

**3833 REDWOOD BOULEVARD
ENVIRONMENTAL NOISE AND
VIBRATION ASSESSMENT**

San Rafael, California

November 1, 2018

Prepared for:

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Project: 18-093

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INTRODUCTION

The project proposes to demolish existing structures and amenities and construct 44 three-story townhomes in nine buildings. This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses noise and land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA)*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq} . The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (DNL or L_{dn})* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn} . Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, and those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the

percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn} . At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to

assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet		Vacuum cleaner at 10 feet
Commercial area	70 dBA	Normal speech at 3 feet
Heavy traffic at 300 feet		
	60 dBA	Large business office
Quiet urban daytime		Dishwasher in next room
	50 dBA	
Quiet urban nighttime		Theater, large conference room
Quiet suburban nighttime	40 dBA	
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
	10 dBA	Broadcast/recording studio
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, November 2009.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

Regulatory Background – Noise

The State of California and the City of San Rafael have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

- (a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- (b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- (c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- (d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- (e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or
- (f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Checklist items (a), (b), (c), and (d) are applicable to the proposed project. The project is not located within two miles of a public airport or within the vicinity of a private airstrip and would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, items (e) and (f) are not carried further in this analysis.

The impacts of the project on the surrounding land uses are addressed in the Noise Impacts and Mitigation Measures Section of the report. The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA and are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn} or greater would be considered significant where exterior noise levels would exceed the compatible noise level standard (60 dBA L_{dn} for residential land uses and 70 dBA L_{dn} for industrial land uses). Where noise levels would remain at or below the compatible noise level standard with the project, noise level increases of 5 dBA L_{dn} or greater would be considered significant.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn} /CNEL in any habitable room.

City of San Rafael General Plan. The Noise Element in the City of San Rafael's 2020 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San Rafael. The following goals and policies are applicable to the proposed project:

N-1a. Acoustical Studies. Require acoustical studies for all new residential projects within the projected L_{dn} 60 dB noise contours (refer to Exhibit 31) so that noise mitigation can be incorporated into project design. Acoustical studies shall identify noise sources and contain a discussion of the existing and future exposure and the mitigation measures that may be used to achieve outdoor and indoor standards.

N-2. Exterior Noise Standards for Residential Use Areas. The exterior noise standard for backyards and/or common usable outdoor areas in a new residential development is up to L_{dn} of 60 dB. In common usable outdoor areas in Downtown, mixed-use residential, and high density residential districts, up to L_{dn} of 65 dB may be allowed if determined acceptable through development review.

N-3. Planning and Design of New Development. Encourage new development to be planned and designed to minimize noise impacts from outside sources. Noise mitigation measures must be taken through appropriate site planning, architectural layout of buildings, use of noise barriers where ever required, construction modifications and using alternatives to sound walls. Detailed guidelines for these mitigation measures are available in the General Plan document.

N-9. Nuisance Noise. Minimize impacts from noise levels that exceed community sound levels by enforcing and updating noise ordinance, mitigating noise from construction activities, etc.

Applicable noise levels for interior and exterior noise are given below:

Interior Noise Levels

- The City's standard for normally acceptable interior noise levels in bedrooms of residential units not in downtown is 40 dB L_{dn} , and 45 dB L_{dn} for other rooms of residential units not

Mitigated	4.1085	0.2428	0.0000	10.1787
Unmitigated	4.1085	0.2428	0.0000	10.1787

8.2 Waste by Land Use

Unmitigated

Land Use	Waste Disposed tons	Total CO2			CO2e
		CH4	N2O	CO2e	
MT/yr					
Condo/Townhouse	20.24	4.1085	0.2428	0.0000	10.1787
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

Mitigated

Land Use	Waste Disposed tons	Total CO2			CO2e
		CH4	N2O	CO2e	
MT/yr					
Condo/Townhouse	20.24	4.1085	0.2428	0.0000	10.1787
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

9.0 Operational Offroad

in downtown, bedrooms of residential units in downtown, hotels, motels, and downtown multifamily homes.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dB L_{dn} or less for residential, hotels, schools, playgrounds and outdoor areas, 65 dB L_{dn} for office and commercial land use, 70 dB L_{dn} for industrial, agricultural and manufacturing land use (Exhibit 31).




**Exhibit 31
Land Use Compatibility Standards
for New Development**

Exterior Noise Exposure to the Site
 L_{dn} (dB)

Land Use	50	55	60	65	70	75	80
Residential, Hotels, Motels	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Auditoriums, Concert Halls, Amphitheaters	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Sports Arena, Outdoor Spectator Sports	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Playgrounds, Neighborhood Parks	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Other Outdoor Recreation and Cemeteries	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Office and Other Commercial Uses	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Industrial, Manufacturing, Utilities, Agriculture	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable

Interior Noise Exposure
 L_{dn} (dB)

	35	40	45	50	55	60	65
Bedrooms in Residential units not in Downtown	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Other Rooms in Residential Units not in Downtown	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Bedrooms in Residential units in Downtown	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Hotels, Motels, Downtown Multifamily	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable

-  Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
-  Conditionally Acceptable – Specific land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
-  Clearly Unacceptable – New construction of development clearly should not be undertaken.

City of San Rafael Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Section 8.13.040 states the allowable sound pressure level at various land uses during the day and night for intermittent and constant noise. The general noise limits are given in Table 8.13-1.

TABLE 8.13-1—GENERAL NOISE LIMITS

Property type or zone	Daytime limits	Nighttime limits
Residential	60 dBA Intermittent	50 dBA Intermittent
	50 dBA Constant	40 dBA Constant
Mixed-use	65 dBA Intermittent	55 dBA Intermittent
	55 dBA Constant	45 dBA Constant
Multifamily residential (interior sound source)	40 dBA Intermittent	35 dBA Intermittent
	35 dBA Constant	30 dBA Constant
Commercial	65 dBA Intermittent	65 dBA Intermittent
	55 dBA Constant	55 dBA Constant
Industrial	70 dBA Intermittent	70 dBA Intermittent
	60 dBA Constant	60 dBA Constant
Public Property	Most restrictive noise limit applicable to adjoining private property	Most restrictive noise limit applicable to adjoining private property

Source: Ord. 1789 § 3 (part), 2002.

Section 8.13.050 of the Municipal Code establishes allowable hours of construction between 7 am and 6 pm Monday through Friday and between 9 am and 6 pm on Saturdays, unless permission is granted with a development permit or other approval from planning commission or the activity belongs to one of the exceptions stated in Subsection B of Section 3.13.050 (Standard Exceptions to general noise limits) of the City of San Rafael’s Municipal Code. No construction activities are permitted on Sundays and holidays. Noise levels at any point within the city limits shall not exceed 90 dBA L_{eq} .

Regulatory Background – Vibration

The City of San Rafael has not established construction vibration guidelines. Based on the thresholds provided by Caltrans shown in Table 3, a vibration limit of 0.3 in/sec PPV is used to minimize potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The project site is located to the west of Redwood Highway (US-101) on Merrydale Road in the City of San Rafael. The primary noise source at the site is vehicular traffic along US-101 and local traffic along Merrydale Road. US-101 is elevated by about 10 feet above the ground level of the site. Residential and commercial structures surround the project site. A noise monitoring survey was performed in the vicinity of the project site beginning Monday, May 21, 2018 and concluding on Thursday, May 24, 2018. The monitoring survey included two long-term noise measurements and five short-term measurements, as shown in Figure 1. Table 4 summarizes the results of the short-term measurements. The results of the long-term noise measurements at LT-1 are shown in Figures 2 and 3 and, the results of long-term measurements at LT-2 are shown in Figures 4 and 5.

Long-term noise measurement LT-1 was made at the backside of 310 Lar Flores Avenue, at a distance of about 17 feet from the centerline of Merrydale Road in front of the proposed project site. The primary noise source at this location was traffic along Redwood Highway and occasional traffic on Merrydale Road. Hourly average noise levels ranged from 53 to 62 dBA L_{eq} at this location during daytime hours, and from 46 to 60 dBA L_{eq} at night. The day-night average noise level on Tuesday May 22, 2018 and on Wednesday, May 23, 2018 was 60 dBA L_{dn} .

LT-2 was measured in the northeast corner of the site, 13 feet below the Redwood Highway alignment and 130 feet from its centerline. The primary noise sources at this location was the traffic on Redwood Highway. Hourly average noise levels at this location ranged from 67 to 70 dBA L_{eq} during the day and from 60 to 70 dBA L_{eq} at night. The day-night average noise level Tuesday May 22, 2018 and on Wednesday, May 23, 2018 was 73 dBA L_{dn} .

TABLE 4 Summary of Short-Term Noise Measurement Data, May 22, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L ₁₀	L ₅₀	L ₉₀	L _{eq}	
ST-1	3817 Redwood Highway, 144 feet from centerline of Redwood Highway (11:40 a.m. to 11:50 a.m.)	68	64	62	65	Traffic on Redwood Highway
ST-2	Southeast corner of the site, 60 feet west of Redwood Highway (12:00 p.m. to 12:10 p.m.)	70	67	65	68	Traffic on Redwood Highway
ST-3	Along the fence line on south side, 105 feet from Redwood Highway and 45 feet south of existing building (12:10 p.m. to 12:20 p.m.)	69	66	63	67	Traffic on Redwood Highway
ST-4	Across from 300 Merrydale Road, 60 feet north of Las Gallinas Avenue (12:30 p.m. to 12:40 p.m.)	57	54	52	56	Traffic on Merrydale Road
ST-5	Northwest corner of site, 360 feet west of Redwood Highway (12:50 p.m. to 01:00 p.m.)	59	57	55	58	Traffic on Merrydale Road

FIGURE 1 Noise Measurement Locations



FIGURE 2 Daily Trend in Noise Levels at LT-1, May 22nd, 2018

**Noise Levels at Noise Measurement Site LT-1
On Merrydale Road, behind 310 Las Flores Avenue
Tuesday, May 22nd, 2018**

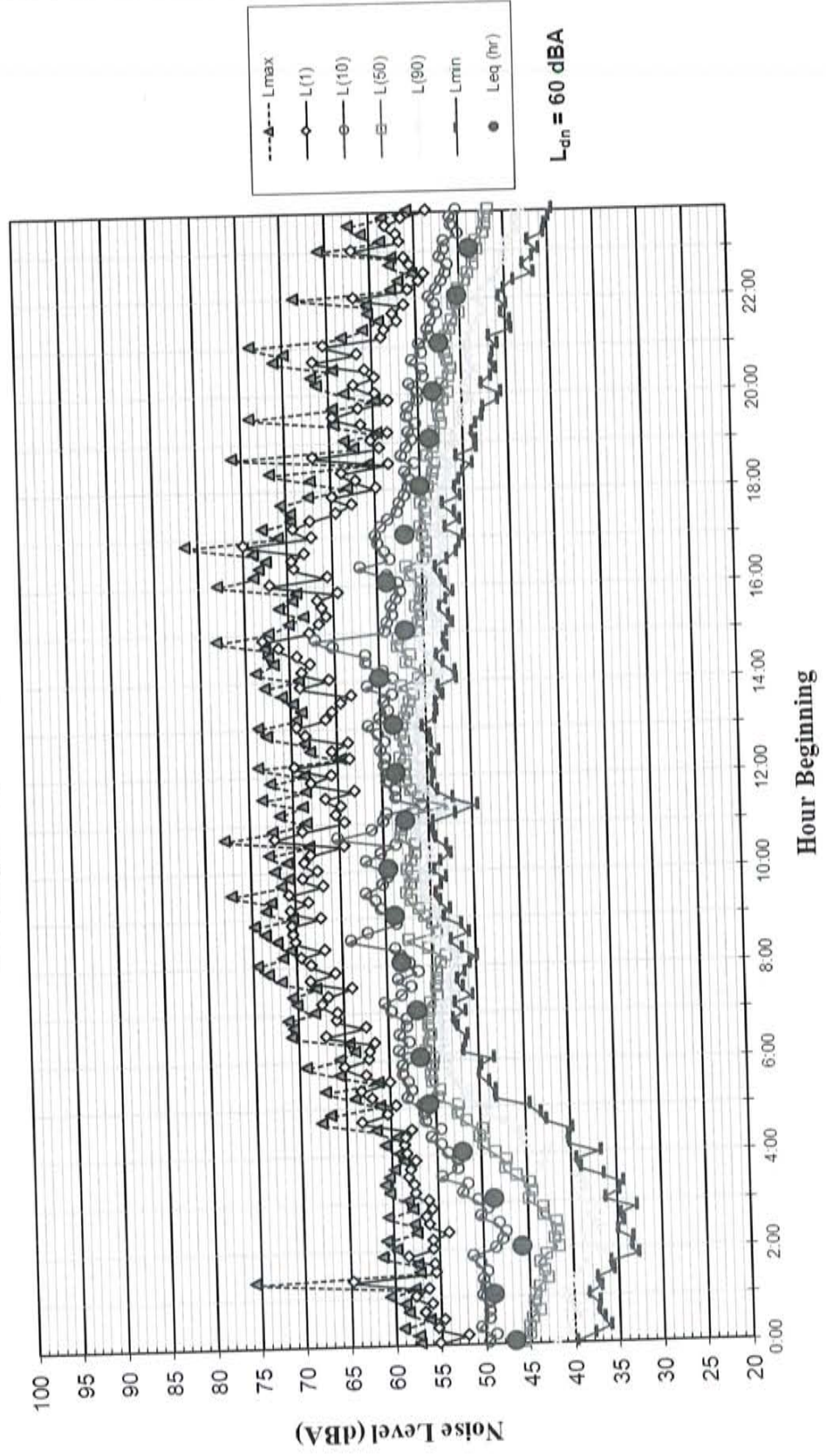


FIGURE 3 Daily Trend in Noise Levels at LT-1, May 23rd, 2018

**Noise Levels at Noise Measurement Site LT-1
On Merrydale Road, behind 310 Las Flores Avenue
Wednesday, May 23rd, 2018**

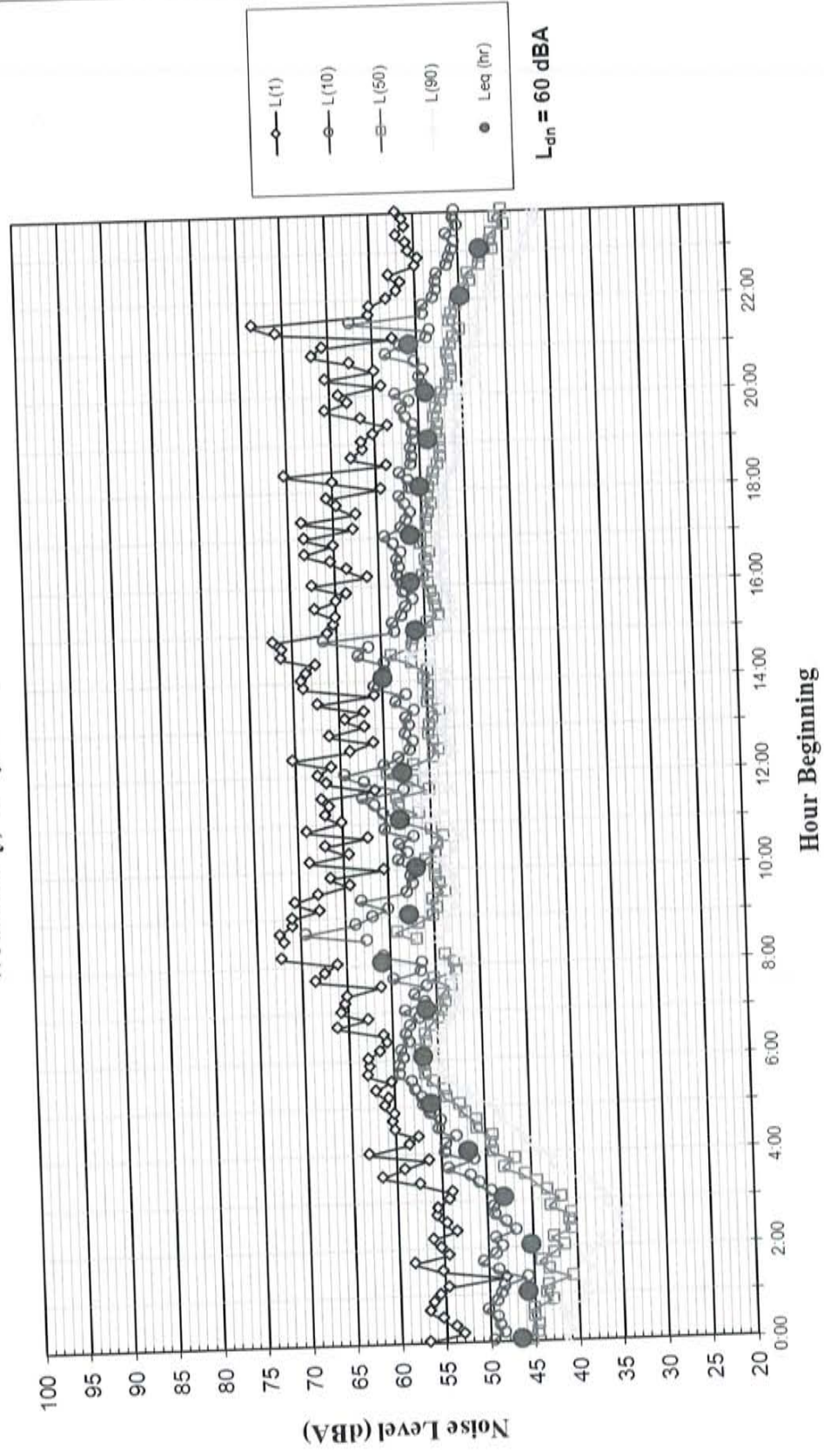


FIGURE 4 Daily Trend in Noise Levels at LT-2, May 22nd, 2018

**Noise Levels at Noise Measurement Site LT-2
Northeast corner of the site
Tuesday, May 22nd, 2018**

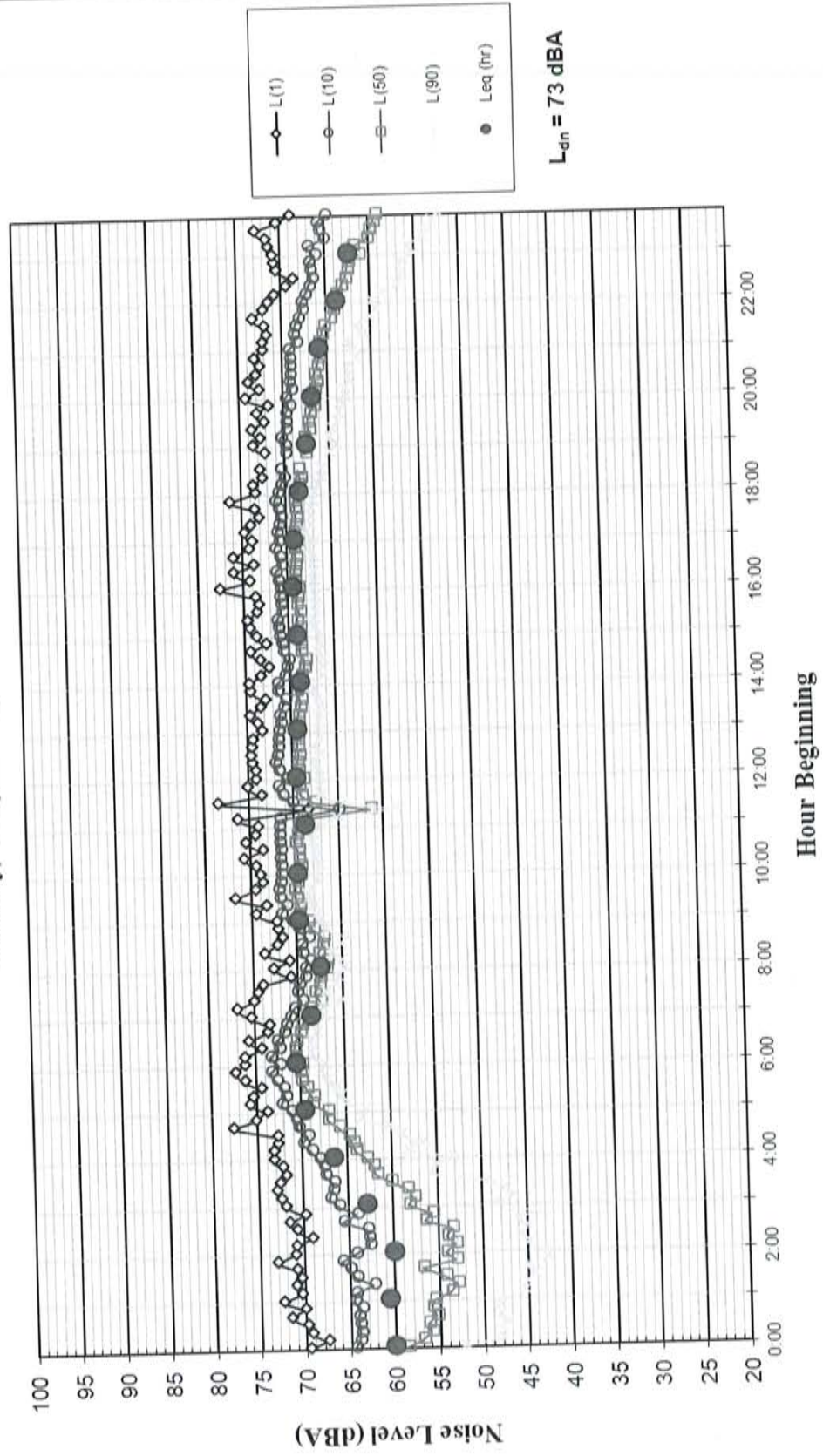
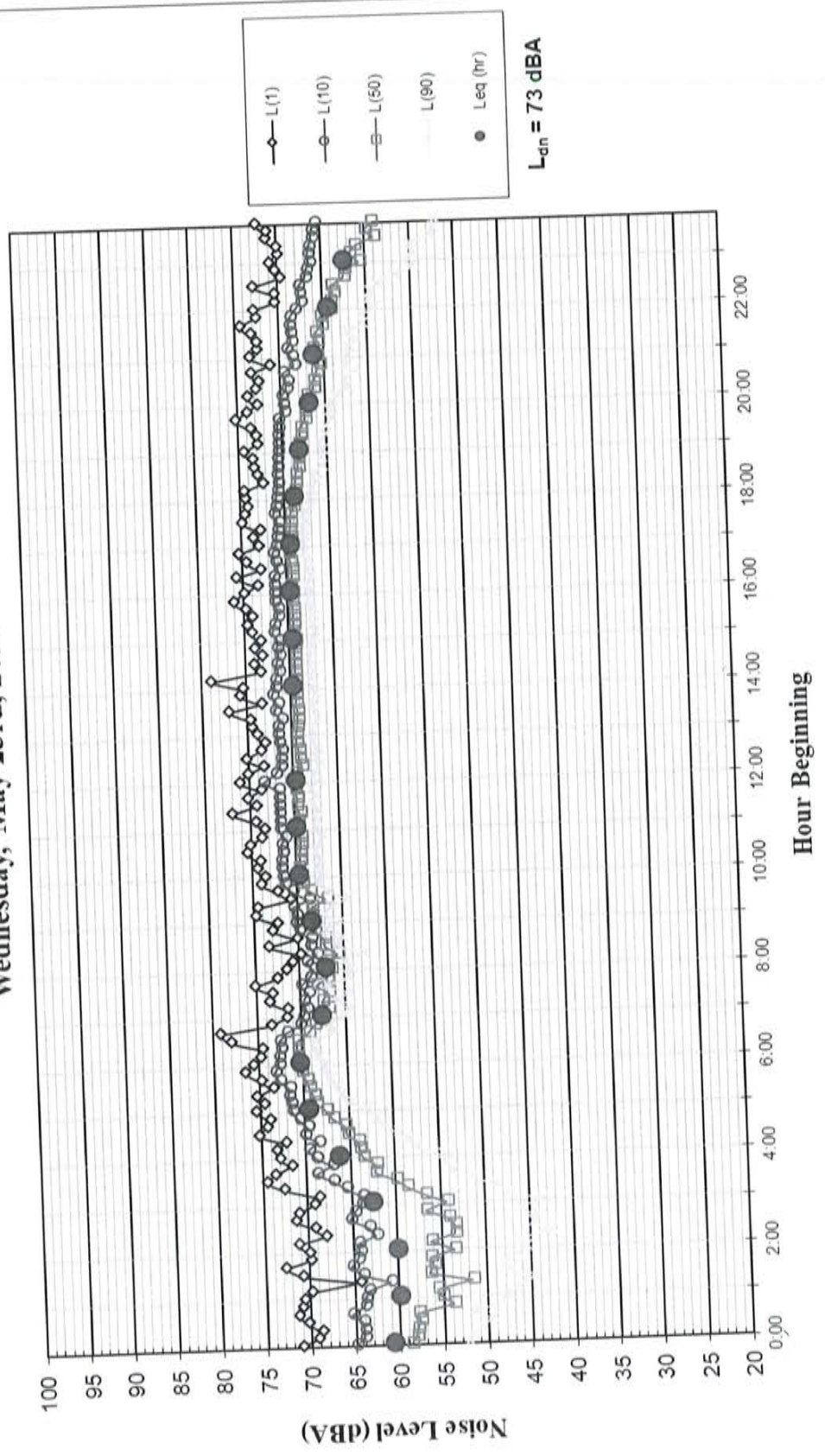


FIGURE 5 Daily Trend in Noise Levels at LT-2, May 23rd, 2018

**Noise Levels at Noise Measurement Site LT-2
Northeast corner of the site
Wednesday, May 23rd, 2018**



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Noise Section in San Rafael 2020 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San Rafael. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

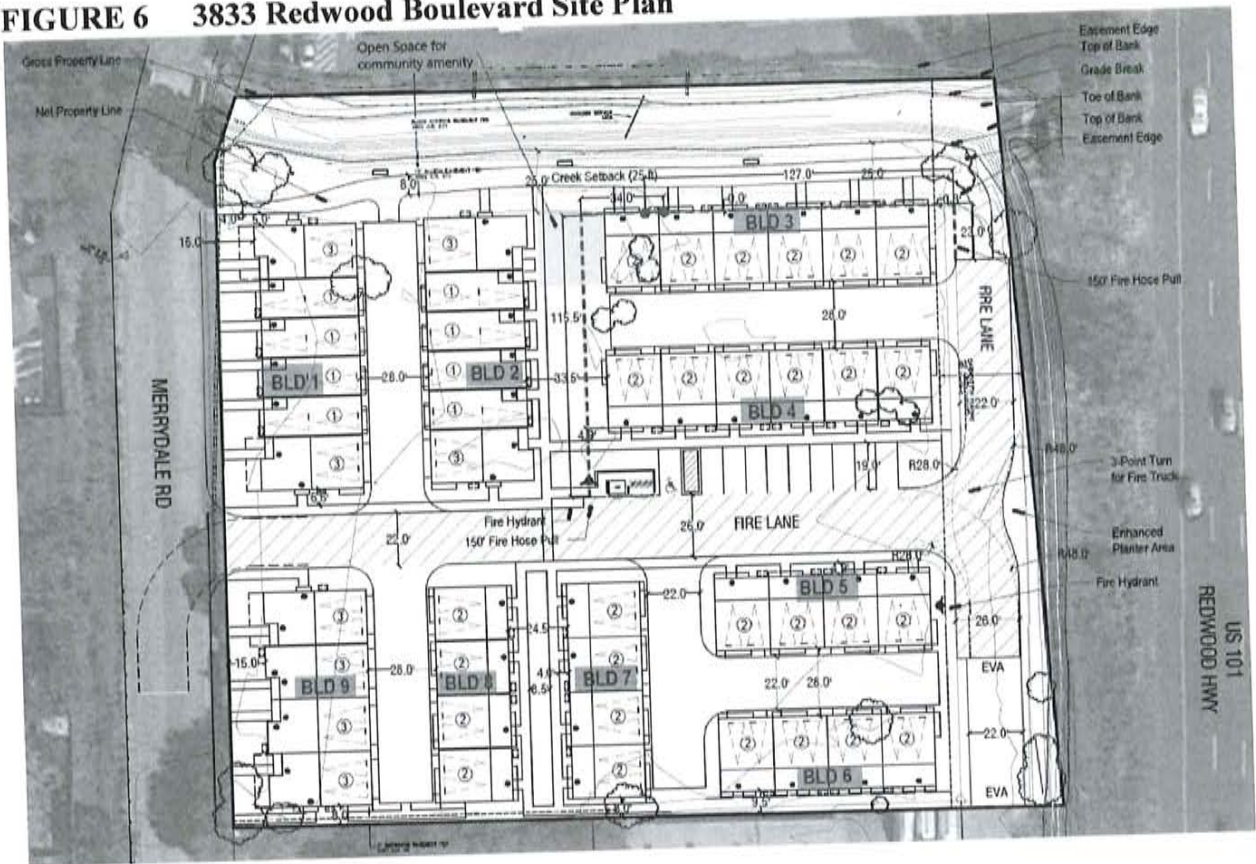
- The City's acceptable exterior noise level objective is 60 dBA L_{dn} or less for the proposed residential uses (Exhibit 31).
- The City's standard for interior noise levels in residences is 40 dBA L_{dn} for bedrooms in residential units not in downtown and 45 dBA L_{dn} otherwise.

Noise and Land Use Compatibility

The project would demolish existing structures and surface parking and construct townhomes on a 2.44 acre site with access from Merrydale Road. The project would construct 9 buildings on site ranging from 4 to 8 units, for a total of 44 three-story homes. Garage parking will be provided for all townhomes and in addition, there will be 15 surface parking spaces on site. Figure 6 shows the site plan and building numbers, based on site plans dated September 13, 2018.

Generally, bedrooms would be located on the top floor (level 3) and living spaces would be located on the middle floor (level 2). None of the buildings would include a rooftop deck. Community open space is proposed along the northern site boundary between Buildings 2 and 3 and in the southeastern corner of the site, adjacent to US-101.

FIGURE 6 3833 Redwood Boulevard Site Plan



Future Exterior Noise Environment

The primary noise sources at the site would continue to be vehicular traffic on US-101 and Merrydale Road. US-101 is elevated by about 10 feet above the site. Based on traffic volumes provided in the Traffic Impact Assessment Report¹, traffic noise levels are calculated to increase by 1 dBA along Merrydale Road under future conditions (2040) due to increases in traffic volumes on Merrydale Road.

The community open space area between Buildings 2 and 3 would be exposed to 52 dBA L_{dn}. Exterior noise levels would meet the City’s acceptable exterior noise level criteria of 60 dBA L_{dn} for residential use at the community open space area between Buildings 2 and 3, but would exceed the criteria at the community open space area adjacent to US 101. Due to the elevation differences between US-101 and the community open space area, noise barriers constructed outside of the Caltrans right-of-way would provide only minimal noise reduction in this area. The community open space between Buildings 2 and 3 would meet the City’s acceptable exterior noise level objectives with no additional noise reduction measures.

¹ Traffic Impact Study for 350 Merrydale Road and 3833 Redwood Highway Project, July 31, 2018.

Future Interior Noise Environment

The City of San Rafael requires that interior noise levels be maintained at 40 dBA L_{dn} for bedrooms in residential units not in downtown and 45 dBA L_{dn} otherwise. Although the project is not located in downtown San Rafael, it is recommended that the 45 dBA L_{dn} criteria be used due to its proximity to US-101.

The east façades of Buildings 3, 4, 5, and 6, facing US-101, would be exposed to 70 dBA L_{dn} . The east façade of Buildings 2 and 7 would be partially shielded by the buildings to the east and would be exposed to 67 dBA L_{dn} . The west façade of Buildings 1 and 9 would be exposed to traffic noise from Merrydale Road up to 58 dBA L_{dn} .

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn} , the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn} , forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

The calculated exterior noise level exposures of building façades are summarized in Table 5, based on the results of the noise monitoring survey. As shown in Table 5, the calculated interior noise levels of all townhomes would exceed the 40 dBA L_{dn} threshold with windows partially open. Buildings 2 through 7 would also exceed the 45 dBA L_{dn} threshold with windows partially open. With standard construction and forced-air ventilation, allowing occupants the option of keeping windows closed to control noise, Buildings 1, 2, 8, and 9 would achieve the 40 dBA L_{dn} and 45 dBA L_{dn} thresholds. The minimum STC² ratings required for windows in Buildings 3 through 7 to achieve the 40 dBA L_{dn} and 45 dBA L_{dn} thresholds is summarized in Table 5. Figure 7 shows the minimum STC rating required for building façades to reduce interior noise levels below 40 dBA L_{dn} threshold. This analysis assumes that the façade area is made up of 40% windows. Where STC rated windows are recommended, windows are assumed to be in the closed position, requiring forced-air ventilation to allow occupants the option of keeping windows closed.

² **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

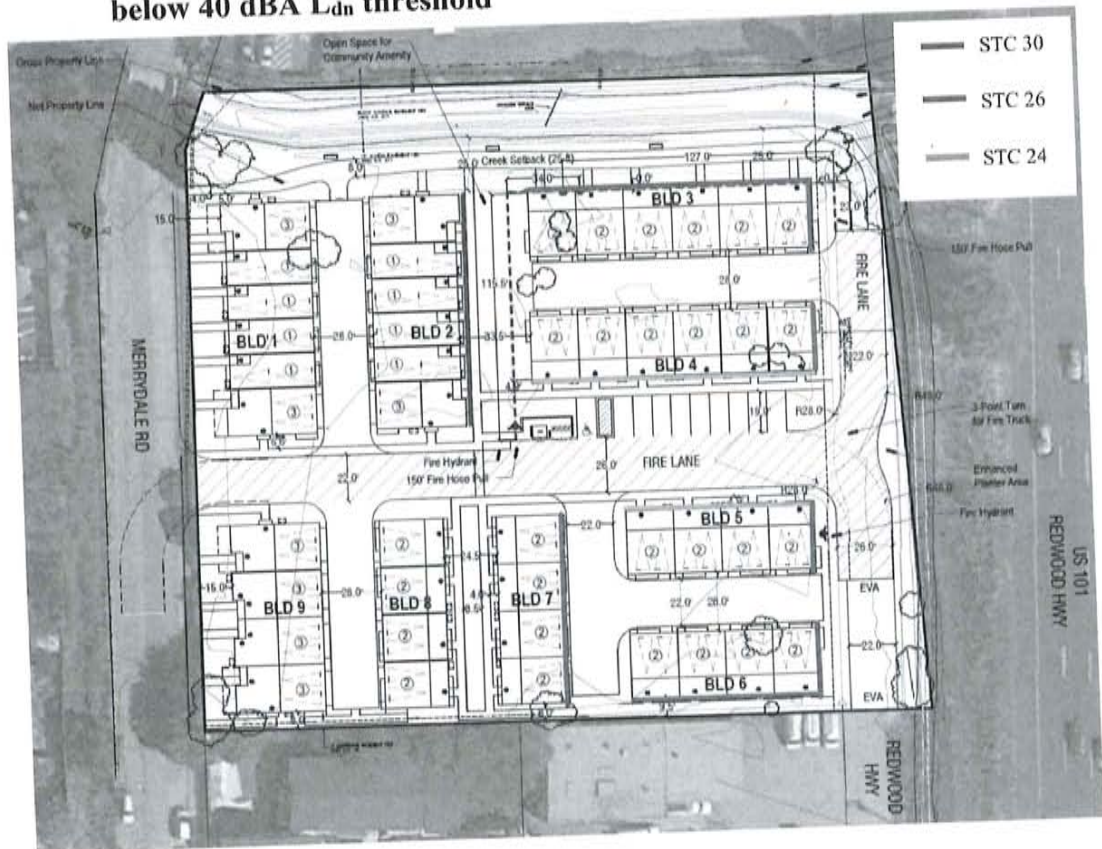
TABLE 5 Minimum STC Ratings Required to Reduce Residential Interior Noise Levels

Façade	Building	Calculated Noise Levels (dBA L _{dn})		Recommended Sound Rated Construction ²	
		Exterior	Interior with Windows Open	45 dBA L _{dn} Threshold	40 dBA L _{dn} Threshold
West	1, 8, & 9	58	43	Standard construction	Forced-air ¹
East	2	65	50	Forced-air ¹	STC 26 ¹
East	3, 4, 5, & 6	70	55	STC 26 ¹	Stucco wall (STC 46) + STC 30 ¹
North	3	67	52	STC 24 ¹	STC 30 ¹
South	6				
North	5	61	46	Forced-air ¹	STC 24 ¹
South	4				
North	4 & 6	48	33	Standard construction	Standard construction
South	3 & 5				
East	7	67	52	STC 24 ¹	STC 30 ¹

¹ Assumes forced-air mechanical ventilation is provided to allow occupants the option of keeping windows closed to control noise.

² Analysis assumes window area to be 40% of the façade area or less and wood stud wall with cavity of STC 39 rating.

Figure 7 Minimum STC Ratings Required to Reduce Residential Interior Noise Levels below 40 dBA L_{dn} threshold



Recommended Conditions of Approval

For consistency with the General Plan, the following Conditions of Approval are recommended for consideration by the City:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all buildings so that windows can be kept closed to control noise.
- Sound rated construction would be required for Buildings 3 through 7 to maintain interior noise levels at acceptable levels. Based on preliminary calculations, windows of Buildings 3 through 7 would require minimum ratings of STC 24 to 30 (see Table 5 for specific recommendations). The east façade of buildings 3 through 6 would require stucco walls with minimum rating of STC 46 or higher. The specific determination of what noise insulation treatments are necessary shall be conducted on a room-by-room basis during final design of the project.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Conflict with Established Standards:** A significant impact would be identified if project construction were to conflict with local noise standards contained in the City of San Rafael General Plan or Municipal Code.
- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.
- **Permanent Noise Increases:** A significant permanent noise impact would occur if the project resulted in an increase of 3 dBA L_{dn} or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA L_{dn} for single-family residential areas) and/or an increase of 5 dBA L_{dn} or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use.
- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. Hourly average noise levels exceeding 70 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would constitute a significant temporary noise increase at adjacent commercial land uses.

Impact 1: Conflict with Established Standards. No outdoor mechanical equipment is proposed for the site. Construction would occur within specified hours and would not exceed the applicable noise thresholds. **This is a less-than-significant impact.**

The City's Municipal Code establishes allowable hours of construction between 7 am and 6 pm Monday through Friday and 9 am and 6 pm on Saturdays, with no construction activities permitted on Sundays and holidays. Noise levels at any point within the city limits are also limited to 90 dBA L_{eq} . Project construction would occur only within allowable hours. Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise

sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Construction activities would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 5 and 6. Table 5 shows the average noise level ranges, by construction phase, and Table 6 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 5 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
 II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 6 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA) ^{1,2}	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor ³	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

¹ Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

² Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

³ Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

The construction of the proposed project would involve demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well. Pile driving is not anticipated in any phase of construction of the project. Table 7 shows the anticipated construction noise levels calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM).

TABLE 7 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	At Distance of 50 ft.	
	L_{eq} , dBA	L_{max} , dBA
Demolition (20 days)	85	90
Site Preparation (2 days)	83	85
Grading/Excavation (4 days)	84	85
Trenching (10 days)	78	81
Building-Exterior (200 days)	78	81
Building-Interior (10 days)	74	78
Paving (10 days)	80	80

At 50 feet from the noise source, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 78 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq} .

The closest noise sensitive use is a residential building located 25 feet south of the project site. This residence would be exposed to a maximum noise level of 98 dBA L_{max} if the concrete saw is used during demolition at a distance of 25 feet. Maximum noise levels of 84 to 91 dBA L_{max} would be anticipated during all other phases of construction at a distance of 25 feet. Typical hourly average noise levels 80 to 91 dBA L_{eq} are anticipated at a distance of 25 feet. At residences across Merrydale Road, located about 75 feet west of the site, maximum instantaneous noise levels would be about 86 dBA L_{max} during use of the concrete saw near the adjoining property line and 74 to 81 dBA L_{max} during all other construction located near the adjoining property line. Typical hourly average noise levels at residences across Merrydale Road would range from 70 to 81 dBA L_{eq} when heavy construction is located near the adjoining property line. Construction noise levels would exceed 90 dBA L_{max} during use of the concrete saw within 50 feet of residences. This is a **potentially significant** impact.

Mitigation Measure 1: Implementation of the following measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance.

- Construction activities shall be limited to the hours specified in the City of San Rafael's Municipal Code (7 am to 6 pm on weekdays and 9 am to 6 pm on Saturdays). No construction activities are permitted on Sundays and holidays.
- Limit use of the concrete saw to a distance of 50 feet or greater from residences, where feasible. Construct temporary noise barriers to screen stationary noise-generating

equipment, such as the concrete saw, when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Unnecessary idling of internal combustion engines should be strictly prohibited.
- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.
- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

Impact 2: Groundborne Vibration from Construction. Construction-related vibration levels resulting from construction activities are not calculated to exceed 0.3 in/sec PPV at the nearest structures. **This is a less-than-significant impact.**

City of San Rafael's General Plan does not specify a construction vibration limit. Based on the thresholds provided by Caltrans (see Table 3), a construction vibration limit of 0.3 in/sec PPV would minimize damage at buildings of normal conventional construction. A significant impact would occur if buildings adjacent to the proposed construction site were exposed to vibration levels in excess of 0.3 in/sec PPV.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition work, preparation work, excavation of below-grade levels, foundation work, and new building framing and finishing.

Table 8 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as use of saws, excavators, scrapers and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 8 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.17
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

The nearest existing structure is 25 feet south of the proposed project proposed. Pile driving is not anticipated for this project. At a distance of 25 feet vibration levels from construction are anticipated to be 0.21 in/sec PPV or less. Vibration levels may be perceptible to occupants but would be below the 0.3 in/sec PPV vibration limit and would not be anticipated to cause architectural or structural damage. As construction moves away from the shared property lines, vibration levels would be even lower. This is a **less-than-significant** impact.

Mitigation Measure 2: None required.

Impact 3: Permanent Traffic Noise Increases. The project would not result in a substantial permanent traffic noise level increase at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant noise impact would occur if traffic or activities generated by the project would substantially increase noise levels at sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn} , or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater.

Traffic data provided by the project’s traffic study¹ was reviewed to calculate potential traffic noise level increases attributable to the project expected along roadways serving the site. Roadways evaluated in the analysis included Merrydale Road and North San Pedro Road. Based on a comparison between traffic volumes under the existing plus project scenario and existing conditions, the traffic noise increase attributable to the project would be less than 1 dBA. This is a **less-than-significant** impact.

Mitigation Measure 3: None required.

Impact 4: Construction Noise. Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact.**

As described in Impact 1, construction would be conducted in accordance with the hours of construction specified within the City of San Rafael's Municipal Code. Impact 1 also provides best construction management practices to reduce construction noise levels to 90 dBA or less at adjoining properties.

Neither the City of San Rafael nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA (see Setting Section, Effects of Noise). Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Therefore, the project would be considered to generate a significant temporary construction noise impact if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Project construction is anticipated to occur over a period of 9 months. As described in Impact 1, the construction of the proposed project would involve demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. Pile driving is not anticipated in any phase of construction of the project. As shown in Table 7, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 78 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq} at a distance of 50 feet.

The closest noise sensitive use is a residential building located 25 feet south of the project site. This residence would be exposed to a maximum noise level of 98 dBA L_{max} if the concrete saw is used during demolition within 25 feet. Maximum noise levels of 84 to 91 dBA L_{max} would be anticipated during all other phases of construction at a distance of 25 feet. Typical hourly average noise levels 80 to 91 dBA L_{eq} are anticipated at a distance of 25 feet. At residences across Merrydale Road, located about 75 feet west of the site, maximum instantaneous noise levels would be about 86 dBA L_{max} during use of the concrete saw near the adjoining property line and 74 to 81 dBA L_{max} during all other construction located near the adjoining property line. Typical hourly average noise levels at residences across Merrydale Road would range from 70 to 81 dBA L_{eq} when heavy construction is located near the adjoining property line. Noise levels would exceed 60 dBA L_{eq} at residences and ambient levels by more than 5 dBA, but would not occur for a period exceeding one year. Implementation of the measures discussed under Impact 1 would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. This is a **less-than-significant impact.**

Mitigation Measure 4: None required.

***3833 REDWOOD BOULEVARD
ENVIRONMENTAL NOISE AND
VIBRATION ASSESSMENT***

San Rafael, California

November 1, 2018

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INTRODUCTION

The project proposes to demolish existing structures and amenities and construct 44 three-story townhomes in nine buildings. This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses noise and land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA)*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq} . The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (DNL or L_{dn})* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn}. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, and those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the

percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn} . At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to

assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime	30 dBA	
		Library
Quiet rural nighttime	20 dBA	Bedroom at night, concert hall (background)
	10 dBA	
	0 dBA	Broadcast/recording studio

Source: Technical Noise Supplement (TeNS), California Department of Transportation, November 2009.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

Regulatory Background – Noise

The State of California and the City of San Rafael have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

- (a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- (b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- (c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- (d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- (e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or
- (f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Checklist items (a), (b), (c), and (d) are applicable to the proposed project. The project is not located within two miles of a public airport or within the vicinity of a private airstrip and would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, items (e) and (f) are not carried further in this analysis.

The impacts of the project on the surrounding land uses are addressed in the Noise Impacts and Mitigation Measures Section of the report. The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA and are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn} or greater would be considered significant where exterior noise levels would exceed the compatible noise level standard (60 dBA L_{dn} for residential land uses and 70 dBA L_{dn} for industrial land uses). Where noise levels would remain at or below the compatible noise level standard with the project, noise level increases of 5 dBA L_{dn} or greater would be considered significant.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn} /CNEL in any habitable room.

City of San Rafael General Plan. The Noise Element in the City of San Rafael's 2020 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San Rafael. The following goals and policies are applicable to the proposed project:

N-1a. Acoustical Studies. Require acoustical studies for all new residential projects within the projected L_{dn} 60 dB noise contours (refer to Exhibit 31) so that noise mitigation can be incorporated into project design. Acoustical studies shall identify noise sources and contain a discussion of the existing and future exposure and the mitigation measures that may be used to achieve outdoor and indoor standards.

N-2. Exterior Noise Standards for Residential Use Areas. The exterior noise standard for backyards and/or common usable outdoor areas in a new residential development is up to L_{dn} of 60 dB. In common usable outdoor areas in Downtown, mixed-use residential, and high density residential districts, up to L_{dn} of 65 dB may be allowed if determined acceptable through development review.

N-3. Planning and Design of New Development. Encourage new development to be planned and designed to minimize noise impacts from outside sources. Noise mitigation measures must be taken through appropriate site planning, architectural layout of buildings, use of noise barriers where ever required, construction modifications and using alternatives to sound walls. Detailed guidelines for these mitigation measures are available in the General Plan document.

N-9. Nuisance Noise. Minimize impacts from noise levels that exceed community sound levels by enforcing and updating noise ordinance, mitigating noise from construction activities, etc.

Applicable noise levels for interior and exterior noise are given below:

Interior Noise Levels

- The City's standard for normally acceptable interior noise levels in bedrooms of residential units not in downtown is 40 dB L_{dn} , and 45 dB L_{dn} for other rooms of residential units not

in downtown, bedrooms of residential units in downtown, hotels, motels, and downtown multifamily homes.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dB L_{dn} or less for residential, hotels, schools, playgrounds and outdoor areas, 65 dB L_{dn} for office and commercial land use, 70 dB L_{dn} for industrial, agricultural and manufacturing land use (Exhibit 31).




**Exhibit 31
Land Use Compatibility Standards
for New Development**

Exterior Noise Exposure to the Site
 L_{dn} (dB)

Land Use	50	55	60	65	70	75	80
Residential, Hotels, Motels	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Schools, Libraries, Churches, Hospitals, Nursing Homes	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Auditoriums, Concert Halls, Amphitheaters	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Sports Arena, Outdoor Spectator Sports	Normally Acceptable	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Playgrounds, Neighborhood Parks	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Other Outdoor Recreation and Cemeteries	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Office and Other Commercial Uses	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable
Industrial, Manufacturing, Utilities, Agriculture	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable

Interior Noise Exposure
 L_{dn} (dB)

	35	40	45	50	55	60	65
Bedrooms in Residential units not in Downtown	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Other Rooms in Residential Units not in Downtown	Normally Acceptable	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Bedrooms in Residential units in Downtown	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable
Hotels, Motels, Downtown Multifamily	Normally Acceptable	Conditionally Acceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable	Clearly Unacceptable

-  Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
-  Conditionally Acceptable – Specific land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
-  Clearly Unacceptable – New construction of development clearly should not be undertaken.

City of San Rafael Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Section 8.13.040 states the allowable sound pressure level at various land uses during the day and night for intermittent and constant noise. The general noise limits are given in Table 8.13-1.

TABLE 8.13-1—GENERAL NOISE LIMITS

Property type or zone	Daytime limits	Nighttime limits
Residential	60 dBA Intermittent	50 dBA Intermittent
	50 dBA Constant	40 dBA Constant
Mixed-use	65 dBA Intermittent	55 dBA Intermittent
	55 dBA Constant	45 dBA Constant
Multifamily residential (interior sound source)	40 dBA Intermittent	35 dBA Intermittent
	35 dBA Constant	30 dBA Constant
Commercial	65 dBA Intermittent	65 dBA Intermittent
	55 dBA Constant	55 dBA Constant
Industrial	70 dBA Intermittent	70 dBA Intermittent
	60 dBA Constant	60 dBA Constant
Public Property	Most restrictive noise limit applicable to adjoining private property	Most restrictive noise limit applicable to adjoining private property

Source: Ord. 1789 § 3 (part), 2002.

Section 8.13.050 of the Municipal Code establishes allowable hours of construction between 7 am and 6 pm Monday through Friday and between 9 am and 6 pm on Saturdays, unless permission is granted with a development permit or other approval from planning commission or the activity belongs to one of the exceptions stated in Subsection B of Section 3.13.050 (Standard Exceptions to general noise limits) of the City of San Rafael’s Municipal Code. No construction activities are permitted on Sundays and holidays. Noise levels at any point within the city limits shall not exceed 90 dBA L_{eq} .

Regulatory Background – Vibration

The City of San Rafael has not established construction vibration guidelines. Based on the thresholds provided by Caltrans shown in Table 3, a vibration limit of 0.3 in/sec PPV is used to minimize potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The project site is located to the west of Redwood Highway (US-101) on Merrydale Road in the City of San Rafael. The primary noise source at the site is vehicular traffic along US-101 and local traffic along Merrydale Road. US-101 is elevated by about 10 feet above the ground level of the site. Residential and commercial structures surround the project site. A noise monitoring survey was performed in the vicinity of the project site beginning Monday, May 21, 2018 and concluding on Thursday, May 24, 2018. The monitoring survey included two long-term noise measurements and five short-term measurements, as shown in Figure 1. Table 4 summarizes the results of the short-term measurements. The results of the long-term noise measurements at LT-1 are shown in Figures 2 and 3 and, the results of long-term measurements at LT-2 are shown in Figures 4 and 5.

Long-term noise measurement LT-1 was made at the backside of 310 Lar Flores Avenue, at a distance of about 17 feet from the centerline of Merrydale Road in front of the proposed project site. The primary noise source at this location was traffic along Redwood Highway and occasional traffic on Merrydale Road. Hourly average noise levels ranged from 53 to 62 dBA L_{eq} at this location during daytime hours, and from 46 to 60 dBA L_{eq} at night. The day-night average noise level on Tuesday May 22, 2018 and on Wednesday, May 23, 2018 was 60 dBA L_{dn} .

LT-2 was measured in the northeast corner of the site, 13 feet below the Redwood Highway alignment and 130 feet from its centerline. The primary noise sources at this location was the traffic on Redwood Highway. Hourly average noise levels at this location ranged from 67 to 70 dBA L_{eq} during the day and from 60 to 70 dBA L_{eq} at night. The day-night average noise level Tuesday May 22, 2018 and on Wednesday, May 23, 2018 was 73 dBA L_{dn} .

TABLE 4 Summary of Short-Term Noise Measurement Data, May 22, 2018

ID	Location (Start Time)	Measured Noise Levels, dBA				Primary noise source
		L ₁₀	L ₅₀	L ₉₀	L _{eq}	
ST-1	3817 Redwood Highway, 144 feet from centerline of Redwood Highway (11:40 a.m. to 11:50 a.m.)	68	64	62	65	Traffic on Redwood Highway
ST-2	Southeast corner of the site, 60 feet west of Redwood Highway (12:00 p.m. to 12:10 p.m.)	70	67	65	68	Traffic on Redwood Highway
ST-3	Along the fence line on south side, 105 feet from Redwood Highway and 45 feet south of existing building (12:10 p.m. to 12:20 p.m.)	69	66	63	67	Traffic on Redwood Highway
ST-4	Across from 300 Merrydale Road, 60 feet north of Las Gallinas Avenue (12:30 p.m. to 12:40 p.m.)	57	54	52	56	Traffic on Merrydale Road
ST-5	Northwest corner of site, 360 feet west of Redwood Highway (12:50 p.m. to 01:00 p.m.)	59	57	55	58	Traffic on Merrydale Road

FIGURE 1 Noise Measurement Locations

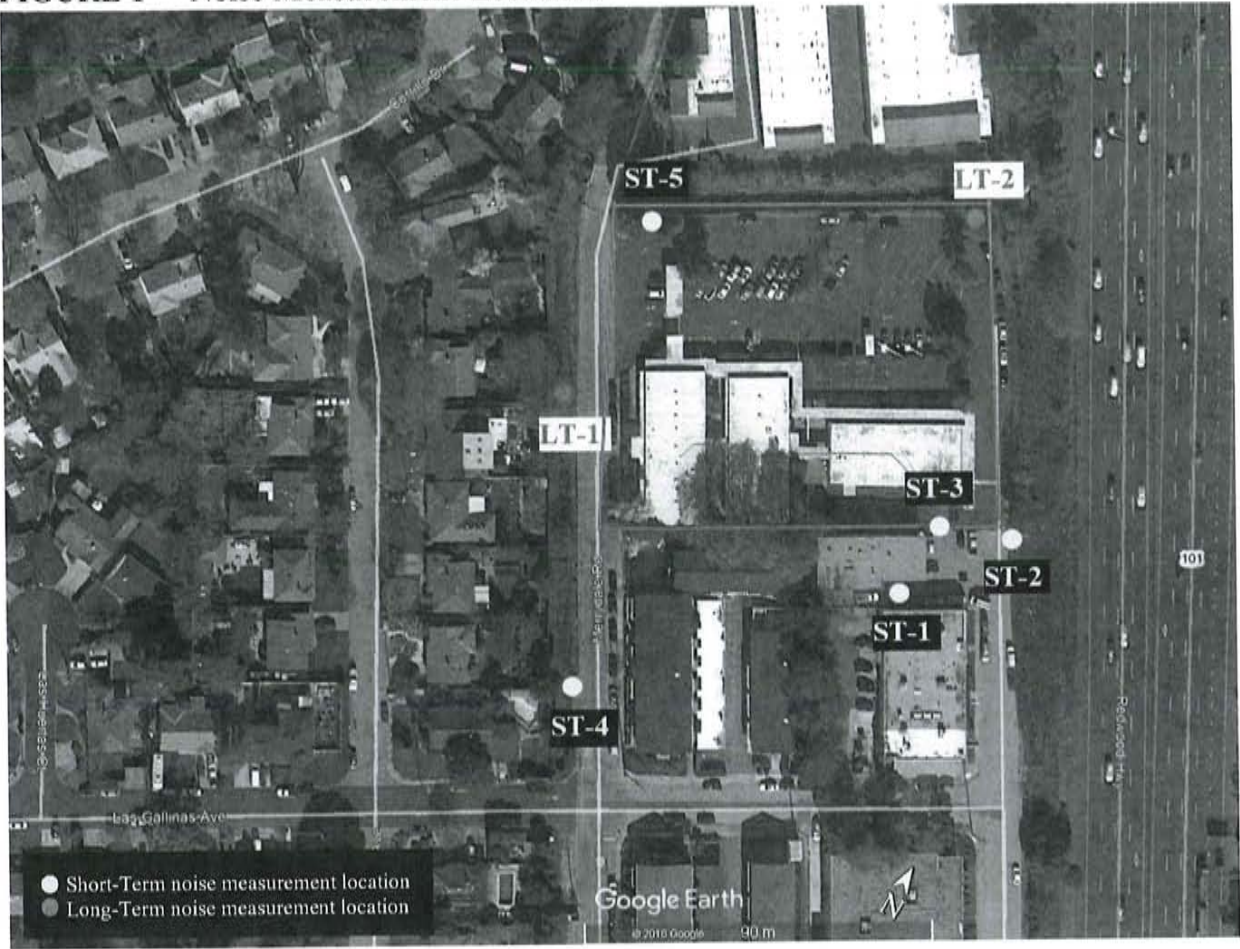


FIGURE 2 Daily Trend in Noise Levels at LT-1, May 22nd, 2018

**Noise Levels at Noise Measurement Site LT-1
On Merrydale Road, behind 310 Las Flores Avenue
Tuesday, May 22nd, 2018**

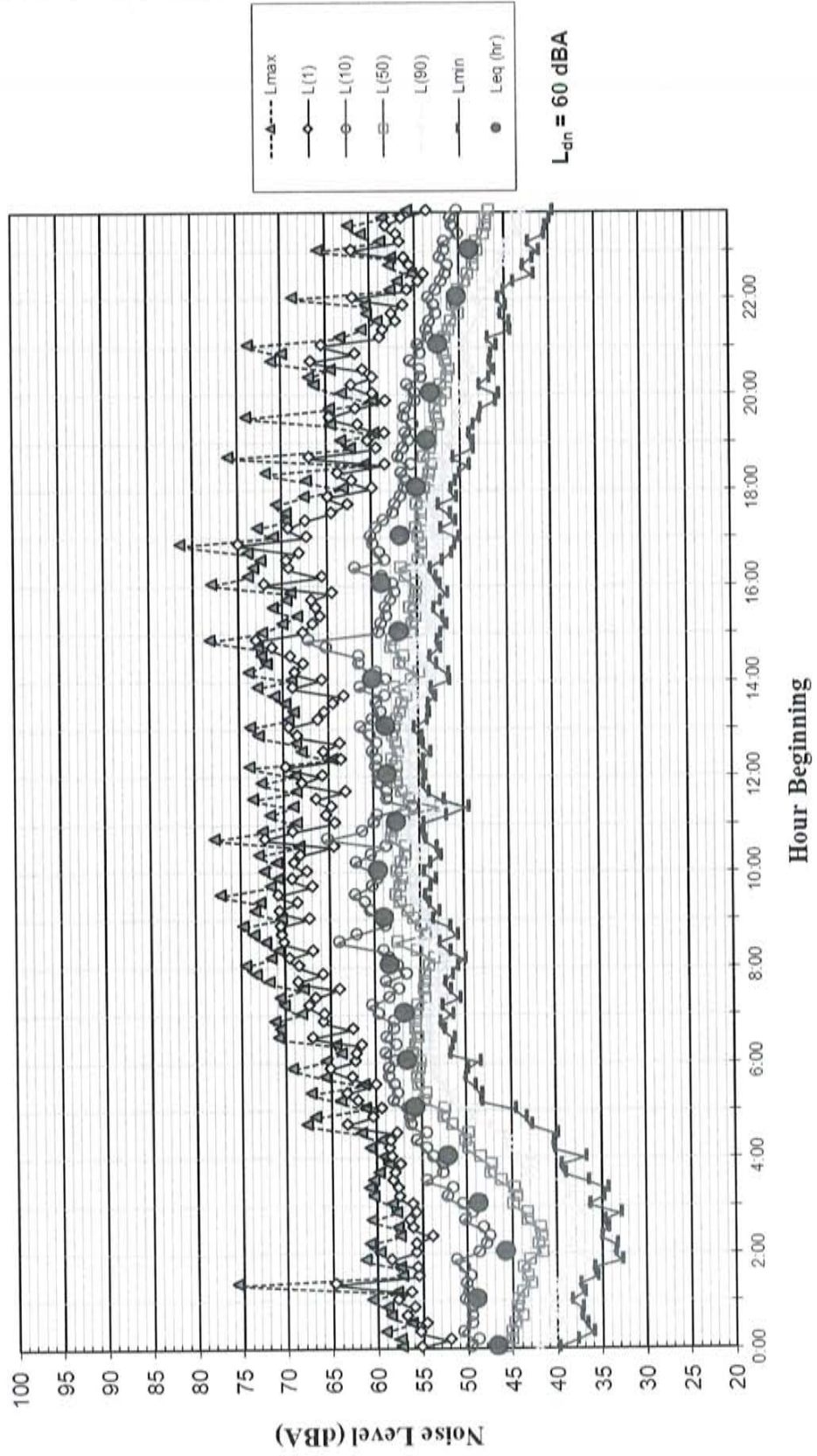


FIGURE 3 Daily Trend in Noise Levels at LT-1, May 23rd, 2018

**Noise Levels at Noise Measurement Site LT-1
On Merrydale Road, behind 310 Las Flores Avenue
Wednesday, May 23rd, 2018**

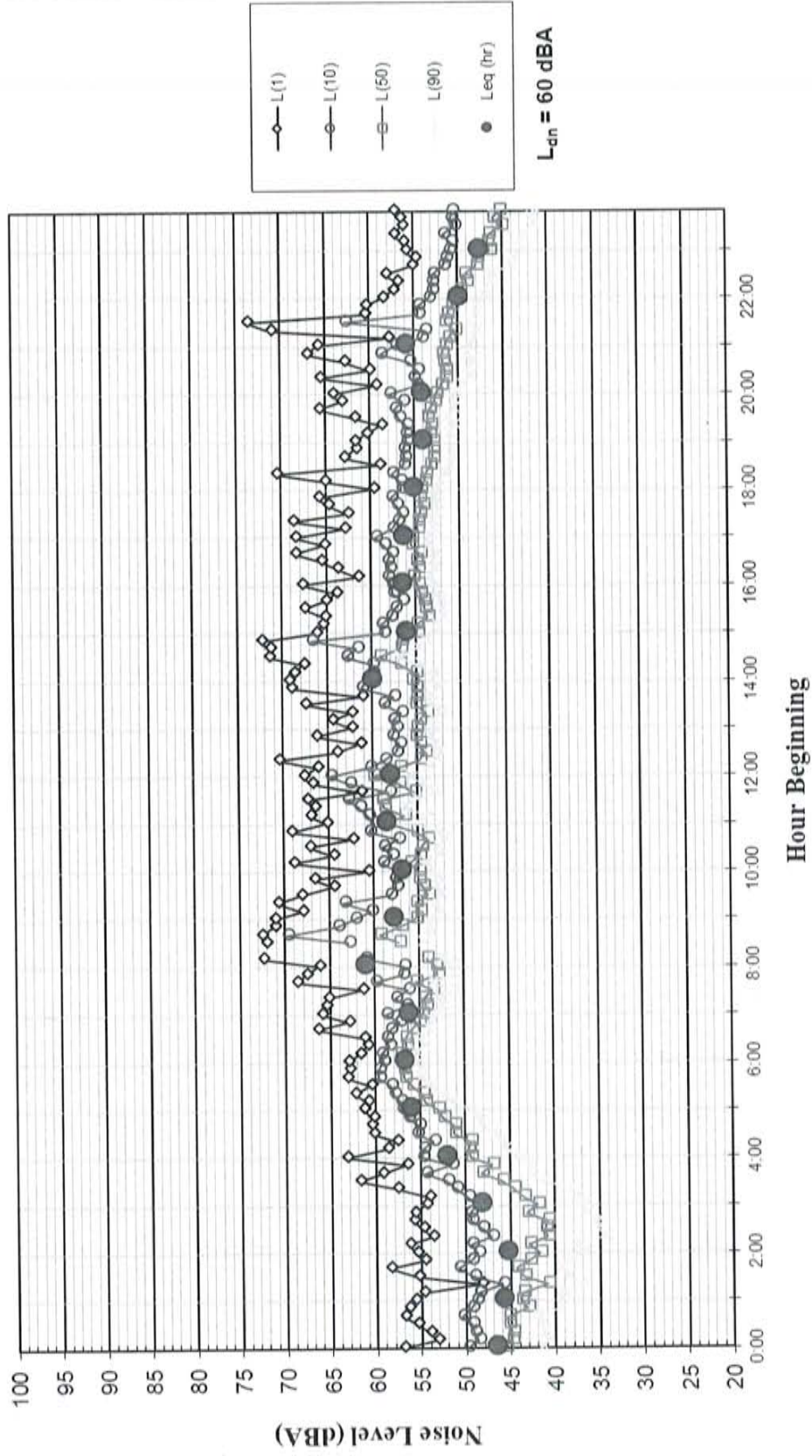


FIGURE 4 Daily Trend in Noise Levels at LT-2, May 22nd, 2018

**Noise Levels at Noise Measurement Site LT-2
Northeast corner of the site
Tuesday, May 22nd, 2018**

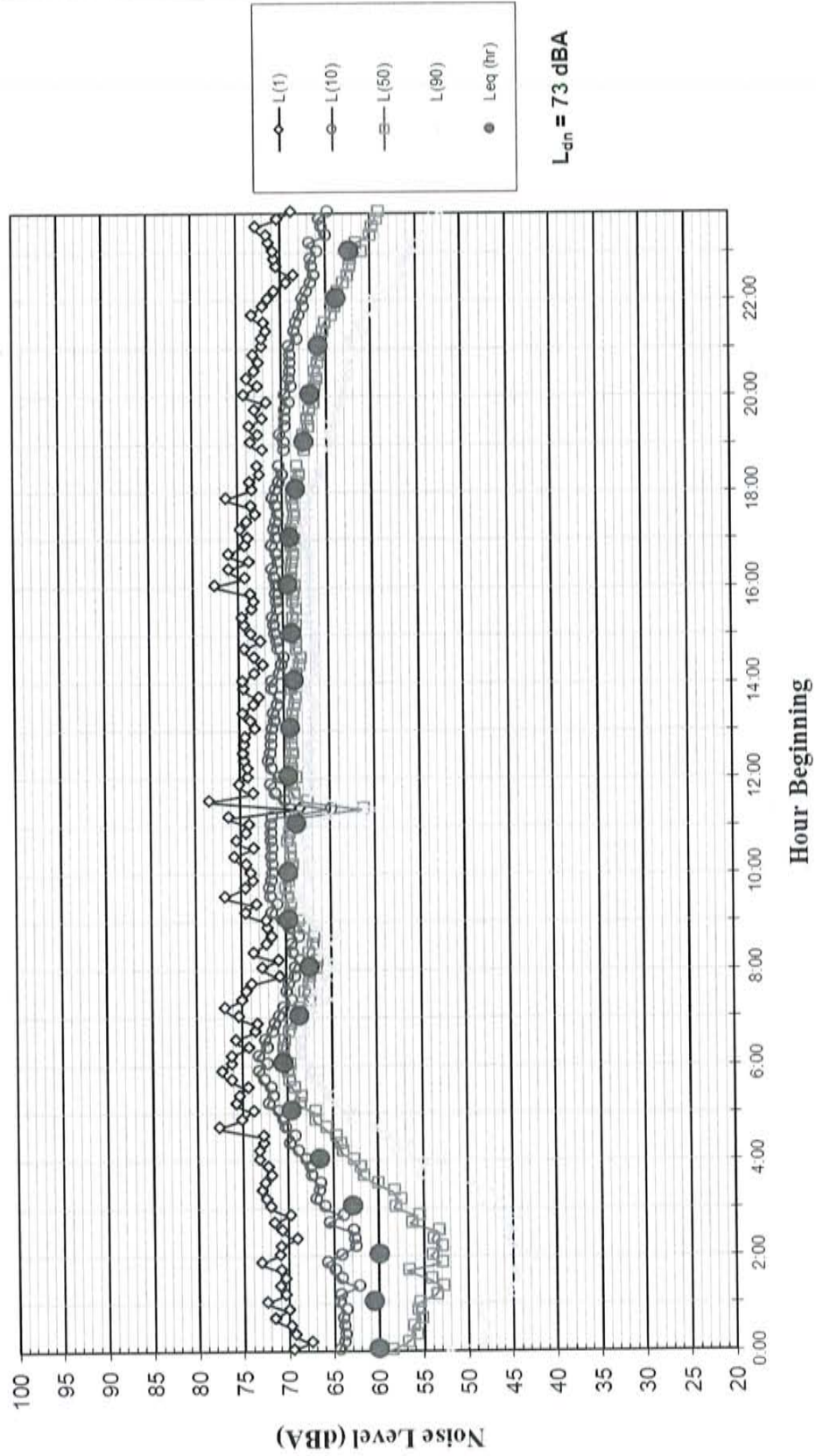
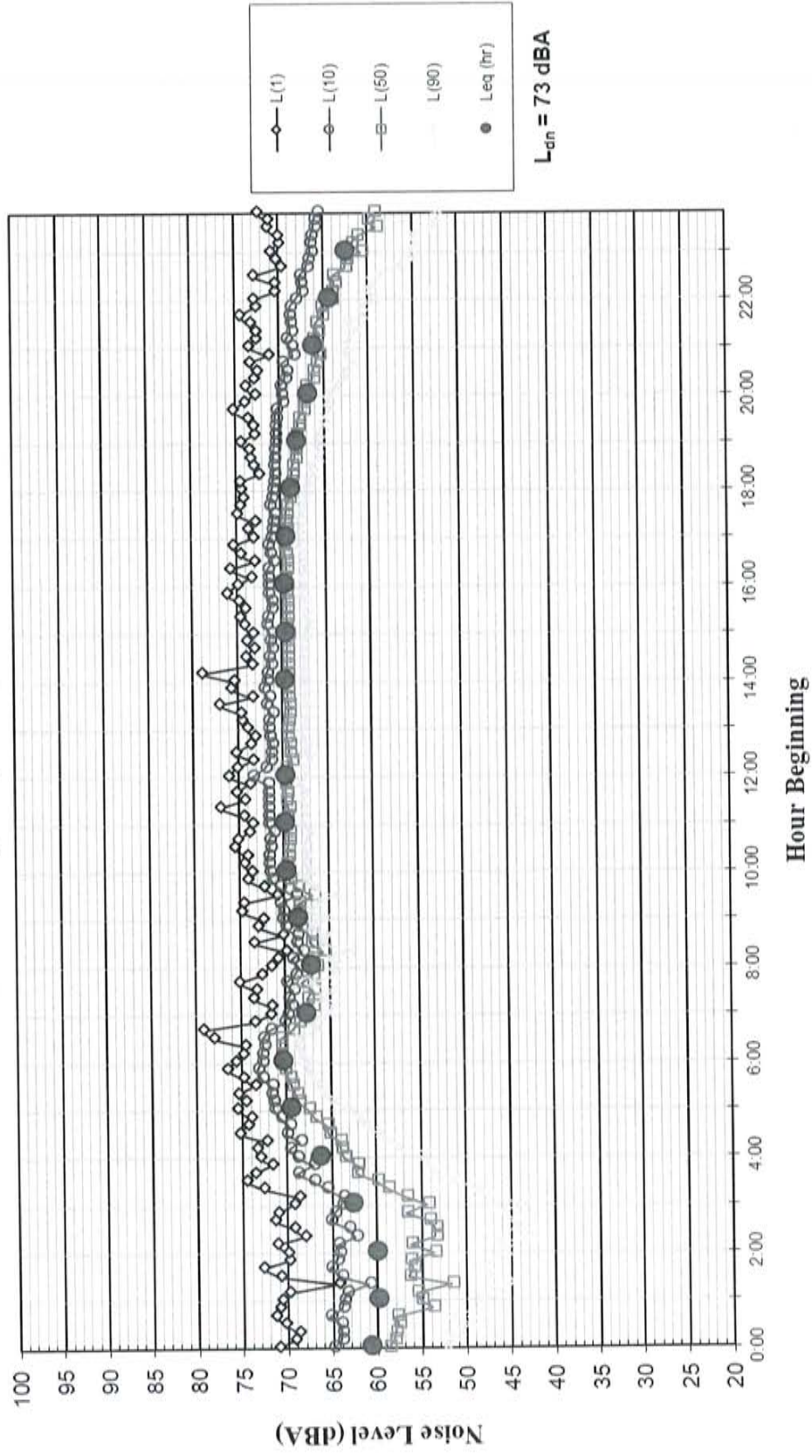


FIGURE 5 Daily Trend in Noise Levels at LT-2, May 23rd, 2018

**Noise Levels at Noise Measurement Site LT-2
Northeast corner of the site
Wednesday, May 23rd, 2018**



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Noise Section in San Rafael 2020 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San Rafael. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

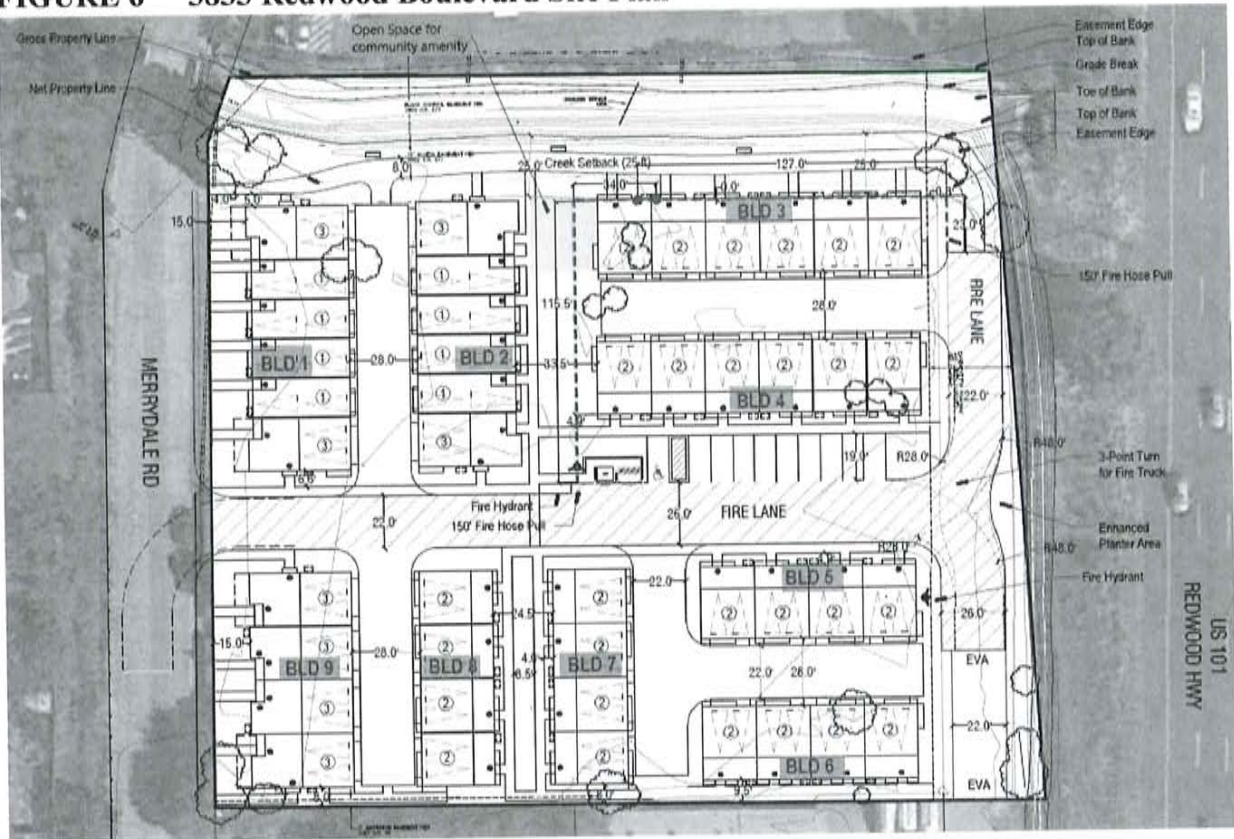
- The City's acceptable exterior noise level objective is 60 dBA L_{dn} or less for the proposed residential uses (Exhibit 31).
- The City's standard for interior noise levels in residences is 40 dBA L_{dn} for bedrooms in residential units not in downtown and 45 dBA L_{dn} otherwise.

Noise and Land Use Compatibility

The project would demolish existing structures and surface parking and construct townhomes on a 2.44 acre site with access from Merrydale Road. The project would construct 9 buildings on site ranging from 4 to 8 units, for a total of 44 three-story homes. Garage parking will be provided for all townhomes and in addition, there will be 15 surface parking spaces on site. Figure 6 shows the site plan and building numbers, based on site plans dated September 13, 2018.

Generally, bedrooms would be located on the top floor (level 3) and living spaces would be located on the middle floor (level 2). None of the buildings would include a rooftop deck. Community open space is proposed along the northern site boundary between Buildings 2 and 3 and in the southeastern corner of the site, adjacent to US-101.

FIGURE 6 3833 Redwood Boulevard Site Plan



Future Exterior Noise Environment

The primary noise sources at the site would continue to be vehicular traffic on US-101 and Merrydale Road. US-101 is elevated by about 10 feet above the site. Based on traffic volumes provided in the Traffic Impact Assessment Report¹, traffic noise levels are calculated to increase by 1 dBA along Merrydale Road under future conditions (2040) due to increases in traffic volumes on Merrydale Road.

The community open space area between Buildings 2 and 3 would be exposed to 52 dBA L_{dn} . Exterior noise levels would meet the City’s acceptable exterior noise level criteria of 60 dBA L_{dn} for residential use at the community open space area between Buildings 2 and 3, but would exceed the criteria at the community open space area adjacent to US 101. Due to the elevation differences between US-101 and the community open space area, noise barriers constructed outside of the Caltrans right-of-way would provide only minimal noise reduction in this area. The community open space between Buildings 2 and 3 would meet the City’s acceptable exterior noise level objectives with no additional noise reduction measures.

¹ Traffic Impact Study for 350 Merrydale Road and 3833 Redwood Highway Project, July 31, 2018.

Future Interior Noise Environment

The City of San Rafael requires that interior noise levels be maintained at 40 dBA L_{dn} for bedrooms in residential units not in downtown and 45 dBA L_{dn} otherwise. Although the project is not located in downtown San Rafael, it is recommended that the 45 dBA L_{dn} criteria be used due to its proximity to US-101.

The east façades of Buildings 3, 4, 5, and 6, facing US-101, would be exposed to 70 dBA L_{dn} . The east façade of Buildings 2 and 7 would be partially shielded by the buildings to the east and would be exposed to 67 dBA L_{dn} . The west façade of Buildings 1 and 9 would be exposed to traffic noise from Merrydale Road up to 58 dBA L_{dn} .

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn} , the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn} , forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

The calculated exterior noise level exposures of building façades are summarized in Table 5, based on the results of the noise monitoring survey. As shown in Table 5, the calculated interior noise levels of all townhomes would exceed the 40 dBA L_{dn} threshold with windows partially open. Buildings 2 through 7 would also exceed the 45 dBA L_{dn} threshold with windows partially open. With standard construction and forced-air ventilation, allowing occupants the option of keeping windows closed to control noise, Buildings 1, 2, 8, and 9 would achieve the 40 dBA L_{dn} and 45 dBA L_{dn} thresholds. The minimum STC² ratings required for windows in Buildings 3 through 7 to achieve the 40 dBA L_{dn} and 45 dBA L_{dn} thresholds is summarized in Table 5. Figure 7 shows the minimum STC rating required for building façades to reduce interior noise levels below 40 dBA L_{dn} threshold. This analysis assumes that the façade area is made up of 40% windows. Where STC rated windows are recommended, windows are assumed to be in the closed position, requiring forced-air ventilation to allow occupants the option of keeping windows closed.

² **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

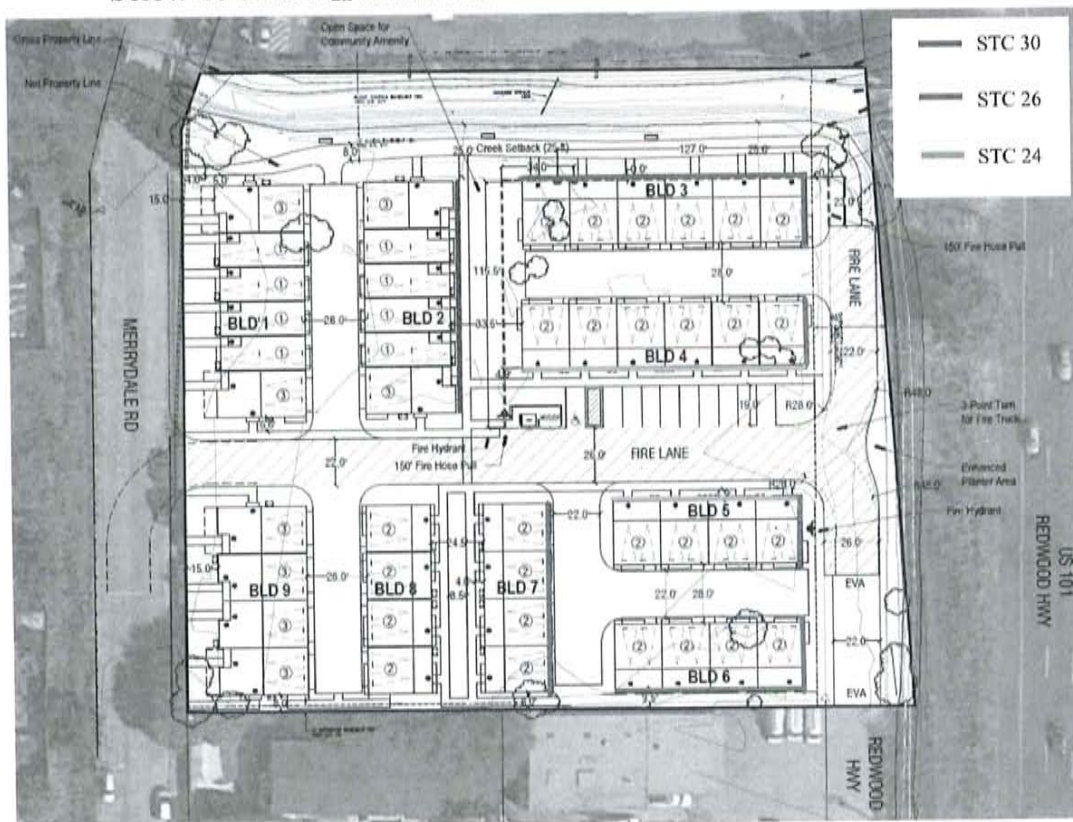
TABLE 5 Minimum STC Ratings Required to Reduce Residential Interior Noise Levels

Façade	Building	Calculated Noise Levels (dBA L _{dn})		Recommended Sound Rated Construction ²	
		Exterior	Interior with Windows Open	45 dBA L _{dn} Threshold	40 dBA L _{dn} Threshold
West	1, 8, & 9	58	43	Standard construction	Forced-air ¹
East	2	65	50	Forced-air ¹	STC 26 ¹
East	3, 4, 5, & 6	70	55	STC 26 ¹	Stucco wall (STC 46) + STC 30 ¹
North	3	67	52	STC 24 ¹	STC 30 ¹
South	6				
North	5	61	46	Forced-air ¹	STC 24 ¹
South	4				
North	4 & 6	48	33	Standard construction	Standard construction
South	3 & 5				
East	7	67	52	STC 24 ¹	STC 30 ¹

¹ Assumes forced-air mechanical ventilation is provided to allow occupants the option of keeping windows closed to control noise.

² Analysis assumes window area to be 40% of the façade area or less and wood stud wall with cavity of STC 39 rating.

Figure 7 Minimum STC Ratings Required to Reduce Residential Interior Noise Levels below 40 dBA L_{dn} threshold



Recommended Conditions of Approval

For consistency with the General Plan, the following Conditions of Approval are recommended for consideration by the City:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all buildings so that windows can be kept closed to control noise.
- Sound rated construction would be required for Buildings 3 through 7 to maintain interior noise levels at acceptable levels. Based on preliminary calculations, windows of Buildings 3 through 7 would require minimum ratings of STC 24 to 30 (see Table 5 for specific recommendations). The east façade of buildings 3 through 6 would require stucco walls with minimum rating of STC 46 or higher. The specific determination of what noise insulation treatments are necessary shall be conducted on a room-by-room basis during final design of the project.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Conflict with Established Standards:** A significant impact would be identified if project construction were to conflict with local noise standards contained in the City of San Rafael General Plan or Municipal Code.
- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.
- **Permanent Noise Increases:** A significant permanent noise impact would occur if the project resulted in an increase of 3 dBA L_{dn} or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA L_{dn} for single-family residential areas) and/or an increase of 5 dBA L_{dn} or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use.
- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. Hourly average noise levels exceeding 70 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would constitute a significant temporary noise increase at adjacent commercial land uses.

Impact 1: **Conflict with Established Standards.** No outdoor mechanical equipment is proposed for the site. Construction would occur within specified hours and would not exceed the applicable noise thresholds. **This is a less-than-significant impact.**

The City's Municipal Code establishes allowable hours of construction between 7 am and 6 pm Monday through Friday and 9 am and 6 pm on Saturdays, with no construction activities permitted on Sundays and holidays. Noise levels at any point within the city limits are also limited to 90 dBA L_{eq} . Project construction would occur only within allowable hours. Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise

sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Construction activities would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 5 and 6. Table 5 shows the average noise level ranges, by construction phase, and Table 6 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 5 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84
I - All pertinent equipment present at site. II - Minimum required equipment present at site.								

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 6 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA) ^{1,2}	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor ³	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

¹ Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

² Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

³ Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

The construction of the proposed project would involve demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well. Pile driving is not anticipated in any phase of construction of the project. Table 7 shows the anticipated construction noise levels calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM).

TABLE 7 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	At Distance of 50 ft.	
	L_{eq} , dBA	L_{max} , dBA
Demolition (20 days)	85	90
Site Preparation (2 days)	83	85
Grading/Excavation (4 days)	84	85
Trenching (10 days)	78	81
Building-Exterior (200 days)	78	81
Building-Interior (10 days)	74	78
Paving (10 days)	80	80

At 50 feet from the noise source, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 78 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq} .

The closest noise sensitive use is a residential building located 25 feet south of the project site. This residence would be exposed to a maximum noise level of 98 dBA L_{max} if the concrete saw is used during demolition at a distance of 25 feet. Maximum noise levels of 84 to 91 dBA L_{max} would be anticipated during all other phases of construction at a distance of 25 feet. Typical hourly average noise levels 80 to 91 dBA L_{eq} are anticipated at a distance of 25 feet. At residences across Merrydale Road, located about 75 feet west of the site, maximum instantaneous noise levels would be about 86 dBA L_{max} during use of the concrete saw near the adjoining property line and 74 to 81 dBA L_{max} during all other construction located near the adjoining property line. Typical hourly average noise levels at residences across Merrydale Road would range from 70 to 81 dBA L_{eq} when heavy construction is located near the adjoining property line. Construction noise levels would exceed 90 dBA L_{max} during use of the concrete saw within 50 feet of residences. This is a **potentially significant** impact.

Mitigation Measure 1: Implementation of the following measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance.

- Construction activities shall be limited to the hours specified in the City of San Rafael's Municipal Code (7 am to 6 pm on weekdays and 9 am to 6 pm on Saturdays). No construction activities are permitted on Sundays and holidays.
- Limit use of the concrete saw to a distance of 50 feet or greater from residences, where feasible. Construct temporary noise barriers to screen stationary noise-generating

equipment, such as the concrete saw, when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Unnecessary idling of internal combustion engines should be strictly prohibited.
- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.
- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

Impact 2: Groundborne Vibration from Construction. Construction-related vibration levels resulting from construction activities are not calculated to exceed 0.3 in/sec PPV at the nearest structures. **This is a less-than-significant impact.**

City of San Rafael's General Plan does not specify a construction vibration limit. Based on the thresholds provided by Caltrans (see Table 3), a construction vibration limit of 0.3 in/sec PPV would minimize damage at buildings of normal conventional construction. A significant impact would occur if buildings adjacent to the proposed construction site were exposed to vibration levels in excess of 0.3 in/sec PPV.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition work, preparation work, excavation of below-grade levels, foundation work, and new building framing and finishing.

Table 8 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities, such as use of saws, excavators, scrapers and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 8 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.17
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

The nearest existing structure is 25 feet south of the proposed project proposed. Pile driving is not anticipated for this project. At a distance of 25 feet vibration levels from construction are anticipated to be 0.21 in/sec PPV or less. Vibration levels may be perceptible to occupants but would be below the 0.3 in/sec PPV vibration limit and would not be anticipated to cause architectural or structural damage. As construction moves away from the shared property lines, vibration levels would be even lower. This is a **less-than-significant impact**.

Mitigation Measure 2: None required.

Impact 3: Permanent Traffic Noise Increases. The project would not result in a substantial permanent traffic noise level increase at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant noise impact would occur if traffic or activities generated by the project would substantially increase noise levels at sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn} , or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater.

Traffic data provided by the project's traffic study¹ was reviewed to calculate potential traffic noise level increases attributable to the project expected along roadways serving the site. Roadways evaluated in the analysis included Merrydale Road and North San Pedro Road. Based on a comparison between traffic volumes under the existing plus project scenario and existing conditions, the traffic noise increase attributable to the project would be less than 1 dBA. This is a **less-than-significant impact**.

Mitigation Measure 3: None required.

Impact 4: Construction Noise. Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact.**

As described in Impact 1, construction would be conducted in accordance with the hours of construction specified within the City of San Rafael's Municipal Code. Impact 1 also provides best construction management practices to reduce construction noise levels to 90 dBA or less at adjoining properties.

Neither the City of San Rafael nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA (see Setting Section, Effects of Noise). Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Therefore, the project would be considered to generate a significant temporary construction noise impact if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Project construction is anticipated to occur over a period of 9 months. As described in Impact 1, the construction of the proposed project would involve demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. Pile driving is not anticipated in any phase of construction of the project. As shown in Table 7, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 78 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq} at a distance of 50 feet.

The closest noise sensitive use is a residential building located 25 feet south of the project site. This residence would be exposed to a maximum noise level of 98 dBA L_{max} if the concrete saw is used during demolition within 25 feet. Maximum noise levels of 84 to 91 dBA L_{max} would be anticipated during all other phases of construction at a distance of 25 feet. Typical hourly average noise levels 80 to 91 dBA L_{eq} are anticipated at a distance of 25 feet. At residences across Merrydale Road, located about 75 feet west of the site, maximum instantaneous noise levels would be about 86 dBA L_{max} during use of the concrete saw near the adjoining property line and 74 to 81 dBA L_{max} during all other construction located near the adjoining property line. Typical hourly average noise levels at residences across Merrydale Road would range from 70 to 81 dBA L_{eq} when heavy construction is located near the adjoining property line. Noise levels would exceed 60 dBA L_{eq} at residences and ambient levels by more than 5 dBA, but would not occur for a period exceeding one year. Implementation of the measures discussed under Impact 1 would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. This is a **less-than-significant impact.**

Mitigation Measure 4: None required.

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
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10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
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Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
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User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

Project Name:		3833 Redwood Blvd.			Complete ALL Portions in Yellow			
See Equipment Type TAB for type, horsepower and load factor								
Project Size	44 Dwelling Units		2 total project acres disturbed		Pile Driving? Y/N? NO			
	89,000 s.f. residential		GROSS inc GARAGES					
	0 s.f. retail							
	0 s.f. office/commercial							
	0 s.f. other, specify:							
Construction Hours	0 s.f. parking garage		spaces		PLUS DRIVEWAYS			
	6,000 s.f. parking lot		15 spaces		PER CITY NOISE ORDINANCE			
	am to		pm					
Qty	Description	HP	Load Factor	Hours/day	Total Work Hours	Avg. Hours	Annual	Comments
Demolition		Start Date:	e.g., 3/1/2018	Total phase	20			Overall Import/Export Volumes
		End Date:						Demolition Volume
	Concrete/Industrial Saws	81	0.73			0	0	Square footage of buildings to be demolished
	Excavators	162	0.38			0	0	(or total tons to be hauled)
	Rubber-Tired Dozers	255	0.4			0	0	18,100 SQ. FT
	Tractors/Loaders/Backhoes	97	0.37			0	0	? Hauling volume (tons)
Site Preparation		Start Date:		Total phase	2			Any pavement demolished and hauled? ? tons
		End Date:						62,000 SQ.FT OF PAVEMENT
	Graders	174	0.41			0	0	
	Rubber Tired Dozers	255	0.4			0	0	
	Tractors/Loaders/Backhoes	97	0.37			0	0	
Grading / Excavation		Start Date:		Total phase	4			Soil Hauling Volume
		End Date:						Export volume = 2,000? cubic yards?
	Excavators	162	0.38			0	0	Import volume = 10,000 cubic yards?
	Graders	174	0.41			0	0	
	Rubber Tired Dozers	255	0.4			0	0	
	Tractors/Loaders/Backhoes	97	0.37			0	0	
	Other Equipment?							
Trenching/Foundation		Start Date:		Total phase	10			
		End Date:						
	Tractor/Loader/Backhoe	97	0.37			0	0	
	Excavators	162	0.38			0	0	
	Other Equipment?							
Building - Exterior		Start Date:		Total phase	200			Cement Trucks? ? Total Round-Trips
		End Date:						Electric? (Y/N) ___ Otherwise assumed diesel
	Cranes	226	0.29			0	0	Liquid Propane (LPG)? (Y/N) ___ Otherwise Assumed diesel
	Forklifts	89	0.2			0	0	Or temporary line power? (Y/N) ___ YES_
	Generator Sets	84	0.74			0	0	
	Tractors/Loaders/Backhoes	97	0.37			0	0	
	Welders	46	0.45			0	0	
	Other Equipment?					0	0	
Building - Interior/Architectural		Start Date:		Total phase	10			
		End Date:						
	Air Compressors	78	0.48			0	0	
	Aerial Lift	62	0.31			0	0	
	Other Equipment?							
Paving		Start Date:		Total phase	10			
		Start Date:						
	Cement and Mortar Mixers	9	0.56			0	0	Asphalt? ___ cubic yards or ___ round trips?
	Pavers	125	0.42			0	0	
	Paving Equipment	130	0.36			0	0	
	Rollers	80	0.38			0	0	
	Tractors/Loaders/Backhoes	97	0.37			0	0	
	Other Equipment?							

Total	4.0000e-005	2.0000e-005	2.7000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	0.0000	1.0000e-005	0.0000	1.0000e-005	0.0302	0.0000	0.0000	0.0302
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Mitigated Construction On-Site

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Archit. Coating	0.6278					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.7000e-004	0.0118	9.1600e-003	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	1.2766	1.2766	1.1000e-004	0.0000	1.2793
Total	0.6283	0.0118	9.1600e-003	1.0000e-005		7.0000e-005	7.0000e-005		7.0000e-005	7.0000e-005	0.0000	1.2766	1.2766	1.1000e-004	0.0000	1.2793

Mitigated Construction Off-Site

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	2.0000e-005	2.7000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0302	0.0302	0.0000	0.0000	0.0302
Total	4.0000e-005	2.0000e-005	2.7000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0302	0.0302	0.0000	0.0000	0.0302

3.8 Trenching/Foundation - 2019
Unmitigated Construction On-Site

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Off-Road	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488
Total	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488

Unmitigated Construction Off-Site

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	1.0000e-005	1.9000e-004	0.0000	2.0000e-005	2.0000e-005	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0216	0.0216	0.0000	0.0000	0.0216
Total	3.0000e-005	1.0000e-005	1.9000e-004	0.0000	2.0000e-005	2.0000e-005	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0216	0.0216	0.0000	0.0000	0.0216

Mitigated Construction On-Site

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category																

Off-Road	1.7400e-003	0.0372	0.0314	4.0000e-005	1.9000e-004	1.9000e-004	1.9000e-004	1.9000e-004	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488
Total	1.7400e-003	0.0372	0.0314	4.0000e-005	1.9000e-004	1.9000e-004	1.9000e-004	1.9000e-004	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488

Mitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	1.0000e-005	1.9000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0216	0.0216	0.0000	0.0000	0.0216
Total	3.0000e-005	1.0000e-005	1.9000e-004	0.0000	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0000	1.0000e-005	0.0000	0.0216	0.0216	0.0000	0.0000	0.0216

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
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Category	tons/yr										MT/yr								
	Electricity Mitigated	Electricity Unmitigated	Natural Gas Mitigated	Natural Gas Unmitigated	CO	NOx	SO2	PM10 Fugitive	PM10 Exhaust	PM10 Total	PM2.5 Fugitive	PM2.5 Exhaust	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Electricity Mitigated								0.0000	0.0000		0.0000	0.0000	0.0000	29.2191	29.2191	2.9200e-003	6.0000e-004		29.4723
Electricity Unmitigated								0.0000	0.0000		0.0000	0.0000	0.0000	29.2191	29.2191	2.9200e-003	6.0000e-004		29.4723
Natural Gas Mitigated	5.3900e-003	0.0461	2.9000e-004		0.0196		3.7200e-003	3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004		53.6619
Natural Gas Unmitigated	5.3900e-003	0.0461	2.9000e-004		0.0196		3.7200e-003	3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004		53.6619

5.2 Energy by Land Use - Natural Gas

Unmitigated

Land Use	Natural Gas Use kBTU/yr	tons/yr										MT/yr							
		ROG	NOx	CO	SO2	PM10 Fugitive	PM10 Exhaust	PM10 Total	PM2.5 Fugitive	PM2.5 Exhaust	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e		
Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004		53.6619	
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	
Total		5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004		53.6619	

Mitigated

Land Use	Natural Gas Use kBTU/yr	tons/yr										MT/yr							
		ROG	NOx	CO	SO2	PM10 Fugitive	PM10 Exhaust	PM10 Total	PM2.5 Fugitive	PM2.5 Exhaust	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e		
Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004		53.6619	
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	

Total	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619
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5.3 Energy by Land Use - Electricity

Unmitigated

Land Use	Electricity Use kWh/yr	MT/yr				
		Total CO2	CH4	N2O	CO2e	
Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936	
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786	
Total		29.2191	2.9200e-003	6.1000e-004	29.4723	

Mitigated

Land Use	Electricity Use kWh/yr	MT/yr				
		Total CO2	CH4	N2O	CO2e	
Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936	
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786	
Total		29.2191	2.9200e-003	6.1000e-004	29.4723	

6.0 Area Detail

6.1 Mitigation Measures Area

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.4209	5.3100e-003	0.3286	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.5000e-004	3.0000e-005	2.3152
Unmitigated	0.4209	5.3100e-003	0.3286	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.5000e-004	3.0000e-005	2.3152

6.2 Area by SubCategory

Unmitigated

SubCategory	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	0.0000	1.7577	1.7577	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.9900e-003	3.7900e-003	0.3279	2.0000e-005	1.8000e-003	1.8000e-003	1.8000e-003	1.8000e-003	1.8000e-003	1.8000e-003	0.0000	0.5339	0.5339	5.2000e-004	0.0000	0.5470
Total	0.4209	5.3100e-003	0.3286	3.0000e-005	1.9200e-003	1.9200e-003	1.9200e-003	1.9200e-003	1.9200e-003	1.9200e-003	0.0000	2.2917	2.2917	5.5000e-004	3.0000e-005	2.3151

Mitigated

SubCategory	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005		1.2000e-004	1.2000e-004		1.2000e-004	1.2000e-004	0.0000	1.7577	3.0000e-005	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.9900e-003	3.7900e-003	0.3279	2.0000e-005		1.8000e-003	1.8000e-003		1.8000e-003	1.8000e-003	0.0000	0.5339	5.2000e-004	5.2000e-004	0.0000	0.5470
Total	0.4209	5.3100e-003	0.3286	3.0000e-005		1.9200e-003	1.9200e-003		1.9200e-003	1.9200e-003	0.0000	2.2917	5.5000e-004	5.5000e-004	3.0000e-005	2.3151

7.0 Water Detail

7.1 Mitigation Measures Water

Category	MT/yr				
	Total CO2	CH4	N2O	CO2e	
Mitigated	3.8869	3.7800e-003	2.2700e-003	4.6563	
Unmitigated	3.8869	3.7800e-003	2.2700e-003	4.6563	

7.2 Water by Land Use

Unmitigated

Land Use	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
	Mgal	MT/yr			
Condo/Townhouse	2.86678 / 1.80732	3.8869	3.7800e-003	2.2700e-003	4.6563
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		3.8869	3.7800e-003	2.2700e-003	4.6563

Mitigated

Land Use	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
	Mgal	MT/yr			
Condo/Townhouse	2.86678 / 1.80732	3.8869	3.7800e-003	2.2700e-003	4.6563
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		3.8869	3.7800e-003	2.2700e-003	4.6563

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

Category/Year	Total CO2	CH4	N2O	CO2e
	MT/yr			

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786
Total		29.2191	2.9200e-003	6.1000e-004	29.4723

6.0 Area Detail

6.1 Mitigation Measures Area

Category	tons/yr															
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.4207	5.2800e-003	0.3266	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3149
Unmitigated	0.4207	5.2800e-003	0.3266	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3149

6.2 Area by SubCategory

Unmitigated

SubCategory	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	0.0000	1.7577	1.7577	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.7600e-003	3.7600e-003	0.3260	2.0000e-005	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	0.0000	0.5339	0.5339	5.1000e-004	0.0000	0.5467
Total	0.4207	5.2800e-003	0.3266	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3148

Mitigated

SubCategory	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	1.2000e-004	0.0000	1.7577	1.7577	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.7600e-003	3.7600e-003	0.3260	2.0000e-005	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	1.8100e-003	0.0000	0.5339	0.5339	5.1000e-004	0.0000	0.5467
Total	0.4207	5.2800e-003	0.3266	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3148

7.0 Water Detail

7.1 Mitigation Measures Water

Category	Total CO2			CH4			N2O			CO2e		
	MT/yr											
Mitigated	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	2.2700e-003	4.6563
Unmitigated	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	2.2700e-003	4.6563

7.2 Water by Land Use

Unmitigated

Land Use	Indoor/Outdoor Use	Total CO2			CH4			N2O			CO2e		
		Mgal											
Condo/Townhouse	2.86678 / 1.80732	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	4.6563	
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Total		3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	4.6563	

Mitigated

Land Use	Indoor/Outdoor Use	Total CO2			CH4			N2O			CO2e		
		Mgal											
Condo/Townhouse	2.86678 / 1.80732	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	4.6563	
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Total		3.8869	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	2.2700e-003	3.7800e-003	2.2700e-003	3.7800e-003	4.6563	

Land Use	Mgal	MT/yr
Condo/Townhouse	2.86678 / 1.80732	3.8869 3.7800e-003 2.2700e-003 4.6563
Parking Lot	0 / 0	0.0000 0.0000 0.0000 0.0000
Total		3.8869 3.7800e-003 2.2700e-003 4.6563

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
Mitigated	4.1085	0.2428	0.0000	10.1787
Unmitigated	4.1085	0.2428	0.0000	10.1787

8.2 Waste by Land Use

Unmitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
Condo/Townhouse	20.24	4.1085	0.2428	0.0000	10.1787

Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

Mitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
		MT/yr			
Condo/Townhouse	20.24	4.1085	0.2428	0.0000	10.1787
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
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10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
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Boilers

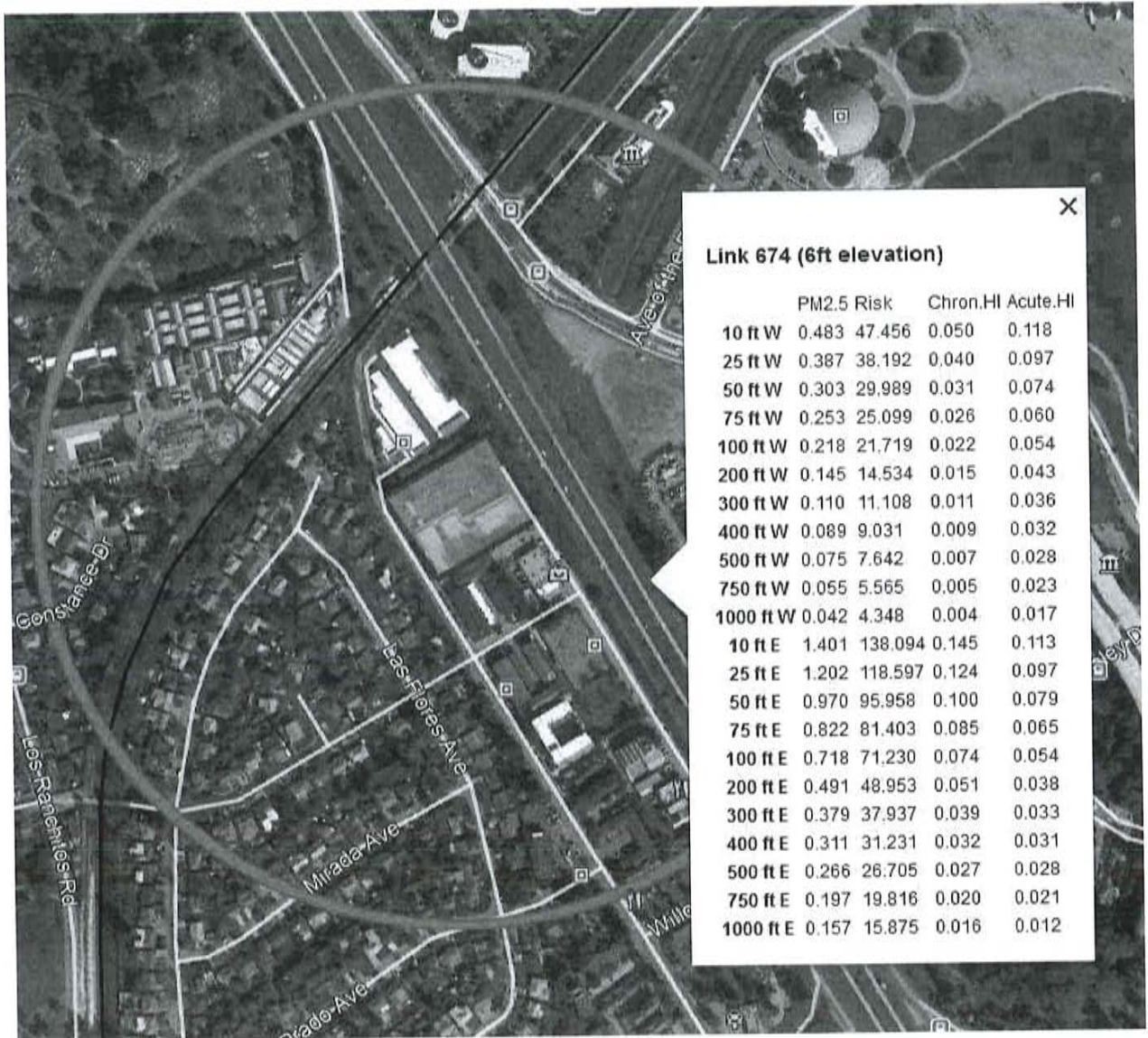
Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
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User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

Attachment 3: Operational Community Risk



Attachment 4: Construction Health Risk Calculations

3833 Redwood Highway, San Rafael, CA

DPM Emissions and Modeling Emission Rates

Construction Year	Activity	DPM (ton/year)	Area Source	DPM Emissions			Modeled Area (m ²)	DPM Emission Rate (g/s/m ²)
				(lb/yr)	(lb/hr)	(g/s)		
2019	Construction	0.1308	CON_DPM	261.6	0.07963	1.00E-02	8,094	1.24E-06

Construction Hours
 hr/day = 9 (7am - 4pm)
 days/yr = 365
 hours/year = 3285

PM2.5 Fugitive Dust Emissions for Modeling

Construction Year	Activity	Area Source	Area (ton/year)	PM2.5 Emissions			Modeled Area (m ²)	PM2.5 Emission Rate g/s/m ²
				(lb/yr)	(lb/hr)	(g/s)		
2019	Construction	CON_FUG	0.00926	18.5	0.00564	7.10E-04	8,094	8.78E-08

Construction Hours
 hr/day = 9 (7am - 4pm)
 days/yr = 365
 hours/year = 3285

DPM Construction Emissions and Modeling Emission Rates - With Mitigation

Construction Year	Activity	DPM (ton/year)	Area Source	DPM Emissions			Modeled Area (m ²)	DPM Emission Rate (g/s/m ²)
				(lb/yr)	(lb/hr)	(g/s)		
2019	Construction	0.0144	CON_DPM	28.8	0.00877	1.10E-03	8,094	1.36E-07

Construction Hours
 hr/day = 10 (7am - 4pm)
 days/yr = 365
 hours/year = 3285

PM2.5 Fugitive Dust Construction Emissions for Modeling - With Mitigation

Construction Year	Activity	Area Source	Area (ton/year)	PM2.5 Emissions			Modeled Area (m ²)	PM2.5 Emission Rate g/s/m ²
				(lb/yr)	(lb/hr)	(g/s)		
2019	Construction	CON_FUG	0.00278	5.6	0.00169	2.13E-04	8,094	2.63E-08

Construction Hours
 hr/day = 9 (7am - 4pm)
 days/yr = 365
 hours/year = 3285

3833 Redwood Highway, San Rafael, CA - Construction Health Impact Summary

Maximum Impacts at MEI Location - Unmitigated

Emissions Year	Maximum Concentrations		Cancer Risk (per million)		Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu\text{g}/\text{m}^3$)
	Exhaust PM10/DPM ($\mu\text{g}/\text{m}^3$)	Fugitive PM2.5 ($\mu\text{g}/\text{m}^3$)	Infant/Child	Adult		
	2019	0.4770	0.0359	78.3	1.4	0.095

Maximum Impacts at MEI Location - With Mitigation

Emissions Year	Maximum Concentrations		Cancer Risk (per million)		Hazard Index (-)	Maximum Annual PM2.5 Concentration ($\mu\text{g}/\text{m}^3$)
	Exhaust PM10/DPM ($\mu\text{g}/\text{m}^3$)	Fugitive PM2.5 ($\mu\text{g}/\text{m}^3$)	Infant/Child	Adult		
	2019	0.0523	0.0108	8.6	0.2	0.010

3833 Redwood Highway, San Rafael, CA - Construction Impacts - Without Mitigation
Maximum DPM Cancer Risk and PM2.5 Calculations From Construction
Impacts at Off-Site MEI Location - 1.5 meter receptor height

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor (mg/kg-day)⁻¹
 ASF = Age sensitivity factor for specified age group
 ED = Exposure duration (years)
 AT = Averaging time for lifetime cancer risk (years)
 FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10⁻⁶

Where: C_{air} = concentration in air (µg/m³)
 DBR = daily breathing rate (L/kg body weight-day)
 A = Inhalation absorption factor
 EF = Exposure frequency (days/year)
 10⁻⁶ = Conversion factor

Values

Age --> Parameter	Infant/Child				Adult
	3rd Trimester	0 - 2	2 - 9	2 - 16	16 - 30
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Exposure Duration (years)	Age	Infant/Child - Exposure Information			Infant/Child Cancer Risk (per million)	Adult - Exposure Information			Adult Cancer Risk (per million)	Maximum	
			DPM Conc (ug/m3)		Age Sensitivity Factor		Modeled		Age Sensitivity Factor		Fugitive PM2.5	Total PM2.5
			Year	Annual			Year	Annual				
0	0.25	-0.25 - 0*	-	-	10	-	-	-	-	-	-	-
1	1	0 - 1	2019	0.3540	10	58.15	2019	0.3540	1	1.02	0.0587	0.413
2	1	1 - 2	2020	0.0000	10	0.00	2020	0.0000	1	0.00		
3	1	2 - 3	2021	0.0000	3	0.00	2021	0.0000	1	0.00		
4	1	3 - 4	2022	0.0000	3	0.00	2022	0.0000	1	0.00		
5	1	4 - 5	2023	0.0000	3	0.00	2023	0.0000	1	0.00		
6	1	5 - 6	2024	0.0000	3	0.00	2024	0.0000	1	0.00		
7	1	6 - 7	2025	0.0000	3	0.00	2025	0.0000	1	0.00		
8	1	7 - 8	2026	0.0000	3	0.00	2026	0.0000	1	0.00		
9	1	8 - 9	2027	0.0000	3	0.00	2027	0.0000	1	0.00		
10	1	9 - 10	2028	0.0000	3	0.00	2028	0.0000	1	0.00		
11	1	10 - 11	2029	0.0000	3	0.00	2029	0.0000	1	0.00		
12	1	11 - 12	2030	0.0000	3	0.00	2030	0.0000	1	0.00		
13	1	12 - 13	2031	0.0000	3	0.00	2031	0.0000	1	0.00		
14	1	13 - 14	2032	0.0000	3	0.00	2032	0.0000	1	0.00		
15	1	14 - 15	2033	0.0000	3	0.00	2033	0.0000	1	0.00		
16	1	15 - 16	2034	0.0000	3	0.00	2034	0.0000	1	0.00		
17	1	16-17	2035	0.0000	1	0.00	2035	0.0000	1	0.00		
18	1	17-18	2036	0.0000	1	0.00	2036	0.0000	1	0.00		
19	1	18-19	2037	0.0000	1	0.00	2037	0.0000	1	0.00		
20	1	19-20	2038	0.0000	1	0.00	2038	0.0000	1	0.00		
21	1	20-21	2039	0.0000	1	0.00	2039	0.0000	1	0.00		
22	1	21-22	2040	0.0000	1	0.00	2040	0.0000	1	0.00		
23	1	22-23	2041	0.0000	1	0.00	2041	0.0000	1	0.00		
24	1	23-24	2042	0.0000	1	0.00	2042	0.0000	1	0.00		
25	1	24-25	2043	0.0000	1	0.00	2043	0.0000	1	0.00		
26	1	25-26	2044	0.0000	1	0.00	2044	0.0000	1	0.00		
27	1	26-27	2045	0.0000	1	0.00	2045	0.0000	1	0.00		
28	1	27-28	2046	0.0000	1	0.00	2046	0.0000	1	0.00		
29	1	28-29	2047	0.0000	1	0.00	2047	0.0000	1	0.00		
30	1	29-30	2048	0.0000	1	0.00	2048	0.0000	1	0.00		
Total Increased Cancer Risk						58.1				1.02		

* Third trimester of pregnancy

3833 Redwood Highway, San Rafael, CA - Construction Impacts - Without Mitigation
Maximum DPM Cancer Risk and PM2.5 Calculations From Construction
Impacts at Off-Site MEI Location - 4.5 meter receptor height

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor (mg/kg-day)⁻¹
 ASF = Age sensitivity factor for specified age group
 ED = Exposure duration (years)
 AT = Averaging time for lifetime cancer risk (years)
 FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10⁻⁶

Where: C_{air} = concentration in air (µg/m³)
 DBR = daily breathing rate (L/kg body weight-day)
 A = Inhalation absorption factor
 EF = Exposure frequency (days/year)
 10⁻⁶ = Conversion factor

Values

Age -->	Infant/Child				Adult
	3rd Trimester	0 - 2	2 - 9	2 - 16	16 - 30
Parameter					
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Exposure Duration (years)	Age	Infant/Child - Exposure Information			Infant/Child Cancer Risk (per million)	Adult - Exposure Information			Adult Cancer Risk (per million)	Maximum	
			DPM Conc (ug/m3)		Age Sensitivity Factor		Modeled		Age Sensitivity Factor		Fugitive PM2.5	Total PM2.5
			Year	Annual			Year	Annual				
0	0.25	-0.25 - 0*	-	-	10	-	-	-	-	-	-	-
1	1	0 - 1	2019	0.4770	10	78.34	2019	0.4770	1	1.37	0.0359	0.513
2	1	1 - 2	2020	0.0000	10	0.00	2020	0.0000	1	0.00		
3	1	2 - 3	2021	0.0000	3	0.00	2021	0.0000	1	0.00		
4	1	3 - 4	2022	0.0000	3	0.00	2022	0.0000	1	0.00		
5	1	4 - 5	2023	0.0000	3	0.00	2023	0.0000	1	0.00		
6	1	5 - 6	2024	0.0000	3	0.00	2024	0.0000	1	0.00		
7	1	6 - 7	2025	0.0000	3	0.00	2025	0.0000	1	0.00		
8	1	7 - 8	2026	0.0000	3	0.00	2026	0.0000	1	0.00		
9	1	8 - 9	2027	0.0000	3	0.00	2027	0.0000	1	0.00		
10	1	9 - 10	2028	0.0000	3	0.00	2028	0.0000	1	0.00		
11	1	10 - 11	2029	0.0000	3	0.00	2029	0.0000	1	0.00		
12	1	11 - 12	2030	0.0000	3	0.00	2030	0.0000	1	0.00		
13	1	12 - 13	2031	0.0000	3	0.00	2031	0.0000	1	0.00		
14	1	13 - 14	2032	0.0000	3	0.00	2032	0.0000	1	0.00		
15	1	14 - 15	2033	0.0000	3	0.00	2033	0.0000	1	0.00		
16	1	15 - 16	2034	0.0000	3	0.00	2034	0.0000	1	0.00		
17	1	16-17	2035	0.0000	1	0.00	2035	0.0000	1	0.00		
18	1	17-18	2036	0.0000	1	0.00	2036	0.0000	1	0.00		
19	1	18-19	2037	0.0000	1	0.00	2037	0.0000	1	0.00		
20	1	19-20	2038	0.0000	1	0.00	2038	0.0000	1	0.00		
21	1	20-21	2039	0.0000	1	0.00	2039	0.0000	1	0.00		
22	1	21-22	2040	0.0000	1	0.00	2040	0.0000	1	0.00		
23	1	22-23	2041	0.0000	1	0.00	2041	0.0000	1	0.00		
24	1	23-24	2042	0.0000	1	0.00	2042	0.0000	1	0.00		
25	1	24-25	2043	0.0000	1	0.00	2043	0.0000	1	0.00		
26	1	25-26	2044	0.0000	1	0.00	2044	0.0000	1	0.00		
27	1	26-27	2045	0.0000	1	0.00	2045	0.0000	1	0.00		
28	1	27-28	2046	0.0000	1	0.00	2046	0.0000	1	0.00		
29	1	28-29	2047	0.0000	1	0.00	2047	0.0000	1	0.00		
30	1	29-30	2048	0.0000	1	0.00	2048	0.0000	1	0.00		
Total Increased Cancer Risk						78.3				1.37		

* Third trimester of pregnancy

3833 Redwood Highway, San Rafael, CA - Construction Impacts - With Mitigation
Maximum DPM Cancer Risk and PM2.5 Calculations From Construction
Impacts at Off-Site MEI Location - 4.5 meter receptor height

Cancer Risk (per million) = CPF x Inhalation Dose x ASF x ED/AT x FAH x 1.0E6

Where: CPF = Cancer potency factor (mg/kg-day)⁻¹
 ASF = Age sensitivity factor for specified age group
 ED = Exposure duration (years)
 AT = Averaging time for lifetime cancer risk (years)
 FAH = Fraction of time spent at home (unitless)

Inhalation Dose = C_{air} x DBR x A x (EF/365) x 10⁻⁶

Where: C_{air} = concentration in air (µg/m³)
 DBR = daily breathing rate (L/kg body weight-day)
 A = Inhalation absorption factor
 EF = Exposure frequency (days/year)
 10⁻⁶ = Conversion factor

Values

Age --> Parameter	Infant/Child				Adult
	3rd Trimester	0 - 2	2 - 9	2 - 16	16 - 30
ASF =	10	10	3	3	1
CPF =	1.10E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00
DBR* =	361	1090	631	572	261
A =	1	1	1	1	1
EF =	350	350	350	350	350
AT =	70	70	70	70	70
FAH =	1.00	1.00	1.00	1.00	0.73

* 95th percentile breathing rates for infants and 80th percentile for children and adults

Construction Cancer Risk by Year - Maximum Impact Receptor Location

Exposure Year	Exposure Duration (years)	Age	Infant/Child - Exposure Information		Age Sensitivity Factor	Infant/Child Cancer Risk (per million)	Adult - Exposure Information		Adult Cancer Risk (per million)	Maximum	
			DPM Conc (ug/m3)				Modeled			Fugitive PM2.5	Total PM2.5
			Year	Annual			Year	Annual			
0	0.25	-0.25 - 0*	-	-	10	-	-	-	-	0.0108	0.063
1	1	0 - 1	2019	0.0523	10	8.59	2019	0.0523	1	0.15	
2	1	1 - 2	2020	0.0000	10	0.00	2020	0.0000	1	0.00	
3	1	2 - 3	2021	0.0000	3	0.00	2021	0.0000	1	0.00	
4	1	3 - 4	2022	0.0000	3	0.00	2022	0.0000	1	0.00	
5	1	4 - 5	2023	0.0000	3	0.00	2023	0.0000	1	0.00	
6	1	5 - 6	2024	0.0000	3	0.00	2024	0.0000	1	0.00	
7	1	6 - 7	2025	0.0000	3	0.00	2025	0.0000	1	0.00	
8	1	7 - 8	2026	0.0000	3	0.00	2026	0.0000	1	0.00	
9	1	8 - 9	2027	0.0000	3	0.00	2027	0.0000	1	0.00	
10	1	9 - 10	2028	0.0000	3	0.00	2028	0.0000	1	0.00	
11	1	10 - 11	2029	0.0000	3	0.00	2029	0.0000	1	0.00	
12	1	11 - 12	2030	0.0000	3	0.00	2030	0.0000	1	0.00	
13	1	12 - 13	2031	0.0000	3	0.00	2031	0.0000	1	0.00	
14	1	13 - 14	2032	0.0000	3	0.00	2032	0.0000	1	0.00	
15	1	14 - 15	2033	0.0000	3	0.00	2033	0.0000	1	0.00	
16	1	15 - 16	2034	0.0000	3	0.00	2034	0.0000	1	0.00	
17	1	16-17	2035	0.0000	1	0.00	2035	0.0000	1	0.00	
18	1	17-18	2036	0.0000	1	0.00	2036	0.0000	1	0.00	
19	1	18-19	2037	0.0000	1	0.00	2037	0.0000	1	0.00	
20	1	19-20	2038	0.0000	1	0.00	2038	0.0000	1	0.00	
21	1	20-21	2039	0.0000	1	0.00	2039	0.0000	1	0.00	
22	1	21-22	2040	0.0000	1	0.00	2040	0.0000	1	0.00	
23	1	22-23	2041	0.0000	1	0.00	2041	0.0000	1	0.00	
24	1	23-24	2042	0.0000	1	0.00	2042	0.0000	1	0.00	
25	1	24-25	2043	0.0000	1	0.00	2043	0.0000	1	0.00	
26	1	25-26	2044	0.0000	1	0.00	2044	0.0000	1	0.00	
27	1	26-27	2045	0.0000	1	0.00	2045	0.0000	1	0.00	
28	1	27-28	2046	0.0000	1	0.00	2046	0.0000	1	0.00	
29	1	28-29	2047	0.0000	1	0.00	2047	0.0000	1	0.00	
30	1	29-30	2048	0.0000	1	0.00	2048	0.0000	1	0.00	
Total Increased Cancer Risk						8.6					

* Third trimester of pregnancy

3833 Redwood Hwy Construction - Marin County, Annual

3833 Redwood Hwy Construction
Marin County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Parking Lot	15.00	Space	0.00	6,000.00	0
Condo/Townhouse	44.00	Dwelling Unit	2.00	89,000.00	126

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	69
Climate Zone	5			Operational Year	2020

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MW/hr)	290	CH4 Intensity (lb/MW/hr)	0.029	N2O Intensity (lb/MW/hr)	0.006
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1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E Intensity Factor Updated

Land Use - Values from Project Specifications

Construction Phase - added trenching

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - added trenching

tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbITripsAndVMT	WorkerTripLength	10.80	1.00
tbWater	AerobicPercent	87.46	100.00
tbWater	AerobicPercent	87.46	100.00
tbWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tbWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tbWater	SepticTankPercent	10.33	0.00
tbWater	SepticTankPercent	10.33	0.00
tbWoodstoves	WoodstoveWoodMass	582.40	0.00

2.0 Emissions Summary

2.1 Overall Construction Unmitigated Construction

Year	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
2019	0.9287	2.3274	1.8495	3.0400e-003	0.0276	0.1308	0.1583	9.2600e-003	0.1247	0.1340	0.0000	257.9624	257.9624	0.0553	0.0000	259.3455
Maximum	0.9287	2.3274	1.8495	3.0400e-003	0.0276	0.1308	0.1583	9.2600e-003	0.1247	0.1340	0.0000	257.9624	257.9624	0.0553	0.0000	259.3455

Mitigated Construction

Year	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
2019	0.7456	2.4454	1.8848	3.0400e-003	0.0142	0.0144	0.0286	2.7800e-003	0.0144	0.0172	0.0000	257.9621	257.9621	0.0553	0.0000	259.3452
Maximum	0.7456	2.4454	1.8848	3.0400e-003	0.0142	0.0144	0.0286	2.7800e-003	0.0144	0.0172	0.0000	257.9621	257.9621	0.0553	0.0000	259.3452

Percent Reduction	tons/quarter										Maximum Mitigated ROG + NOx (tons/quarter)					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
19.72	-5.07	-1.91	0.00	48.41	88.99	81.91	68.98	88.46	87.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOx (tons/quarter)	Maximum Mitigated ROG + NOx (tons/quarter)
1	1-1-2019	3-31-2019	0.6649	0.6259
2	4-1-2019	6-30-2019	0.7132	0.6978
3	7-1-2019	9-30-2019	0.7211	0.7055
		Highest	0.7211	0.7055

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2019	1/28/2019	5	20	
2	Site Preparation	Site Preparation	1/29/2019	1/30/2019	5	2	
3	Grading/Excavation	Grading	1/31/2019	2/5/2019	5	4	
4	Building - Exterior	Building Construction	2/20/2019	11/26/2019	5	200	
5	Paving	Paving	11/27/2019	12/10/2019	5	10	
6	Building - Interior/Architectural Coating	Architectural Coating	12/11/2019	12/24/2019	5	10	

7	Trenching/Foundation	Trenching	2/6/2019	2/19/2019	5	10
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Acres of Grading (Site Preparation Phase): 3

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 180,225; Residential Outdoor: 60,075; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Scrapers	1	8.00	367	0.48
Site Preparation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Grading/Excavation	Graders	1	8.00	187	0.41
Grading/Excavation	Rubber Tired Dozers	1	8.00	247	0.40
Grading/Excavation	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Trenching/Foundation	Excavators	1	8.00	158	0.38
Trenching/Foundation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Building - Exterior	Cranes	1	8.00	231	0.29
Building - Exterior	Forklifts	2	7.00	89	0.20
Building - Exterior	Generator Sets	1	8.00	84	0.74
Building - Exterior	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building - Exterior	Welders	3	8.00	46	0.45
Building - Interior/Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	1	8.00	9	0.56
Paving	Pavers	1	8.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38

Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
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Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	82.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation	4	10.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Trenching/Foundation	2	5.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Building - Exterior	8	34.00	6.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
Building - Interior/Architectural Paving	1	7.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT
	6	15.00	0.00	0.00	1.00	1.00	1.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

- Use Cleaner Engines for Construction Equipment
- Use DPF for Construction Equipment
- Use Soil Stabilizer
- Replace Ground Cover
- Water Exposed Area
- Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2019

Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Fugitive Dust					8.91000e-003	0.0000	8.91000e-003	1.35000e-003	0.0000	1.35000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
tons/yr																
MT/yr																

Off-Road	0.0230	0.2268	0.1489	2.4000e-004	*	0.0129	0.0129	0.0120	0.0120	0.0000	21.4161	21.4161	5.4500e-003	0.0000	21.5524
Total	0.0230	0.2268	0.1489	2.4000e-004	8.9100e-003	0.0129	0.0218	0.0134	0.0120	0.0000	21.4161	21.4161	5.4500e-003	0.0000	21.5524

Unmitigated Construction Off-Site

Category	tons/yr										MT/yr					CO2e
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	
Hauling	1.1000e-004	4.1500e-003	1.2300e-003	0.0000	4.0000e-005	1.0000e-005	4.0000e-005	1.0000e-005	1.0000e-005	2.0000e-005	0.0000	0.4646	0.4646	5.0000e-005	0.0000	0.4658
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.7000e-004	8.0000e-005	9.9000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1121	0.1121	1.0000e-005	0.0000	0.1123
Total	2.8000e-004	4.2300e-003	2.2200e-003	0.0000	1.4000e-004	1.0000e-005	1.4000e-004	4.0000e-005	1.0000e-005	5.0000e-005	0.0000	0.5767	0.5767	6.0000e-005	0.0000	0.5780

Mitigated Construction On-Site

Category	tons/yr										MT/yr					CO2e
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	
Fugitive Dust					4.0100e-003	0.0000	4.0100e-003	3.0000e-004	0.0000	3.0000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.8600e-003	0.2121	0.1542	2.4000e-004	1.0800e-003	1.0800e-003	1.0800e-003	1.0800e-003	1.0800e-003	1.0800e-003	0.0000	21.4161	21.4161	5.4500e-003	0.0000	21.5524
Total	8.8600e-003	0.2121	0.1542	2.4000e-004	4.0100e-003	1.0800e-003	5.0900e-003	3.0000e-004	1.0800e-003	1.3800e-003	0.0000	21.4161	21.4161	5.4500e-003	0.0000	21.5524

Worker	1.0000e-005	0.0000	6.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.9000e-003	0.0000	0.0000	6.9100e-003
Total	1.0000e-005	0.0000	6.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.9000e-003	0.0000	0.0000	6.9100e-003

3.4 Grading/Excavation - 2019 Unmitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Fugitive Dust					0.0138	0.0000	0.0138	6.8400e-003	0.0000	6.8400e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.0600e-003	0.0455	0.0203	4.0000e-005		2.1500e-003	2.1500e-003	1.9700e-003	1.9700e-003	1.9700e-003	0.0000	3.7036	3.7036	1.1700e-003	0.0000	3.7329
Total	4.0600e-003	0.0455	0.0203	4.0000e-005	0.0138	2.1500e-003	0.0159	6.8400e-003	1.9700e-003	8.8100e-003	0.0000	3.7036	3.7036	1.1700e-003	0.0000	3.7329

Unmitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	1.0000e-005	1.5000e-004	0.0000	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0173	0.0173	0.0000	0.0000	0.0173
Total	3.0000e-005	1.0000e-005	1.5000e-004	0.0000	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0173	0.0173	0.0000	0.0000	0.0173

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	0.2558	1.8910	1.5255	2.5000e-003	0.1090	0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7543	209.7543	0.0436	0.0000	210.8452
Total	0.2558	1.8910	1.5255	2.5000e-003	0.1090	0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7543	209.7543	0.0436	0.0000	210.8452

Unmitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5200e-003	0.0391	0.0173	4.0000e-005	5.5000e-004	1.1000e-004	6.6000e-004	1.6000e-004	1.0000e-004	2.6000e-004	0.0000	4.3202	4.3202	4.2000e-004	0.0000	4.3307
Worker	4.3400e-003	2.0200e-003	0.0258	3.0000e-005	2.5100e-003	4.0000e-005	2.5500e-003	6.7000e-004	3.0000e-005	7.1000e-004	0.0000	2.9328	2.9328	1.4000e-004	0.0000	2.9363
Total	5.8600e-003	0.0411	0.0431	7.0000e-005	3.0600e-003	1.5000e-004	3.2100e-003	8.3000e-004	1.3000e-004	9.7000e-004	0.0000	7.2530	7.2530	5.6000e-004	0.0000	7.2671

Mitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	0.0947	2.0046	1.5408	2.5000e-003	0.0123	0.0123	0.0123	0.0123	0.0123	0.0123	0.0000	209.7541	209.7541	0.0436	0.0000	210.8450
Total	0.0947	2.0046	1.5408	2.5000e-003	0.0123	0.0123	0.0123	0.0123	0.0123	0.0123	0.0000	209.7541	209.7541	0.0436	0.0000	210.8450

Mitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.5200e-003	0.0391	0.0173	4.0000e-005	5.5000e-004	1.1000e-004	6.6000e-004	1.6000e-004	1.0000e-004	2.6000e-004	0.0000	4.3202	4.3202	4.2000e-004	0.0000	4.3307
Worker	4.3400e-003	2.0200e-003	0.0258	3.0000e-005	2.5100e-003	4.0000e-005	2.5500e-003	6.7000e-004	3.0000e-005	7.1000e-004	0.0000	2.9328	2.9328	1.4000e-004	0.0000	2.9363
Total	5.8600e-003	0.0411	0.0431	7.0000e-005	3.0600e-003	1.5000e-004	3.2100e-003	8.3000e-004	1.3000e-004	9.7000e-004	0.0000	7.2530	7.2530	5.6000e-004	0.0000	7.2671

3.6 Paving - 2019

Unmitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	6.2300e-003	0.0628	0.0593	9.0000e-005	3.6500e-003	3.6500e-003	3.6500e-003	3.3600e-003	0.0000	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823
Paving	0.0000				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	6.2300e-003	0.0628	0.0593	9.0000e-005	3.6500e-003	3.6500e-003	3.6500e-003	3.3600e-003	0.0000	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823

Unmitigated Construction Off-Site

Total	4.0600e-003	0.0455	0.0203	4.0000e-005	0.0138	2.1500e-003	0.0159	6.8400e-003	1.9700e-003	8.8100e-003	0.0000	3.7036	1.1700e-003	0.0000	3.7329
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Mitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-005	5.0000e-005	5.3000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1451	0.1451	0.0000	0.0000	0.1452
Total	8.0000e-005	5.0000e-005	5.3000e-004	0.0000	1.6000e-004	0.0000	1.6000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1451	0.1451	0.0000	0.0000	0.1452

3.5 Building - Exterior - 2019

Unmitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	0.2558	1.8910	1.5255	2.5000e-003		0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7543	209.7543	0.0436	0.0000	210.8452
Total	0.2558	1.8910	1.5255	2.5000e-003		0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7543	209.7543	0.0436	0.0000	210.8452

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.2600e-003	0.0730	0.0284	1.6000e-004	3.9200e-003	5.4000e-004	4.4600e-003	1.1300e-003	5.1000e-004	1.6500e-003	0.0000	15.4875	15.4875	8.3000e-004	0.0000	15.5082
Worker	0.0129	9.1700e-003	0.0894	2.7000e-004	0.0268	1.9000e-004	0.0270	7.1300e-003	1.7000e-004	7.3000e-003	0.0000	24.6597	24.6597	6.4000e-004	0.0000	24.6758
Total	0.0161	0.0822	0.1177	4.3000e-004	0.0307	7.3000e-004	0.0314	8.2600e-003	6.8000e-004	8.9500e-003	0.0000	40.1472	40.1472	1.4700e-003	0.0000	40.1839

Mitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	MT/yr															
Off-Road	0.2558	1.8910	1.5255	2.5000e-003	0.1090	0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7541	209.7541	0.0436	0.0000	210.8450
Total	0.2558	1.8910	1.5255	2.5000e-003	0.1090	0.1090	0.1090	0.1045	0.1045	0.1045	0.0000	209.7541	209.7541	0.0436	0.0000	210.8450

Mitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr															
MIT/yr																

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.2600e-003	0.0730	0.0264	1.6000e-004	3.9200e-003	5.4000e-004	4.4600e-003	1.1300e-003	5.1000e-004	1.6500e-003	0.0000	15.4875	15.4875	8.3000e-004	0.0000	15.5082
Worker	0.0129	9.1700e-003	0.0894	2.7000e-004	0.0268	1.9000e-004	0.0270	7.1300e-003	1.7000e-004	7.3000e-003	0.0000	24.6597	24.6597	6.4000e-004	0.0000	24.6758
Total	0.0161	0.0822	0.1177	4.3000e-004	0.0307	7.3000e-004	0.0314	8.2600e-003	6.8000e-004	8.9500e-003	0.0000	40.1472	40.1472	1.4700e-003	0.0000	40.1839

3.6 Paving - 2019

Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Off-Road	6.2300e-003	0.0628	0.0593	9.0000e-005	3.6500e-003	3.6500e-003	3.6500e-003	3.3600e-003	3.3600e-003	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823
Paving	0.0000				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	6.2300e-003	0.0628	0.0593	9.0000e-005	3.6500e-003	3.6500e-003	3.6500e-003	3.3600e-003	3.3600e-003	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8000e-004	2.0000e-004	1.9700e-003	1.0000e-005	5.9000e-004	0.0000	5.9000e-004	1.6000e-004	0.0000	1.6000e-004	0.0000	0.5440	0.5440	1.0000e-005	0.0000	0.5443

Total	2.8000e-004	2.0000e-004	1.9700e-003	1.0000e-005	5.9000e-004	0.0000	5.9000e-004	1.6000e-004	0.0000	1.6000e-004	0.5440	0.0000	1.0000e-005	0.5440	0.0000	0.5443
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Mitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Off-Road	6.2300e-003	0.0628	0.0593	9.0000e-005		3.6500e-003	3.6500e-003		3.3600e-003	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	6.2300e-003	0.0628	0.0593	9.0000e-005		3.6500e-003	3.6500e-003		3.3600e-003	3.3600e-003	0.0000	7.9208	7.9208	2.4600e-003	0.0000	7.9823

Mitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.8000e-004	2.0000e-004	1.9700e-003	1.0000e-005	5.9000e-004	0.0000	5.9000e-004	1.6000e-004	0.0000	1.6000e-004	0.0000	0.5440	0.5440	1.0000e-005	0.0000	0.5443
Total	2.8000e-004	2.0000e-004	1.9700e-003	1.0000e-005	5.9000e-004	0.0000	5.9000e-004	1.6000e-004	0.0000	1.6000e-004	0.0000	0.5440	0.5440	1.0000e-005	0.0000	0.5443

3.7 Building - Interior/Architectural Coating - 2019
Unmitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
	tons/yr															
Archit. Coating	0.6278					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.3300e-003	9.1800e-003	9.2100e-003	1.0000e-005		6.4000e-004	6.4000e-004		6.4000e-004	6.4000e-004	0.0000	1.2766	1.2766	1.1000e-004	0.0000	1.2793
Total	0.6291	9.1800e-003	9.2100e-003	1.0000e-005		6.4000e-004	6.4000e-004		6.4000e-004	6.4000e-004	0.0000	1.2766	1.2766	1.1000e-004	0.0000	1.2793

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
	tons/yr															
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3000e-004	9.0000e-005	9.2000e-004	0.0000	2.8000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	8.0000e-005	0.0000	0.2539	0.2539	1.0000e-005	0.0000	0.2540
Total	1.3000e-004	9.0000e-005	9.2000e-004	0.0000	2.8000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	8.0000e-005	0.0000	0.2539	0.2539	1.0000e-005	0.0000	0.2540

Mitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
	tons/yr															
Mitigated Construction On-Site																

Archit. Coating	0.6278								0.0000	0.0000				0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Off-Road	1.3300e-003	9.1800e-003	9.2100e-003	1.0000e-005				6.4000e-004	6.4000e-004			6.4000e-004	6.4000e-004	6.4000e-004	1.2766	1.2766	1.1000e-004	1.1000e-004	1.2766	1.2766	1.1000e-004	1.2793
Total	0.6291	9.1800e-003	9.2100e-003	1.0000e-005				6.4000e-004	6.4000e-004			6.4000e-004	6.4000e-004	6.4000e-004	1.2766	1.2766	1.1000e-004	1.1000e-004	1.2766	1.2766	1.1000e-004	1.2793

Mitigated Construction Off-Site

Category	tons/yr										MT/yr					CO2e
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3000e-004	9.0000e-005	9.2000e-004	0.0000	2.8000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	8.0000e-005	0.0000	0.2539	0.2539	1.0000e-005	0.0000	0.2540
Total	1.3000e-004	9.0000e-005	9.2000e-004	0.0000	2.8000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	8.0000e-005	0.0000	0.2539	0.2539	1.0000e-005	0.0000	0.2540

3.8 Trenching/Foundation - 2019

Unmitigated Construction On-Site

Category	tons/yr										MT/yr					CO2e
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	
Off-Road	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488
Total	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488

Unmitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	7.0000e-005	6.6000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1813	0.1813	0.0000	0.0000	0.1814
Total	9.0000e-005	7.0000e-005	6.6000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1813	0.1813	0.0000	0.0000	0.1814

Mitigated Construction On-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Off-Road	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488
Total	2.4700e-003	0.0251	0.0279	4.0000e-005	1.4300e-003	1.4300e-003	1.4300e-003	1.3100e-003	1.3100e-003	1.3100e-003	0.0000	3.7194	3.7194	1.1800e-003	0.0000	3.7488

Mitigated Construction Off-Site

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	7.0000e-005	6.6000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1813	0.1813	0.0000	0.0000	0.1814
Total	9.0000e-005	7.0000e-005	6.6000e-004	0.0000	2.0000e-004	0.0000	2.0000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1813	0.1813	0.0000	0.0000	0.1814

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.0713	0.2381	0.7894	2.4300e-003	0.2128	2.8600e-003	0.2156	0.0571	2.6900e-003	0.0598	0.0000	221.6297	221.6297	8.0100e-003	0.0000	221.8300
Unmitigated	0.0713	0.2381	0.7894	2.4300e-003	0.2128	2.8600e-003	0.2156	0.0571	2.6900e-003	0.0598	0.0000	221.6297	221.6297	8.0100e-003	0.0000	221.8300

4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated Annual VMT	Mitigated Annual VMT
	Weekday	Saturday	Sunday		
Condo/Townhouse	255.64	249.48	212.96	574,314	574,314
Parking Lot	0.00	0.00	0.00		
Total	255.64	249.48	212.96	574,314	574,314

4.3 Trip Type Information

Land Use	Miles					Trip %					Trip Purpose %		
	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C- H-S or C-C	H-O or C-NW	H-W or C- H-S or C-C	H-O or C-NW	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by	
Condo/Townhouse	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3				
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0				

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Condo/Townhouse	0.586103	0.042797	0.200835	0.113384	0.018054	0.005119	0.010148	0.010539	0.002013	0.003657	0.005892	0.000682	0.000777
Parking Lot	0.586103	0.042797	0.200835	0.113384	0.018054	0.005119	0.010148	0.010539	0.002013	0.003657	0.005892	0.000682	0.000777

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Category	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
	M/yr															
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	29.2191	29.2191	2.9200e-003	6.0000e-004	29.4723
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	29.2191	29.2191	2.9200e-003	6.0000e-004	29.4723
Natural Gas Mitigated	5.3900e-003	0.0461	0.0196	2.9000e-004		3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619
Natural Gas Unmitigated	5.3900e-003	0.0461	0.0196	2.9000e-004		3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619

5.2 Energy by Land Use - Natural Gas

Unmitigated

Land Use	Natural Gas Use kBTU/yr	tons/yr										MT/yr					
		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	0.0000	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	0.0000	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619

Mitigated

Land Use	Natural Gas Use kBTU/yr	tons/yr										MT/yr					
		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	0.0000	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	0.0000	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619

5.3 Energy by Land Use - Electricity

Unmitigated

Land Use	Electricity Use kWh/yr	MT/yr				
		Total CO2	CH4	N2O	CO2e	

Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786
Total		29.2191	2.9200e-003	6.1000e-004	29.4723

Mitigated

Land Use	Electricity Use kWh/yr	Total CO2	CH4	N2O	CO2e
Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786
Total		29.2191	2.9200e-003	6.1000e-004	29.4723

6.0 Area Detail

6.1 Mitigation Measures Area

Category	tons/yr															
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.4209	5.3100e-003	0.3286	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.5000e-004	3.0000e-005	2.3152
Unmitigated	0.4209	5.3100e-003	0.3286	3.0000e-005	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.5000e-004	3.0000e-005	2.3152

6.2 Area by SubCategory

Unmitigated

SubCategory	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005		1.2000e-004	1.2000e-004		1.2000e-004	1.2000e-004	0.0000	1.7577	3.0000e-005	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.9900e-003	3.7900e-003	0.3279	2.0000e-005		1.8000e-003	1.8000e-003		1.8000e-003	1.8000e-003	0.0000	0.5339	5.2000e-004	5.2000e-004	0.0000	0.5470
Total	0.4209	5.3100e-003	0.3286	3.0000e-005		1.9200e-003	1.9200e-003		1.9200e-003	1.9200e-003	0.0000	2.2917	5.5000e-004	5.5000e-004	3.0000e-005	2.3151

Mitigated

SubCategory	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0628					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.3480					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.8000e-004	1.5200e-003	6.5000e-004	1.0000e-005		1.2000e-004	1.2000e-004		1.2000e-004	1.2000e-004	0.0000	1.7577	3.0000e-005	3.0000e-005	3.0000e-005	1.7682
Landscaping	9.9900e-003	3.7900e-003	0.3279	2.0000e-005		1.8000e-003	1.8000e-003		1.8000e-003	1.8000e-003	0.0000	0.5339	5.2000e-004	5.2000e-004	0.0000	0.5470
Total	0.4209	5.3100e-003	0.3286	3.0000e-005		1.9200e-003	1.9200e-003		1.9200e-003	1.9200e-003	0.0000	2.2917	5.5000e-004	5.5000e-004	3.0000e-005	2.3151

7.0 Water Detail

7.1 Mitigation Measures Water

Category	Total CO2			CH4			N2O			CO2e		
	MIT/yr											
Mitigated	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	4.6563							
Unmitigated	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	4.6563							

7.2 Water by Land Use

Unmitigated

Land Use	Indoor/Outdoor Use		Total CO2			CH4			N2O			CO2e		
	Mgal		MIT/yr											
Condo/Townhouse	2.86678	1.80732	3.8869	3.7800e-003	2.2700e-003	2.2700e-003	4.6563							
Parking Lot	0	0	0.0000	0.0000	0.0000	0.0000	0.0000							
Total			3.8869	3.7800e-003	2.2700e-003	2.2700e-003	4.6563							

Mitigated

Land Use	Indoor/Outdoor Use Mgal	Total CO2			CO2e
		CH4	N2O	MT/yr	
Condo/Townhouse	2.86678 / 1.80732	3.8869	3.7800e-003	2.2700e-003	4.6563
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		3.8869	3.7800e-003	2.2700e-003	4.6563

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2			CO2e
	CH4	N2O	MT/yr	
Mitigated	4.1085	0.2428	0.0000	10.1787
Unmitigated	4.1085	0.2428	0.0000	10.1787

8.2 Waste by Land Use

Unmitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
		MT/yr			
Condo/Townhouse e	20.24	4.1085	0.2428	0.0000	10.1787
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

Mitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
		MT/yr			
Condo/Townhouse e	20.24	4.1085	0.2428	0.0000	10.1787
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		4.1085	0.2428	0.0000	10.1787

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
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10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
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Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
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User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

3833 Redwood Hwy Existing - Marin County, Annual

3833 Redwood Hwy Existing
Marin County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Office Building	21.00	1000sqft	0.48	21,000.00	0
Parking Lot	47.00	1000sqft	1.08	47,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	69
Climate Zone	5			Operational Year	2020

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MW/hr)	290	CH4 Intensity (lb/MW/hr)	0.029	N2O Intensity (lb/MW/hr)	0.006
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1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E 2020 Rates = 290

Land Use - Existing Land Use

Construction Phase - Existing Land Use

Off-road Equipment - Existing No Construction

Grading - Existing no construction

Demolition -

Trips and VMT -

Woodstoves -

Water And Wastewater - WTP treatment 100% aerobic

Table Name	Column Name	Default Value	New Value
tbiConstructionPhase	NumDays	2.00	1.00
tbiConstructionPhase	PhaseEndDate	1/30/2019	1/29/2019
tbiOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tbiOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tbiOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tbiProjectCharacteristics	CO2IntensityFactor	641.35	290
tbiTripsAndVMT	WorkerTripNumber	0.00	8.00
tbiWater	AerobicPercent	87.46	100.00
tbiWater	AerobicPercent	87.46	100.00
tbiWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tbiWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tbiWater	SepticTankPercent	10.33	0.00
tbiWater	SepticTankPercent	10.33	0.00

2.0 Emissions Summary

2.2 Overall Operational
Unmitigated Operational

Category	tons/yr											MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Area	0.0970	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003
Energy	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	58.3003	58.3003	4.0800e-003	1.1600e-003	0.0000	58.7465
Mobile	0.0511	0.1725	0.5725	1.7800e-003	0.1558	2.0900e-003	0.1579	0.0418	1.9600e-003	0.0438	0.0000	162.0389	162.0389	5.8300e-003	0.0000	0.0000	162.1845

Waste										0.0000	0.0000	3.9644	0.0000	0.2343	0.0000	9.8217
Water										0.0000	0.0000	5.0304	2.9500e-003	4.9200e-003	2.9500e-003	6.0319
Total	0.1503	0.1924	0.5898	1.9000e-003	0.1558	3.6000e-003	0.1594	0.0418	3.4700e-003	0.0453	5.2849	229.3352	0.2491	4.1100e-003	4.1100e-003	236.7859

Mitigated Operational

Category	tons/yr											MT/yr				
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Area	0.0970	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003
Energy	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	58.3003	58.3003	4.0800e-003	1.1600e-003	58.7465
Mobile	0.0511	0.1725	0.5725	1.7800e-003	0.1558	2.0900e-003	0.1579	0.0418	1.9600e-003	0.0438	0.0000	162.0389	162.0389	5.8300e-003	0.0000	162.1845
Waste						0.0000	0.0000		0.0000	0.0000	3.9644	0.0000	0.2343	0.0000	9.8217	
Water						0.0000	0.0000		0.0000	0.0000	1.3205	3.7098	5.0304	4.9200e-003	2.9500e-003	6.0319
Total	0.1503	0.1924	0.5898	1.9000e-003	0.1558	3.6000e-003	0.1594	0.0418	3.4700e-003	0.0453	5.2849	224.0502	229.3352	0.2491	4.1100e-003	236.7859

Percent Reduction	ROG		NOx		CO		SO2		Fugitive PM10		Exhaust PM10		PM10 Total		Fugitive PM2.5		Exhaust PM2.5		PM2.5 Total		Bio- CO2		NBio- CO2		Total CO2		CH4		N2O		CO2e	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.0511	0.1725	0.5725	1.7800e-003	0.1558	2.0900e-003	0.1579	0.0418	1.9600e-003	0.0438	0.0000	162.0389	5.8300e-003	0.0000	0.0000	162.1845
Unmitigated	0.0511	0.1725	0.5725	1.7800e-003	0.1558	2.0900e-003	0.1579	0.0418	1.9600e-003	0.0438	0.0000	162.0389	5.8300e-003	0.0000	0.0000	162.1845

4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated Annual VMT	Mitigated Annual VMT
	Weekday	Saturday	Sunday		
General Office Building	231.63	51.66	22.05	420,549	420,549
Parking Lot	0.00	0.00	0.00		
Total	231.63	51.66	22.05	420,549	420,549

4.3 Trip Type Information

Land Use	Miles						Trip %				Trip Purpose %				
	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-...	H-S or C-C	H-O or C-NW	H-W or C-...	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by	Primary	Diverted	Pass-by
General Office Building	9.50	7.30	7.30	33.00	48.00	19.00	33.00	48.00	19.00	77	19	4	77	19	4
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Office Building	0.586103	0.042797	0.200835	0.113384	0.018054	0.005119	0.010148	0.010539	0.002013	0.003657	0.005892	0.000682	0.000777
Parking Lot	0.586103	0.042797	0.200835	0.113384	0.018054	0.005119	0.010148	0.010539	0.002013	0.003657	0.005892	0.000682	0.000777

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Category	tons/yr										MT/yr					CO2e
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	36.6383	36.6383	3.6600e-003	7.6000e-004	36.9558
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	36.6383	36.6383	3.6600e-003	7.6000e-004	36.9558
NaturalGas Mitigated	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907
NaturalGas Unmitigated	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907

5.2 Energy by Land Use - NaturalGas

Unmitigated

Land Use	NaturalGas Use KBTU/yr	tons/yr										MT/yr					CO2e
		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	
General Office Building	405930	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907

Mitigated

Land Use	Natural Gas Use kBtu/yr	tons/yr										MT/yr					
		ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
General Office Building	405930	2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		2.1900e-003	0.0199	0.0167	1.2000e-004	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	1.5100e-003	0.0000	21.6620	21.6620	4.2000e-004	4.0000e-004	21.7907

5.3 Energy by Land Use - Electricity

Unmitigated

Land Use	Electricity Use kWh/yr	MT/yr					
		Total CO2	CH4	N2O	CO2e		
General Office Building	262080	34.4745	3.4500e-003	7.1000e-004	34.7732		
Parking Lot	16450	2.1639	2.2000e-004	4.0000e-005	2.1826		
Total		36.6383	3.6700e-003	7.5000e-004	36.9558		

Mitigated

Land Use	Electricity Use kWh/yr	MT/yr					
		Total CO2	CH4	N2O	CO2e		
General Office Building	262080	34.4745	3.4500e-003	7.1000e-004	34.7732		

Parking Lot	16450	2.1639	2.2000e-004	4.0000e-005	2.1826
Total		36.6383	3.6700e-003	7.5000e-004	36.9558

6.0 Area Detail

6.1 Mitigation Measures Area

Category	tons/yr										MT/yr						
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e	
Mitigated	0.0970	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003
Unmitigated	0.0970	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003

6.2 Area by SubCategory

Unmitigated

SubCategory	tons/yr										MT/yr						
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e	
Architectural Coating	0.0119					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0851					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	6.0000e-005	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003

Total	0.0970	1.0000e-005	6.3000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2200e-003	1.2200e-003	0.0000	0.0000	1.3000e-003
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Mitigated

SubCategory	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Architectural Coating	0.0119					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0851					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	6.0000e-005	1.0000e-005	6.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003
Total	0.0970	1.0000e-005	6.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2200e-003	0.0000	0.0000	0.0000	1.3000e-003

7.0 Water Detail

7.1 Mitigation Measures Water

Category	MT/yr				
	Total CO2	CH4	N2O	CO2e	CO2e
Mitigated	5.0304	4.9200e-003	2.9500e-003	6.0319	6.0319
Unmitigated	5.0304	4.9200e-003	2.9500e-003	6.0319	6.0319

7.2 Water by Land Use

Unmitigated

Land Use	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
	Mgal	MIT/yr			
General Office Building	3.73241 / 2.28761	5.0304	4.9200e-003	2.9500e-003	6.0319
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		5.0304	4.9200e-003	2.9500e-003	6.0319

Mitigated

Land Use	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
	Mgal	MIT/yr			
General Office Building	3.73241 / 2.28761	5.0304	4.9200e-003	2.9500e-003	6.0319
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		5.0304	4.9200e-003	2.9500e-003	6.0319

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	3.9644	0.2343	0.0000	9.8217
Unmitigated	3.9644	0.2343	0.0000	9.8217

8.2 Waste by Land Use

Unmitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
		MT/yr			
General Office Building	19.53	3.9644	0.2343	0.0000	9.8217
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		3.9644	0.2343	0.0000	9.8217

Mitigated

Land Use	Waste Disposed tons	Total CO2	CH4	N2O	CO2e
		MT/yr			
General Office Building	19.53	3.9644	0.2343	0.0000	9.8217

Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		3.9644	0.2343	0.0000	9.8217

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
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10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
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Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type
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User Defined Equipment

Equipment Type	Number
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11.0 Vegetation

3833 Redwood Hwy - Marin County, Annual

**3833 Redwood Hwy
Marin County, Annual**

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Parking Lot	15.00	Space	0.00	6,000.00	0
Condo/Townhouse	44.00	Dwelling Unit	2.00	89,000.00	126

1.2 Other Project Characteristics

Urbanization	Urban	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	69
Climate Zone	5			Operational Year	2030

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MW/hr)	290	CH4 Intensity (lb/MW/hr)	0.029	N2O Intensity (lb/MW/hr)	0.006
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1.3 User Entered Comments & Non-Default Data

Project Characteristics - PG&E Intensity Factor Updated

Land Use - Values from Project Specifications

Construction Phase - added trenching

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - Default Construction Equipment and hours

Off-road Equipment -

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - added trenching

Trips and VMT -

Demolition - 18,100sf demo

Grading - 2,000cy exported, 10,000cy imported

Woodstoves - No woodmass, wood moved to gas

Energy Use -

Water And Wastewater - WTP treatment, 100% aerobic

Table Name	Column Name	Default Value	New Value
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	6.60	14.08
tblFireplaces	NumberWood	7.48	0.00
tblGrading	MaterialExported	0.00	2,000.00
tblGrading	MaterialImported	0.00	10,000.00
tblLandUse	LandUseSquareFeet	44,000.00	89,000.00
tblLandUse	LotAcreage	0.13	0.00
tblLandUse	LotAcreage	2.75	2.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblTripsAndVMT	HaulingTripNumber	1,500.00	0.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWoodstoves	WoodstoveWoodMass	582.40	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Area	0.4207	5.2800e-003	0.3266	3.0000e-005		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3149
Energy	5.3900e-003	0.0461	0.0196	2.9000e-004		3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	82.5639	82.5639	3.9400e-003	1.5800e-003	83.1341
Mobile	0.0394	0.1256	0.4263	1.7800e-003	0.2121	1.4200e-003	0.2135	0.0568	1.3300e-003	0.0581	0.0000	163.3251	163.3251	4.8000e-003	0.0000	163.4450
Waste						0.0000	0.0000		0.0000	0.0000	4.1085	0.0000	4.1085	0.2428	0.0000	10.1787
Water						0.0000	0.0000		0.0000	0.0000	1.0143	2.8726	3.8869	3.7800e-003	2.2700e-003	4.6563
Total	0.4655	0.1770	0.7725	2.1000e-003	0.2121	7.0700e-003	0.2191	0.0568	6.9800e-003	0.0638	5.1228	251.0533	256.1761	0.2559	3.8800e-003	263.7290

Mitigated Operational

Category	tons/yr										MT/yr					
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Area	0.4207	5.2800e-003	0.3266	3.0000e-005		1.9300e-003	1.9300e-003		1.9300e-003	1.9300e-003	0.0000	2.2917	2.2917	5.4000e-004	3.0000e-005	2.3149
Energy	5.3900e-003	0.0461	0.0196	2.9000e-004		3.7200e-003	3.7200e-003		3.7200e-003	3.7200e-003	0.0000	82.5639	82.5639	3.9400e-003	1.5800e-003	83.1341
Mobile	0.0394	0.1256	0.4263	1.7800e-003	0.2121	1.4200e-003	0.2135	0.0568	1.3300e-003	0.0581	0.0000	163.3251	163.3251	4.8000e-003	0.0000	163.4450
Waste						0.0000	0.0000		0.0000	0.0000	4.1085	0.0000	4.1085	0.2428	0.0000	10.1787
Water						0.0000	0.0000		0.0000	0.0000	1.0143	2.8726	3.8869	3.7800e-003	2.2700e-003	4.6563
Total	0.4655	0.1770	0.7725	2.1000e-003	0.2121	7.0700e-003	0.2191	0.0568	6.9800e-003	0.0638	5.1228	251.0533	256.1761	0.2559	3.8800e-003	263.7290

ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent Reduction															

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	tons/yr															
	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Mitigated	0.0394	0.1256	0.4263	1.7800e-003	0.2121	1.4200e-003	0.2135	0.0568	1.3300e-003	0.0581	0.0000	163.3251	163.3251	4.8000e-003	0.0000	163.4450
Unmitigated	0.0394	0.1256	0.4263	1.7800e-003	0.2121	1.4200e-003	0.2135	0.0568	1.3300e-003	0.0581	0.0000	163.3251	163.3251	4.8000e-003	0.0000	163.4450

4.2 Trip Summary Information

Land Use	Average Daily Trip Rate			Unmitigated Annual VMT
	Weekday	Saturday	Sunday	
Condo/Townhouse	255.64	249.48	212.96	574,314
Parking Lot	0.00	0.00	0.00	
Total	255.64	249.48	212.96	574,314

4.3 Trip Type Information

Land Use	Miles			Trip %			Trip Purpose %		
	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Condo/Townhouse	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619

Mitigated

Land Use	Natural Gas Use	kBTU/yr	tons/yr											MT/yr			
			ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio-CO2	NBio-CO2	Total CO2	CH4	N2O
Condo/Townhouse	999645	5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619		
Parking Lot	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Total		5.3900e-003	0.0461	0.0196	2.9000e-004	3.7200e-003	3.7200e-003	3.7200e-003	3.7200e-003	0.0000	53.3449	53.3449	1.0200e-003	9.8000e-004	53.6619		

5.3 Energy by Land Use - Electricity

Unmitigated

Land Use	Electricity Use	kWh/yr	MT/yr					CO2e
			Total CO2	CH4	N2O	CO2e		
Condo/Townhouse	220028	28.9428	2.8900e-003	6.0000e-004	29.1936			
Parking Lot	2100	0.2762	3.0000e-005	1.0000e-005	0.2786			
Total		29.2191	2.9200e-003	6.1000e-004	29.4723			