Appendix I

Noise Impact Analysis

Rio Rockwell Site

NOISE IMPACT ANALYSIS

RIO ROCKWELL RESIDENTIAL PROJECT

CITY OF OCEANSIDE

Lead Agency:

City of Oceanside
300 N. Coast Highway
Oceanside, CA 92054

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Project No. 18074

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TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

APPENDIX

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibels
DOT	Department of Transportation
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
EPA	Environmental Protection Agency
Hz	Hertz
Ldn	Day-night average noise level
Leq	Equivalent sound level
Lmax	Maximum noise level
ONAC	Federal Office of Noise Abatement and Control
OSB	Oriented Strand Board
OSHA	Occupational Safety and Health Administration
PPV	Peak particle velocity
RMS	Root mean square
SEL	Single Event Level or Sound Exposure Level
STC	Sound Transmission Class
TTM	Tentative Tract Map
UMTA	Federal Urban Mass Transit Administration
VdB	Vibration velocity level in decibels

1.0 INTRODUCTION

1.1 Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared to determine the noise impacts associated with the proposed Rio Rockwell Residential project (proposed project). The following is provided in this report:

- A description of the study area and the proposed project;
- Information regarding the fundamentals of noise;
- Information regarding the fundamentals of vibration;
- A description of the local noise guidelines and standards;
- An evaluation of the current noise environment;
- An analysis of the potential short-term construction-related noise impacts from the proposed project; and
- An analysis of long-term operations-related noise impacts from the proposed project.

1.2 Site Location and Study Area

The project site is located in the central portion of the City of Oceanside (City) on the north side of Old Grove Road, west of Frazee Road. The approximately 11.54-acre project site is currently vacant and is bounded by open space (San Luis Rey River Channel) to the north, Frazee Road and single-family residential uses to the east, Old Grove Road and single-family residential uses to the south, and Nichols Elementary School to the west. The project study area is shown in Figure 1.

Sensitive Receptors in Project Vicinity

The nearest sensitive receptors to the project site are single-family homes located as near as 60 feet to the south of the project site and the nearest outdoor activity area or structure at Nichols Elementary School is as near as 180 feet west of the project site.

1.3 Proposed Project Description

The proposed project consists of the development of 50 detached single-family homes (SF) and 54 attached townhomes (MF) on approximately 6.92 acres of the 11.54-acre project site that would also include area for onsite roads, parking spaces, and recreation areas. The remaining portion of the project site would be utilized as a natural open space buffer adjacent to the San Luis Rey River Channel. In order to bring up the ground elevations of the proposed homes to the 100 year flood elevations, approximately 62,000 cubic yards of dirt will be imported to the project site. The proposed site plan is shown in Figure 2.

1.4 Existing and Proposed Land Use and Zoning Designations

The project site is made up of two adjacent vacant parcels. The southernmost parcel (approximately 2.76-acres) that is located adjacent to the intersection of Old Grove Road and Frazee Road is currently designated for General Commercial (GC) in the General Plan and is zoned Limited Commercial (CL). The remainder of the project site is currently designated Single Family Detached Residential (SFD-R) in the General Plan and is zoned Single Family Residential (RS). Development of the proposed project would

include a General Plan Amendment to re-designate the entire project site to Medium Density A Residential (MD A – R) that allows for development of between 6.0 and 9.9 dwelling units per acre and would be re-zoned to Planned Development District (PD).

1.5 Executive Summary

Standard Noise Regulatory Conditions

The proposed project will be required to comply with the following regulatory conditions from the City and State of California (State).

City of Oceanside Noise Regulations

The following lists the noise and vibration regulations from the Municipal Code that are applicable, but not limited to the proposed project.

- Section 38.12(a) Sound Level Limits
- Section 38.17(h) Construction Noise Limitations

State of California Noise Regulations

The following lists the State of California noise regulations that are applicable, but not limited to the proposed project.

- California Vehicle Code Section 2700-27207 – On Road Vehicle Noise Limits
- California Vehicle Code Section 38365-38350 – Off-Road Vehicle Noise Limits

Summary of Analysis Results

The following is a summary of the proposed project's impacts with regard to the State CEQA Guidelines noise checklist questions.

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 applicable standards of other agencies?

Potentially significant impact. Implementation of Mitigation Measures 1 and 2 would reduce the impact to less than significant levels.

Generation of excessive groundborne vibration or groundborne noise levels?

Less than significant impact.

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?

No impact.

1.6 Mitigation Measures for the Proposed Project

This analysis found that through adherence to the noise and vibration regulations detailed in Section 1.4 above and through implementation of the following mitigation all noise and vibration impacts would be reduced to less than significant levels.

Mitigation Measure 1:

The project applicant shall construct a minimum 4-foot high sound wall located between Frazee Road and the backyards for Buildings MF19, MF21, MF33, and MF34. The sound wall shall be constructed of concrete masonry units (CMUs) and shall be free of any decorative cutouts or openings.

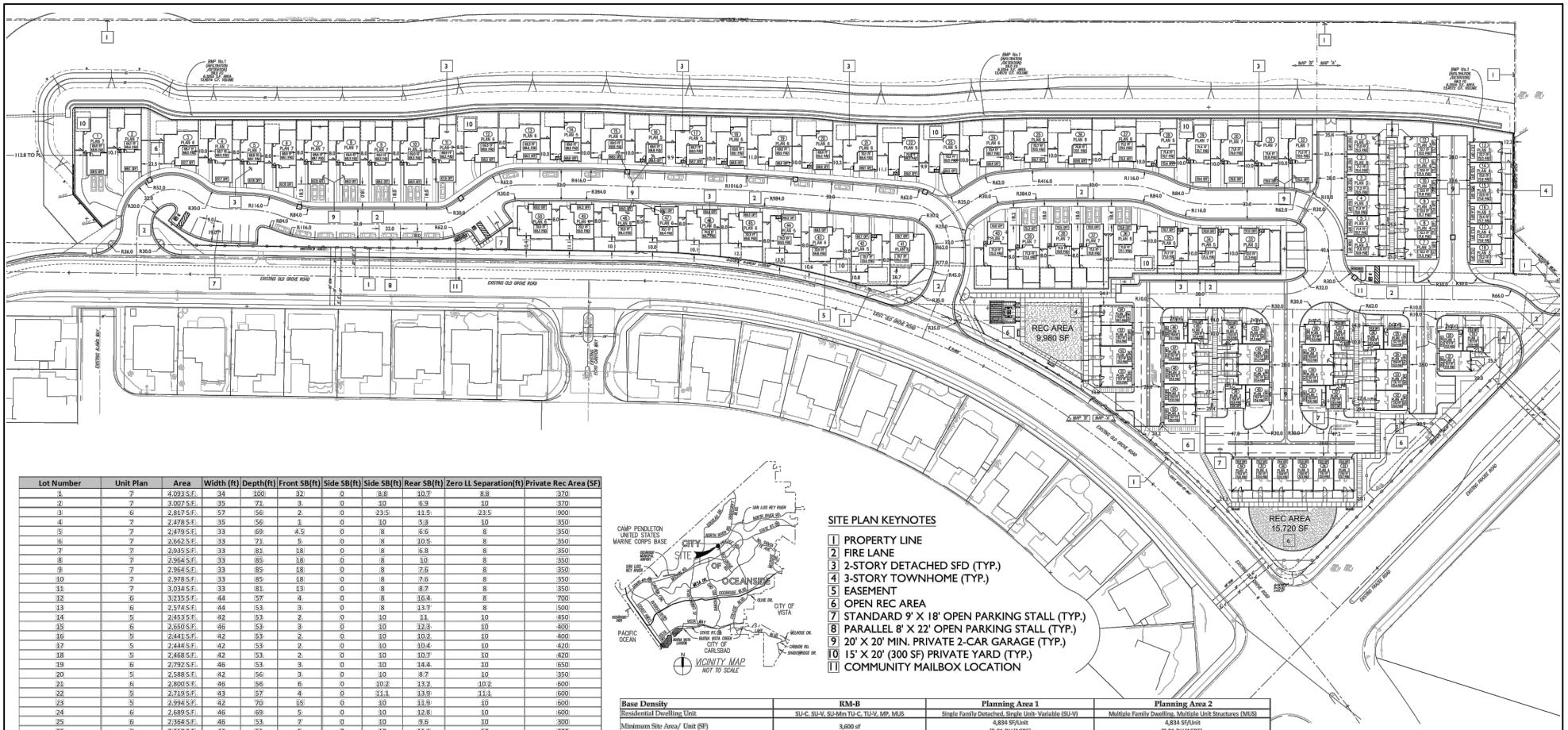
Mitigation Measure 2:

The project applicant shall provide a "windows closed" condition for each proposed home. A "windows closed" condition requires a means of mechanical ventilation per Chapter 12, Section 1205 of the Uniform Building Code. This shall be achieved with a standard forced air conditioning and heating system for each home.

SOURCE: Google Maps.

VISTA ENVIRONMENTAL

Figure 1
Project Location Map



Lot Number	Unit Plan	Area	Width (ft)	Depth(ft)	Front SB(ft)	Side SB(ft)	Side SB(ft)	Rear SB(ft)	Zero LL Separation(ft)	Private Rec Area (SF)
1	7	4,093 S.F.	34	100	32	0	8.8	10.7	8.8	370
2	7	3,007 S.F.	35	71	3	0	10	6.9	10	370
3	6	2,817 S.F.	57	56	2	0	23.5	11.5	23.5	900
4	7	2,478 S.F.	35	56	1	0	10	5.3	10	350
5	7	2,479 S.F.	33	69	4.5	0	8	6.6	8	350
6	7	2,662 S.F.	33	71	5	0	8	10.5	8	350
7	7	2,935 S.F.	33	81	18	0	8	6.8	8	350
8	7	2,964 S.F.	33	85	18	0	8	10	8	350
9	7	2,964 S.F.	33	85	18	0	8	7.6	8	350
10	7	2,978 S.F.	33	85	18	0	8	7.6	8	350
11	7	3,034 S.F.	33	81	13	0	8	8.7	8	350
12	6	3,235 S.F.	44	57	4	0	8	16.4	8	700
13	6	2,574 S.F.	44	53	3	0	8	13.7	8	500
14	5	2,453 S.F.	42	53	2	0	10	11	10	450
15	6	2,650 S.F.	46	53	3	0	10	12.3	10	400
16	5	2,441 S.F.	42	53	2	0	10	10.2	10	400
17	5	2,444 S.F.	42	53	2	0	10	10.4	10	420
18	5	2,468 S.F.	42	53	2	0	10	10.7	10	420
19	6	2,792 S.F.	46	53	3	0	10	14.4	10	650
20	5	2,588 S.F.	42	56	3	0	10	8.7	10	350
21	6	2,800 S.F.	46	56	6	0	10.2	13.2	10.2	600
22	5	2,719 S.F.	43	57	4	0	11.1	13.9	11.1	600
23	5	2,994 S.F.	42	70	16	0	10	13.9	10	600
24	6	2,689 S.F.	46	69	5	0	10	12.8	10	600
25	6	2,364 S.F.	46	53	7	0	10	9.6	10	300
26	6	2,318 S.F.	46	51	5	0	10	13.6	10	300
27	6	2,322 S.F.	46	51	8	0	10	8.5	10	300
28	5	2,371 S.F.	42	51	5	0	10	10.7	10	300
29	7	2,408 S.F.	33	66	4	0	10	6.9	10	405
30	7	2,478 S.F.	33	74	4	0	10	7.8	10	405
31	7	2,474 S.F.	35	68	3	0	10	9.8	10	405
32	7	2,527 S.F.	35	70	7	5	10	6.9	10	405
33	5	2,147 S.F.	43	48	2	32	11	6.5	11	300
34	5	2,090 S.F.	44	48	2	0	10	6.5	10	320
35	5	2,300 S.F.	42	49	5	0	10	7.7	10	300
36	6	3,552 S.F.	51	77	20	5	10	15	10	800
37	7	3,226 S.F.	38	84	20	5	8	7	8	330
38	7	2,802 S.F.	33	84	19	0	8	7	8	330
39	7	2,765 S.F.	33	84	23	0	8	6	8	330
40	7	2,610 S.F.	35	79	5	8	8	12	8	330
41	6	2,559 S.F.	46	70	12	0	9	18.8	9	400
42	5	2,820 S.F.	40	70	7	0	8	18.5	8	420
43	6	3,347 S.F.	44	60	14	8	8	10.2	8	500
44	5	2,336 S.F.	40	56	2	0	8	13.6	8	550
45	6	2,351 S.F.	44	54	3	0	8	12.9	8	550
46	6	2,207 S.F.	44	54	2	0	8	12.5	8	550
47	6	2,158 S.F.	44	53	2	0	8	11	8	440
48	6	2,185 S.F.	44	53	2	0	8	11.1	8	440
49	6	2,201 S.F.	44	53	2	0	8	12	8	480
50	6	2,100 S.F.	39	53	2	0	8	11.4	8	550
Average SFR		*2646 SF*	*40.54*	*63.74*	*7.43*	*0.86*	*9.392*	*10.468*	*9.392*	*437*
Private OS SFR Rear Yards										37,417
Attached Private OS										7,841
Total Common Active Rec										25,264
Total Rec										70,522

SITE PLAN KEYNOTES

1. PROPERTY LINE
2. FIRE LANE
3. 2-STORY DETACHED SFD (TYP.)
4. 3-STORY TOWNHOME (TYP.)
5. EASEMENT
6. OPEN REC AREA
7. STANDARD 9' X 18' OPEN PARKING STALL (TYP.)
8. PARALLEL 8' X 22' OPEN PARKING STALL (TYP.)
9. 20' X 20' MIN. PRIVATE 2-CAR GARAGE (TYP.)
10. 15' X 20' (300 SF) PRIVATE YARD (TYP.)
11. COMMUNITY MAILBOX LOCATION

Base Density	RM-B	Planning Area 1	Planning Area 2
Residential Dwelling Unit	SU-C, SU-V, SU-Mm TU-C, TU-V, MP, MUS	Single Family Detached, Single Unit- Variable (SU-V)	Multiple Family Dwelling, Multiple Unit Structures (MUS)
Minimum Site Area/ Unit (SF)	3,600 sf	4,834 SF/Unit (9.01 DU/ACRE)	4,834 SF/Unit (9.01 DU/ACRE)
Maximum Potential Density: Site Area / Unit (sq.ft)	2,500 sf	4,834 SF/Unit (9.01 DU/ACRE)	4,834 SF/Unit (9.01 DU/ACRE)
Minimum Lot Area (sq.ft.)	7,500 sf	2,100 sf (2,646 Average sfr)	NA
Minimum Lot Width (ft)	60 ft	33-66 ft (40.54 Average)	NA
Minimum Yards: Front (ft.)	20 ft	1.5-24 ft (7.8 Feet Average)	NA
Side (ft.)	5; 10 Ft	0-27 ft (9.8 Feet Average	NA
Corner Side (ft.)	10 ft	5-12 ft	NA
Rear (ft.)	15 ft	6.2-24.2 ft (11.39 feet Average	NA
Courts	1/2 the building height or min 18 feet	8-27 feet detached)	15-28 feet attached
Maximum Height (ft.)	35 ft	28 feet detached	36 feet attached
Maximum Coverage	60%	26.95%	26.95%
Outdoor Living Area	300 sf/unit; Min 15 foot dimension; Minimum 4,000 SF common recreation area; 50% Common Space	437 sf/unit; Min 15 foot dimension; 9,980 SF common recreation area	300 sf/unit; Min 15 foot dimension; 15,284 SF common recreation area common recreation area
Minimum Site Landscaping	15% of Site (75,406 sf)	55.80% of Site (280,527 sf)	55.80% of Site (280,527 sf)
Fences and Walls	Section 3040 - Max 6 feet, except 42" in FY; no chain link	5.5 to 6 feet; no chain link	5.5 to 6 feet; no chain link
Off-Street Parking and Loading	2 car garage per unit (	153 spaces (100 garage + 34 guest + 19 driveway)	129 spaces (108 garage + 21 guest)
Signs	Article 33A	Compliance with Article 33A	Compliance with Article 33A
Outdoor Facilities	Section 3020	No outdoor storage	No outdoor storage
Screening of Mechanical Equipment	Section 3021 - Screened from all sides	Screened from all sides	Screened from all sides
Refuse Storage Areas	Section 3022	Approved by City Planner and City Engineer	Approved by City Planner and City Engineer
Underground Utilities	Section 3023	All Underground	All Underground
Performance Standards	Section 3024 - Comply with Noise/Vibration/Dust/Odors/Glare/Etc.	Comply with Noise/Vibration/Dust/Odors/Glare/ Etc.	Comply with Noise/Vibration/Dust/Odors/Glare/ Etc.
Vehicular Access	Section 3114; 16-foot width for units with 150 feet of street; 24-foot width for 3-9 dwelling units	32-foot street width access to all properties with 16-foot wide driveways	28-foot private street width to all units
Outdoor Storage	160 cubic feet of enclosed outdoor storage per unit	Exempt due to private garage	Exempt due to private garage

104 UNITS TOTAL

		TOWN	DETACH
PLAN 1	1,179 SF	7	0
PLAN 2	1,255 SF	7	0
PLAN 3	1,558 SF	25	0
PLAN 4	1,700 SF	15	0
PLAN 5	1,745 SF	0	13
PLAN 6	1,883 SF	0	19
PLAN 7	2,050 SF	0	18
	TOTALS	54	50

PARKING SUMMARY
208 GARAGES (2 CAR GARAGE/DU TYP
55 OPEN STALLS (37 STAND. AND 18 P/
19 PRIVATE DRIVE STALLS
282 TOTAL PARKING STALLS (2.71 STAL

N

SOURCE: Summa Architecture, January 8, 2020.

OLD GROVE - FRAZEE HOMES

SITE PLAN

VISTA ENVIRONMENTAL

Figure 2
Proposed Site Plan

2.0 NOISE FUNDAMENTALS

Noise is defined as unwanted sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level. A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear.

2.1 Noise Descriptors

Noise Equivalent sound levels are not measured directly, but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The peak traffic hour Leq is the noise metric used by California Department of Transportation (Caltrans) for all traffic noise impact analyses.

The Day-Night Average Level (Ldn) is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time of day corrections require the addition of ten decibels to sound levels at night between 10 p.m. and 7 a.m. While the Community Noise Equivalent Level (CNEL) is similar to the Ldn, except that it has another addition of 4.77 decibels to sound levels during the evening hours between 7 p.m. and 10 p.m. These additions are made to the sound levels at these time periods because during the evening and nighttime hours, when compared to daytime hours, there is a decrease in the ambient noise levels, which creates an increased sensitivity to sounds. For this reason the sound appears louder in the evening and nighttime hours and is weighted accordingly. The City of Oceanside relies on the Ldn noise standard to assess transportation-related impacts on noise sensitive land uses.

2.2 Tone Noise

A pure tone noise is a noise produced at a single frequency and laboratory tests have shown that humans are more perceptible to changes in noise levels of a pure tone. For a noise source to contain a “pure tone,” there must be a significantly higher A-weighted sound energy in a given frequency band than in the neighboring bands, thereby causing the noise source to “stand out” against other noise sources. A pure tone occurs if the sound pressure level in the one-third octave band with the tone exceeds the average of the sound pressure levels of the two contiguous one-third octave bands by:

- 5 dB for center frequencies of 500 hertz (Hz) and above
- 8 dB for center frequencies between 160 and 400 Hz
- 15 dB for center frequencies of 125 Hz or less

2.3 Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound

from point sources, such as air conditioning condensers, radiate uniformly outward as it travels away from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD). Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

2.4 Ground Absorption

The sound drop-off rate is highly dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in traffic noise models, soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA/DD is typically observed over soft ground with landscaping, as compared with a 6.0 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3.0 dBA/DD drop-off rate for hard-site conditions. Caltrans research has shown that the use of soft-site conditions is more appropriate for the application of the Federal Highway Administration (FHWA) traffic noise prediction model used in this analysis.

3.0 GROUND-BORNE VIBRATION FUNDAMENTALS

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

3.1 Vibration Descriptors

There are several different methods that are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (rms) amplitude of the vibration velocity. Due to the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels and is denoted as (L_v) and is based on the rms velocity amplitude. A commonly used abbreviation is "VdB", which in this text, is when L_v is based on the reference quantity of 1 micro inch per second.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration.

3.3 Vibration Propagation

The propagation of ground-borne vibration is not as simple to model as airborne noise. This is due to the fact that noise in the air travels through a relatively uniform median, while ground-borne vibrations travel through the earth which may contain significant geological differences. There are three main types of vibration propagation; surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or "side-to-side and perpendicular to the direction of propagation."

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 REGULATORY SETTING

The project site is located in the City of Oceanside. Noise regulations are addressed through the efforts of various federal, state, and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Promulgating noise emission standards for interstate commerce
- Assisting state and local abatement efforts
- Promoting noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees. For example, the Occupational Safety and Health Administration (OSHA) agency prohibits exposure of workers to excessive sound levels. The Department of Transportation (DOT) assumed a significant role in noise control through its various operating agencies. The Federal Aviation Administration (FAA) regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the Federal Transit Administration (FTA). Transit noise is regulated by the federal Urban Mass Transit Administration (UMTA), while freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being sited adjacent to a highway or, alternately that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Although the proposed project is not under the jurisdiction of the FTA, the FTA is the only agency that has defined what constitutes a significant noise impact from implementing a project. The FTA standards are based on extensive studies by the FTA and other governmental agencies on the human effects and reaction to noise and a summary of the FTA findings are provided below in Table A.

Table A – FTA Project Effects on Cumulative Noise Exposure

Existing Noise Exposure (dBA Leq or Ldn)	Allowable Noise Impact Exposure dBA Leq or Ldn		
	Project Only	Combined	Noise Exposure Increase
45	51	52	+7
50	53	55	+5
55	55	58	+3
60	57	62	+2
65	60	66	+1
70	64	71	+1
75	65	75	0

Source: Federal Transit Administration, 2006.

The FTA also provides guidance on construction noise and recommends developing construction noise criteria on a project-specific basis that utilizes local noise ordinances if possible. However, local noise ordinances usually relates to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels, but are generally not practical for assessing the noise impacts of a construction project. Project construction noise criteria should take into account the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land uses. The FTA standards are based on extensive studies by the FTA and other governmental agencies on the human effects and reaction to noise and a summary of the FTA findings for a detailed construction noise assessment are provided below in Table B.

Table B – FTA Construction Noise Criteria

Land Use	Day (dBA Leq(8-hour))	Night (dBA Leq(8-hour))	30-day Average (dBA Ldn)
Residential	80	70	75[(1)]
Commercial	85	85	80[(2)]
Industrial	90	90	85[(2)]

Notes:
[(1)] In urban areas with very high ambient noise levels (Ldn > 65 dB), Ldn from construction operations should not exceed existing ambient +10 dB
[(2)] 24-hour Leq not Ldn.
Source: Federal Transit Administration, 2006.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation sources, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

4.2 State Regulations

Noise Standards

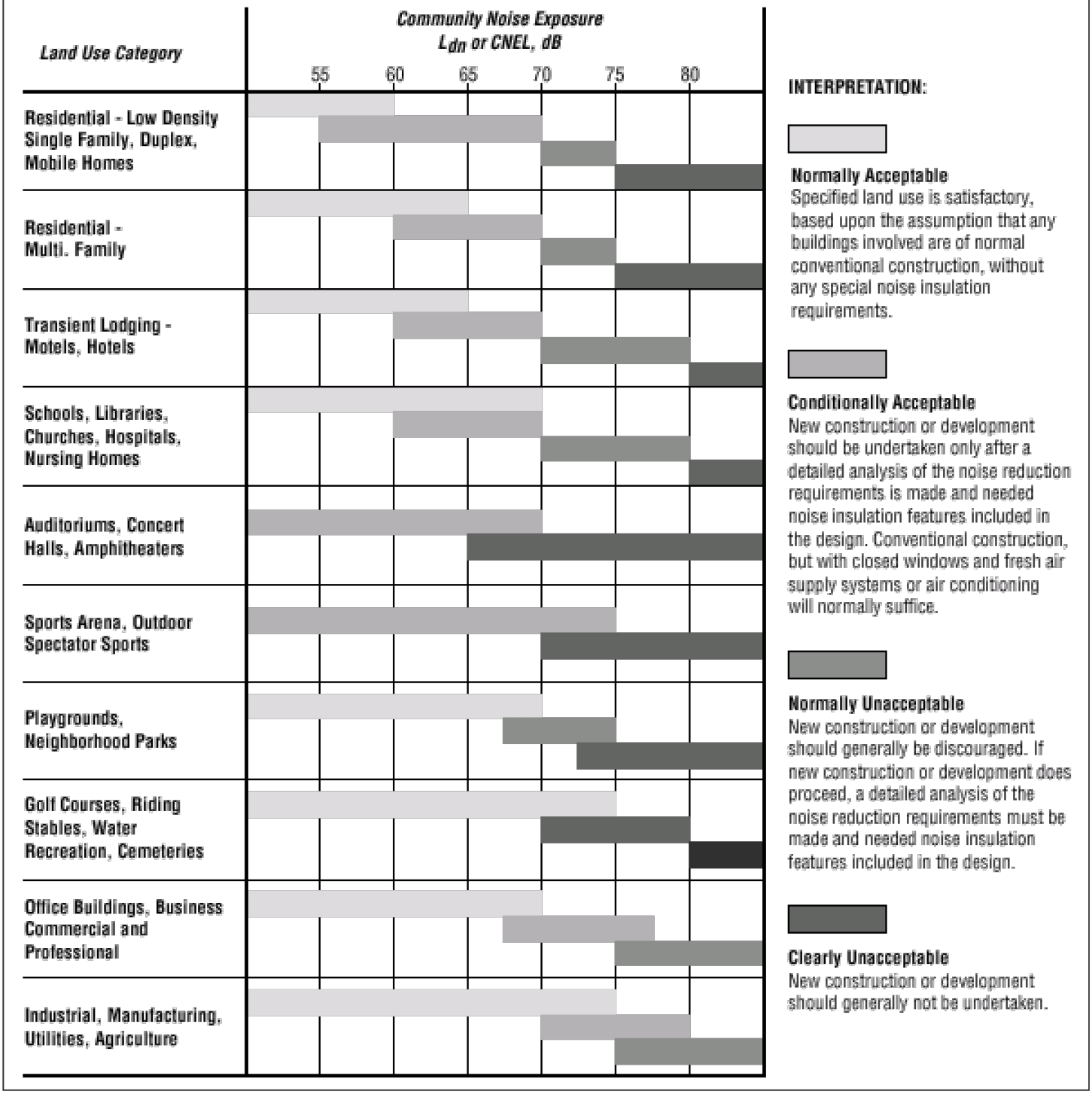
California Department of Health Services Office of Noise Control

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix," which allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise and which is shown below in Figure 3.

California Noise Insulation Standards

Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) requires noise insulation in new hotels, motels, apartment houses, and dwellings (other than single-family detached housing) that provides an annual average noise level of no more than 45 dBA CNEL. When such structures are located within a 60-dBA CNEL (or greater) noise contour, an acoustical analysis is required to ensure that interior levels do not exceed the 45-dBA CNEL annual threshold. In addition, Title 21, Chapter 6, Article 1 of the California Administrative Code requires that all habitable rooms, hospitals, convalescent homes, and places of worship shall have an interior CNEL of 45 dB or less due to aircraft noise.

FIGURE 2



SOURCE: OPR Appendix D Noise Element Guidelines.

VISTA ENVIRONMENTAL

Figure 3
Land Use Compatibility Matrix

Government Code Section 65302

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

California Vehicle Code Section 27200-27207 – On-Road Vehicle Noise

California Vehicle Code Section 27200-27207 provides noise limits for vehicles operated in California. For vehicles over 10,000 pounds noise is limited to 88 dB for vehicles manufactured before 1973, 86 dB for vehicles manufactured before 1975, 83 dB for vehicles manufactured before 1988, and 80 dB for vehicles manufactured after 1987. All measurements are based at 50 feet from the vehicle.

California Vehicle Section 38365-38380 – Off-Road Vehicle Noise

California Vehicle Code Section 38365-38380 provides noise limits for off-highway motor vehicles operated in California. 92 dBA for vehicles manufactured before 1973, 88 dBA for vehicles manufactured before 1975, 86 dBA for vehicles manufactured before 1986, and 82 dBA for vehicles manufactured after December 31, 1985. All measurements are based at 50 feet from the vehicle.

Vibration Standards

Title 14 of the California Administrative Code Section 15000 requires that all state and local agencies implement the California Environmental Quality Act (CEQA) Guidelines, which requires the analysis of exposure of persons to excessive groundborne vibration. However, no statute has been adopted by the state that quantifies the level at which excessive groundborne vibration occurs.

Caltrans issued the *Transportation- and Construction-Induced Vibration Guidance Manual* in 2004. The manual provides practical guidance to Caltrans engineers, planners, and consultants who must address vibration issues associated with the construction, operation, and maintenance of Caltrans projects. However, this manual is also used as a reference point by many lead agencies and CEQA practitioners throughout California, as it provides numeric thresholds for vibration impacts. Thresholds are established for continuous (construction-related) and transient (transportation-related) sources of vibration, which found that the human response becomes distinctly perceptible at 0.25 inch per second PPV for transient sources and 0.04 inch per second PPV for continuous sources.

4.3 Local Regulations

The City of Oceanside General Plan and Municipal Code establishes the following applicable policies related to noise and vibration.

City of Oceanside General Plan

Construction Noise

1. It should be unlawful for any person within any residential zone or 500 feet therefrom to operate any pile driver, power shovel, pneumatic, power hoist, or other construction equipment between 8 PM and 7 AM generating an ambient noise level of 50 dBA at any property line, unless an emergency exists.

2. It should be unlawful for any person to operate any construction equipment at a level in excess of 85 dBA at 100 feet from the source.

3. It should be unlawful for any person to engage in construction activities between 6 PM and 7 AM when such activities exceed the ambient noise level by 5 dBA. A special permit may be granted by the Director of Public Works if extenuating circumstances exist.

Recommendations

4. Truck traffic on residential streets should be prohibited for all vehicles over two tons in weight. This recommendation is based upon complaints from residents subjected to serve noise and disruptions caused by heavy trucks using residential streets not designed for that purpose. (Oceanside currently has no streets prohibited to trucks in excess of certain weight.)

5. Land uses in the City of Oceanside should be planned in order to insure that residential areas will not be impacted by noise. Approval of any project in the City where the health of future residents or occupants may be adversely affected by noise associated with the site should be taken to reduce or abate the noise effects or should be denied approval and recommended for an alternative site (example – a new rest home or hospital should not be constructed on areas subjected to noise levels 65 dBA or higher).

City of Oceanside Municipal Code

The City of Oceanside Municipal Code establishes the following applicable standards related to noise.

Chapter 38 Noise Control

Section 38.12. General sound level limits.

(a) Except for exempted activities and sounds as provided in this chapter or exempted properties as referenced in Section 38.15, it shall be unlawful for any person to cause or allow the creation of any noise to the extent that the one-hour average sound level, at any point on or beyond the boundaries of the property in the applicable base district zone on which the sound is produced exceeds the applicable limits set forth below:

Table C – City of Oceanside Sound Level Limits

Base District Zone	Sound Level Limits (decibels)	
	7:00 a.m. to 9:59 p.m.	10:00 p.m. to 6:59 a.m.
RE (Residential Estate)	50	45
RS (Single-Family)	50	45
RM (Medium Density)	50	45
RH (High Density)	55	50
RT (Residential Tourist)	55	50
C (Commercial)	65	60
I (Industrial)	70	65
D (Downtown)	65	55
A (Agricultural)	50	45
OS (Open Space)	50	45

Source: City of Oceanside Municipal Code Section 38.12.

(b) Limits for planned developments. In addition to the sound level limits established above. There is hereby established sound limits for PD (planned development) base district zones.

For any residential land use within a PD zone, the sound level limit is that limit which would be otherwise applicable in the residential zone (RE, RS, RM, RH or RT) corresponding to density of the residential development in that PD zone.

For any nonresidential land use within a PD zone, the sound level limit is that limit corresponding to the C (commercial) or I (industrial) zone which would be applicable to that use if not subject to the PD zone. For the purposes of this section, a land use shall be that use shown on a duly approved planned development plan or specific plan.

(c) Limits for joint boundaries. When property lines form the joint boundary of two (2) base district zones, the sound level limit shall be the arithmetic mean of the limit applicable to each of the two (2) zones.

Section 38.17. Specific noises prohibited.

Notwithstanding the rebuttable presumption referenced in Section 38.16, the following acts are declared to cause disturbing, excessive, or offensive noises in violation of this article although such enumeration shall not be deemed to be exclusive:

(a) *Horns, signaling devices, etc.* The intentional sounding of any horn or other signaling device on any automobile, motorcycle, or other vehicle, except as a danger warning; the creation by means of any such signaling device of any unreasonably loud or harsh sound; and the sounding of any such device for any unnecessary and unreasonable period of time.

(b) *Exhausts.* The noise emanating into the open air of the noise from the exhaust of any stationary-internal-combustion engine, motorboat, or motor vehicle except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.

(c) *Pile drivers, hammers, etc.* The operation between the hours of 10:00 p.m. and 7:00 a.m. of any pneumatic or air hammer, pile driver, steam shovel, derrick, steam or electric hoist, parking lot cleaning equipment or other appliance, the use of which is attended by loud or unusual noise.

Section 38.21. Preempted activities.

The provisions of this chapter shall not apply to any activity to the extent regulation thereof has been preempted by state or federal law or which is a necessary or appropriate means of complying with health or safety requirements imposed by state or federal law.

5.0 EXISTING NOISE CONDITIONS

To determine the existing noise levels, noise measurements have been taken in the vicinity of the project site. The field survey noted that noise within the proposed project area is generally characterized by vehicle traffic on Frazee Road and Old Grove Road. The following describes the measurement procedures, measurement locations, noise measurement results, and the modeling of the existing noise environment.

5.1 Noise Measurement Equipment

The noise measurements were taken using two Extech Model 407780 Type 2 integrating sound level meters programmed in "slow" mode to record the sound pressure level at 3-second intervals for approximately 24 hours in "A" weighted form. In addition, the L_{eq} averaged over the entire measuring time and L_{max} were recorded. The sound level meters and microphones were mounted approximately five to seven feet above the ground and were equipped with a windscreen. The sound level meters were calibrated before and after the monitoring using an Extech calibrator, Model 407766. The noise level measurement equipment meets American National Standards Institute specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA).

Noise Measurement Location

The noise monitoring locations were selected in order to obtain noise levels on the project site from Frazee Road and Old Grove Road. Descriptions of the noise monitoring sites are provided below in Table D. Appendix A includes a photo index of the study area and noise level measurement locations.

Noise Measurement Timing and Climate

The noise measurements were recorded between 5:55 p.m. on Wednesday, February 27, 2019 and 6:03 p.m. on Thursday, February 28, 2019. When the noise measurements were started the sky was partly cloudy, the temperature was 59 degrees Fahrenheit, the humidity was 57 percent, barometric pressure was 30.01 inches of mercury, and the wind was blowing around 3 miles per hour. Overnight, the sky became cloudy and the temperature dropped to 52 degrees Fahrenheit. At the conclusion of the noise measurements, the sky was cloudy, the temperature was 63 degrees Fahrenheit, the humidity was 63 percent, barometric pressure was 29.99 inches of mercury, and the wind was blowing around 2 miles per hour.

5.2 Noise Measurement Results

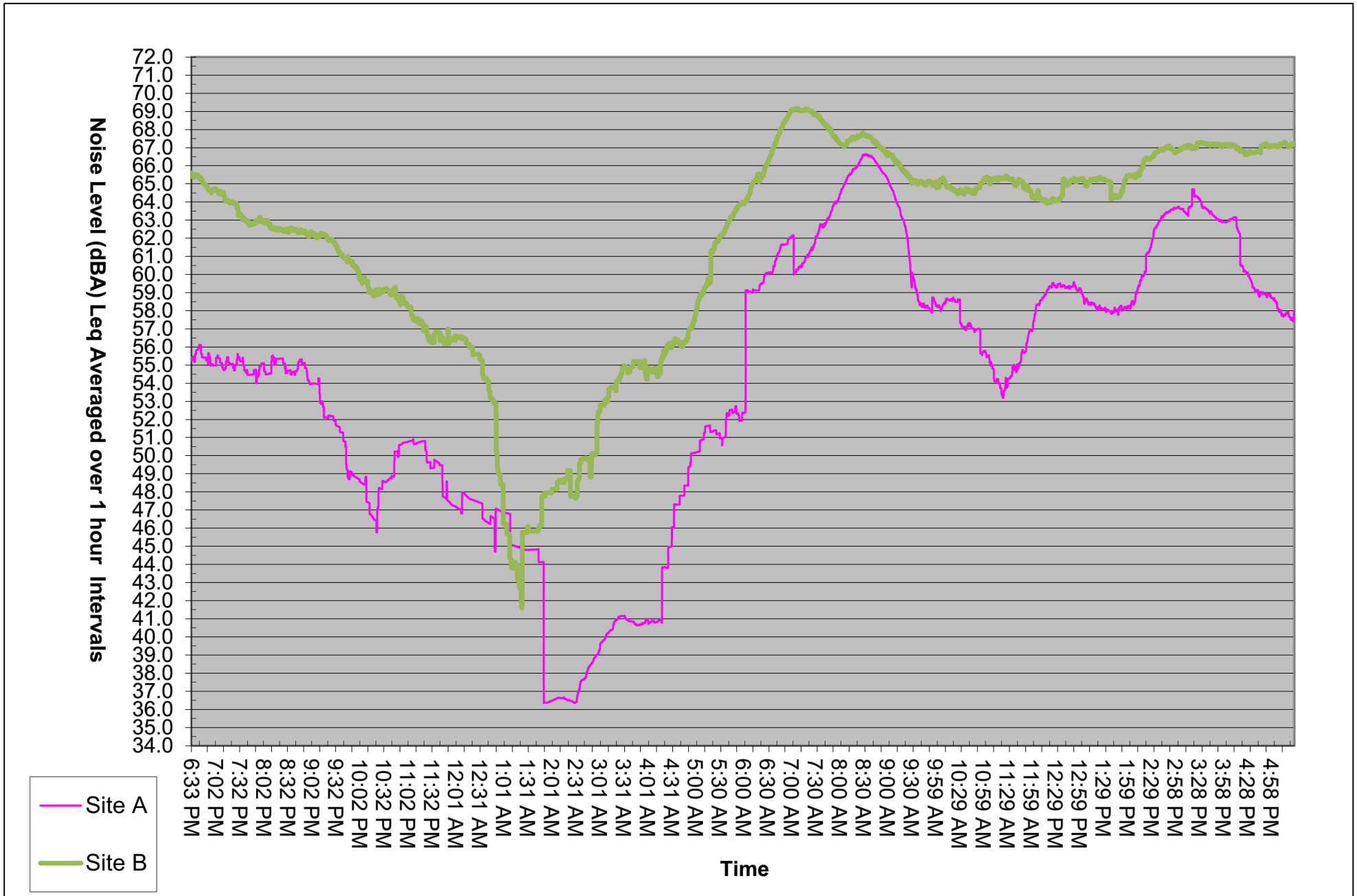
The results of the noise level measurements are presented in Table D. The measured sound pressure levels in dBA have been used to calculate the minimum and maximum L_{eq} averaged over 1-hour intervals. Table D also shows the L_{eq}, L_{max}, and Ldn, based on the entire measurement time. The noise monitoring data printouts are included in Appendix B. Figure 4 shows a graph of the 24-hour noise measurements.

Table D – Existing (Ambient) Noise Level Measurements

Site No.	Site Description	Average (dBA L_{eq})		1-hr Average (dBA L_{eq}/Time)		Average (dBA Ldn)
		Daytime[1]	Nighttime[2]	Minimum	Maximum	
1	Located on the west side of the project site on a sign approximately 30 feet north of Old Grove Road centerline and 290 feet west of Echo Canyon Way.	60.7	51.1	36.3 1:49 a.m.	66.6 8:26 a.m.	60.9
2	Located on the east side of the project site on a sign, approximately 60 feet northwest of Frazee Road and 350 feet northeast of Old Grove Road.	66.2	58.5	41.6 1:24 a.m.	69.2 7:06 a.m.	67.4

Notes:
[1] Daytime defined as 7:00 a.m. to 9:59 p.m. (Section 38.12 of the Municipal Code)
[2] Nighttime define as 10:00 p.m. to 6:59 a.m. (Section 38.12 of the Municipal Code)
Source: Noise measurements taken between Wednesday, February 27 and Thursday, February 28, 2019.

Table D shows that the noise level on the project site adjacent to Old Grove Road at Site 1 of 60.9 dBA Ldn is within the City's 65 dBA Ldn standard and the noise level on the project site adjacent to Frazee Road at Site 2 of 67.4 dBA Ldn slightly exceeds the City's 65 dBA Ldn standard.



SOURCE: Extech Model 407780 Type 2 Sound Level Meters.

VISTA ENVIRONMENTAL

Figure 4
Field Noise Measurements Graph

6.0 MODELING PARAMETERS AND ASSUMPTIONS

6.1 Construction Noise

The proposed project consists of the development of 50 single-family homes (SF) and 54 townhomes (MF) on approximately 6.92 acres of the 11.54-acre project site that would also include area for onsite roads, parking spaces, and recreation areas. The remaining portion of the project site would be utilized as a natural open space buffer adjacent to the San Luis Rey River Channel.

The noise impacts from construction of the proposed project have been analyzed through use of the FHWA's Roadway Construction Noise Model (RCNM). The FHWA compiled noise measurement data regarding the noise generating characteristics of several different types of construction equipment used during the Central Artery/Tunnel project in Boston. Table E below provides a list of the construction equipment anticipated to be used for each phase of construction as detailed in *Air Quality, Energy and Greenhouse Gas Emissions Impact Analysis Rio Rockwell Residential Project* (Air Quality Analysis), prepared by Vista Environmental, July 9, 2019.

Table E – Construction Equipment Noise Emissions and Usage Factors

Equipment Description	Number of Equipment	Acoustical Use Factor[1] (percent)	Spec 721.560 Lmax at 50 feet[2] (dBA, slow[3])	Actual Measured Lmax at 50 feet[4] (dBA, slow[3])
Site Preparation				
Rubber Tired Dozer	3	40	85	82
Tractor, Loader or Backhoe[5]	4	40	84	N/A
Grading				
Excavator	2	40	85	81
Grader	1	40	85	83
Rubber Tired Dozer	1	40	85	82
Scraper	2	40	85	84
Tractor, Loader or Backhoe[5]	2	40	84	N/A
Building Construction				
Crane	1	16	85	81
Forklift (Gradall)	3	40	85	83
Generator	1	50	82	81
Tractor, Loader or Backhoe[5]	3	40	84	N/A
Welder	1	40	73	74
Paving				
Paver	2	50	85	77
Paving Equipment	2	50	85	77
Roller	2	20	85	80
Architectural Coating				
Air Compressor	1	40	80	78

Notes:
[1] Acoustical use factor is the percentage of time each piece of equipment is operational during a typical workday.
[2] Spec 721.560 is the equipment noise level utilized by the RCNM program.
[3] The "slow" response averages sound levels over 1-second increments. A "fast" response averages sound levels over 0.125-second increments.
[4] Actual Measured is the average noise level measured of each piece of equipment during the Central Artery/Tunnel project in Boston, Massachusetts primarily during the 1990s.
[5] For the tractor/loader/backhoe, the tractor noise level was utilized, since it is the loudest of the three types of equipment.

Source: Federal Highway Administration, 2006 and CalEEMod default equipment mix.

Table E also shows the associated measured noise emissions for each piece of equipment from the RCNM model and measured percentage of typical equipment use per day. Construction noise impacts to the nearby sensitive receptors have been calculated according to the equipment noise levels and usage factors listed in Table E and through use of the RCNM. For each phase of construction, the nearest piece of equipment was placed at the shortest distance of possible locations for the proposed activity to the nearest sensitive receptor and each subsequent piece of equipment was placed an additional 50 feet away.

6.2 Operations-Related Noise

FHWA Model Methodology

The proposed project would result in increases in traffic noise to the nearby roadways as well as introduce new sensitive receptors to the project site. The project impacts to the offsite roadways were analyzed through use of the FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 (FHWA Model). The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Adjustments are then made to the reference energy mean emission level to account for: the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT) and the percentage of ADT which flows during the day, evening and night, the travel speed, the vehicle mix on the roadway, which is a percentage of the volume of automobiles, medium trucks and heavy trucks, the roadway grade, the angle of view of the observer exposed to the roadway and site conditions ("hard" or "soft" relates to the absorption of the ground, pavement or landscaping). The following section provides a discussion of the software and modeling input parameters used in this analysis and a discussion of the resultant existing noise model.

FHWA Model Traffic Noise Prediction Model Inputs

The roadway parameters used for this study are presented in Table F. The roadway classifications are based on the City's General Plan Circulation Element. The roadway speeds are based on the posted speed limits. The distance to the nearest sensitive receptor was determined by measuring the distance from the roadway centerline to the nearest residence. Since the study area is located in a suburban environment and landscaping exists along the sides of all analyzed roadways, soft site conditions were modeled.

Table F – FHWA Model Roadway Parameters

Roadway	Segment	General Plan Classification	Vehicle Speed (MPH)	Distance to Nearest Receptor[1] (feet)
Old Grove Road	Northwest of Frazee Road	Collector	25	50
Old Grove Road	Southeast of Frazee Road	Major Arterial (4 Lanes)	45	60
Frazee Road	Northeast of Old Grove Road	Major Arterial (4 Lanes)	45	80

Notes:
[1] Distance measured from nearest residential structure to centerline of roadway.
Source: Linscott Law & Greenspan, 2019; and City of Oceanside, 2012.

The average daily traffic (ADT) volumes were obtained from the *Traffic Impact Analysis Oceanside Frazee/Old Grove Road Residential* (Traffic Impact Analysis), prepared by Linscott Law and Greenspan,

December 16, 2019. The Traffic Impact Analysis provides the ADT volumes for both without project and with project conditions for the existing year and existing plus cumulative projects scenarios. The ADT volumes used in this analysis are shown in Table G.

Table G – FHWA Model Average Daily Traffic Volumes

Roadway	Segment	Average Daily Traffic Volumes			
		Existing	Existing + Project	Existing + Cumulative	Existing + Cumulative + Project
Old Grove Road	Northwest of Frazee Road	2,700	3,680	2,700	3,630
Old Grove Road	Southeast of Frazee Road	6,800	7,310	7,490	8,000
Frazee Road	Northeast of Old Grove Road	5,700	6,030	5,960	6,290

Source: Linscott Law & Greenspan, 2019.

The vehicle mixes used in the FHWA-RD-77-108 Model is shown below in Table H. For Old Grove Road northwest of Frazee Road the Collector and Local vehicle mix was utilized and for Old Grove Road southwest of Frazee Road and for Frazee Road, the Major Arterial vehicle mix was utilized. Both vehicle mixes are based on typical vehicle mixes observed in Southern California for similar arterial roadways.

Table H – Roadway Vehicle Mixes

Vehicle Type	Traffic Flow Distributions			
	Day (7 a.m. to 7 p.m.)	Evening (7 p.m. to 10 p.m.)	Night (10 p.m. to 7 a.m.)	Overall
Collector and Local				
Automobiles	73.60%	13.60%	10.22%	97.42%
Medium Trucks	0.90%	0.90%	0.04%	1.84%
Heavy Trucks	0.35%	0.04%	0.35%	0.74%
Major Arterial				
Automobiles	69.50%	12.90%	9.60%	92.00%
Medium Trucks	1.44%	0.06%	1.50%	3.00%
Heavy Trucks	2.40%	0.10%	2.50%	5.00%

Source: Caltrans, 2018; Vista Environmental.

FHWA Model Source Assumptions

To assess the roadway noise generation in a uniform manner, all vehicles are analyzed at the single lane equivalent acoustic center of the roadway being analyzed. In order to determine the height above the road grade where the noise is being emitted from, each type of vehicle has been analyzed independently with autos at road grade, medium trucks at 2.3 feet above road grade, and heavy trucks at 8 feet above road grade. These elevations were determined through a noise-weighted average of the elevation of the exhaust pipe, tires and mechanical parts in the engine, which are the primary noise emitters from a vehicle.

6.3 Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the construction site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. Table I gives approximate vibration levels for particular construction activities. The data in Table I provides a reasonable estimate for a wide range of soil conditions.

Table I – Vibration Source Levels for Construction Equipment

Equipment		Peak Particle Velocity (inches/second)	Approximate Vibration Level (L_v)at 25 feet
Pile driver (impact)	Upper range	1.518	112
	typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drill		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Federal Transit Administration, May 2006.

The construction-related vibration impacts have been calculated through the vibration levels shown above in Table I and through typical vibration propagation rates. The equipment assumptions were based on the equipment lists provided above in Table E.

7.0 IMPACT ANALYSIS

7.1 CEQA Thresholds of Significance

Consistent with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines, a significant impact related to noise would occur if a proposed project is determined to 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 applicable standards of other agencies;
- 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.

7.2 Generation of Noise Levels in Excess of Standards

The proposed project would not generate 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 applicable standards of other agencies. The following section calculates the potential noise emissions associated with the temporary construction activities and long-term operations of the proposed project and compares the noise levels to the City standards.

Construction-Related Noise

The construction activities for the proposed project are anticipated to include site preparation and grading of approximately 6.92 acres of the 11.54-acre project site, building construction of 50 single-family homes (SF) and 54 townhomes (MF), paving of onsite parking areas and driveways, and application of architectural coatings. Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities. The nearest sensitive receptors to the project site are single-family homes located as near as 60 feet to the south of the project site and the nearest outdoor activity area or structure at Nichols Elementary School is as near as 180 feet west of the project site.

The City's General Plan requires that construction activities that occur within 500 feet of residential uses and creates a noise level of 50 dBA or higher to be restricted from occurring between 8 PM and 7 AM. The City's General Plan also restricts the operation of any construction equipment that produces a noise level of 85 dBA at 100 feet. Finally, the City's General Plan also restricts any construction activities that increases the ambient noise level by 5 dBA or more from occurring between 6 PM and 7 AM.

Section 38.17(b) of the City's Municipal Code restricts the operation of any internal combustion engines without a muffler or other device that prevents loud explosive noises from occurring. Section 38.17(c) of the City's Municipal Code restricts the operation of construction equipment between 10 PM and 7 AM. However, the City construction noise standards do not provide any limits to the noise levels that may be created from construction activities and even with adherence to the City standards, the resultant construction noise levels may result in a significant substantial temporary noise increase to the nearby residents and school.

In order to determine if the proposed construction activities would create a significant substantial temporary noise increase, the FTA construction noise criteria thresholds detailed above in Section 4.1 have been utilized, which shows that a significant construction noise impact would occur if construction noise exceeds 80 dBA during the daytime at any of the nearby homes and school.

Construction noise impacts to the nearby sensitive receptors have been calculated through use of the RCNM and the parameters and assumptions detailed in Section 6.1 of this report including Table E – Construction Equipment Noise Emissions and Usage Factors. The results are shown below in Table J and the RCNM printouts are provided in Appendix C.

Table J – Construction Noise Levels at the Nearest Homes and School

Construction Phase	Construction Noise Level (dBA Leq) at:	
	Nearest Homes[1]	Nearest School[2]
Site Preparation	74	72
Grading	73	72
Building Construction	71	69
Paving	70	64
Painting	64	59
FTA Construction Noise Threshold[3]	**80**	**80**
Exceed Thresholds?	**No**	**No**

[1] The nearest homes are located on the south side of Old Grove Road and are as near as 60 feet south of the project site. 5 dB of attenuation was added to the RCNM model in order to account for the 6-foot wall that is located along the south side of Old Grove Road.
[2] The nearest school is Nichols Elementary School, where the nearest outdoor activity area or structure is as near as 180 feet west of the project site
[3] FTA Construction Noise Threshold obtained from Table B above.
Source: RCNM, Federal Highway Administration, 2006

Table J shows that the greatest noise impacts would occur during the site preparation phase of construction, with a noise level as high as 74 dBA Leq at the nearest homes and as high as 72 dBA at the nearest school to the project site, which are both within the FTA daytime construction noise standards of 80 dBA. Therefore, the proposed project would not create a substantial temporary increase in ambient noise levels from construction of the proposed project. Impacts would be less than significant.

Operational-Related Noise

The proposed project would consist of the development of 50 single-family homes (SF) and 54 townhomes (MF). Potential noise impacts associated with the operations of the proposed project would be from project-generated vehicular traffic on the nearby roadways. In addition, the proposed development would be adjacent to Old Grove Road and Frazee Road, which may create noise levels in excess of City standards at the proposed residential uses. The noise impacts to the nearby residents and proposed homes have been analyzed separately below.

Roadway Vehicular Noise Impacts to Nearby Residents

Vehicle noise is a combination of the noise produced by the engine, exhaust and tires. The level of traffic noise depends on three primary factors (1) the volume of traffic, (2) the speed of traffic, and (3) the number of trucks in the flow of traffic. The proposed project does not propose any uses that would require a substantial number of truck trips and the proposed project would not alter the speed limit on any existing roadway so the proposed project's potential offsite noise impacts have been focused on the noise

impacts associated with the change of volume of traffic that would occur with development of the proposed project.

Since, neither the General Plan nor the CEQA Guidelines define what constitutes a "substantial permanent increase to ambient noise levels", this impact analysis has utilized guidance from the Federal Transit Administration for a moderate impact that has been detailed above in Table A that shows that the project contribution to the noise environment can range between 0 and 7 dB, which is dependent on the existing noise levels.

The potential offsite traffic noise impacts created by the on-going operations of the proposed project have been analyzed through utilization of the FHWA model and parameters described above in Section 6.2 and the FHWA model traffic noise calculation spreadsheets are provided in Appendix D. The proposed project's potential offsite traffic noise impacts have been analyzed for the existing year and existing plus cumulative projects conditions that are discussed separately below.

Existing Conditions

The proposed project's potential offsite traffic noise impacts have been calculated through a comparison of the Existing scenario to the Existing With Project scenario. The results of this comparison are shown in Table K.

Table K – Existing Project Traffic Noise Contributions

		dBA Ldn at Nearest Receptor[1]			
Roadway	Segment	Existing	Existing Plus Project	Project Contribution	Increase Threshold[2]
Old Grove Road	Northwest of Frazee Road	52.5	53.8	1.3	+5 dBA
Old Grove Road	Southeast of Frazee Road	62.7	63.0	0.3	+2 dBA
Frazee Road	Northeast of Old Grove Road	59.7	60.0	0.3	+3 dBA

Notes:
[1] Distance to nearest residential use shown in Table F, does not take into account existing noise barriers.
[2] Increase Threshold obtained from the FTA's allowable noise impact exposures detailed above in Table A.
Source: FHWA Traffic Noise Prediction Model FHWA-RD-77-108.

Table K shows that the proposed project's permanent noise increases to the nearby homes from the generation of additional vehicular traffic would not exceed the FTA's allowable increase thresholds detailed above. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the existing conditions. Impacts would be less than significant.

Existing Plus Cumulative Projects Conditions

The proposed project's potential offsite traffic noise impacts have been calculated through a comparison of the Existing plus cumulative projects scenario to the Existing plus cumulative projects with project scenario. The results of this comparison are shown in Table L.

Table L – Existing Plus Cumulative Projects Traffic Noise Contributions

Roadway	Segment	dBA Ldn at Nearest Receptor[1]			Increase Threshold[2]
		Existing Plus Cumulative	Existing Plus Cumulative With Project	Project Contribution	
Old Grove Road	Northwest of Frazee Road	52.5	53.8	1.3	+5 dBA
Old Grove Road	Southeast of Frazee Road	63.1	63.4	0.3	+2 dBA
Frazee Road	Northeast of Old Grove Road	59.9	60.1	0.2	+3 dBA

Notes:
[1] Distance to nearest residential use shown in Table F, does not take into account existing noise barriers.
[2] Increase Threshold obtained from the FTA's allowable noise impact exposures detailed above in Table A.
Source: FHWA Traffic Noise Prediction Model FHWA-RD-77-108.

Table L shows that the proposed project's permanent noise increases to the nearby homes from the generation of additional vehicular traffic would not exceed the FTA's allowable increase thresholds detailed above. Therefore, the proposed project would not result in a substantial permanent increase in ambient noise levels for the existing plus cumulative projects conditions. Impacts would be less than significant.

Roadway Vehicular Noise Impacts to Proposed Homes

The proposed project would consist of the development of a residential community with 50 single-family homes (SF) and 54 townhomes (MF). The proposed project would be adjacent to Old Grove Road and Frazee Road, which may create noise levels in excess of City standards at the proposed residential uses. The roadway noise impacts have been analyzed below.

Proposed Homes Exterior Roadway Noise Impacts

The City's General Plan Noise Element does not provide any specific noise limitation policies for the exterior of new homes in the City, however the General Plan Noise Element does provide Recommendation Number 5, that details that the City should be planned in order to ensure that residential areas are not be impacted by noise and that projects should only be approved only if the noise impacts can be reduced or abated. Since the City does not provide a specific noise standard for the exterior of the proposed homes, the State's land use compatibility noise standards (see Figure 3 above) have been utilized instead, which details that the "Normally Acceptable" noise level for single-family homes is 60 dBA CNEL or less and for multi-family homes is 65 dBA CNEL or less. In order to provide a conservative analysis, the 60 dBA CNEL noise standard has been utilized for both the proposed single-family homes and multi-family townhomes.

The FHWA RD-77-108 model has been utilized based on the methodology detailed above in Section 6.2 to calculate the noise levels at the backyards of representative proposed homes adjacent to Old Grove Road and Frazee Road. The noise levels were calculated at a location near the proposed building structures and five feet above ground level. A summary of the results are shown below in Table M and the FHWA model printouts of the proposed exterior backyard noise calculations are provided in Appendix E.

Table M – Proposed Homes Exterior Backyard Noise Levels from Nearby Roads

Building Number	Roadway	Exterior Backyard Noise Levels (dBA CNEL)		Minimum Sound Wall Height (feet)
		Without Sound Wall	With Sound Wall	
MF18	Frazee Road	57	--[1]	--[1]
MF20	Frazee Road	**61**	58	4
MF33	Frazee Road	**62**	59	4
MF35	Frazee Road	59	--[1]	--[1]
MF38	Old Grove Road	54	--[1]	--[1]
MF50	Old Grove Road	53	--[1]	--[1]
MF51	Old Grove Road	54	--[1]	--[1]
SF44	Old Grove Road	55	--[1]	--[1]
SF46	Old Grove Road	55	--[1]	--[1]
SF48	Old Grove Road	55	--[1]	--[1]
SF50	Old Grove Road	55	--[1]	--[1]

Notes:
Exceedance of 60 dBA Ldn residential interior noise standard shown in **bold**.
[1] No sound wall required, since below 60 dBA Ldn standard.
Source: FHWA RD-77-108 Model.

Table M shows that the exterior private backyard noise levels would be as high as 62 dBA CNEL without any sound walls for the backyard areas, which would exceed the 60 dBA exterior noise standard detailed above. This would be considered a significant impact.

Mitigation Measure 1 is provided that would require the construction of a minimum 4-foot high wall between Frazee Road and the backyards for Buildings MF 19, MF 21, MF 33, and MF38. Table M shows that with implementation of the proposed sound wall detailed in Mitigation Measure 1, that the noise levels at all analyzed backyards would be within the 60 dBA CNEL noise standard. This would result in a less than significant impact with implementation of Mitigation Measure 1.

Proposed Homes Interior Roadway Noise Impacts

The City's General Plan Noise Element does not provide any specific noise limitation policies for the interior of new homes in the City, however the General Plan Noise Element does provide Recommendation Number 5, that details that the City should be planned in order to ensure that residential areas are not be impacted by noise and that projects should only be approved only if the noise impacts can be reduced or abated. Since the City does not provide a specific noise standard for the interior of the proposed homes, the interior noise standard from new dwellings from Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) of 45 dBA CNEL or Ldn or less has been utilized in this analysis.

To assess the interior noise levels related to compliance with the dBA L_{dn} interior noise standard, the same proposed homes analyzed for the exterior private backyard analysis were also analyzed for their interior noise levels. According to *Highway Traffic Noise: Analysis and Abatement Guidance,* prepared by U.S. Department of Transportation, December, 2011, a new residential building provides a minimum of 10 dB of noise attenuation with windows open and a minimum of 25 dB of noise attenuation with windows closed and dual-paned windows. The proposed residential structures will be required to be designed to

meet the CCR Title 24, Part 6: California's Energy Efficiency Standards that require the installation of dual paned windows in the climate zone where the proposed project is located. The exterior noise level at the façade of the first floor and second floors were calculated for each analyzed unit and are shown below in Table N and the FHWA model printouts are provided in Appendix C.

Table N – Proposed Residential Interior Noise Levels from Nearby Roads

Building Number	Roadway	Floor	Exterior Noise Level at Building Façade (dBA Ldn)	Interior Noise Levels (dBA Ldn)	
				Windows Open	Windows Closed
MF18	Frazee Road	1	57	45	32
		2	57	45	32
MF20	Frazee Road	1	60	**48**	35
		2	61	**49**	36
MF33	Frazee Road	1	61	**49**	36
		2	61	**49**	36
MF35	Frazee Road	1	59	**47**	34
		2	59	**47**	34
MF38	Old Grove Road	1	54	42	29
		2	53	41	28
MF50	Old Grove Road	1	53	41	28
		2	53	41	28
MF51	Old Grove Road	1	54	42	29
		2	54	42	29
SF44	Old Grove Road	1	55	43	30
		2	54	42	29
SF46	Old Grove Road	1	55	43	30
		2	55	43	30
SF48	Old Grove Road	1	55	43	30
		2	55	43	30
SF50	Old Grove Road	1	55	43	30
		2	55	43	30

Notes: Exceedance of 45 dBA Ldn residential interior noise standard shown in **bold**.
Source: FHWA RD-77-108 Model.

Table N shows that the analyzed Buildings MF20, MF33, and MF35 would exceed the City's 45 dBA Ldn interior noise standard for the windows open condition. This would result in a significant impact.

Mitigation Measure 2 is provided that would require all proposed homes to be designed for a "windows closed" condition. A "windows closed" condition requires a means of mechanical ventilation per Chapter 12, Section 1205 of the Uniform Building Code. This shall be achieved with a standard forced air conditioning and heating system for each home. Table N shows that with implementation of Mitigation Measure 2, the interior areas of the proposed homes would be mitigated to less than significant levels.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

Mitigation Measure 1:

The project applicant shall construct a minimum 4-foot high sound wall located between Frazee Road and the backyards for Buildings 69, 71, 83, and 84. The sound wall shall be constructed of concrete masonry units (CMUs) and shall be free of any decorative cutouts or openings.

Mitigation Measure 2:

The project applicant shall provide a "windows closed" condition for each proposed home. A "windows closed" condition requires a means of mechanical ventilation per Chapter 12, Section 1205 of the Uniform Building Code. This shall be achieved with a standard forced air conditioning and heating system for each home.

Level of Significance After Mitigation

Less than significant impact.

7.3 Generation of Excessive Groundborne Vibration

The proposed project would not expose persons to or generation of excessive groundborne vibration or groundborne noise levels. The following section analyzes the potential vibration impacts associated with the construction and operations of the proposed project.

Construction-Related Vibration Impacts

The construction activities for the proposed project are anticipated to include site preparation and grading of approximately 6.92 acres of the 11.54-acre project site, building construction of 50 single-family homes and 54 townhomes, paving of onsite parking areas and driveways, and application of architectural coatings. Vibration impacts from construction activities associated with the proposed project would typically be created from the operation of heavy off-road equipment. The nearest sensitive receptors to the project site are single-family homes located as near as 60 feet to the south of the project site and the nearest outdoor activity area or structure at Nichols Elementary School is as near as 180 feet west of the project site.

Since neither the City's General Plan nor the Municipal Code provide a quantifiable vibration threshold, Caltrans guidance that is detailed above in Section 4.2 has been utilized, which defines the threshold of perception from transient sources at 0.25 inch per second PPV.

The primary source of vibration during construction would be from the operation of a bulldozer. From Table I above a large bulldozer would create a vibration level of 0.089 inch per second PPV at 25 feet. Based on typical propagation rates, the vibration level at the nearest offsite receptor (60 feet away) would be 0.02 inch per second PPV. The vibration level at the nearest offsite receptor would be within the 0.2 inch per second PPV threshold detailed above. Therefore, a less than significant vibration impact is anticipated from construction of the proposed project.

Operations-Related Vibration Impacts

The proposed project would consist of the development of 50 single-family homes and 54 townhomes. The on-going operation of the proposed project would not include the operation of any known vibration sources other than typical vehicle operations for a residential development onsite. Therefore, a less than significant vibration impact is anticipated from operation of the proposed project.

Level of Significance

Less than significant impact.

7.4 Aircraft Noise

The proposed project would not expose people residing or working in the project area to excessive noise levels from aircraft. The nearest airport is Oceanside Municipal Airport that is located as near as 2.3 miles southwest of the project site. The project site is located outside of the 60 dBA CNEL noise contours of Oceanside Municipal Airport. No impact would occur from aircraft noise.

Level of Significance

No impact.

8.0 REFERENCES

California Department of Transportation, *2016 Annual Average Daily Truck Traffic on the California State Highway System*, 2018.

California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analytics Protocol*, September 2013.

California Department of Transportation, *Transportation- and Construction-Induced Vibration Guidance Manual*, September 2013.

City of Oceanside, *Oceanside General Plan Noise Element,* 2002.

City of Oceanside, *Oceanside General Plan Circulation Element,* September 2012.

City of Oceanside, *Oceanside, California Code of Ordinances Chapter 38 Noise Control*.

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment,* May 2006.

Linscott Law & Greenspan, *Traffic Impact Analysis Oceanside Frazee/Old Grove Road Residential,* December 16, 2019.

U.S. Department of Transportation, *FHWA Roadway Construction Noise Model User's Guide,* January, 2006.

Vista Environmental, *Air Quality, Energy, and Greenhouse Gas Emissions Impact Analysis Rio Rockwell Residential Project,* March 3, 2020.

APPENDIX A

Field Noise Measurements Photo Index

Noise Measurement Site 1 - looking north

Noise Measurement Site 1 - looking northeast

Noise Measurement Site 1 - looking east

Noise Measurement Site 1 - looking southeast

Noise Measurement Site 1 - looking south

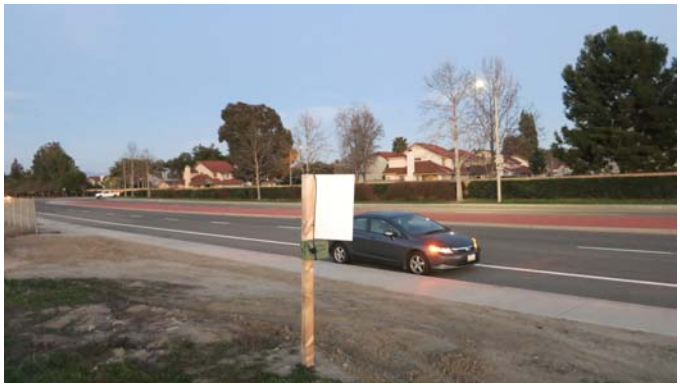
Noise Measurement Site 1 - looking southwest

Noise Measurement Site 1 - looking west

Noise Measurement Site 1 - looking northwest

Noise Measurement Site 2 - looking north

Noise Measurement Site 2 - looking northeast



Noise Measurement Site 2 - looking east

Noise Measurement Site 2 - looking southeast

Noise Measurement Site 2 - looking south

Noise Measurement Site 2 - looking southwest

Noise Measurement Site 2 - looking west

Noise Measurement Site 2 - looking northwest

APPENDIX B

Field Noise Measurements Printouts

Site A - On West Side of Project Site

Date	Time=02/27/19	5:55:00 PM	Leq Daytime	60.7	
Sampling	Time=3	Weighting=A	Leq Nighttim	51.1	
Record	Num= 30400	Weighting=Slow	CNEL(24hr)=	61.1	
Leq	58.5 SEL	Value=115.7	Ldn(24hr)=	60.9	
MAX	88	Min Leq1hr =	36.3	1:49 AM	
MIN	32.8	Max Leq1hr =	66.6	8:26 AM	

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
70.6	17:55:00		70.6	70.6
69.9	17:55:03		69.9	69.9
67	17:55:06		67	67
71.3	17:55:09		71.3	71.3
59.4	17:55:12		59.4	59.4
64.2	17:55:15		64.2	64.2
68	17:55:18		68	68
68.4	17:55:21		68.4	68.4
69.5	17:55:24		69.5	69.5
59.1	17:55:27		59.1	59.1
55.9	17:55:30		55.9	55.9
51.3	17:55:33		51.3	51.3
47.9	17:55:36		47.9	47.9
49.9	17:55:39		49.9	49.9
53.2	17:55:42		53.2	53.2
50.4	17:55:45		50.4	50.4
49.5	17:55:48		49.5	49.5
50.9	17:55:51		50.9	50.9
49.9	17:55:54		49.9	49.9
48.9	17:55:57		48.9	48.9
52.4	17:56:00		52.4	52.4
46.8	17:56:03		46.8	46.8
59.3	17:56:06		59.3	59.3
56.8	17:56:09		56.8	56.8
57.6	17:56:12		57.6	57.6
54.7	17:56:15		54.7	54.7
52.6	17:56:18		52.6	52.6
65.5	17:56:21		65.5	65.5
69	17:56:24		69	69
61.7	17:56:27		61.7	61.7
50.7	17:56:30		50.7	50.7
54.7	17:56:33		54.7	54.7
65.3	17:56:36		65.3	65.3
64.6	17:56:39		64.6	64.6
68.1	17:56:42		68.1	68.1
63	17:56:45		63	63
64	17:56:48		64	64
64.8	17:56:51		64.8	64.8
66.5	17:56:54		66.5	66.5
56.4	17:56:57		56.4	56.4
60.2	17:57:00		60.2	60.2
68.8	17:57:03		68.8	68.8
61.4	17:57:06		61.4	61.4
55	17:57:09		55	55
56.7	17:57:12		56.7	56.7
50.7	17:57:15		50.7	50.7
43.6	17:57:18		43.6	43.6
39.6	17:57:21		39.6	39.6
39	17:57:24		39	39
44.8	17:57:27		44.8	44.8
39.2	17:57:30		39.2	39.2
39.1	17:57:33		39.1	39.1
39.2	17:57:36		39.2	39.2
41.8	17:57:39		41.8	41.8
42.6	17:57:42		42.6	42.6
46.9	17:57:45		46.9	46.9
55.2	17:57:48		55.2	55.2
66.1	17:57:51		66.1	66.1
58.5	17:57:54		58.5	58.5
52.4	17:57:57		52.4	52.4
46.3	17:58:00		46.3	46.3
45.1	17:58:03		45.1	45.1
43.8	17:58:06		43.8	43.8
40.6	17:58:09		40.6	40.6
46	17:58:12		46	46
47.9	17:58:15		47.9	47.9
53.1	17:58:18		53.1	53.1
41.8	17:58:21		41.8	41.8
40.9	17:58:24		40.9	40.9
50.3	17:58:27		50.3	50.3
43.2	17:58:30		43.2	43.2
40.7	17:58:33		40.7	40.7
42.9	17:58:36		42.9	42.9
40	17:58:39		40	40
41.2	17:58:42		41.2	41.2
40.3	17:58:45		40.3	40.3
40.1	17:58:48		40.1	40.1

Site B - On East Side of Project Site

Date	Time=02/27/19	6:03:00 PM	Leq Daytime	66.2	
Sampling	Time=3	Freq Weighting=	Leq Nighttim	58.5	
Record	Num= 30400	Weighting=Slow	CNEL(24hr)=	67.7	
Leq	64.2 SEL	Value=119.9	Ldn(24hr)=	67.4	
MAX	88.4	Min Leq1hr =	41.6	1:24 AM	
MIN	37.5	Max Leq1hr =	69.2	7:06 AM	

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
60.2	18:03:00		60.2	60.2
68.3	18:03:03		68.3	68.3
66.8	18:03:06		66.8	66.8
71	18:03:09		71	71
64.2	18:03:12		64.2	64.2
62.8	18:03:15		62.8	62.8
69.2	18:03:18		69.2	69.2
69.2	18:03:21		69.2	69.2
64.6	18:03:24		64.6	64.6
68.6	18:03:27		68.6	68.6
73.7	18:03:30		73.7	73.7
69.6	18:03:33		69.6	69.6
69.6	18:03:36		69.6	69.6
66.9	18:03:39		66.9	66.9
73.2	18:03:42		73.2	73.2
71.6	18:03:45		71.6	71.6
74	18:03:48		74	74
72.2	18:03:51		72.2	72.2
69.7	18:03:54		69.7	69.7
68	18:03:57		68	68
70.3	18:04:00		70.3	70.3
70.1	18:04:03		70.1	70.1
66.6	18:04:06		66.6	66.6
70.8	18:04:09		70.8	70.8
70.3	18:04:12		70.3	70.3
74.5	18:04:15		74.5	74.5
66.9	18:04:18		66.9	66.9
67	18:04:21		67	67
67.5	18:04:24		67.5	67.5
67.3	18:04:27		67.3	67.3
66.8	18:04:30		66.8	66.8
64.9	18:04:33		64.9	64.9
63.8	18:04:36		63.8	63.8
55.7	18:04:39		55.7	55.7
55.9	18:04:42		55.9	55.9
66.1	18:04:45		66.1	66.1
70.1	18:04:48		70.1	70.1
60	18:04:51		60	60
61.7	18:04:54		61.7	61.7
67.8	18:04:57		67.8	67.8
63.1	18:05:00		63.1	63.1
60.8	18:05:03		60.8	60.8
67.4	18:05:06		67.4	67.4
64.2	18:05:09		64.2	64.2
56.8	18:05:12		56.8	56.8
62.5	18:05:15		62.5	62.5
67.7	18:05:18		67.7	67.7
61	18:05:21		61	61
61.4	18:05:24		61.4	61.4
70.6	18:05:27		70.6	70.6
69	18:05:30		69	69
65.9	18:05:33		65.9	65.9
70	18:05:36		70	70
65.3	18:05:39		65.3	65.3
65.1	18:05:42		65.1	65.1
66.8	18:05:45		66.8	66.8
64.9	18:05:48		64.9	64.9
66.4	18:05:51		66.4	66.4
65	18:05:54		65	65
60.3	18:05:57		60.3	60.3
55.5	18:06:00		55.5	55.5
49.9	18:06:03		49.9	49.9
47.8	18:06:06		47.8	47.8
49	18:06:09		49	49
48.8	18:06:12		48.8	48.8
48.3	18:06:15		48.3	48.3
47.3	18:06:18		47.3	47.3
47.8	18:06:21		47.8	47.8
48.8	18:06:24		48.8	48.8
51.7	18:06:27		51.7	51.7
59.9	18:06:30		59.9	59.9
61.3	18:06:33		61.3	61.3
56.2	18:06:36		56.2	56.2
54.2	18:06:39		54.2	54.2
58.8	18:06:42		58.8	58.8
63.7	18:06:45		63.7	63.7
58.4	18:06:48		58.4	58.4

APPENDIX C

RCNM Model Construction Noise Calculation Printouts

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 4/3/2019
Case Description: Rio Rockwell Residential Project - Site Preparation

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Nearest SFH	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	60	5
Dozer	No	40		81.7	110	5
Dozer	No	40		81.7	160	5
Tractor	No	40	84		210	5
Tractor	No	40	84		260	5
Tractor	No	40	84		310	5
Tractor	No	40	84		360	5

				Results			
		Calculated (dBA)			Noise Limits (dBA)		
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer		75.1	71.1	N/A	N/A	N/A	N/A
Dozer		69.8	65.8	N/A	N/A	N/A	N/A
Dozer		66.6	62.6	N/A	N/A	N/A	N/A
Tractor		66.5	62.6	N/A	N/A	N/A	N/A
Tractor		64.7	60.7	N/A	N/A	N/A	N/A
Tractor		63.2	59.2	N/A	N/A	N/A	N/A
Tractor		61.9	57.9	N/A	N/A	N/A	N/A
	Total	**75**	**74**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest School	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	180	0
Dozer	No	40		81.7	230	0
Dozer	No	40		81.7	280	0
Tractor	No	40.0	84		330	0
Tractor	No	40.0	84		380	0
Tractor	No	40.0	84		430	0
Tractor	No	40.0	84		480	0

Equipment		Calculated (dBA) *Lmax	Leq	Results Day Lmax	Noise Limits (dBA) Day Leq	Evening Lmax	Evening Leq
Dozer		70.5	66.6	N/A	N/A	N/A	N/A
Dozer		68.4	64.4	N/A	N/A	N/A	N/A
Dozer		66.7	62.7	N/A	N/A	N/A	N/A
Tractor		67.6	63.6	N/A	N/A	N/A	N/A
Tractor		66.4	62.4	N/A	N/A	N/A	N/A
Tractor		65.3	61.3	N/A	N/A	N/A	N/A
Tractor		64.4	60.4	N/A	N/A	N/A	N/A
	Total	**71**	**72**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 4/3/2019
Case Description: Rio Rockwell Residential Project - Grading

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Nearest SFH	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	60	5
Excavator	No	40		80.7	110	5
Grader	No	40	85		160	5
Dozer	No	40		81.7	210	5
Scraper	No	40		83.6	260	5
Scraper	No	40		83.6	310	5
Tractor	No	40	84		360	5
Tractor	No	40	84		410	5

		Results					
		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		74.1	70.1	N/A	N/A	N/A	N/A
Excavator		68.9	64.9	N/A	N/A	N/A	N/A
Grader		69.9	65.9	N/A	N/A	N/A	N/A
Dozer		64.2	60.2	N/A	N/A	N/A	N/A
Scraper		64.3	60.3	N/A	N/A	N/A	N/A
Scraper		62.7	58.8	N/A	N/A	N/A	N/A
Tractor		61.9	57.9	N/A	N/A	N/A	N/A
Tractor		60.7	56.7	N/A	N/A	N/A	N/A
	Total	**74**	**73**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest School	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	180	0
Excavator	No	40		80.7	230	0
Grader	No	40	85		280	0
Dozer	No	40		81.7	330	0
Scraper	No	40		83.6	380	0
Scraper	No	40		83.6	430	0
Tractor	No	40	84		480	0
Tractor	No	40	84		530	0

Equipment		Calculated (dBA) *Lmax	Leq	Results Day Lmax	Noise Limits (dBA) Day Leq	Evening Lmax	Evening Leq
Excavator		69.6	65.6	N/A	N/A	N/A	N/A
Excavator		67.5	63.5	N/A	N/A	N/A	N/A
Grader		70.0	66.1	N/A	N/A	N/A	N/A
Dozer		65.3	61.3	N/A	N/A	N/A	N/A
Scraper		66.0	62.0	N/A	N/A	N/A	N/A
Scraper		64.9	60.9	N/A	N/A	N/A	N/A
Tractor		64.4	60.4	N/A	N/A	N/A	N/A
Tractor		63.5	59.5	N/A	N/A	N/A	N/A
	Total	**70**	**72**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 4/3/2019
Case Description: Rio Rockwell Residential Project - Building Construction

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Nearest SFH	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	85	5
Gradall	No	40		83.4	135	5
Gradall	No	40		83.4	185	5
Gradall	No	40		83.4	235	5
Tractor	No	40	84		285	5
Tractor	No	40	84		335	5
Tractor	No	40	84		385	5
Generator	No	50		80.6	435	5
Welder / Torch	No	40		74	485	5

		Calculated (dBA)		Results			
				Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		70.9	63.0	N/A	N/A	N/A	N/A
Gradall		69.8	65.8	N/A	N/A	N/A	N/A
Gradall		67.0	63.1	N/A	N/A	N/A	N/A
Gradall		65.0	61.0	N/A	N/A	N/A	N/A
Tractor		63.9	59.9	N/A	N/A	N/A	N/A
Tractor		62.5	58.5	N/A	N/A	N/A	N/A
Tractor		61.3	57.3	N/A	N/A	N/A	N/A
Generator		56.8	53.8	N/A	N/A	N/A	N/A
Welder / Torch		49.3	45.3	N/A	N/A	N/A	N/A
	Total	**71**	**71**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest School	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	280	0
Gradall	No	40		83.4	330	0
Gradall	No	40		83.4	380	0
Gradall	No	40		83.4	430	0
Tractor	No	40	84		480	0
Tractor	No	40	84		530	0
Tractor	No	40	84		580	0
Generator	No	50		80.6	630	0
Welder / Torch	No	40		74	680	0

		Calculated (dBA)		Results	Noise Limits (dBA)		
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		65.6	57.6	N/A	N/A	N/A	N/A
Gradall		67.0	63.0	N/A	N/A	N/A	N/A
Gradall		65.8	61.8	N/A	N/A	N/A	N/A
Gradall		64.7	60.7	N/A	N/A	N/A	N/A
Tractor		64.4	60.4	N/A	N/A	N/A	N/A
Tractor		63.5	59.5	N/A	N/A	N/A	N/A
Tractor		62.7	58.7	N/A	N/A	N/A	N/A
Generator		58.6	55.6	N/A	N/A	N/A	N/A
Welder / Torch		51.3	47.3	N/A	N/A	N/A	N/A
	Total	**67**	**69**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 4/3/2019
Case Description: Rio Rockwell Residential Project - Paving

					---- Receptor #1 ----
		Baselines (dBA)			
Description	Land Use	Daytime	Evening	Night	
Nearest SFH	Residential	60.7	60.7	51.1	

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	60	5
Paver	No	50		77.2	110	5
Roller	No	20		80	160	5
Roller	No	20		80	210	5
Paver	No	50		77.2	260	5
Paver	No	50		77.2	310	5

			Results			
	Calculated (dBA)			Noise Limits (dBA)		
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver	70.6	67.6	N/A	N/A	N/A	N/A
Paver	65.4	62.4	N/A	N/A	N/A	N/A
Roller	64.9	57.9	N/A	N/A	N/A	N/A
Roller	62.5	55.5	N/A	N/A	N/A	N/A
Paver	57.9	54.9	N/A	N/A	N/A	N/A
Paver	56.4	53.4	N/A	N/A	N/A	N/A
Total	**71**	**70**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest School	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	270	0
Paver	No	50		77.2	320	0
Roller	No	20		80	370	0
Roller	No	20		80	420	0
Paver	No	50		77.2	470	0
Paver	No	50		77.2	520	0

		Results					
		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver		62.6	59.6	N/A	N/A	N/A	N/A
Paver		61.1	58.1	N/A	N/A	N/A	N/A
Roller		62.6	55.6	N/A	N/A	N/A	N/A
Roller		61.5	54.5	N/A	N/A	N/A	N/A
Paver		57.8	54.7	N/A	N/A	N/A	N/A
Paver		56.9	53.9	N/A	N/A	N/A	N/A
	Total	**63**	**64**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 4/3/2019
Case Description: Rio Rockwell Residential Project - Painting

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest SFH	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	85	5

Equipment	Calculated (dBA) *Lmax	Leq	Results Day Lmax	Day Leq	Evening Lmax	Evening Leq
Compressor (air)	68.1	64.1	N/A	N/A	N/A	N/A
Total	**68**	**64**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest School	Residential	60.7	60.7	51.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	280	0

Equipment	Calculated (dBA) *Lmax	Leq	Results Day Lmax	Day Leq	Evening Lmax	Evening Leq
Compressor (air)	62.7	58.7	N/A	N/A	N/A	N/A
Total	**63**	**59**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

APPENDIX D

FHWA Model Offsite Traffic Noise Calculation Printouts

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Scenario: EXISTING

Project: Rio Rockwell Residential
Site Conditions: Soft

	Vehicle Mix 1 (Collector - Local)				Vehicle Mix 2 (Arterial)				Vehicle Mix 3 (State Route 76)			
Vehicle Type	Day	Evening	Night	Daily	Day	Evening	Night	Daily	Day	Evening	Night	Daily
Automobiles	73.60%	13.60%	10.22%	97.40%	69.50%	12.90%	9.60%	92.00%	65.76%	13.48%	15.77%	95.00%
Medium Trucks	0.90%	0.90%	0.04%	1.84%	1.60%	0.80%	0.60%	3.00%	1.92%	0.35%	0.97%	3.24%
Heavy Trucks	0.35%	0.04%	0.35%	0.74%	3.50%	1.00%	0.50%	5.00%	0.96%	0.09%	0.70%	1.76%

Road Name: Old Grove Road **Segment: Northwest of Frazee Road**
Average Daily Traffic: 2700 Vehicles Vehicle Speed: 25 MPH Vehicle Mix: 1 Roadway Classification: Collector

	NOISE PARAMETERS AT 50 FEET FROM CENTERLINE (Equiv. Lane Dist: 47.02 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	59.44	-5.09	0.30	-1.20	53.5	51.3	50.0	44.0	52.4	53.05	70 dBA:	**3**	**4**
Medium Trucks	71.09	-22.32	0.30	-1.20	47.9	26.6	32.6	14.3	27.5	30.24	65 dBA:	**7**	**8**
Heavy Trucks	78.74	-26.28	0.30	-1.20	51.6	26.2	22.8	27.5	33.7	33.75	60 dBA:	**16**	**17**
				Total:	**56.3**	**51.4**	**50.1**	**44.1**	**52.5**	**53.1**	55 dBA:	**34**	**37**

Road Name: Old Grove Road **Segment: Southeast of Frazee Road**
Average Daily Traffic: 6800 Vehicles Vehicle Speed: 45 MPH Vehicle Mix: 2 Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 60 FEET FROM CENTERLINE (Equiv. Lane Dist: 53.58 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-3.87	-0.55	-1.20	63.7	61.3	60.1	54.0	62.4	63.1	70 dBA:	**20**	**22**
Medium Trucks	77.62	-18.74	-0.55	-1.20	57.1	38.4	41.4	35.4	42.6	43.4	65 dBA:	**42**	**47**
Heavy Trucks	82.14	-16.52	-0.55	-1.20	63.9	48.5	49.1	41.3	49.8	50.7	60 dBA:	**91**	**100**
				Total:	**67.2**	**61.6**	**60.4**	**54.3**	**62.7**	**63.3**	55 dBA:	**196**	**216**

Road Name: Frazee Road **Segment: Northeast of Old Grove Road**
Average Daily Traffic: 5700 Vehicles Vehicle Speed: 45 MPH Vehicle Mix: 2 Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 80 FEET FROM CENTERLINE (Equiv. Lane Dist: 75.31 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-4.64	-2.77	-1.20	60.7	58.4	57.1	51.0	59.4	60.1	70 dBA:	**17**	**18**
Medium Trucks	77.62	-19.51	-2.77	-1.20	54.1	35.4	38.4	32.4	39.6	40.4	65 dBA:	**36**	**39**
Heavy Trucks	82.14	-17.29	-2.77	-1.20	60.9	45.5	46.1	38.3	46.9	47.7	60 dBA:	**77**	**85**
				Total:	**64.3**	**58.6**	**57.5**	**51.3**	**59.7**	**60.4**	55 dBA:	**165**	**182**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Scenario: EXISTING WITH PROJECT

Project: Rio Rockwell Residential
Site Conditions: Soft

	Vehicle Mix 1 (Collector - Local)				Vehicle Mix 2 (Arterial)				Vehicle Mix 3 (State Route 76)			
Vehicle Type	Day	Evening	Night	Daily	Day	Evening	Night	Daily	Day	Evening	Night	Daily
Automobiles	73.60%	13.60%	10.22%	97.40%	69.50%	12.90%	9.60%	92.00%	65.76%	13.48%	15.77%	95.00%
Medium Trucks	0.90%	0.90%	0.04%	1.84%	1.60%	0.80%	0.60%	3.00%	1.92%	0.35%	0.97%	3.24%
Heavy Trucks	0.35%	0.04%	0.35%	0.74%	3.50%	1.00%	0.50%	5.00%	0.96%	0.09%	0.70%	1.76%

Road Name: Old Grove Road **Segment: Northwest of Frazee Road**
Average Daily Traffic: 3630 Vehicles Vehicle Speed: 25 MPH Vehicle Mix: 1 Roadway Classification: Collector

	NOISE PARAMETERS AT 50 FEET FROM CENTERLINE (Equiv. Lane Dist: 47.02 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	59.44	-3.80	0.30	-1.20	54.7	52.6	51.3	45.3	53.7	54.3	70 dBA:	**4**	**5**
Medium Trucks	71.09	-21.04	0.30	-1.20	49.1	27.9	33.9	15.6	28.8	31.5	65 dBA:	**9**	**10**
Heavy Trucks	78.74	-24.99	0.30	-1.20	52.8	27.5	24.1	28.7	34.9	35.0	60 dBA:	**19**	**21**
				Total:	**57.6**	**52.6**	**51.4**	**45.4**	**53.8**	**54.4**	55 dBA:	**41**	**46**

Road Name: Old Grove Road **Segment: Southeast of Frazee Road**
Average Daily Traffic: 7310 Vehicles Vehicle Speed: 45 MPH Vehicle Mix: 2 Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 60 FEET FROM CENTERLINE (Equiv. Lane Dist: 53.58 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-3.56	-0.55	-1.20	64.0	61.7	60.4	54.3	62.7	63.4	70 dBA:	**21**	**23**
Medium Trucks	77.62	-18.43	-0.55	-1.20	57.4	38.7	41.7	35.7	42.9	43.7	65 dBA:	**44**	**49**
Heavy Trucks	82.14	-16.21	-0.55	-1.20	64.2	48.8	49.4	41.6	50.2	51.0	60 dBA:	**95**	**105**
				Total:	**67.6**	**61.9**	**60.8**	**54.6**	**63.0**	**63.7**	55 dBA:	**205**	**227**

Road Name: Frazee Road **Segment: Northeast of Old Grove Road**
Average Daily Traffic: 6030 Vehicles Vehicle Speed: 45 MPH Vehicle Mix: 2 Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 80 FEET FROM CENTERLINE (Equiv. Lane Dist: 75.31 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-4.40	-2.77	-1.20	61.0	58.6	57.3	51.3	59.7	60.3	70 dBA:	**17**	**19**
Medium Trucks	77.62	-19.26	-2.77	-1.20	54.4	35.6	38.6	32.6	39.8	40.6	65 dBA:	**37**	**41**
Heavy Trucks	82.14	-17.04	-2.77	-1.20	61.1	45.8	46.4	38.6	47.1	48.0	60 dBA:	**80**	**88**
				Total:	**64.5**	**58.8**	**57.7**	**51.5**	**60.0**	**60.6**	55 dBA:	**171**	**189**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Scenario: EXISTING PLUS CUMULATIVE PROJECTS WITHOUT PROJECT

Project: Rio Rockwell Residential
Site Conditions: Soft

	Vehicle Mix 1 (Collector - Local)				Vehicle Mix 2 (Arterial)				Vehicle Mix 3 (State Route 76)			
Vehicle Type	Day	Evening	Night	Daily	Day	Evening	Night	Daily	Day	Evening	Night	Daily
Automobiles	73.60%	13.60%	10.22%	97.40%	69.50%	12.90%	9.60%	92.00%	65.76%	13.48%	15.77%	95.00%
Medium Trucks	0.90%	0.90%	0.04%	1.84%	1.60%	0.80%	0.60%	3.00%	1.92%	0.35%	0.97%	3.24%
Heavy Trucks	0.35%	0.04%	0.35%	0.74%	3.50%	1.00%	0.50%	5.00%	0.96%	0.09%	0.70%	1.76%

Road Name: Old Grove Road **Segment: Northwest of Frazee Road**

Average Daily Traffic: 2700 Vehicles | Vehicle Speed: 25 MPH | Vehicle Mix: 1 | Roadway Classification: Collector

	NOISE PARAMETERS AT 50 FEET FROM CENTERLINE (Equiv. Lane Dist: 47.02 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	59.44	-5.09	0.30	-1.20	53.5	51.3	50.0	44.0	52.4	53.0	70 dBA:	**3**	**4**
Medium Trucks	71.09	-22.32	0.30	-1.20	47.9	26.6	32.6	14.3	27.5	30.2	65 dBA:	**7**	**8**
Heavy Trucks	78.74	-26.28	0.30	-1.20	51.6	26.2	22.8	27.5	33.7	33.8	60 dBA:	**16**	**17**
				Total:	**56.3**	**51.4**	**50.1**	**44.1**	**52.5**	**53.1**	55 dBA:	**34**	**37**

Road Name: Old Grove Road **Segment: Southeast of Frazee Road**

Average Daily Traffic: 7490 Vehicles | Vehicle Speed: 45 MPH | Vehicle Mix: 2 | Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 60 FEET FROM CENTERLINE (Equiv. Lane Dist: 53.58 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-3.45	-0.55	-1.20	64.1	61.8	60.5	54.4	62.8	63.5	70 dBA:	**21**	**23**
Medium Trucks	77.62	-18.32	-0.55	-1.20	57.5	38.8	41.8	35.8	43.0	43.8	65 dBA:	**45**	**50**
Heavy Trucks	82.14	-16.10	-0.55	-1.20	64.3	48.9	49.5	41.7	50.3	51.2	60 dBA:	**97**	**107**
				Total:	**67.7**	**62.0**	**60.9**	**54.7**	**63.1**	**63.8**	55 dBA:	**209**	**231**

Road Name: Frazee Road **Segment: Northeast of Old Grove Road**

Average Daily Traffic: 5960 Vehicles | Vehicle Speed: 45 MPH | Vehicle Mix: 2 | Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 80 FEET FROM CENTERLINE (Equiv. Lane Dist: 75.31 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-4.45	-2.77	-1.20	60.9	58.6	57.3	51.2	59.6	60.3	70 dBA:	**17**	**19**
Medium Trucks	77.62	-19.31	-2.77	-1.20	54.3	35.6	38.6	32.6	39.8	40.6	65 dBA:	**37**	**40**
Heavy Trucks	82.14	-17.10	-2.77	-1.20	61.1	45.7	46.3	38.5	47.1	47.9	60 dBA:	**79**	**87**
				Total:	**64.5**	**58.8**	**57.7**	**51.5**	**59.9**	**60.6**	55 dBA:	**170**	**188**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Scenario: EXISTING PLUS CUMULATIVE PROJECTS WITH PROJECT

Project: Rio Rockwell Residential
Site Conditions: Soft

	Vehicle Mix 1 (Collector - Local)				Vehicle Mix 2 (Arterial)				Vehicle Mix 3 (State Route 76)			
Vehicle Type	Day	Evening	Night	Daily	Day	Evening	Night	Daily	Day	Evening	Night	Daily
Automobiles	73.60%	13.60%	10.22%	97.40%	69.50%	12.90%	9.60%	92.00%	65.76%	13.48%	15.77%	95.00%
Medium Trucks	0.90%	0.90%	0.04%	1.84%	1.60%	0.80%	0.60%	3.00%	1.92%	0.35%	0.97%	3.24%
Heavy Trucks	0.35%	0.04%	0.35%	0.74%	3.50%	1.00%	0.50%	5.00%	0.96%	0.09%	0.70%	1.76%

Road Name: Old Grove Road **Segment: Northwest of Frazee Road**

Average Daily Traffic: 3630 Vehicles | Vehicle Speed: 25 MPH | Vehicle Mix: 1 | Roadway Classification: Collector

	NOISE PARAMETERS AT 50 FEET FROM CENTERLINE (Equiv. Lane Dist: 47.02 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	59.44	-3.80	0.30	-1.20	54.7	52.6	51.3	45.3	53.7	54.3	70 dBA:	**4**	**5**
Medium Trucks	71.09	-21.04	0.30	-1.20	49.1	27.9	33.9	15.6	28.8	31.5	65 dBA:	**9**	**10**
Heavy Trucks	78.74	-24.99	0.30	-1.20	52.8	27.5	24.1	28.7	34.9	35.0	60 dBA:	**19**	**21**
				Total:	**57.6**	**52.6**	**51.4**	**45.4**	**53.8**	**54.4**	55 dBA:	**41**	**46**

Road Name: Old Grove Road **Segment: Southeast of Frazee Road**

Average Daily Traffic: 8000 Vehicles | Vehicle Speed: 45 MPH | Vehicle Mix: 2 | Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 60 FEET FROM CENTERLINE (Equiv. Lane Dist: 53.58 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-3.17	-0.55	-1.20	64.4	62.0	60.8	54.7	63.1	63.8	70 dBA:	**22**	**24**
Medium Trucks	77.62	-18.04	-0.55	-1.20	57.8	39.1	42.1	36.1	43.3	44.1	65 dBA:	**47**	**52**
Heavy Trucks	82.14	-15.82	-0.55	-1.20	64.6	49.2	49.8	42.0	50.5	51.4	60 dBA:	**101**	**112**
				Total:	**68.0**	**62.3**	**61.1**	**55.0**	**63.4**	**64.1**	55 dBA:	**218**	**241**

Road Name: Frazee Road **Segment: Northeast of Old Grove Road**

Average Daily Traffic: 6290 Vehicles | Vehicle Speed: 45 MPH | Vehicle Mix: 2 | Roadway Classification: Major Arterial (4 Lanes)

	NOISE PARAMETERS AT 80 FEET FROM CENTERLINE (Equiv. Lane Dist: 75.31 ft)										**Centerline Distance to**		
	Noise Adjustments				**Unmitigated Noise Levels**						**Noise Contour (in feet)**		
Vehicle Type	REMEL	Traffic Adj.	Dist Adj.	Finite Adj	Leq Peak	Leq Day	Leq Eve.	Leq Night	Ldn	CNEL		Ldn	CNEL
Automobiles	69.34	-4.21	-2.77	-1.20	61.2	58.8	57.5	51.4	59.9	60.5	70 dBA:	**18**	**19**
Medium Trucks	77.62	-19.08	-2.77	-1.20	54.6	35.8	38.8	32.8	40.0	40.8	65 dBA:	**38**	**42**
Heavy Trucks	82.14	-16.86	-2.77	-1.20	61.3	46.0	46.5	38.8	47.3	48.2	60 dBA:	**82**	**90**
				Total:	**64.7**	**59.0**	**57.9**	**51.7**	**60.1**	**60.8**	55 dBA:	**176**	**195**

APPENDIX E

FHWA Model Onsite Traffic Noise Calculation Printouts

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Frazee Road
Building: MF18

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	6,290 vehicles
Peak Hour Volume:	629 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	54 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	63.8%	13.1%	15.3%	92.1%
Medium Trucks:	3.5%	0.6%	1.8%	6.0%
Heavy Trucks:	1.1%	0.1%	0.8%	1.9%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	115 feet
C.L. Dist. To Observer (Backyard):	125 feet
Barrier Dist. To Observer (Backyard):	10 feet
C.L. Dist. To Observer (Structure):	125 feet
Barrier Dist. To Observer (Structure):	10 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	71.2 feet
Road Elevation:	71.6 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	71.2 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	69.34	-4.21	-5.92	-1.20	0.00	0	0	0
Med Trucks:	77.62	-19.08	-5.92	-1.20	0.00	0	0	0
Hvy Trucks:	82.14	-16.86	-5.92	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.0	55.6	54.3	48.3	56.7	57.4
Med Trucks:	51.4	32.2	24.4	33.6	39.8	39.8
Hvy Trucks:	58.2	41.2	33.4	42.6	48.8	48.8
Traffic Noise:	**61.5**	**55.8**	**54.4**	**49.4**	**57.4**	**58.0**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.0	55.6	54.3	48.3	56.7	57.4
Med Trucks:	51.4	32.2	24.4	33.6	39.8	39.8
Hvy Trucks:	58.2	41.2	33.4	42.6	48.8	48.8
Traffic Noise:	**61.5**	**55.8**	**54.4**	**49.4**	**57.4**	**58.0**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.0	55.6	54.3	48.3	56.7	57.4
Med Trucks:	54.4	32.2	24.4	33.6	39.8	39.8
Hvy Trucks:	54.0	41.2	33.4	42.6	48.7	48.8
Traffic Noise:	**60.7**	**55.8**	**54.4**	**49.4**	**57.4**	**58.0**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.0	55.6	54.3	48.3	56.7	57.3
Med Trucks:	54.4	32.2	24.4	33.6	39.8	39.8
Hvy Trucks:	54.0	41.1	33.3	42.6	48.7	48.7
Traffic Noise:	**60.6**	**55.8**	**54.3**	**49.4**	**57.4**	**57.9**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Frazee Road
Building: MF20

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	6,290 vehicles
Peak Hour Volume:	629 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	54 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	63.8%	13.1%	15.3%	92.1%
Medium Trucks:	3.5%	0.6%	1.8%	6.0%
Heavy Trucks:	1.1%	0.1%	0.8%	1.9%

Site Data

Barrier Height:	**4 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	67 feet
C.L. Dist. To Observer (Backyard):	72 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	72 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	71.9 feet
Road Elevation:	72.2 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	71.9 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	69.34	-4.21	-2.00	-1.20	0.00	-3.6	-1.085	0
Med Trucks:	77.62	-19.08	-2.00	-1.20	0.00	-1.75	-0.62	0
Hvy Trucks:	82.14	-16.86	-2.00	-1.20	0.00	-0.68	-0.34	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.9	59.6	58.3	52.2	60.6	61.3
Med Trucks:	55.3	36.1	28.4	37.6	43.7	43.7
Hvy Trucks:	62.1	45.1	37.3	46.5	52.7	52.7
Traffic Noise:	**65.5**	**59.7**	**58.3**	**53.4**	**61.4**	**61.9**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.3	56.0	54.7	48.6	57.0	57.7
Med Trucks:	53.6	34.4	26.6	35.8	42.0	42.0
Hvy Trucks:	61.4	44.4	36.6	45.8	52.0	52.0
Traffic Noise:	**63.6**	**56.3**	**54.7**	**50.6**	**58.3**	**58.8**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	60.8	58.5	57.2	51.1	59.6	60.2
Med Trucks:	57.7	35.5	27.7	36.9	43.1	43.1
Hvy Trucks:	57.6	44.7	37.0	46.2	52.3	52.4
Traffic Noise:	**63.8**	**58.7**	**57.2**	**52.5**	**60.4**	**60.9**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.8	59.4	58.1	52.1	60.5	61.1
Med Trucks:	58.2	36.0	28.2	37.4	43.6	43.6
Hvy Trucks:	57.8	45.0	37.2	46.4	52.5	52.6
Traffic Noise:	**64.4**	**59.6**	**58.2**	**53.2**	**61.2**	**61.8**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Frazee Road
Building: MF33

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	6,290 vehicles
Peak Hour Volume:	629 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	54 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	63.8%	13.1%	15.3%	92.1%
Medium Trucks:	3.5%	0.6%	1.8%	6.0%
Heavy Trucks:	1.1%	0.1%	0.8%	1.9%

Site Data

Barrier Height:	**4 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	65 feet
C.L. Dist. To Observer (Backyard):	70 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	70 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	72.4 feet
Road Elevation:	72.7 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	72.4 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	69.34	-4.21	-1.79	-1.20	0.00	-3.6	-1.13	0
Med Trucks:	77.62	-19.08	-1.79	-1.20	0.00	-1.75	-0.62	0
Hvy Trucks:	82.14	-16.86	-1.79	-1.20	0.00	-0.68	-0.33	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.1	59.8	58.5	52.4	60.9	61.5
Med Trucks:	55.6	36.3	28.6	37.8	43.9	44.0
Hvy Trucks:	62.3	45.3	37.5	46.7	52.9	52.9
Traffic Noise:	**65.7**	**59.9**	**58.5**	**53.6**	**61.6**	**62.1**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	58.5	56.2	54.9	48.8	57.3	57.9
Med Trucks:	53.8	34.6	26.8	36.0	42.2	42.2
Hvy Trucks:	61.6	44.6	36.8	46.0	52.2	52.2
Traffic Noise:	**63.8**	**56.5**	**55.0**	**50.8**	**58.5**	**59.0**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	61.0	58.6	57.3	51.3	59.7	60.4
Med Trucks:	57.9	35.7	27.9	37.1	43.3	43.3
Hvy Trucks:	57.8	45.0	37.2	46.4	52.5	52.6
Traffic Noise:	**64.0**	**58.8**	**57.4**	**52.6**	**60.6**	**61.1**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	62.0	59.6	58.3	52.3	60.7	61.3
Med Trucks:	58.4	36.2	28.4	37.6	43.8	43.8
Hvy Trucks:	58.0	45.2	37.4	46.6	52.7	52.8
Traffic Noise:	**64.6**	**59.8**	**58.4**	**53.4**	**61.4**	**62.0**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Frazee Road
Lot Number: MF35

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	6,290 vehicles
Peak Hour Volume:	629 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	54 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	63.8%	13.1%	15.3%	92.1%
Medium Trucks:	3.5%	0.6%	1.8%	6.0%
Heavy Trucks:	1.1%	0.1%	0.8%	1.9%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	98 feet
C.L. Dist. To Observer (Backyard):	103 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	103 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	73.0 feet
Road Elevation:	73.0 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	72.0 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	69.34	-4.21	-4.58	-1.20	0.00	0	0	0
Med Trucks:	77.62	-19.08	-4.58	-1.20	0.00	0	0	0
Hvy Trucks:	82.14	-16.86	-4.58	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.3	57.0	55.7	49.6	58.1	58.7
Med Trucks:	52.8	33.5	25.8	35.0	41.1	41.2
Hvy Trucks:	59.5	42.5	34.7	43.9	50.1	50.1
Traffic Noise:	**62.9**	**57.1**	**55.7**	**50.8**	**58.8**	**59.3**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.3	57.0	55.7	49.6	58.1	58.7
Med Trucks:	52.8	33.5	25.8	35.0	41.1	41.2
Hvy Trucks:	59.5	42.5	34.7	43.9	50.1	50.1
Traffic Noise:	**62.9**	**57.1**	**55.7**	**50.8**	**58.8**	**59.3**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.4	57.0	55.7	49.6	58.1	58.7
Med Trucks:	55.7	33.5	25.8	35.0	41.1	41.2
Hvy Trucks:	55.4	42.5	34.7	43.9	50.1	50.1
Traffic Noise:	**62.0**	**57.1**	**55.7**	**50.8**	**58.8**	**59.3**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	59.3	56.9	55.6	49.6	58.0	58.6
Med Trucks:	55.7	33.5	25.7	34.9	41.1	41.1
Hvy Trucks:	55.3	42.5	34.7	43.9	50.0	50.1
Traffic Noise:	**61.9**	**57.1**	**55.7**	**50.7**	**58.7**	**59.3**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: MF38

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	46 feet
C.L. Dist. To Observer (Backyard):	51 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	51 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	73.3 feet
Road Elevation:	73.3 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	72.3 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	0.13	-1.20	0.00	0	0	0
Med Trucks:	71.09	-21.04	0.13	-1.20	0.00	0	0	0
Hvy Trucks:	78.74	-24.99	0.13	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	54.6	52.4	51.1	45.1	53.5	54.2
Med Trucks:	49.0	27.7	33.7	15.5	28.6	31.4
Hvy Trucks:	52.7	27.3	23.9	28.6	34.8	34.9
Traffic Noise:	**57.4**	**52.5**	**51.2**	**45.2**	**53.6**	**54.2**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	54.6	52.4	51.1	45.1	53.5	54.2
Med Trucks:	49.0	27.7	33.7	15.5	28.6	31.4
Hvy Trucks:	52.7	27.3	23.9	28.6	34.8	34.9
Traffic Noise:	**57.4**	**52.5**	**51.2**	**45.2**	**53.6**	**54.2**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	54.6	52.4	51.1	45.1	53.5	54.2
Med Trucks:	49.0	27.7	33.7	15.5	28.6	31.3
Hvy Trucks:	52.7	27.3	23.9	28.6	34.8	34.9
Traffic Noise:	**57.4**	**52.5**	**51.2**	**45.2**	**53.6**	**54.2**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	54.3	52.2	50.9	44.9	53.3	53.9
Med Trucks:	48.8	27.5	33.5	15.2	28.4	31.1
Hvy Trucks:	52.5	27.1	23.7	28.3	34.5	34.6
Traffic Noise:	**57.2**	**52.2**	**51.0**	**45.0**	**53.4**	**54.0**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: MF50

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	53 feet
C.L. Dist. To Observer (Backyard):	58 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	58 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	72.8 feet
Road Elevation:	72.8 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	71.4 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	-0.79	-1.20	0.00	0	0	0
Med Trucks:	71.09	-21.04	-0.79	-1.20	0.00	0	0	0
Hvy Trucks:	78.74	-24.99	-0.79	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	53.6	51.5	50.2	44.2	52.6	53.2
Med Trucks:	48.1	26.8	32.8	14.5	27.7	30.4
Hvy Trucks:	51.8	26.4	23.0	27.7	33.9	33.9
Traffic Noise:	**56.5**	**51.6**	**50.3**	**44.3**	**52.7**	**53.3**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	53.6	51.5	50.2	44.2	52.6	53.2
Med Trucks:	48.1	26.8	32.8	14.5	27.7	30.4
Hvy Trucks:	51.8	26.4	23.0	27.7	33.9	33.9
Traffic Noise:	**56.5**	**51.6**	**50.3**	**44.3**	**52.7**	**53.3**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	53.6	51.5	50.2	44.2	52.6	53.2
Med Trucks:	48.1	26.8	32.8	14.5	27.7	30.4
Hvy Trucks:	51.8	26.4	23.0	27.6	33.8	33.9
Traffic Noise:	**56.5**	**51.5**	**50.3**	**44.3**	**52.7**	**53.3**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	53.5	51.4	50.0	44.0	52.5	53.1
Med Trucks:	47.9	26.6	32.7	14.4	27.5	30.3
Hvy Trucks:	51.6	26.2	22.8	27.5	33.7	33.8
Traffic Noise:	**56.3**	**51.4**	**50.1**	**44.1**	**52.5**	**53.2**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: MF51

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	42 feet
C.L. Dist. To Observer (Backyard):	47 feet
Barrier Dist. To Observer (Backyard):	5 feet
C.L. Dist. To Observer (Structure):	47 feet
Barrier Dist. To Observer (Structure):	5 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	72.4 feet
Road Elevation:	72.4 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	71.2 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	0.73	-1.20	0.00	0	0	0
Med Trucks:	71.09	-21.04	0.73	-1.20	0.00	0	0	0
Hvy Trucks:	78.74	-24.99	0.73	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.2	53.0	51.7	45.7	54.1	54.8
Med Trucks:	49.6	28.3	34.4	16.1	29.2	32.0
Hvy Trucks:	53.3	27.9	24.5	29.2	35.4	35.5
Traffic Noise:	**58.0**	**53.1**	**51.8**	**45.8**	**54.2**	**54.8**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.2	53.0	51.7	45.7	54.1	54.8
Med Trucks:	49.6	28.3	34.4	16.1	29.2	32.0
Hvy Trucks:	53.3	27.9	24.5	29.2	35.4	35.5
Traffic Noise:	**58.0**	**53.1**	**51.8**	**45.8**	**54.2**	**54.8**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.2	53.0	51.7	45.7	54.1	54.8
Med Trucks:	49.6	28.3	34.3	16.1	29.2	31.9
Hvy Trucks:	53.3	27.9	24.5	29.2	35.4	35.5
Traffic Noise:	**58.0**	**53.1**	**51.8**	**45.8**	**54.2**	**54.8**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	54.9	52.8	51.5	45.5	53.9	54.5
Med Trucks:	49.3	28.1	34.1	15.8	28.9	31.7
Hvy Trucks:	53.0	27.7	24.3	28.9	35.1	35.2
Traffic Noise:	**57.7**	**52.8**	**51.6**	**45.6**	**54.0**	**54.6**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: SF44

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	32 feet
C.L. Dist. To Observer (Backyard):	44 feet
Barrier Dist. To Observer (Backyard):	12 feet
C.L. Dist. To Observer (Structure):	44 feet
Barrier Dist. To Observer (Structure):	12 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	70.0 feet
Road Elevation:	70.0 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	69.2 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	1.22	-1.20	0.00	-0.199	-0.175	0
Med Trucks:	71.09	-21.04	1.22	-1.20	0.00	-0.112	0	0
Hvy Trucks:	78.74	-24.99	1.22	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.5	53.3	52.0	46.0	54.4	55.1
Med Trucks:	50.0	28.7	34.7	16.4	29.6	32.3
Hvy Trucks:	53.8	28.4	25.0	29.7	35.9	36.0
Traffic Noise:	**58.4**	**53.4**	**52.1**	**46.1**	**54.5**	**55.1**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.5	53.3	52.0	46.0	54.4	55.1
Med Trucks:	50.0	28.7	34.7	16.4	29.6	32.3
Hvy Trucks:	53.8	28.4	25.0	29.7	35.9	36.0
Traffic Noise:	**58.4**	**53.4**	**52.1**	**46.1**	**54.5**	**55.1**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.5	53.4	52.0	46.0	54.4	55.1
Med Trucks:	50.1	28.8	34.8	16.5	29.7	32.4
Hvy Trucks:	53.8	28.4	25.0	29.7	35.9	36.0
Traffic Noise:	**58.4**	**53.4**	**52.1**	**46.1**	**54.5**	**55.2**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.3	53.2	51.9	45.9	54.3	54.9
Med Trucks:	49.8	28.5	34.5	16.2	29.4	32.1
Hvy Trucks:	53.5	28.1	24.7	29.3	35.5	35.6
Traffic Noise:	**58.2**	**53.2**	**52.0**	**46.0**	**54.4**	**55.0**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: SF46

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	30 feet
C.L. Dist. To Observer (Backyard):	42 feet
Barrier Dist. To Observer (Backyard):	12 feet
C.L. Dist. To Observer (Structure):	42 feet
Barrier Dist. To Observer (Structure):	12 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	69.7 feet
Road Elevation:	69.7 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	68.9 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	1.58	-1.20	0.00	-0.21	-0.177	0
Med Trucks:	71.09	-21.04	1.58	-1.20	0.00	-0.111	0	0
Hvy Trucks:	78.74	-24.99	1.58	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.3	29.1	35.1	16.8	29.9	32.7
Hvy Trucks:	54.1	28.8	25.4	30.0	36.2	36.3
Traffic Noise:	**58.7**	**53.7**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.3	29.1	35.1	16.8	29.9	32.7
Hvy Trucks:	54.1	28.8	25.4	30.0	36.2	36.3
Traffic Noise:	**58.7**	**53.7**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.4	29.2	35.2	16.9	30.0	32.8
Hvy Trucks:	54.1	28.8	25.4	30.0	36.2	36.3
Traffic Noise:	**58.8**	**53.7**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.7	53.5	52.2	46.2	54.6	55.3
Med Trucks:	50.1	28.8	34.8	16.6	29.7	32.4
Hvy Trucks:	53.8	28.4	25.0	29.7	35.9	36.0
Traffic Noise:	**58.5**	**53.6**	**52.3**	**46.3**	**54.7**	**55.3**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: SF48

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	30 feet
C.L. Dist. To Observer (Backyard):	43 feet
Barrier Dist. To Observer (Backyard):	13 feet
C.L. Dist. To Observer (Structure):	43 feet
Barrier Dist. To Observer (Structure):	13 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	69.2 feet
Road Elevation:	69.2 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	68.5 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	1.39	-1.20	0.00	-0.26	-0.184	0
Med Trucks:	71.09	-21.04	1.39	-1.20	0.00	-0.117	0	0
Hvy Trucks:	78.74	-24.99	1.39	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.6	53.5	52.1	46.1	54.5	55.2
Med Trucks:	50.1	28.9	34.9	16.6	29.7	32.5
Hvy Trucks:	53.9	28.6	25.2	29.8	36.0	36.1
Traffic Noise:	**58.5**	**53.5**	**52.2**	**46.2**	**54.6**	**55.2**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.6	53.5	52.1	46.1	54.5	55.2
Med Trucks:	50.1	28.9	34.9	16.6	29.7	32.5
Hvy Trucks:	53.9	28.6	25.2	29.8	36.0	36.1
Traffic Noise:	**58.5**	**53.5**	**52.2**	**46.2**	**54.6**	**55.2**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.6	53.5	52.2	46.2	54.6	55.2
Med Trucks:	50.2	29.0	35.0	16.7	29.9	32.6
Hvy Trucks:	53.9	28.6	25.2	29.8	36.0	36.1
Traffic Noise:	**58.6**	**53.5**	**52.3**	**46.3**	**54.7**	**55.3**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.5	53.4	52.1	46.0	54.5	55.1
Med Trucks:	49.9	28.7	34.7	16.4	29.5	32.3
Hvy Trucks:	53.6	28.3	24.9	29.5	35.7	35.8
Traffic Noise:	**58.3**	**53.4**	**52.1**	**46.1**	**54.5**	**55.2**

FHWA-RD-77-108 HIGHWAY TRAFFIC NOISE PREDICTION MODEL

Road Name: Old Grove Road
Lot Number: SF50

Project Name: Rio Rockwell
Job Number: 18074

NOISE MODEL INPUTS

Highway Data

Average Daily Traffic:	3,630 vehicles
Peak Hour Volume:	363 vehicles
Vehicle Speed:	25 mph
Near/Far Lane Distance:	34 feet

Vehicle Mix

	Day	Evening	Night	Daily
Autos:	73.6%	13.6%	10.2%	97.4%
Medium Trucks:	0.9%	0.9%	0.0%	1.8%
Heavy Trucks:	0.4%	0.0%	0.4%	0.7%

Site Data

Barrier Height:	**0 feet**
Barrier Type(Wall/Berm):	Wall
Site Conditions(Hard/Soft):	Soft
Centerline (C.L.) Dist. to Barrier:	30 feet
C.L. Dist. To Observer (Backyard):	42 feet
Barrier Dist. To Observer (Backyard):	12 feet
C.L. Dist. To Observer (Structure):	42 feet
Barrier Dist. To Observer (Structure):	12 feet
Road Grade:	0.00 %
Left View:	-90 degrees
Right View:	90 degrees

Elevations

Barrier Base Elevation:	68.8 feet
Road Elevation:	68.7 feet
Noise Source Elevation above Road	
Autos:	0 feet
Med Trucks:	2.3 feet
Hvy Trucks:	8 feet
Pad Elevation:	68.8 feet
Observer Heights Above Pad Elevation	
Exterior:	5 feet
First Floor:	5.5 feet
Second Floor:	14 feet

FHWA NOISE MODEL CALCULATIONS

	REMEL	Traffic Flow	Distance	Finite Road	Grade	Barrier Attenuation Exterior	1st Flr	2nd Flr
Autos:	59.44	-3.80	1.56	-1.20	0.00	-0.164	-0.137	0
Med Trucks:	71.09	-21.04	1.56	-1.20	0.00	0	0	0
Hvy Trucks:	78.74	-24.99	1.56	-1.20	0.00	0	0	0

UNMITIGATED NOISE LEVELS (with topographical and existing barrier attenuation)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.4	29.2	35.2	16.9	30.0	32.8
Hvy Trucks:	54.1	28.8	25.4	30.0	36.2	36.3
Traffic Noise:	**58.8**	**53.7**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (Backyard)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.4	29.2	35.2	16.9	30.0	32.8
Hvy Trucks:	54.1	28.8	25.4	30.0	36.2	36.3
Traffic Noise:	**58.8**	**53.7**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (First Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.8	53.7	52.4	46.4	54.8	55.4
Med Trucks:	50.4	29.1	35.2	16.9	30.0	32.8
Hvy Trucks:	54.1	28.7	25.3	30.0	36.2	36.3
Traffic Noise:	**58.8**	**53.8**	**52.5**	**46.5**	**54.9**	**55.5**

MITIGATED NOISE LEVELS (Second Floor)

	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	55.6	53.5	52.2	46.2	54.6	55.2
Med Trucks:	50.0	28.8	34.8	16.5	29.6	32.4
Hvy Trucks:	53.7	28.4	25.0	29.6	35.8	35.9
Traffic Noise:	**58.5**	**53.5**	**52.3**	**46.3**	**54.7**	**55.3**