RGD ACOUSTICS

Acoustical & Audiovisual Consultants

DRAFT ACOUSTICAL STUDY FOR:

703 Third Street

San Rafael, CA

RGD Project #: 18-034

PREPARED FOR:

703 Third Street Associates, LLC
980 Fifth Avenue
San Rafael, CA 94901

PREPARED BY:

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Tsz ("Anthony") Wong

DATE:

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1. Introduction

The project is a 6-story mixed-use building including 120-apartments and ground floor retail space in downtown San Rafael. The project site is exposed to noise from SMART trains, US Highway 101, and Second and Third Streets. This study addresses the existing and future noise with respect to the requirements of the State of California Building Code and the City of San Rafael General Plan. Potential temporary noise impacts from construction activities are also evaluated.

2. Environmental Noise Fundamentals

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter captures the sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels. To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car passby or airplane flyover. To express the average noise level the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 15 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time.

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (DNL or L_{dn}) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the L_{eq} except they include a 10 dB penalty during nighttime hours (and a 5 dB penalty during evening hours in the CNEL) to account for peoples increased sensitivity during these hours. The CNEL and L_{dn} are typically less that one decibel apart.

In environmental noise, a change in noise level of 3 dB is considered a just noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness.

3. Acoustical Criteria

3.1. State of California

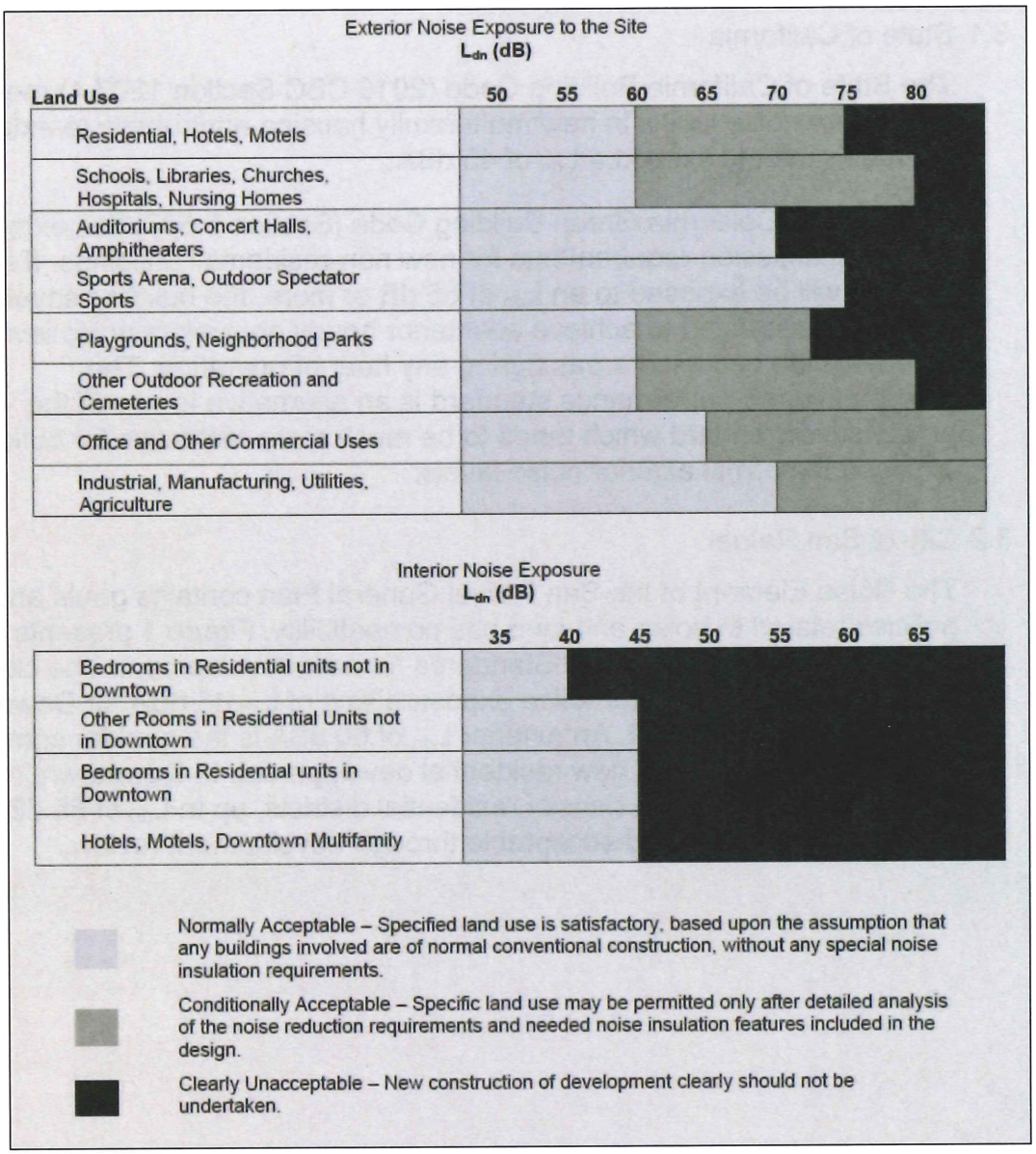
The State of California Building Code (2016 CBC Section 1207.4) requires that indoor noise levels in new multi-family housing attributable to exterior sources shall not exceed a L_{dn} of 45 dBA.

The State of California Green Building Code (Section 5.507) has exterior noise transmission requirements for new non-residential buildings. If the building will be exposed to an L_{dn} of 65 dB or more, the building envelope shall be constructed to achieve an interior hourly equivalent noise level (L_{eq}) of 50 dBA in the occupied areas during any hour of operation. The aforementioned performance standard is an alternative to use of the prescriptive standard which tends to be much more restrictive for buildings exposed to normal exterior noise levels.

3.2. City of San Rafael

The Noise Element of the San Rafael General Plan contains goals and policies related to noise and land use compatibility. Figure 1 presents the city's Land Use Compatibility Standards for new development. The city's policies identify an interior noise exposure limit of L_{dn} 45 dBA for Downtown Multifamily development. An exterior L_{dn} of 60 dBA is the goal for common usable outdoor areas in new residential development. In Downtown, mixed-use residential and high density residential districts, up to L_{dn} of 65 dBA may be allowed if determined acceptable through development review.

Figure 1: Land Use Compatibility Standards for New Development



The San Rafael Municipal Code (Section 14.16.260) also includes noise performance standards. The standards tend to reiterate the General Plan policies. The Municipal Code (Section 8.13.040) specifies general noise limits as summarized in Table 8.13-1. These noise limits would apply to project noise sources such as roof-top mechanical equipment.

Table 8.13-1—General Noise Limits

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

The Municipal Code (Section 8.13.050) includes an exception to the noise limits for certain construction activities as described in the following excerpt.

> ***Construction***. *Except as otherwise provided in subsection B of this section, or by the planning commission or city council as part of the development review for the project, on any construction project on property within the city, construction, alteration, demolition, maintenance of construction equipment, deliveries of materials or equipment, or repair activities otherwise allowed under applicable law shall be allowed between the hours of seven a.m. (7:00 a.m.) and six p.m. (6:00 p.m.), Monday through Friday, and nine a.m. (9:00 a.m.) and six p.m. (6:00 p.m.) on Saturdays, provided that the noise level at any point outside of the property plane of the project shall not exceed ninety (90) dBA. All such activities shall be precluded on Sundays and holidays. Violation of the foregoing may subject the permittee to suspension of work by the chief building official for up to two (2) days per violation.*

1.

4. Noise Environment

In addition to the noise from SMART train operations, the project site is exposed to noise from traffic on 2nd Street, 3rd Street, Lincoln Avenue, Tamalpais Street and US 101. The noise environment at the project site is quantified by a combination of acoustical measurements and predictions.

4.1. Noise Measurements

To quantify the existing noise environment, noise measurements were made at the site including two continuous 3-day noise measurements (Locations LT-1 and LT-2) and three short-term attended noise measurements at Location ST-1, ST-2, and ST-3. The noise measurement locations are shown in Figure 2.

The long-term measurement at Location LT-1 was on a light pole at the setback of the proposed site along 3rd Street at a height of 12 feet above ground. The dominant noise source was traffic on Third Street. The long-term measurement location at Location LT-2 was on a light pole along Lincoln Avenue at a height of 12 feet above ground. The light pole is located near the sidewalk edge, closer to Lincoln Avenue than the setback of the proposed building. The dominant noise sources at this location were traffic on Third Street and Lincoln Avenue. The noise from US-101 did not significantly affect this location because of the acoustical shielding provided by the existing building.

The short-term measurement at Location ST-1 was conducted on Tamalpais Avenue at the setback of the proposed building. The dominant noise source is traffic on Third Street since traffic on Tamalpais Avenue was much lighter. The noise measurement also included noise from people talking and laughing on and near the project site. Adjustments were made to exclude noise from people talking close to the microphone.

The short-term measurement at Location ST-2 was conducted on the roof of the nearby parking structure on 2nd Street. The dominant noise source was traffic on US-101.

The short-term measurement at Location ST-3 was conducted on the 4th Street sidewalk near the Lotus Cusine of India. This location was approximately in line with the setback of the proposed building from Tamalpais Avenue and the future SMART train tracks. The purpose of ST-3 was to document the noise level of SMART trains.

Figures 3 and 4 show the long-term measurement results. Table 2 summarizes the short-term measurements at Locations ST-1 and ST-2. Table 3 shows the measured noise levels from SMART trains at Location ST-3.

Figure 2: Noise Measurement Locations

Figure 2: Long-Term Noise Measurement Results at LT-1 (L_{dn} 72 dBA)

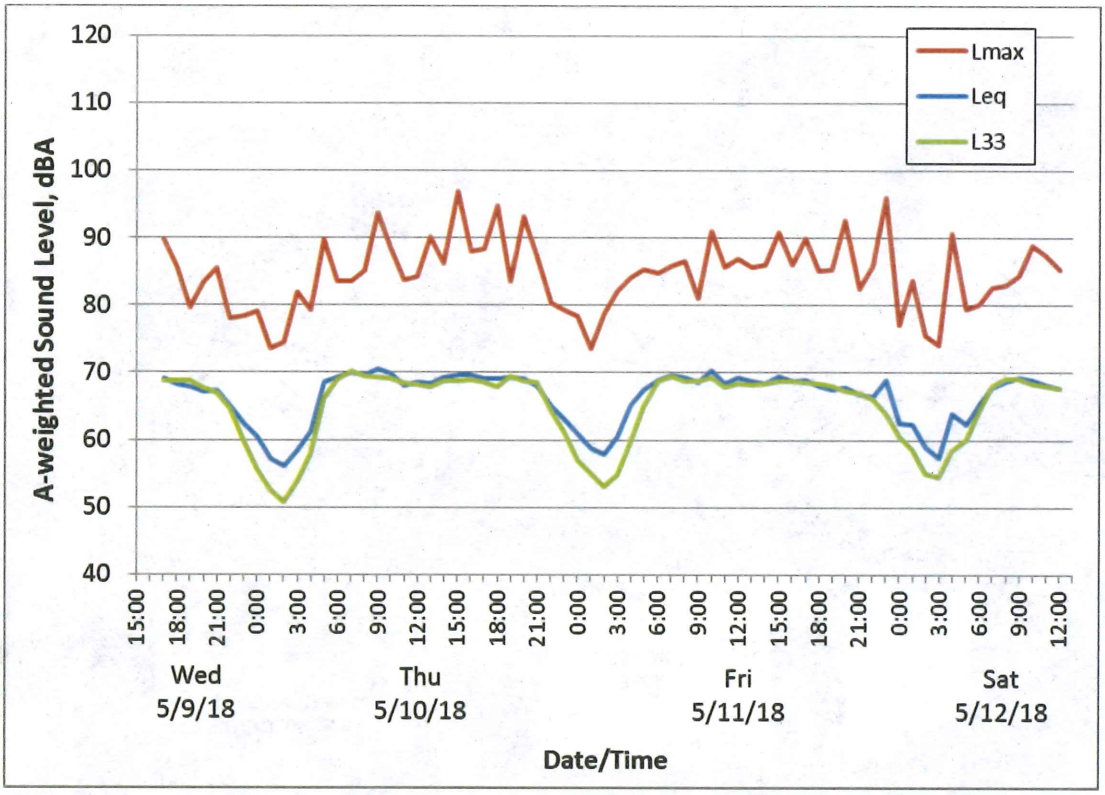


Figure 3: Long-Term Noise Measurement Results at LT-2 (L_{dn} 72 dBA)

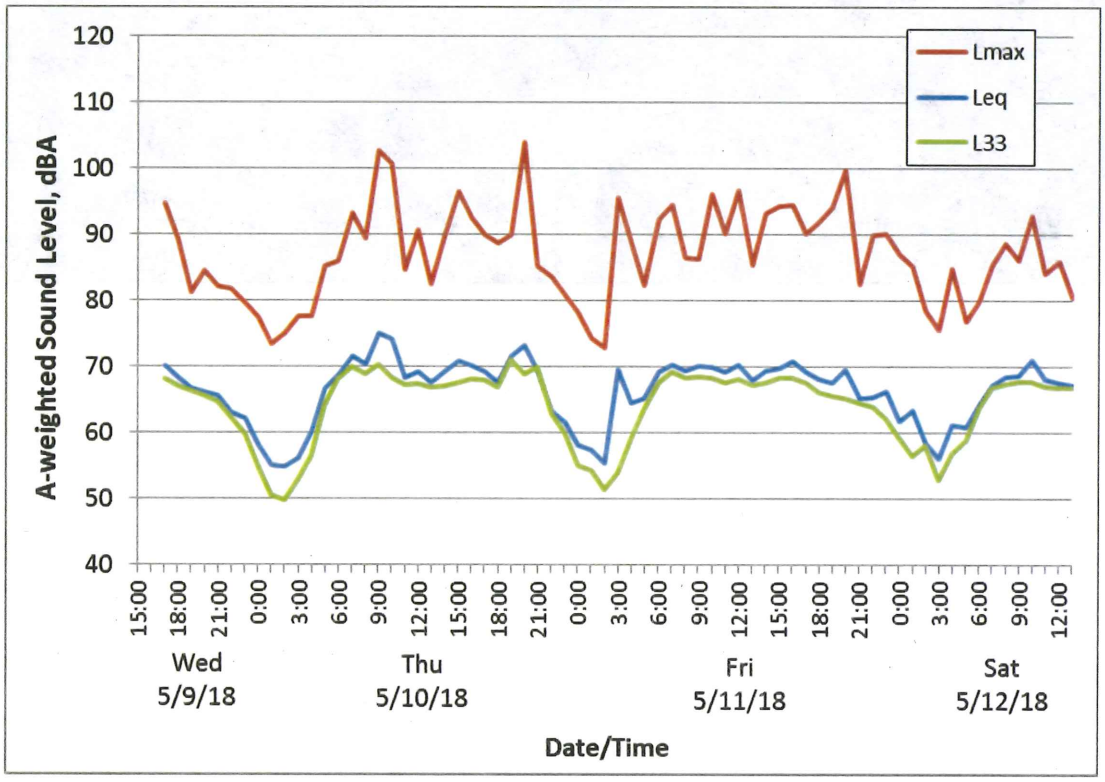


Table 2: Short-Term Noise Measurement Results

Location		Date/Time	A-weighted Sound Level, dBA					
			L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{dn}*
ST-1	Tamalpais Ave 5 feet above ground	9 May 18 5:36 PM – 5:56 PM	67	82	69	65	61	69
ST-2	Parking Lot Structure Roof	11 May 18 2:44 PM – 2:59 PM	67	74	68	67	66	71

*Ldn calculated based on correlation with simultaneous measurement at long-term locations.

Table 3: SMART Train Passby Noise Measurement Results, 9 May 2018

Train Direction	Time	Leq (dBA)	Duation (seconds)	L_{max} (dBA)
Arriving Train	4:58 PM	68	219	Crossing bells: 66 – 67 Train engine: 67 – 74 Screech: 69, 71
Departing Train	5:01 PM	73	62	Crossing bells: 67 – 68 Train engine: 73 – 77 Horn: 85, 74, 67

4.1. Future SMART Train Noise

Although the SMART alignment currently ends at the Downtown San Rafael Station, the process to extend the alignment to the south has begun. Noise from future SMART Train operations will affect the project building primarily along the east, north and south facing elevations. Since the City of San Rafael established a "Quiet Zone" the trains are not required to sound their horn as they approach and enter at-grade roadway crossings. The trains only sound the horn as it leaves a station or if the train operator determines that it is necessary for safety. This is consistent with our on-site observation that only the departing train sounded its horn and the arriving train did not.

According to the SMART train schedule, the San Rafael station sees 28 departing/arriving trains during the daytime hours (7 AM and 10 PM) and 6 departing/arriving trains during the nighttime hours (10 PM and 7 AM). Based on our measurements and the SMART train schedule, noise from SMART trains will generate a day/night average noise level of L_{dn} 61 dBA at the project site. We have assumed that the "Quiet Zone" operations will occur at the new train operations to the south of the Downtown San Rafael Station. Therefore, the SMART train noise contribution is relatively small compared to the noise contributions from traffic on the nearby streets and freeway.

5. Analysis/Preliminary Recommendations

Based on our measurements and calculations, the proposed building would be exposed to an exterior L_{dn} of up to 75 dBA along the east façade, 74 dBA along the north façade, 71 dBA along the west façade, and 70 dBA along the south façade. We have included a 1 dBA increase in the traffic noise to account for an approximate 25% increase in future traffic.

Exterior noise levels at the site will generally be in the "conditional acceptable" range according to the General Plan's compatibility guidelines. Therefore, detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Outdoor Use Areas

According to the San Rafael General Plan, an exterior L_{dn} of 60 dBA is the goal for common usable outdoor areas in new residential development. However, in Downtown, mixed-use residential and high density residential districts, an exterior L_{dn} of up to 65 dBA may be allowed if determined acceptable through development review.

The primary outdoor use areas for the project are the courtyard at the second level and the roof deck along the north and east side of the building at the roof level. These areas are acoustically shielded by the project building. Based on our analysis, the common use courtyard on the 2nd floor would be exposed to a L_{dn} of less than 60 dBA and the common use rooftop roof deck would be exposed to a L_{dn} of 68 dBA. The calculation of roof deck noise levels includes the noise barrier effect of a solid 4-foot high parapet wall for a seated person in the roof deck area. To meet the City's goal of L_{dn} 65 dBA at the roof deck, a 6 foot high solid parapet wall would be needed.

Interior Noise

The State of California and the City of San Rafael require that interior noise levels be reduced to an L_{dn} of 45 dBA or less in habitable residential rooms. Based on our measurements and calculations, sound-rated windows and specially constructed exterior walls will be required in order to meet the City and State's indoor standard.

The Planning Submittal drawings dated 20 March 2018 include typical unit layouts on Sheet A6.0 and exterior elevations on Sheets A9.0 and A10.0.

Based on the measured traffic and predicted train noise levels, our preliminary analysis indicates that most rooms will require windows with an STC rating of approximately STC 36. Some corner rooms may require windows with higher ratings. Balcony doors will also need to be sound-rated. Some of the walls with siding may require additional layers of gypsum board.

The STC ratings discussed in this section are preliminary and should not be used for detailed design or construction. Detailed recommendations for window, balcony doors, and/or exterior wall STC ratings would be determined during the architectural design phase and are excluded from this report.

The windows in the dwelling units are expected to be in the closed position to meet the required interior noise level as per CBC 1207.4. This closed window condition will need to be considered by the Mechanical Engineer in their determination of the outdoor air ventilation requirements for the dwelling units. Specifically, if the Mechanical Engineer determines that the ventilation code for these dwelling units requires outdoor air, then natural ventilation via open windows should not be relied upon and that an alternate means of achieving outdoor air should be provided such as through mechanical ventilation. Additionally, the alternate means for achieving outdoor air must be reviewed by the Acoustical Consultant to confirm that it does not otherwise compromise the noise reduction provided by the window and wall assembly.

Meeting the California Green Building Code performance standard of L_{eq} 50 dBA at the non-residential portions of the building will generally require less noise insulation than at the residential portion of the building. The proposed building would be exposed to a peak-hourly L_{eq} of 70 dBA on the ground floor. Therefore, the non-residential spaces of the building (i.e. retail space and lobby) would need to provide a noise reduction of 20 decibels. Standard building construction will reduce noise levels by approximately 25 dBA with the windows and doors closed.

Construction Noise

At this time in the project development there is no proposed construction schedule. Also, the equipment that will be used at the site has not been determined. For the purpose of this noise assessment it is assumed that standard excavation activities and equipment will be used with no major earthmoving or fill/cut activities. Typical low rise construction equipment and a crane will likely be used during the construction of the 6 story building. Based on some initial assumptions on the soil conditions, the foundation type will be slab on grade and possibly Torque Down Piles. This type of piles are less disruptive and do not require off haul[1].

Table 4 presents typical construction equipment noise levels at a reference distance of 50 feet. The noisier activities tend to occur during the demolishing, grading and foundation phases of construction. The later construction phases of the project building generate lower noise levels when the construction activities occur indoors. The noisiest activities on in Table 4 is pile driving (impact or vibratory). According to the project design team, the project construction will likely use Torque Down Piles which generate lower noise levels. Although we do not have specific noise data for this activity, it is likely comparable to an auger drill rig which generates an L_{max} of 84 dBA at 50 feet.

[1] Email from Architect, VMWP and Developer Willis K. Polite Jr, 15 May 2018.

The nearest existing land use is the commercial building (Marin Color Service Paint and Decorating) directly to the south on the same block. This building backs up to the project site so there are no large openings (i.e. windows or doors) facing the project site. The next nearest land uses are the commercial buildings across Lincoln Street and Third Streets. These buildings are at least 60 feet from the project site. The Whistlestop Active Aging Center is located 90 feet northeast of the project site, across Third Street and Tamalpais Street. This center provides services for seniors including meals, educational classes, gatherings and referral services. The Whistlestop is not a residential facility. The nearest residences are along Fifth Avenue about 600 feet north of the site. Other residential land uses to the west, east and south are at least 1,000 feet from the project site.

Sound levels from construction equipment will be reduced with distance at a rate of 6 dBA per doubling of distance. For example, a dozer that generates a noise level of 85 dBA at 50 feet will generate a noise level of 83 dBA at 60 feet, 63 dBA at 600 feet and 59 dBA at 1,000 feet. For existing land uses directly adjacent to the project site, the noise levels will be greater than those in Table 9 when the distance to the equipment is less than 50 feet. For example, a dozer would generate a noise level of 91 dBA at a distance of 25 feet. The noise levels inside the adjacent buildings will be about 20 to 25 dBA lower when the windows are closed.

The construction noise levels will temporarily increase noise levels at the nearest commercial buildings. Construction noise levels will also be loud enough at times to temporarily interfere with speech communication outdoors indoors when the loudest equipment is very close to nearest buildings. However, since most of the nearest buildings are across a busy street from the project site, the commercial uses already experience high noise levels from traffic (see measurement locations LT-1 and LT-2). The nearest residential land uses would be exposed to much lower noise levels because of the extra distance and would not tend to interfere with speech communication.

Table 4: Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Auger Drill Rig	84
Backhoe	80
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Impact Hammer (Hoe Ram)	90
Jack Hammer	88
Loader	85
Paver	89
Pile-driver (Impact)	101
Pile-driver (Vibratory)	96
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76
Scraper	89
Truck	88

Sources: Federal Transit Administration, *Transit Noise And Vibration Impact Assessment*, May 2006, FTA-VA-90-1003-06; Federal Highway Administration, *Roadway Construction Noise Model User's Guide, January 2006*, FHWA-HEP-05-054

Recommendation:

Prior to Grading Permit issuance, the Project Applicant shall demonstrate, to the satisfaction of the San Rafael Planning Division that the project complies with the following[2]:

- Construction contracts specify that all construction equipment, fixed or mobile, shall be equipped with properly operating and maintained mufflers and other state required noise attenuation devices.

- Property owners and occupants located within 250 feet of the project boundary shall be sent a notice, at least 15 days prior to commencement of construction of each phase, regarding the construction schedule of the proposed project. A sign, legible at a distance of 50 feet shall also be posted at the project construction site. All notices and

[2] Initial Study/Mitigated Negative Declaration, San Rafael Corporate Center 755 Lindaro Street and 788 Lincoln Avenue, June 30, 2015

signs shall be reviewed and approved by the City of San Rafael Community Development Director (or designee), prior to mailing or posting and shall indicate the dates and duration of construction activities, as well as provide a contact name and a telephone number where residents can inquire about the construction process and register complaints.

- The Contractor shall provide evidence that a construction staff member would be designated as a Noise Disturbance Coordinator and would be present on-site during construction activities. The Noise Disturbance Coordinator shall be responsible for responding to any local complaints about construction noise. When a complaint is received, the Noise Disturbance Coordinator shall notify the City within 24-hours of the complaint and determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and shall implement reasonable measures to resolve the complaint, as deemed acceptable by the Community Development Director (or designee). All notices that are sent to residential units immediately surrounding the construction site and all signs posted at the construction site shall include the contact name and the telephone number for the Noise Disturbance Coordinator.

- Prior to issuance of any Grading or Building Permit, the Project Applicant shall demonstrate to the satisfaction of the Community Development Director (or designee) that construction noise reduction methods shall be used where feasible. These reduction methods include shutting off idling equipment, installing temporary acoustic barriers around stationary construction noise sources, maximizing the distance between construction equipment staging areas and occupied residential areas, and electric air compressors and similar power tools.

- Construction haul routes shall be designed to avoid noise sensitive uses (e.g., residences, convalescent homes, etc.), to the extent feasible.

- During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers.

Construction activities shall not take place outside of the allowable hours specified by the City's Municipal Code Section 8.13.050 (7:00 a.m. and 6:00 p.m. on weekdays and 9:00

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