilized noise level data from a long-term (24-hour) noise level survey previously conducted on the project site from September 14-15, 2017. The long-term noise survey location is shown on Figure 1. The long-term noise survey location was located approximately 100 feet from the centerline of SR 99.

A Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter was used to complete the long-term noise level survey. The meter was calibrated immediately before and after 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 long-term noise survey results are summarized below in Table 2. The detailed results of the ambient noise survey are contained in Appendix C in tabular format and graphically in Appendix D.

Table 2
Summary of Long-Term Ambient Noise Measurement Results – September 14-15, 2017[1]

		Average Measured Hourly Noise Levels (dB)			
		Daytime (7:00 a.m. to 10:00 p.m.)		Nighttime (10:00 p.m. to 7:00 a.m.)	
Location[2]	L_{dn}	L_{eq}	L_{max}	L_{eq}	L_{max}
LT-1: Approximately 100' from centerline of SR 99	82	78	89	75	87

[1] Detailed summaries of the noise monitoring results are provided in Appendices C & D.
[2] Long-term ambient noise survey location is identified on Figure 1.
Source: Bollard Acoustical Consultants, Inc. (2017)

The Table 2 data indicated that the measured day-night average level (L_{dn}) at site LT-1 exceeded the City of Galt General Plan normally acceptable and conditionally acceptable exterior noise level standards of 60 and 70 dB L_{dn} (respectively) applicable to new residential land uses.

Existing Ambient Vibration Environment

During a site visit on September 17, 2017, BAC staff noted that vibration levels were below the threshold of perception at the project site and in the immediate project vicinity. Therefore, the existing vibration environment in the immediate project vicinity is considered to be negligible.

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, the City of Galt does not currently have a policy for assessing noise impacts associated with increases in ambient noise levels from project-generated noise sources. As a result, the following federal noise criteria was applied to the project.

Federal Interagency Commission on Noise (FICON)

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. The criteria shown in Table 3 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The FICON standards have been used extensively in recent years by the authors of this section in the preparation of the noise sections of Environmental Impact Reports that have been certified in many California cities and counties.

The use of the FICON standards are considered conservative relative to thresholds used by other agencies in the State of California. For example, the California Department of Transportation (Caltrans) requires a project-related traffic noise level increase of 12 dB for a finding of significance, and the California Energy Commission (CEC) considers project-related noise level increases between 5 to 10 dB significant, depending on local factors. Therefore, the use of the FICON standards, which set the threshold for finding of significant noise impacts as low as 1.5 dB, provides a very conservative approach to impact assessment for this project.

Table 3
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project (L_{dn} or CNEL)	Change in Ambient Noise Level Due to Project
<60 dB	+5.0 dB or more
60 to 65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, as shown in Table 3, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB. Where pre-project ambient conditions are between 60 and 65 dB, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels, specifically pre-project noise levels in excess of 65 dB, a 1.5 dB increase is considered by FICON as the threshold of significance.

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.

California Department of Transportation (Caltrans)

The City of Galt does not currently have adopted standards for groundborne vibration. As a result, the vibration impact criteria developed by the California Department of Transportation (Caltrans) was applied to the project. The Caltrans criteria applicable to damage and annoyance from transient and continuous vibration typically associated with construction activities are presented in Tables 4 and 5. Equipment or activities typical of continuous vibration include: excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment. Equipment or activities typical of single-impact (transient) or low-rate repeated impact vibration include: impact pile drivers, blasting, drop balls, “pogo stick” compactors, and crack-and-seat equipment (California Department of Transportation 2013).

Table 4
Guideline Vibration Damage Potential Threshold Criteria

	Maximum PPV (inches/second)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

PPV = Peak Particle Velocity

Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013).

Table 5
Guideline Vibration Annoyance Potential Criteria

	Maximum PPV (inches/second)	
Human Response	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Barely perceptible	0.40	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

PPV = Peak Particle Velocity

Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013).

Local

2030 Galt General Plan

The Noise Element of the 2030 Galt General Plan contains policies to ensure that city residents are not subjected to noise beyond acceptable levels. The specific policies which are generally applicable to the project are reproduced below.

<u>Policy N-1.1: Noise-Generating Uses</u>

The City should work to reduce noise levels and land use conflicts surrounding existing noise generating uses.

<u>Policy N-1.2: Noise Mitigation</u>

The City shall develop and implement effective strategies to abate and avoid excessive noise exposures in the city by requiring that effective noise mitigation measures be incorporated in the design of new noise-generating and new noise-sensitive land uses.

<u>Policy N-1.3: Neighborhood Noise Protection</u>

The City should protect areas within the city where the present noise environment is within acceptable limits.

<u>Policy N-1.4: Noise Level Performance Standards</u>

The City shall use noise level performance standards for reviewing development proposals.

<u>Policy N-1.8: Development near Major Roadways and Thoroughfares</u>

The City shall require noise mitigation for new sensitive receptors near major roadways and thoroughfares by requiring noise buffering and/or special construction techniques (e.g., increased insulation, special windows, etc.) in new construction.

<u>Policy N-1.9: Sound Attenuation Features</u>

The City should require sound attenuation features such as walls, berms, and distance separation between commercial, and residential uses to reduce noise and vibration impacts.

<u>Policy N-1.10: Noise Mitigation</u>

The City shall require noise mitigation in new development along major streets, highways, and railroad tracks.

<u>Policy N-1.11: Land Use Compatibility</u>

The City shall allow the development of noise-sensitive land uses which include, but are not limited to, residential neighborhoods, schools, and hospitals, only in areas where existing or projected noise levels are “acceptable” according to Table 6. Noise mitigation measures may be required to reduce noise in outdoor activity areas and interior spaces to achieve these levels.

Table 6
Land Use Compatibility Guidelines for Development (L_{dn} or CNEL)

Locations	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential - Low Density Single Family, Duplex, Mobile Homes	< 60	55-70	71-75	>75
Residential – Multiple Family, Group Homes	<65	60-70	71-75	>75
Motels / Hotels	<60	60-70	71-80	>80
Schools, Libraries, Churches, Hospitals, Extended Care Facilities	<70	60-70	71-80	>80
Auditoriums, Concert Halls, Amphitheaters	--	<70	>65	--
Sports Arenas, Outdoor Spectator Sports	--	<75	>75	--
Playgrounds, Neighborhood Parks	<70	--	70-80	>80
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75	--	70-75	>80
Office Buildings, Business Commercial and Professional	<70	70-75	>75	--
Industrial, Manufacturing, Utilities, Agriculture	<75	70-80	>80	--

[1] **Normally Acceptable:** Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
[2] **Conditionally Acceptable:** New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed insulation features have been included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
[3] **Normally Unacceptable:** New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
[4] **Clearly Unacceptable:** New construction or development should not be undertaken.

Source: 2030 Galt General Plan Noise Element, Page N-8

Additionally, the General Plan establishes an interior noise level standard of 45 dB L_{dn} or less within noise-sensitive residential dwellings. The intent of this interior noise limit is to provide a suitable environment for indoor communication and sleep.

Galt Municipal Code

The Galt Municipal Code contains exterior and interior noise level criteria that would be applicable to project construction activities. However, the Municipal Code contains an exemption for noise associated with construction activities provided that those activities fulfill specific criteria. The Municipal Code exemption pertaining to noise associated with construction activities is provided below.

8.40.60 Exemptions.

The following activities shall be exempted from the provisions of this chapter (Municipal Code Chapter 8.40 Noise Control Standards):

E. Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided the activities take place between the hours of 6:00 a.m. and 8:00 p.m. on weekdays and 7:00 a.m. and 8:00 p.m. on Saturdays and Sundays. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after 8:00 p.m. and to operate machinery and equipment as necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner. Provided further, however, from June through September, the pouring of concrete may occur starting at 5:00 a.m. on weekdays.

Impacts and Mitigation Measures

Thresholds of Significance

For the purposes of this report, a noise and vibration impact is 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 Interagency Commission on Noise (FICON), California Department of Transportation (Caltrans), 2030 Galt General Plan and Galt Municipal Code 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 2030 Galt General Plan or Galt Municipal Code.

- A significant impact would be identified if project-generated traffic or construction activities would cause a substantial increase in noise levels at existing sensitive receptors in the vicinity. A substantial increase would be identified relative to the FICON standards provided in Table 3.

- A significant impact would be identified if project construction activities would expose noise-sensitive receptors to excessive groundborne vibration levels. Specifically, an impact would be identified if groundborne vibration levels due to these sources would exceed the Caltrans vibration impact criteria.

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 traffic impact analysis (prepared by GHD, Inc.) to predict project traffic noise level increases relative to Existing and Cumulative project and no project conditions.

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

Traffic data in the form of AM and PM peak hour movements for Existing and Existing Plus Project conditions in the project area roadway network were obtained from the project transportation impact analysis completed by GHD, Inc. Average daily traffic (ADT) volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions.

Existing versus Existing Plus Project traffic noise levels on the local roadway network are shown in Table 7. The following section includes an assessment of predicted traffic noise levels relative to the FICON increase significance noise criteria identified in Table 3. The Table 7 data are provided in terms of L_{dn} at a standard distance of 100 feet from the centerlines of the project-area roadways. Appendix B contains the FWHA Model inputs.

Table 7
Traffic Noise Modeling Results and Project-Related Traffic Noise Increases
Existing vs. Existing Plus Project Conditions

Segment	Intersection	Direction	Traffic Noise Level at 100 feet, dB L_{dn}			Substantial Increase?
			E	E+P	Increase	
1	Lincoln Way / Kost Road	North	57.3	57.5	0.2	No
2		South	62.5	62.6	0.1	No
3		East	--	--	--	--
4		West	57.7	57.8	0.1	No
5	Lincoln Way / Ranch Road	North	60.3	60.4	0.1	No
6		South	57.2	57.5	0.3	No
7		East	48.8	49.7	0.9	No
8		West	--	--	--	--
9	Lincoln Way / Cornell Road	North	56.9	57.0	0.1	No
10		South	60.4	60.5	0.1	No
11		East	39.9	43.4	3.5	No
12		West	--	--	--	--
13	Lincoln Way / C Street	North	56.8	57.0	0.2	No
14		South	56.9	57.2	0.3	No
15		East	58.6	58.6	0.0	No
16		West	53.6	53.7	0.1	No
17	Glendale Ave / SR 99 SB Ramps	North	52.4	54.9	2.5	No
18		South	53.1	53.9	0.8	No
19		East	--	--	--	--
20		West	48.1	50.9	2.8	No
21	Fairway Drive / C Street	North	59.6	57.7	-1.9	No
22		South	58.9	59.4	0.5	No
23		East	62.1	62.2	0.1	No
24		West	60.8	60.1	-0.7	No
25	A Street / SR 99 SB Off-Ramp	North	58.9	59.0	0.1	No
26		South	58.3	58.3	0.0	No
27		East	58.7	58.7	0.0	No
28		West	60.6	60.6	0.0	No
29	C Street / SR 99 NB Off-Ramp	North	59.4	59.5	0.1	No
30		South	58.2	58.4	0.2	No
31		East	60.3	60.4	0.1	No
32		West	62.7	62.9	0.2	No
33	A Street / SR 99 NB Off-Ramp	North	59.9	60.1	0.2	No
34		South	59.4	59.5	0.1	No
35		East	49.1	49.1	0.0	No
36		West	58.7	58.7	0.0	No

Note: Blank entries are roadway segments for which no traffic data was provided.
Source: FHWA-RD-77-108 with inputs from GHD, Inc. Appendix B contains the FHWA Model inputs.

The data in Table 7 indicate that traffic generated by the project would not result in an increase of traffic noise levels on the local roadway network. Relative to the FICON significance criteria identified in Table 3, the increases would not be considered substantial. As a result, off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Existing vs. Existing Plus Project conditions) are identified as being ***less than significant***.

Impact 2: Increases in Cumulative Traffic Noise Levels due to the Project

Traffic data in the form of AM and PM peak hour movements for Cumulative and Cumulative Plus Project conditions in the project area roadway network were obtained from the project transportation impact analysis completed by GHD, Inc. Average daily traffic (ADT) volumes were conservatively estimated by applying a factor of 5 to the sum of AM and PM peak hour conditions.

Cumulative versus Cumulative Plus Project traffic noise levels on the local roadway network are shown in Table 8. The following section includes an assessment of predicted traffic noise levels relative to the FICON increase significance noise criteria identified in Table 3. The Table 8 data are provided in terms of L_{dn} at a standard distance of 100 feet from the centerlines of the project-area roadways. Appendix B contains the FWHA model inputs.

Table 8
Traffic Noise Modeling Results and Project-Related Traffic Noise Increases
Cumulative vs. Cumulative Plus Project Conditions

			Traffic Noise Level at 100 feet, dB L_{dn}			
Segment	**Intersection**	**Direction**	**C**	**C+P**	**Increase**	**Substantial Increase?**
1	Lincoln Way / Kost Road	North	59.3	59.4	0.1	No
2		South	64.0	64.1	0.1	No
3		East	--	--	--	--
4		West	58.6	58.7	0.1	No
5	Lincoln Way / Ranch Road	North	62.2	62.3	0.1	No
6		South	59.3	59.4	0.1	No
7		East	49.3	50.1	0.8	No
8		West	--	--	--	--
9	Lincoln Way / Cornell Road	North	58.6	58.8	0.2	No
10		South	62.2	62.3	0.1	No
11		East	42.2	44.6	2.4	No
12		West	--	--	--	--
13	Lincoln Way / C Street	North	59.1	59.3	0.2	No
14		South	58.9	59.1	0.2	No
15		East	60.6	60.6	0.0	No
16		West	55.9	55.9	0.0	No
17	Glendale Ave / SR 99 SB Ramps	North	54.3	56.1	1.8	No
18		South	53.8	54.9	1.1	No
19		East	--	--	--	--
20		West	49.3	51.9	2.6	No
21	Fairway Drive / C Street	North	60.5	60.5	0.0	No
22		South	62.4	62.7	0.3	No
23		East	65.8	65.8	0.0	No
24		West	62.2	62.3	0.1	No
25	A Street / SR 99 SB Off-Ramp	North	59.6	59.7	0.1	No
26		South	61.1	61.2	0.1	No
27		East	64.6	64.6	0.0	No
28		West	63.7	63.7	0.0	No
29	C Street / SR 99 NB Off-Ramp	North	62.6	62.2	-0.4	No
30		South	61.7	61.8	0.1	No
31		East	65.1	65.1	0.0	No
32		West	66.6	66.5	-0.1	No

Table 8
Traffic Noise Modeling Results and Project-Related Traffic Noise Increases
Cumulative vs. Cumulative Plus Project Conditions

Segment	Intersection	Direction	Traffic Noise Level at 100 feet, dB L_{dn} C	C+P	Increase	Substantial Increase?
33	A Street / SR 99 NB Off-Ramp	North	60.1	60.2	0.1	No
34		South	62.1	62.2	0.1	No
35		East	64.9	64.9	0.0	No
36		West	64.6	64.6	0.0	No

Note: Blank entries are roadway segments for which no traffic data was provided.
Source: FHWA-RD-77-108 with inputs from GHD, Inc. Appendix B contains the FHWA Model inputs.

The data in Table 8 indicate that traffic generated by the project would not result in an increase of traffic noise levels on the local roadway network. Relative to the FICON significance criteria identified in Table 3, the increases would not be considered substantial. As a result, off-site traffic noise impacts related to increases in traffic resulting from the implementation of the project (Cumulative vs. Cumulative Plus Project conditions) are identified as being ***less than significant***.

Noise Impacts Associated with Project Construction Activities

Impact 3: Project Construction Noise Levels at Existing 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. The nearest existing sensitive uses (residences) are located approximately 30 feet away from where construction activities would occur on the project site.

Table 9 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. Not all of these construction activities would be required of this project. The Table 9 data also include predicted maximum equipment noise levels at the nearest existing sensitive uses located approximately 30 feet away, which assume a standard spherical spreading loss of 6 dB per doubling of distance.

Table 9
Construction Equipment Reference Noise Levels and Predicted Noise Levels 30 Feet

Equipment Description	Maximum Noise Level at 50 Feet, dBA	Predicted Maximum Noise Level at 30 feet, dBA
Air compressor	80	84
Backhoe	80	84
Ballast equalizer	82	86
Ballast tamper	83	87
Compactor	82	86
Concrete mixer	85	89
Concrete pump	82	86
Concrete vibrator	76	80
Crane, mobile	83	87
Dozer	85	89
Generator	82	86
Grader	85	89
Impact wrench	85	89
Jack hammer	88	92
Loader	80	84
Paver	85	89
Pneumatic tool	85	89
Pump	77	81
Rail saw	90	94
Saw	76	80
Scarifier	83	87
Scraper	85	89
Shovel	82	86
Spike driver	77	81
Tie cutter	84	88
Tie handler	80	84
Tie inserter	85	89
Truck	84	88
Source: FTA Transit Noise and Vibration Impact Assessment Manual, Table 7-1 (2018)		

Based on the equipment noise levels in Table 9, worst-case on-site project construction equipment noise levels at the property lines of the nearest existing residential uses located 30 feet away are expected to range from approximately 80 to 94 dB. Thus, it is possible that a portion of the project construction equipment could result in substantial short-term increases over ambient maximum noise levels at the nearest existing sensitive uses.

As noted in the Regulatory Setting section of this report, Section 8.40.060 of the Galt Municipal Code exempts noise from construction activities provided the activities occur between the hours of 6:00 a.m. and 8:00 p.m. on weekdays and 7:00 a.m. and 8:00 p.m. on Saturdays and Sundays. Thus, provided project construction activities do not occur outside of these hours, construction activities would be exempt and this impact would be considered less than significant.

However, if construction activities were to occur during the hours not exempted by Galt Municipal Code Section 8.40.60, noise levels generated by construction activities would likely exceed applicable Municipal Code noise level standards at the nearest residences. As a result, noise impacts associated with construction activities are identified as being **potentially significant.**

Mitigation Impact 3: Construction Noise Control Measures

MM 3: To the maximum extent practical, the following measures should be incorporated into the project construction operations:

- Project noise-generating construction activities shall occur within the hours identified in Galt Municipal Code Section 8.40.060.
- 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 receptors.
- Project area and site access road speed limits shall be established and enforced during the construction period.
- Nearby residences 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.

Significance of Impact 3 after Mitigation: *Less than Significant*

Vibration Impacts Associated with Project Activities

Impact 4: Project Vibration Levels at Existing Sensitive Uses

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 the construction. The nearest existing sensitive uses are residential structures located approximately 30 feet from construction activities which would occur within the project site.

Table 10 includes the range of vibration levels for equipment commonly used in general construction projects at a distance of 25 feet. The Table 10 data also include predicted equipment vibration levels at the nearest existing residences to the project site located approximately 30 feet away.

Table 10
Vibration Source Levels for Construction Equipment and Predicted Levels at 30 Feet

Equipment	Maximum PPV (inches/second)[1]	
	Maximum PPV at 25 Feet[2]	Predicted PPV at 30 Feet
Hoe ram	0.089	0.068
Large bulldozer	0.089	0.068
Caisson drilling	0.089	0.068
Loaded trucks	0.076	0.058
Jackhammer	0.035	0.027
Small bulldozer	0.003	0.002

[1] PPV = Peak Particle Velocity
[2] Reference vibration level obtained from the FTA Transit Noise and Vibration Impact Assessment Manual (2018).

As indicated in Table 10, vibration levels generated from on-site construction activities at the nearest existing residences are predicted to be well below the strictest Caltrans thresholds for damage to residential structures of 0.30 in/sec PPV shown in Table 4. Further, the predicted vibration levels are also below the Caltrans thresholds for annoyance presented in Table 5. Therefore, on-site construction within the project area would not result in excessive groundborne vibration levels at nearby existing residential uses.

During a site visit on September 17, 2017 vibration levels were below the threshold of perception at the project site and in the immediate project vicinity (below 0.1 inches per second if converted to peak particle velocity). Therefore, the project would not result in the exposure of persons to excessive groundborne vibration levels at the project site.

The project proposes the development of single-family residential uses. It is the experience of BAC that activities associated with residential uses do not typically have equipment that generates appreciable vibration.

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

Noise Impacts Upon the Fairway Oaks Development

The California Supreme Court issued an opinion in *California Building Industry Association v. Bay Area Air Quality Management District (2015)* holding that CEQA is primarily concerned with the impacts of a project on the environment and generally does not require agencies to analyze the impact of existing conditions on a project's future users or residents. Nevertheless, the City of Galt has policies that address existing/future conditions affecting the proposed project, which are discussed in the following section.

On-Site Traffic Noise Impacts

Traffic Noise Prediction Calibration

The FHWA Model provides reasonably accurate traffic noise predictions under “ideal” roadway conditions. Ideal conditions are generally considered to be long straight roadway segments with uniform vehicle speeds, a flat roadway surface, good pavement conditions, a statistically large volume of traffic, and an unimpeded view of the roadway from the receiver location. Such conditions did not appear to be in effect at this project site due to varied views of the project site. As a result, BAC conducted a calibration of the FHWA Model through site-specific traffic noise level measurements and concurrent traffic counts.

The calibration process was performed at three (3) locations on the project site on September 18, 2017. The measurements were conducted at a height of 5 feet above ground to quantify traffic noise levels at the future outdoor activity areas and building facades of proposed residences which will have direct exposure to SR 99. The traffic calibration survey locations are shown on Figure 1. Detailed results of the calibration procedure are provided in Appendix E.

As indicated in Appendix E, the FHWA Model was found to over-predict traffic noise levels by approximately 2.8 to 6.6 dB at the three measurement locations. This over-prediction is believed to have been caused by excess ground attenuation caused by the unimproved project site. While some of this attenuation will remain following project development, the residence proposed closest to SR 99 are not expected to benefit from that attenuation upon completion of the project development.

As a result of the calibration process, adjustments were applied to the FHWA Model for the prediction of future traffic noise levels at lots located 350 feet or more from SR 99. No calibration adjustment was applied for the prediction of future traffic noise levels at lots located 100 feet or less from the roadway.

Impact 5: Future Exterior Traffic Noise Levels at the Project Site

The calibrated FHWA Model was used with future traffic data to predict traffic noise levels at the project site. The future Average Daily Traffic (ADT) for SR 99 was conservatively estimated by increasing the existing ADT volume by a factor of 50% to account for regional growth in the next twenty years. The existing (2017) ADT volume for SR 99 was obtained from published Caltrans traffic volume data. The FHWA Model inputs and predicted future traffic noise levels at the project site are shown in Appendix F and summarized in Table 11.

Table 11
Predicted Future Exterior Traffic Noise Levels at Nearest Lots to SR 99[1]

	Distance from Roadway (feet)[2]			Predicted Noise Levels, L_{dn} (dB)[3]		
Lots	Backyard	1st Floor Facade	Upper-Floor Facade	Backyard	1st Floor Facade	Upper-Floor Facade
18	460	470	470	67	67	71
21	310	320	320	74	74	77
24-33	140	150	150	79	79	82
34	140	150	150	79	79	82
35	350	320	320	67	71	74
57	410	420	420	66	66	69
58	615	550	550	62	62	67

1 A complete listing of FHWA Model inputs and results are provided in Appendix F.
2 Distances were measured from said location to the center of SR 99.
3 Calibration adjustments were applied due to predicted traffic noise levels to account for the difference in measured versus modeled existing traffic noise levels.

Source: Bollard Acoustical Consultants, Inc. (2020)

According to the project site plan, the project proposes the construction of a solid CMU noise barrier along a portion of the lots adjacent to SR 99. Figure shows the location of the proposed CMU wall. The effectiveness of the shielding provided by the proposed 8-foot tall solid traffic noise barrier was evaluated and the results of that evaluation are summarized in Table 12. Noise barrier effectiveness prediction worksheets are provided in Appendix G.

Based on the proposed location of the barrier, the barrier would completely shield ground level locations of Lots 18-33. However, the proposed orientation of the barrier would only provide partial shielding at ground level locations of Lot 34. As a result, a barrier effectiveness prediction analysis was not conducted for ground level locations of Lot 34.

Table 12
Predicted Future Exterior Traffic Noise Levels Including Proposed 8-Foot Tall Barrier[1]

	Distance from Roadway (feet)[2]			Predicted Noise Levels, L_{dn} (dB)[3]		
Lots	Backyard	1st Floor Facade	Upper-Floor Facade	Backyard	1st Floor Facade	Upper-Floor Facade
18	460	470	470	59	60	71
21	310	320	320	66	67	77
24-33	140	150	150	73	72	82
34	140	150	150	79	79	82
35	350	320	320	67	71	74
57	410	420	420	66	66	69
58	615	550	550	62	62	67

1 Barrier effectiveness prediction worksheets for ground level locations of Lots 18-33 provided in Appendix G.
2 Distances were measured from said location to the center of SR 99.
3 Calibration adjustments were applied due to predicted traffic noise levels to account for the difference in measured versus modeled existing traffic noise levels.
Source: Bollard Acoustical Consultants, Inc. (2020)

As indicated in Table 12, future SR 99 traffic noise levels are predicted to exceed the City of Galt exterior noise standard of 60 dB L_{dn} at portions of the proposed outdoor activity areas (backyards) nearest to the roadway, including the shielding provided by the proposed 8-foot tall CMU wall as indicated on Figure 2. As a result, this impact is identified as being **potentially significant**.

Mitigation Impact 5:

In order to satisfy applicable City of Galt General Plan exterior noise level criteria at the outdoor activity areas of the nearest residential lots to SR 99, the following specific traffic noise mitigation measure should be implemented:

MM 5: The construction of solid traffic noise barriers of various heights will be required. Table 13 shows the minimum barrier heights needed to satisfy the City of Galt normally acceptable 60 dB L_{dn}, and conditionally acceptable 65 and 75 dB L_{dn} exterior noise level standards at the nearest residential lots. Figure 2 shows the locations of the required barriers. Noise barrier effectiveness prediction worksheets for the required barriers are provided in Appendix H.

Table 13
Predicted Future SR 99 Traffic Noise Levels at Backyards – Mitigated[1]

Lots	Minimum Barrier Height Required to Satisfy Noise Standard (feet)[2,3]		
	70 dB L_{dn}	65 dB L_{dn}	60 dB L_{dn}
21	--	9	14
24-33	11	19	--
34	11	19	--
35	--	6	7
57	--	6	7
58	--	--	6

[1] Barrier effectiveness prediction worksheets are provided in Appendix H.
[2] Figure 2 shows the location of the required barriers.
Source: Bollard Acoustical Consultants, Inc. (2020)

Significance of Impact 5 after Mitigation: *Less than Significant*

Impact 6: Future Interior Traffic Noise Levels at the Project Site

Standard building construction (stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof), typically results in an exterior to interior noise reduction of approximately 25 dB with windows closed and approximately 15 dB with windows open.

As indicated in Table 12, future SR 99 traffic noise levels are predicted to range from 60 to 79 dB L_{dn} at first-floor building facades of the residences proposed nearest to SR 99, including shielding provided by the proposed 8-foot tall CMU noise barrier as indicated on Figure 2. Due to reduced ground absorption at elevated positions, and lack of shielding provided by the proposed barrier, future SR 99 traffic noise levels at upper-floor building facades are predicted to range from 71 to 82 dB L_{dn}.

First-floor exterior noise levels are expected to be reduced to 70 dB L_{dn} or less after construction of the noise barriers required to achieve satisfaction with the City of Galt General Plan's normally to conditionally acceptable range of exterior noise level standards. Therefore, standard construction practices *should* be adequate for first-floor facades of the residences adjacent to SR 99 but would not allow for a factor of safety. In addition, because upper-floor facades would not experience the same degree of ground attenuation as first-floor facades, a greater degree of upper-floor construction would be necessary to comply with the General Plan 45 dB L_{dn} interior noise level standard. As a result, this impact is identified as being **potentially significant**.

Mitigation Impact 6:

In order to satisfy applicable City of Galt General Plan interior noise level criteria within the residences constructed nearest to SR 99, the following specific traffic noise mitigation measures should be implemented:

MM 6A: Window construction upgrades are recommended for a portion of the residences of the development. The lot locations and associated window construction upgrades are indicated in Figure 2. Specifically, all north, south and east-facing bedroom windows of residences constructed on the lots identified in Figure 2 should have the associated minimum STC rating.

AND

MM 6B: Mechanical ventilation (air conditioning) should be provided for all guestrooms/residences within this development to allow the occupants to close doors and windows as desired for additional acoustical isolation.

Significance of Impact 6 after Mitigation: *Less than Significant*

This concludes BAC's noise and vibration assessment of the Fairway Oaks Residential Development project in Galt, 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.

Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq Equivalent or energy-averaged sound level.

Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.

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.

Sabin The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.

Threshold of Hearing The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain Approximately 120 dB above the threshold of hearing.

Appendix B-1
FHWA Highway Traffic Noise Prediction Model Data Inputs
Fairway Oaks Residential Development
File Name: 2019-196 01 Existing
Model Run Date: 2/25/2020

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Lincoln Way / Kost Road	North	4,340	80	20	2	1	35	100
2		South	6,100	80	20	2	1	50	100
3		East							
4		West	3,510	80	20	2	1	40	100
5	Lincoln Way / Ranch Road	North	4,810	80	20	2	1	45	100
6		South	4,305	80	20	2	1	35	100
7		East	1,125	80	20	2	1	25	100
8		West							
9	Lincoln Way / Cornell Road	North	5,060	80	20	2	1	30	100
10		South	4,945	80	20	2	1	45	100
11		East	145	80	20	2	1	25	100
12		West							
13	Lincoln Way / C Street	North	5,030	80	20	2	1	30	100
14		South	5,160	80	20	2	1	30	100
15		East	7,485	80	20	2	1	30	100
16		West	5,205	80	20	2	1	20	100
17	Glendale Avenue / SR 99 SB Ramps	North	780	80	20	2	1	45	100
18		South	1,210	80	20	2	1	40	100
19		East							
20		West	970	80	20	2	1	25	100
21	Fairway Drive / C Street	North	5,460	80	20	2	1	40	100
22		South	4,675	80	20	2	1	40	100
23		East	9,590	80	20	2	1	40	100
24		West	12,555	80	20	2	1	30	100
25	A Street / SR 99 SB Off-Ramp	North	3,995	80	20	2	2	40	100
26		South	3,450	80	20	2	2	40	100
27		East	3,780	80	20	2	2	40	100
28		West	5,915	80	20	2	2	40	100
29	C Street / SR 99 NB Off-Ramp	North	4,440	80	20	2	2	40	100
30		South	3,415	80	20	2	2	40	100
31		East	5,465	80	20	2	2	40	100
32		West	9,590	80	20	2	2	40	100
33	A Street / SR 99 NB On-Ramp	North	5,040	80	20	2	2	40	100
34		South	4,440	80	20	2	2	40	100
35		East	420	80	20	2	2	40	100
36		West	3,780	80	20	2	2	40	100

Note: Blank cells represent roadways for which no traffic data was provided.

Appendix B-2
FHWA Highway Traffic Noise Prediction Model Data Inputs
Fairway Oaks Residential Development
File Name: 2019-196 02 Existing+Project
Model Run Date: 2/25/2020

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Lincoln Way / Kost Road	North	4,570	80	20	2	1	35	100
2		South	6,255	80	20	2	1	50	100
3		East							
4		West	3,585	80	20	2	1	40	100
5	Lincoln Way / Ranch Road	North	4,900	80	20	2	1	45	100
6		South	4,535	80	20	2	1	35	100
7		East	1,385	80	20	2	1	25	100
8		West							
9	Lincoln Way / Cornell Road	North	5,270	80	20	2	1	30	100
10		South	5,035	80	20	2	1	45	100
11		East	325	80	20	2	1	25	100
12		West							
13	Lincoln Way / C Street	North	5,265	80	20	2	1	30	100
14		South	5,455	80	20	2	1	30	100
15		East	7,485	80	20	2	1	30	100
16		West	5,265	80	20	2	1	20	100
17	Glendale Avenue / SR 99 SB Ramps	North	1,400	80	20	2	1	45	100
18		South	1,475	80	20	2	1	40	100
19		East							
20		West	1,855	80	20	2	1	25	100
21	Fairway Drive / C Street	North	3,485	80	20	2	1	40	100
22		South	5,220	80	20	2	1	40	100
23		East	10,005	80	20	2	1	40	100
24		West	10,640	80	20	2	1	30	100
25	A Street / SR 99 SB Off-Ramp	North	4,030	80	20	2	2	40	100
26		South	3,485	80	20	2	2	40	100
27		East	3,780	80	20	2	2	40	100
28		West	5,915	80	20	2	2	40	100
29	C Street / SR 99 NB Off-Ramp	North	4,595	80	20	2	2	40	100
30		South	3,500	80	20	2	2	40	100
31		East	5,640	80	20	2	2	40	100
32		West	10,005	80	20	2	2	40	100
33	A Street / SR 99 NB On-Ramp	North	5,195	80	20	2	2	40	100
34		South	4,595	80	20	2	2	40	100
35		East	420	80	20	2	2	40	100
36		West	3,780	80	20	2	2	40	100

Note: Blank cells represent roadways for which no traffic data was provided.

Appendix B-3
FHWA Highway Traffic Noise Prediction Model Data Inputs
Fairway Oaks Residential Development
File Name: 2019-196 03 Cumulative
Model Run Date: 2/25/2020

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Lincoln Way / Kost Road	North	6,925	80	20	2	1	35	100
2		South	8,675	80	20	2	1	50	100
3		East							
4		West	4,300	80	20	2	1	40	100
5	Lincoln Way / Ranch Road	North	7,450	80	20	2	1	45	100
6		South	6,925	80	20	2	1	35	100
7		East	1,275	80	20	2	1	25	100
8		West							
9	Lincoln Way / Cornell Road	North	7,625	80	20	2	1	30	100
10		South	7,475	80	20	2	1	45	100
11		East	250	80	20	2	1	25	100
12		West							
13	Lincoln Way / C Street	North	8,550	80	20	2	1	30	100
14		South	8,150	80	20	2	1	30	100
15		East	11,900	80	20	2	1	30	100
16		West	8,750	80	20	2	1	20	100
17	Glendale Avenue / SR 99 SB Ramps	North	1,200	80	20	2	1	45	100
18		South	1,425	80	20	2	1	40	100
19		East							
20		West	1,275	80	20	2	1	25	100
21	Fairway Drive / C Street	North	6,650	80	20	2	1	40	100
22		South	10,475	80	20	2	1	40	100
23		East	22,450	80	20	2	1	40	100
24		West	17,425	80	20	2	1	30	100
25	A Street / SR 99 SB Off-Ramp	North	4,700	80	20	2	2	40	100
26		South	6,650	80	20	2	2	40	100
27		East	14,700	80	20	2	2	40	100
28		West	11,900	80	20	2	2	40	100
29	C Street / SR 99 NB Off-Ramp	North	9,300	80	20	2	2	40	100
30		South	7,600	80	20	2	2	40	100
31		East	16,400	80	20	2	2	40	100
32		West	23,500	80	20	2	2	40	100
33	A Street / SR 99 NB On-Ramp	North	5,225	80	20	2	2	40	100
34		South	8,250	80	20	2	2	40	100
35		East	15,875	80	20	2	2	40	100
36		West	14,700	80	20	2	2	40	100

Note: Blank cells represent roadways for which no traffic data was provided.

Appendix B-4
FHWA Highway Traffic Noise Prediction Model Data Inputs
Fairway Oaks Residential Development
File Name: 2019-196 04 Cumulative+Project
Model Run Date: 2/25/2020

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	Lincoln Way / Kost Road	North	7,155	80	20	2	1	35	100
2		South	8,830	80	20	2	1	50	100
3		East							
4		West	4,375	80	20	2	1	40	100
5	Lincoln Way / Ranch Road	North	7,540	80	20	2	1	45	100
6		South	7,155	80	20	2	1	35	100
7		East	1,535	80	20	2	1	25	100
8		West							
9	Lincoln Way / Cornell Road	North	7,835	80	20	2	1	30	100
10		South	7,565	80	20	2	1	45	100
11		East	430	80	20	2	1	25	100
12		West							
13	Lincoln Way / C Street	North	8,785	80	20	2	1	30	100
14		South	8,445	80	20	2	1	30	100
15		East	11,900	80	20	2	1	30	100
16		West	8,810	80	20	2	1	20	100
17	Glendale Avenue / SR 99 SB Ramps	North	1,820	80	20	2	1	45	100
18		South	1,840	80	20	2	1	40	100
19		East							
20		West	2,310	80	20	2	1	25	100
21	Fairway Drive / C Street	North	6,685	80	20	2	1	40	100
22		South	11,020	80	20	2	1	40	100
23		East	22,865	80	20	2	1	40	100
24		West	17,520	80	20	2	1	30	100
25	A Street / SR 99 SB Off-Ramp	North	4,735	80	20	2	2	40	100
26		South	6,685	80	20	2	2	40	100
27		East	14,700	80	20	2	2	40	100
28		West	11,900	80	20	2	2	40	100
29	C Street / SR 99 NB Off-Ramp	North	8,405	80	20	2	2	40	100
30		South	7,685	80	20	2	2	40	100
31		East	16,575	80	20	2	2	40	100
32		West	22,865	80	20	2	2	40	100
33	A Street / SR 99 NB On-Ramp	North	5,380	80	20	2	2	40	100
34		South	8,405	80	20	2	2	40	100
35		East	15,875	80	20	2	2	40	100
36		West	14,700	80	20	2	2	40	100

Note: Blank cells represent roadways for which no traffic data was provided.

Appendix C
Ambient Noise Monitoring Results
Fairway Oaks Residential Development - Galt, California - Site LT-1
September 14-15, 2017

Hour	Leq	Lmax	L50	L90
3:00 PM	79	87	78	74
4:00 PM	79	91	78	74
5:00 PM	78	90	78	73
6:00 PM	78	92	78	72
7:00 PM	77	88	76	71
8:00 PM	77	91	76	69
9:00 PM	76	89	74	67
10:00 PM	75	86	73	65
11:00 PM	74	94	71	61
12:00 AM	73	86	69	58
1:00 AM	73	86	67	56
2:00 AM	73	86	67	56
3:00 AM	74	88	70	59
4:00 AM	76	85	74	66
5:00 AM	78	87	77	71
6:00 AM	79	85	78	73
7:00 AM	79	87	79	74
8:00 AM	79	86	78	73
9:00 AM	79	94	78	72
10:00 AM	79	87	78	73
11:00 AM	79	87	78	73
12:00 PM	79	88	79	74
1:00 PM	79	89	78	74
2:00 PM	79	91	78	74

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	79	76	78	79	73	75
Lmax (Maximum)	94	86	89	94	85	87
L50 (Median)	79	74	78	78	67	72
L90 (Background)	74	67	73	73	56	63

Computed Ldn, dB	82
% Daytime Energy	77%
% Nighttime Energy	23%

GPS Coordinates	38°14'45.80"N 121°17'19.19"W

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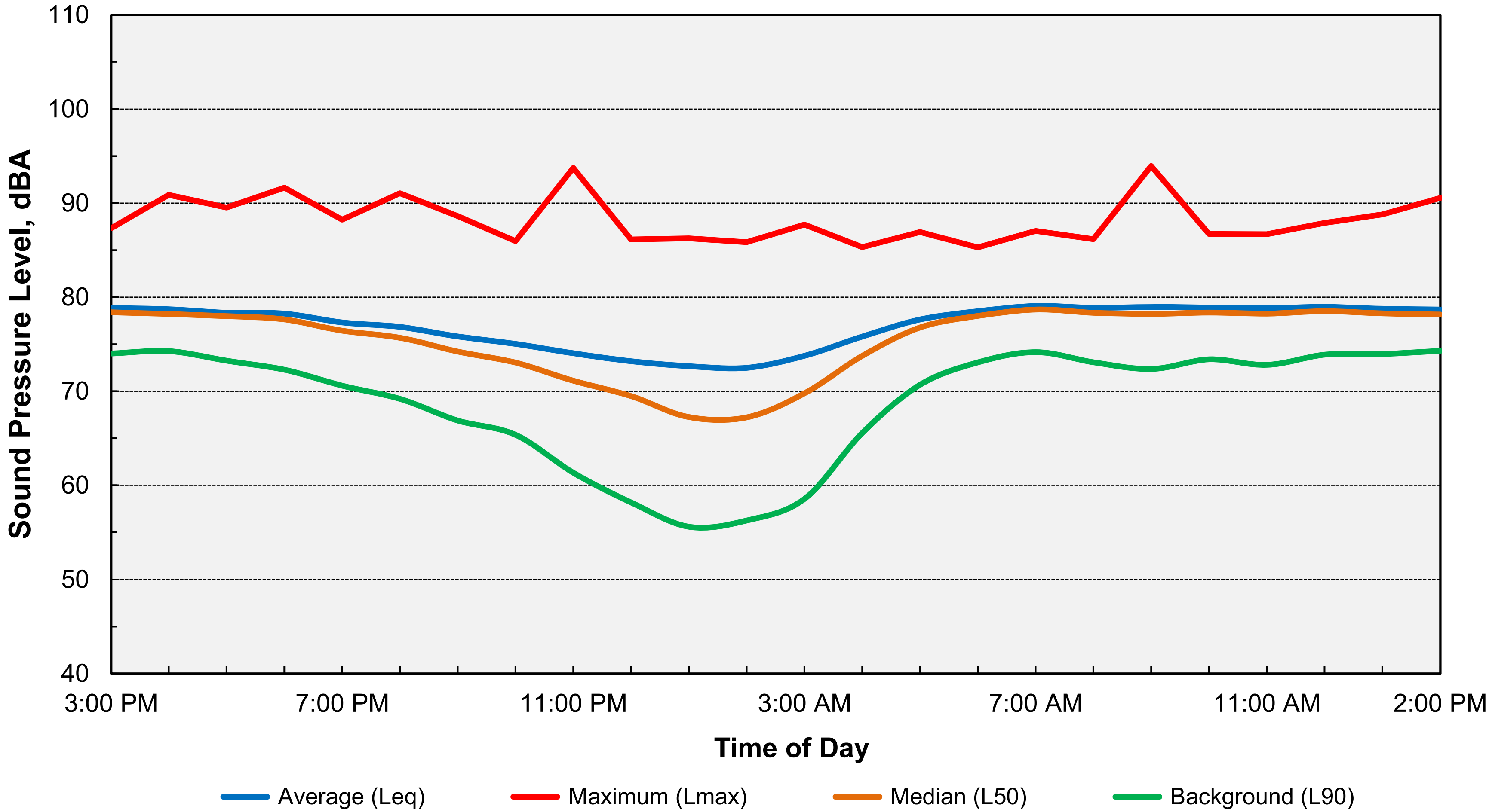
Appendix D
Ambient Noise Monitoring Results
Fairway Oaks Residential Development - Galt, California - Site LT-1
September 14-15, 2017



Computed Ldn = 82 dB

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Appendix E-1
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Calibration Worksheet

Project Information:	Job Number:	2017-161
	Project Name:	Fairway Oaks Residential Development
	Roadway Tested:	State Route 99
	Test Location:	Site TC-1
	Test Date:	September 18, 2017
Weather Conditions:	Temperature (Fahrenheit):	70
	Relative Humidity:	68%
	Wind Speed and Direction:	SE 7 mph
	Cloud Cover:	Partly Cloudy
Sound Level Meter:	Sound Level Meter:	LDL Model 820 (BAC #1)
	Calibrator:	LDL Model CAL200
	Meter Calibrated:	Immediately before
	Meter Settings:	A-weighted, slow response
Microphone:	Microphone Location:	On project site
	Distance to Centerline (feet):	200
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	**Soft**
	Elevation Relative to Road (feet):	5
Roadway Condition:	Pavement Type	Asphalt
	Pavement Condition:	Good
	Number of Lanes:	4
	Posted Maximum Speed (mph):	65
Test Parameters:	Test Time:	10:30 AM
	Test Duration (minutes):	15
	Observed Number Automobiles:	682
	Observed Number Medium Trucks:	36
	Observed Number Heavy Trucks:	144
	Observed Average Speed (mph):	65
Model Calibration:	Measured Average Level (L_{eq}):	68.3
	Level Predicted by FHWA Model:	71.1
	Difference:	***2.8 dB***

Conclusions:

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Appendix E-2
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Calibration Worksheet

Project Information:	Job Number:	2017-161
	Project Name:	Fairway Oaks Residential Development
	Roadway Tested:	State Route 99
	Test Location:	Site TC-2
	Test Date:	September 18, 2017
Weather Conditions:	Temperature (Fahrenheit):	70
	Relative Humidity:	68%
	Wind Speed and Direction:	SE 7 mph
	Cloud Cover:	Partly Cloudy
Sound Level Meter:	Sound Level Meter:	LDL Model 820 (BAC #1)
	Calibrator:	LDL Model CAL200
	Meter Calibrated:	Immediately before
	Meter Settings:	A-weighted, slow response
Microphone:	Microphone Location:	On project site
	Distance to Centerline (feet):	330
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	**Soft**
	Elevation Relative to Road (feet):	5
Roadway Condition:	Pavement Type	Asphalt
	Pavement Condition:	Good
	Number of Lanes:	4
	Posted Maximum Speed (mph):	65
Test Parameters:	Test Time:	10:30 AM
	Test Duration (minutes):	15
	Observed Number Automobiles:	682
	Observed Number Medium Trucks:	36
	Observed Number Heavy Trucks:	144
	Observed Average Speed (mph):	65
Model Calibration:	Measured Average Level (L_{eq}):	61.7
	Level Predicted by FHWA Model:	67.9
	Difference:	***6.2 dB***

Conclusions:

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Appendix E-3
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Calibration Worksheet

Project Information:	Job Number:	2017-161
	Project Name:	Fairway Oaks Residential Development
	Roadway Tested:	State Route 99
	Test Location:	Site TC-3
	Test Date:	September 18, 2017
Weather Conditions:	Temperature (Fahrenheit):	70
	Relative Humidity:	68%
	Wind Speed and Direction:	SE 7 mph
	Cloud Cover:	Partly Cloudy
Sound Level Meter:	Sound Level Meter:	LDL Model 820 (BAC #1)
	Calibrator:	LDL Model CAL200
	Meter Calibrated:	Immediately before
	Meter Settings:	A-weighted, slow response
Microphone:	Microphone Location:	On project site
	Distance to Centerline (feet):	590
	Microphone Height:	5 feet above ground
	Intervening Ground (Hard or Soft):	**Soft**
	Elevation Relative to Road (feet):	5
Roadway Condition:	Pavement Type	Asphalt
	Pavement Condition:	Good
	Number of Lanes:	4
	Posted Maximum Speed (mph):	65
Test Parameters:	Test Time:	10:30 AM
	Test Duration (minutes):	15
	Observed Number Automobiles:	682
	Observed Number Medium Trucks:	36
	Observed Number Heavy Trucks:	144
	Observed Average Speed (mph):	65
Model Calibration:	Measured Average Level (L_{eq}):	57.5
	Level Predicted by FHWA Model:	64.1

Difference: 6.6 dB

Conclusions:

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Appendix F-1
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				L_{dn}, dB			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyard	460	-4	64	58	64	67
Lot 18	First-floor facade	470	-4	64	58	63	67
	Upper-floor facade	470		68	62	67	71

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:

1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A conservative -4 dB offset was applied to account for the difference in measured versus modeled existing traffic noise levels.

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Appendix F-2
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------- L_{dn}, dB -----------------			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyard	310		71	65	70	74
Lot 21	First-floor facade	320		71	65	70	74
	Upper-floor facade	320	3	74	68	73	77

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:
1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A +3 dB offset was applied to upper-floor facades due to reduced ground absorption of sound at elevated locations.

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Appendix F-3
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------L_{dn}, dB----------------			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyards	140		76	70	75	79
Lots 24-33	First-floor facades	150		75	70	75	79
	Upper-floor facades	150	3	78	73	78	82

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:
1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A +3 dB offset was applied to upper-floor facades due to reduced ground absorption of sound at elevated locations.

Appendix F-4
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------L_{dn}, dB----------------			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyard	140		76	70	75	79
Lot 34	First-floor facade	150		75	70	75	79
	Upper-floor facade	150	3	78	73	78	82

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	**Distance from Centerline, (ft)**
75	266
70	573
65	1234
60	2658

Notes:

1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A +3 dB offset was applied to upper-floor facades due to reduced ground absorption of sound at elevated locations.

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Appendix F-5
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				L_{dn}, dB			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyard	350	-6	64	58	63	67
Lot 35	First-floor facade	320	-3	68	62	67	71
	Upper-floor facade	320		71	65	70	74

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:
1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A -3 dB offset was applied at the backyard to account for partial shielding of the roadway provided by intervening buildings. A conservative -3 dB offset was applied to account for the difference in measured versus modeled existing traffic noise levels.

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Appendix F-6
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				L_{dn}, dB			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
Lot 57	Backyard	410	-6	63	57	62	66
	First-floor facade	420	-6	63	57	62	66
	Upper-floor facade	420	-3	66	60	65	69

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:
1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A -3 dB offset was applied for partial view of the roadway resulting from intervening buildings. A conservative -3 dB offset was applied to account for the difference in measured versus modeled existing traffic noise levels.

Appendix F-7
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2019-196
Project Name:	Fairway Oaks Residential Development
Roadway Name:	SR 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	112,500
Percent Daytime Traffic:	77
Percent Nighttime Traffic:	23
Percent Medium Trucks (2 axle):	6
Percent Heavy Trucks (3+ axle):	9
Assumed Vehicle Speed (mph):	70
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				L_{dn}, dB			
Lots	**Location**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
	Backyard	615	-8	58	52	58	62
Lot 58	First-floor facade	550	-8	59	53	58	62
	Upper-floor facade	550	-3	64	58	63	67

Traffic Noise Contours (No Calibration Offset):

L_{dn} Contour, dB	Distance from Centerline, (ft)
75	266
70	573
65	1234
60	2658

Notes:
1. Future ADT was conservatively estimated by increasing the existing ADT volume for SR 99 adjacent to the proejct site by 50%. Existing (2017) ADT obtained from published Caltrans traffic volume data (2017 - 75,000 ADT).
2. A -3 dB offset was applied for partial view of the roadway resulting from intervening buildings. A conservative -5 dB offset was applied to account for the difference in measured versus modeled existing traffic noise levels.

Appendix G-1
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 18

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 64
Medium Truck L_{dn}, dB: 58
Heavy Truck L_{dn}, dB: 64

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 450
Barrier to Receiver Distance (C_2): 10
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	-------------------- L_{dn}, dB --------------------				Barrier Breaks Line of Sight to...		
		Autos	Medium Trucks	Heavy Trucks	Total	Autos?	Medium Trucks?	Heavy Trucks?
8	8	56	50	55	**59**	Yes	Yes	Yes
9	9	54	49	54	**58**	Yes	Yes	Yes
10	10	53	48	53	**57**	Yes	Yes	Yes
11	11	52	47	52	**56**	Yes	Yes	Yes
12	12	52	46	51	**55**	Yes	Yes	Yes
13	13	51	45	50	**54**	Yes	Yes	Yes
14	14	50	44	50	**53**	Yes	Yes	Yes
15	15	50	44	49	**53**	Yes	Yes	Yes
16	16	49	44	49	**53**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix G-2
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 18

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 64
Medium Truck L_{dn}, dB: 58
Heavy Truck L_{dn}, dB: 63

Site Geometry:

Receiver Description: First-floor facade
Centerline to Barrier Distance (C_1): 450
Barrier to Receiver Distance (C_2): 20
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	-------------------- L_{dn}, dB -------------------- Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to... Autos?	Medium Trucks?	Heavy Trucks?
8	8	57	51	57	**60**	Yes	Yes	Yes
9	9	56	50	56	**59**	Yes	Yes	Yes
10	10	55	49	55	**58**	Yes	Yes	Yes
11	11	54	48	54	**57**	Yes	Yes	Yes
12	12	53	47	53	**57**	Yes	Yes	Yes
13	13	53	47	52	**56**	Yes	Yes	Yes
14	14	52	46	51	**55**	Yes	Yes	Yes
15	15	51	45	51	**54**	Yes	Yes	Yes
16	16	50	45	50	**54**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix G-3
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 21

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 71
Medium Truck L_{dn}, dB: 65
Heavy Truck L_{dn}, dB: 70

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 300
Barrier to Receiver Distance (C_2): 10
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

		------------------- L_{dn}, dB -------------------				Barrier Breaks Line of Sight to...		
Top of Barrier Elevation (ft)	**Barrier Height[2] (ft)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**	**Autos?**	**Medium Trucks?**	**Heavy Trucks?**
8	8	62	56	62	**66**	Yes	Yes	Yes
9	9	61	55	61	**64**	Yes	Yes	Yes
10	10	60	54	60	**63**	Yes	Yes	Yes
11	11	59	53	59	**62**	Yes	Yes	Yes
12	12	58	52	58	**61**	Yes	Yes	Yes
13	13	57	51	57	**61**	Yes	Yes	Yes
14	14	57	51	56	**60**	Yes	Yes	Yes
15	15	56	50	56	**59**	Yes	Yes	Yes
16	16	55	49	56	**59**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix G-4
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 21

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 71
Medium Truck L_{dn}, dB: 65
Heavy Truck L_{dn}, dB: 70

Site Geometry:

Receiver Description: First-floor facade
Centerline to Barrier Distance (C_1): 300
Barrier to Receiver Distance (C_2): 20
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	------------------- L_{dn}, dB -------------------				Barrier Breaks Line of Sight to...		
		Autos	Medium Trucks	Heavy Trucks	Total	Autos?	Medium Trucks?	Heavy Trucks?
8	8	63	57	63	**67**	Yes	Yes	Yes
9	9	62	56	62	**66**	Yes	Yes	Yes
10	10	61	55	61	**65**	Yes	Yes	Yes
11	11	60	54	60	**64**	Yes	Yes	Yes
12	12	60	54	59	**63**	Yes	Yes	Yes
13	13	59	53	59	**62**	Yes	Yes	Yes
14	14	58	52	58	**61**	Yes	Yes	Yes
15	15	57	52	57	**61**	Yes	Yes	Yes
16	16	57	51	57	**60**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix G-5
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lots 24-33

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 76
Medium Truck L_{dn}, dB: 70
Heavy Truck L_{dn}, dB: 75

Site Geometry:

Receiver Description: Backyards
Centerline to Barrier Distance (C_1): 100
Barrier to Receiver Distance (C_2): 40
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to... Autos?	Medium Trucks?	Heavy Trucks?
8	8	68	63	70	**73**	Yes	Yes	Yes
9	9	67	62	69	**72**	Yes	Yes	Yes
10	10	67	61	68	**71**	Yes	Yes	Yes
11	11	66	60	67	**70**	Yes	Yes	Yes
12	12	65	60	66	**69**	Yes	Yes	Yes
13	13	65	59	65	**69**	Yes	Yes	Yes
14	14	64	58	65	**68**	Yes	Yes	Yes
15	15	63	58	64	**67**	Yes	Yes	Yes
16	16	63	57	64	**67**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix G-6
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lots 24-33

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 75
Medium Truck L_{dn}, dB: 70
Heavy Truck L_{dn}, dB: 75

Site Geometry:

Receiver Description: First-floor facades
Centerline to Barrier Distance (C_1): 100
Barrier to Receiver Distance (C_2): 50
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness: Proposed 8-Foot Tall Noise Barrier

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to... Autos?	Medium Trucks?	Heavy Trucks?
8	8	68	63	69	**72**	Yes	Yes	Yes
9	9	67	62	69	**71**	Yes	Yes	Yes
10	10	66	61	68	**71**	Yes	Yes	Yes
11	11	66	60	67	**70**	Yes	Yes	Yes
12	12	65	59	66	**69**	Yes	Yes	Yes
13	13	65	59	66	**69**	Yes	Yes	Yes
14	14	64	58	65	**68**	Yes	Yes	Yes
15	15	63	58	64	**67**	Yes	Yes	Yes
16	16	63	57	64	**67**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix H-1
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 21

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 71
Medium Truck L_{dn}, dB: 65
Heavy Truck L_{dn}, dB: 70

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 300
Barrier to Receiver Distance (C_2): 10
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
8	8	62	56	62	**66**	Yes	Yes	Yes
9	9	61	55	61	**64**	Yes	Yes	Yes
10	10	60	54	60	**63**	Yes	Yes	Yes
11	11	59	53	59	**62**	Yes	Yes	Yes
12	12	58	52	58	**61**	Yes	Yes	Yes
13	13	57	51	57	**61**	Yes	Yes	Yes
14	14	57	51	56	**60**	Yes	Yes	Yes
15	15	56	50	56	**59**	Yes	Yes	Yes
16	16	55	49	56	**59**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix H-2
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lots 24-33

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 76
Medium Truck L_{dn}, dB: 70
Heavy Truck L_{dn}, dB: 75

Site Geometry:

Receiver Description: Backyards
Centerline to Barrier Distance (C_1): 100
Barrier to Receiver Distance (C_2): 40
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
11	11	66	60	67	**70**	Yes	Yes	Yes
12	12	65	60	66	**69**	Yes	Yes	Yes
13	13	65	59	65	**69**	Yes	Yes	Yes
14	14	64	58	65	**68**	Yes	Yes	Yes
15	15	63	58	64	**67**	Yes	Yes	Yes
16	16	63	57	64	**67**	Yes	Yes	Yes
17	17	62	57	63	**66**	Yes	Yes	Yes
18	18	62	56	62	**66**	Yes	Yes	Yes
19	19	61	56	62	**65**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix H-3
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 34

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 76
Medium Truck L_{dn}, dB: 70
Heavy Truck L_{dn}, dB: 75

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 100
Barrier to Receiver Distance (C_2): 40
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 11

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB				Barrier Breaks Line of Sight to…		
		Autos	Medium Trucks	Heavy Trucks	Total	Autos?	Medium Trucks?	Heavy Trucks?
11	11	66	60	67	**70**	Yes	Yes	Yes
12	12	65	60	66	**69**	Yes	Yes	Yes
13	13	65	59	65	**69**	Yes	Yes	Yes
14	14	64	58	65	**68**	Yes	Yes	Yes
15	15	63	58	64	**67**	Yes	Yes	Yes
16	16	63	57	64	**67**	Yes	Yes	Yes
17	17	62	57	63	**66**	Yes	Yes	Yes
18	18	62	56	62	**66**	Yes	Yes	Yes
19	19	61	56	62	**65**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix H-4
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 35

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 64
Medium Truck L_{dn}, dB: 58
Heavy Truck L_{dn}, dB: 63

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 340
Barrier to Receiver Distance (C_2): 10
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
6	6	58	53	58	**62**	Yes	Yes	Yes
7	7	57	51	57	**60**	Yes	Yes	Yes
8	8	56	50	55	**59**	Yes	Yes	Yes
9	9	54	48	54	**58**	Yes	Yes	Yes
10	10	53	47	53	**57**	Yes	Yes	Yes
11	11	52	46	52	**56**	Yes	Yes	Yes
12	12	51	45	51	**55**	Yes	Yes	Yes
13	13	50	45	50	**54**	Yes	Yes	Yes
14	14	50	44	49	**53**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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Appendix H-5
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 57

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 63
Medium Truck L_{dn}, dB: 57
Heavy Truck L_{dn}, dB: 62

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 400
Barrier to Receiver Distance (C_2): 10
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	L_{dn}, dB Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
6	6	57	51	57	**61**	Yes	Yes	Yes
7	7	56	50	56	**59**	Yes	Yes	Yes
8	8	55	49	54	**58**	Yes	Yes	Yes
9	9	53	47	53	**57**	Yes	Yes	Yes
10	10	52	46	52	**56**	Yes	Yes	Yes
11	11	51	45	51	**55**	Yes	Yes	Yes
12	12	50	44	50	**54**	Yes	Yes	Yes
13	13	49	44	49	**53**	Yes	Yes	Yes
14	14	49	43	48	**52**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix H-6
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number: 2019-196
Project Name: Fairway Oaks Residential Development
Roadway Name: SR 99
Location(s): Lot 58

Noise Level Data:

Year: Future
Auto L_{dn}, dB: 58
Medium Truck L_{dn}, dB: 52
Heavy Truck L_{dn}, dB: 58

Site Geometry:

Receiver Description: Backyard
Centerline to Barrier Distance (C_1): 600
Barrier to Receiver Distance (C_2): 15
Automobile Elevation: 0
Medium Truck Elevation: 2
Heavy Truck Elevation: 8
Pad/Ground Elevation at Receiver: 0
Receiver Elevation[1]: 5
Base of Barrier Elevation: 0
Starting Barrier Height 6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	-------------------- L_{dn}, dB -------------------- Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
6	6	53	47	52	**56**	Yes	Yes	Yes
7	7	52	46	51	**55**	Yes	Yes	Yes
8	8	51	45	50	**54**	Yes	Yes	Yes
9	9	50	44	49	**53**	Yes	Yes	Yes
10	10	48	43	48	**52**	Yes	Yes	Yes
11	11	48	42	47	**51**	Yes	Yes	Yes
12	12	47	41	46	**50**	Yes	Yes	Yes
13	13	46	40	46	**49**	Yes	Yes	Yes
14	14	45	39	45	**49**	Yes	Yes	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

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