Veneklasen Associates
Consultants in Acoustics | Noise | Vibration | AV | IT

April 11, 2024

City Ventures
444 Spear Street Suite 200
San Francisco, California 94105

Attention: Kian Malek | Director of Development

Subject: **Auburn Grove**
San Rafael, California
Exterior Noise and Exterior Façade Acoustical Analysis
Veneklasen Project No. 4616-033

Dear Kian:

Veneklasen Associates, Inc. (Veneklasen) has completed the review of the Auburn Grove project located in San Rafael, California. This report predicts the exterior noise level at the site using measurements. Using this information, interior noise levels were calculated based on the exterior noise exposure and the construction types proposed. From this, the exterior façade design was determined. This report discusses the results of the analysis.

1.0 INTRODUCTION

This study was conducted to determine the impact of the exterior noise sources on the Auburn Grove project in San Rafael, California. Veneklasen's scope of work included calculating the exterior noise levels impacting the site and determining the method, if any, required to reduce the interior and exterior sound levels to meet the applicable code requirements of the State of California and the City of San Rafael.

The project consists of 16 3-story townhome buildings totaling 79 units. The project is bisected by Woodland Avenue and is bounded by US-101 to the east, Auburn Street to the east and west, the Sonoma-Marin Area Rail Transit (SMART) pathway to the north, and unimproved wetland to the south.

2.0 NOISE AND VIBRATION CRITERIA

DNL (Day-Night Level) is the 24-hour equivalent (average) sound pressure level in which the nighttime (10 pm – 7 am) noise is weighted by adding 10 dB to the hourly level. Since this is a 24-hour metric, short-duration noise events (truck pass-bys, buses, trains, etc.) are not as prominent in the analysis.

Leq (equivalent continuous sound level) is defined as the steady sound pressure level which, over a given period of time, has the same total energy as the actual fluctuating noise.

All reported noise levels are A-weighted.

2.1 Interior Noise Levels – Residential

The State of California Building Code (Title 24, Part 2, Section 1206 "Sound Transmission") and the City of San Rafael Noise Element state that interior DNL for residential land uses are not to exceed 45 dB in any habitable room.

If the windows must be closed to meet an interior DNL of 45 dB, then a mechanical ventilating system or other means of natural ventilation may be required.

Although not a regulatory requirement, Veneklasen suggests that the maximum noise level from short-duration noise events during the night not exceed 55 dB. This criterion is based on sleep disturbance research and experience with similar projects.

2.2 Exterior Noise Levels – Residential

The City of San Rafael Noise Element states that for new multi-family residential projects, the exterior DNL is not to exceed 75 dB DNL in backyards, decks, and common/usable outdoor spaces.

2.3 Vibration Criteria– Residential

There are no regulatory requirements for vibration levels.

The "Transit Noise and Vibration Impact Assessment Manual" from the Federal Transit Administration, U.S. Department of Transportation, dated September 2018 ("FTA Report No. 0123") is used as a guideline. The criterion presented in Table 6-3 of that report for occasional events (defined as between 30 and 70 per day) in residences is that the vibration levels do not exceed 75 VdB.

3.0 EXTERIOR NOISE AND VIBRATION ENVIRONMENT

3.1 Noise And Vibration Measurements

Traffic on US-101 is the primary source of noise affecting the site. Veneklasen visited the site on Monday, April 8, 2024 and completed short-term noise and vibration measurements. Table 1 and Figure 1 show the location and summary of the noise and vibration measurements.

Table 1 – Measured Sound Levels

Location	Measured Level (dB)	SMART Noise Event (dB)	SMART Vibration Event (VdB)
L1	65	86	52
S1	65	---	---
S2	64	---	---

Figure 1 – Aerial View of Project Site Showing Measurement Locations

3.2 Sonoma-Marin Area Rail Transit (SMART)

The Sonoma-Marin Area Rail Transit (SMART) runs north of the project site. The schedule indicates that the trains run every 30-40 minutes from approximately 5 am to 8 pm (37 total daily trains). The measured sound level of the event at S1 was approximately 86 dB. Veneklasen utilized 86 dB as the noise event level for Zone A.

The measured vibration level of the event at S1 (V1) was approximately 52 VdB.

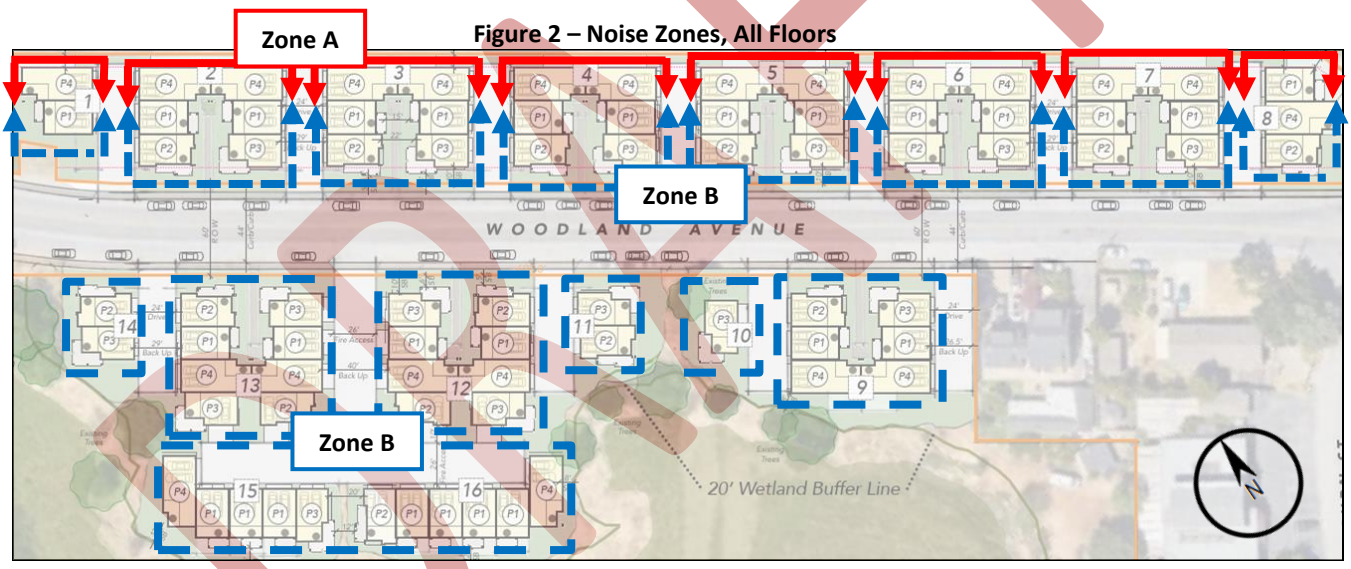
3.3 Overall Exterior Exposure

Based on the computer model and measurements, Veneklasen calculated the noise level at different locations across the project site. To simplify the presentation of the exterior noise levels, Veneklasen has separated the site into locations based on the sound exposure and required mitigation. The predicted sound levels at each zone, shown in Figure 2, are listed in Table 2 below.

Table 2 – Exterior Noise Levels

Location	Exterior DNL (dB)	Event Level (dB)
Zone A	68	86
Zone B	61 – 68	< 75

Figure 2 – Noise Zones, All Floors



4.0 INTERIOR NOISE CALCULATION

4.1 Exterior Façade Construction

Calculations were based on the plans dated February 16, 2024. The exterior wall will consist of 3-coat stucco over sheathing on wood studs with a single layer of gypsum board on the interior and batt insulation in the cavity.

Veneklasen's analysis included the roof path, but this was insignificant in the interior noise level calculated.

Veneklasen utilized the glazing ratings (glass, frame, and seals) shown in Appendix I. Appendix I shall be the acoustical specification for the exterior windows and doors.

4.2 Interior Average Noise Level (DNL) – Residential

Veneklasen calculated the interior level within the residential units given the measured noise environment and the exterior façade construction described above. Table 3 shows the predicted interior DNL based on the windows and doors with STC ratings as shown and glazing construction as described in Appendix I. Note that the STC ratings indicated in the table do not completely specify the building element performance, as the building element must also meet the octave band transmission loss across the frequency spectrum as specified in Appendix I.

Table 3 – Calculated Interior DNL

Location	Exterior DNL (dB)	Window/ Door Rating[1]	Interior DNL (dB)
Zone A	68	STC 30	42
Zone B	61 – 68	STC 30	< 42

4.3 Interior Short-duration Noise Event – Veneklasen Recommended Glazing (Optional)

In a similar manner Veneklasen calculated the interior noise levels from SMART train passbys. As described in Section 2.1, Veneklasen's recommended interior nighttime noise level criterion is 55 dB. Table 4 shows Veneklasen's recommended mitigation to reduce the interior noise levels due to short-duration noise events.

Table 4 – Calculated Interior Short-Duration Event Noise Levels

Location	Exterior Event Level (dB)	Glazing Rating	Interior Event Level (dB)
Zone A	86	STC 35	55
Zone B	< 75	STC 30	< 50

4.4 Mechanical Ventilation – Residential

Because the windows and doors must be kept closed to meet the noise requirements, mechanical or other means of ventilation may be required for all units. The ventilation system shall not compromise the sound insulation capability of the exterior façade assembly.

5.0 EXTERIOR NOISE CALCULATION

5.1 Exterior Average Noise Level (LDN) – Residential

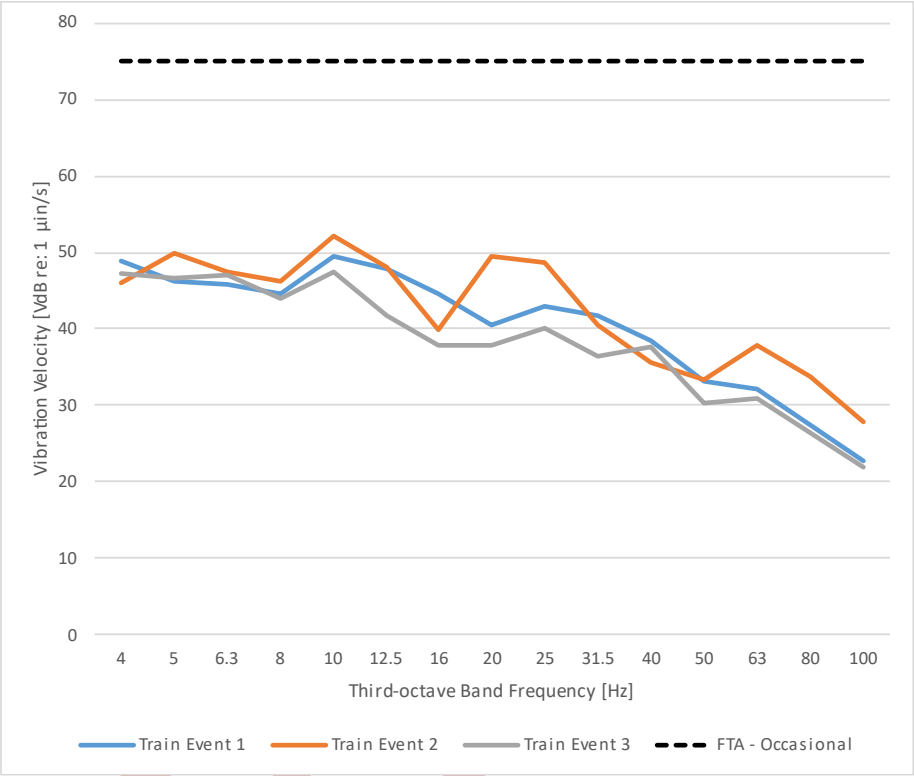
The maximum predicted DNL onsite is 68 dB. Therefore, no additional mitigation is necessary to ensure that the DNL at backyards, decks, and common/usable outdoor spaces is below 70 dB.

[1] STC rating does not fully specify the building element performance. Refer to Appendix I.

6.0 INTERIOR VIBRATION LEVELS (VDB)

Veneklasen evaluated the vibration levels due to the SMART train passing by at location V1. The vibration levels were measured in the vertical direction. Figure 3 shows the measured vibration velocity curves, compared to the FTA guideline.

Figure 3 – Vibration Velocity



According to the Veneklasen analysis, the measured vibration levels do not exceed 75 VdB. Additionally, there are no regulatory requirements related to vibration from the train line; therefore, there are no mitigation requirements for this project.

7.0 SUMMARY

The following summarizes the acoustical items required to satisfy the noise criteria as described in this report.

Residential

- Exterior wall assembly is acceptable as described in Section 4.1.
- The roof assembly was included in the analysis and is not a significant path of sound and can remain as designed.
- Windows and glass doors as shown in Table 3 with Transmission Loss values and STC ratings defined in Appendix I are required. Appendix I shall be the acoustical specification for all exterior windows and doors.
- Optional: In order to meet Veneklasen's criterion for short-duration noise events, windows and glass doors with minimum STC ratings as shown in Table 4 are recommended. This is not required by code but will increase occupant comfort.
- Residential mechanical ventilation, or other means of natural ventilation, may be required for all units.

Exterior Use Areas

- No additional mitigation is necessary for the exterior use areas.

Exterior Use Areas

- The measured vibration level is below FTA guidelines. No mitigation is recommended.

Various noise mitigation methods may be utilized to satisfy the noise criteria described in this report. Alteration of mitigation methods that deviate from requirements should be reviewed by the acoustical consultant.

If you have any questions or comments regarding this report, please do not hesitate to contact the undersigned.

Sincerely,
Veneklasen Associates, Inc.

Elias Montoya
Associate

Adam Thompson
Associate

APPENDIX I – GLAZING REQUIREMENTS

In order to meet the predicted interior noise levels described in Section 4.0, the glazing shall meet the following requirements:

Table 5 – Acoustical Glazing Requirements: Minimum Octave Band Transmission Loss and STC Rating

Nominal Thickness	Minimum Transmission Loss Octave Band Center Frequency (Hz)						Min. STC Rating
	125	250	500	1000	2000	4000	
1" dual	21	18	27	34	37	32	**30**
1" dual	23	22	32	37	38	38	**35**

The transmission loss values in the table above can likely be met with the following glazing assemblies:

1. Up to STC 35: nominal 1" insulated glazing unit

An assembly's frame and seals may limit the performance of the overall system. Therefore, the window and door systems selected for the project shall not be selected on the basis of the STC rating of the glass alone, but on the entire assembly including frame and seals. Additionally, the assemblies given above are provided as a basis of design, but regardless of construction, the octave band Transmission Loss (TL) and STC value of the system selected must meet the minimum values in Table 5 above.

Independent laboratory acoustical test reports should be submitted for review by the design team to ensure compliance with glazing acoustical performance requirements. Laboratories shall be accredited by the Department of Commerce National Voluntary Laboratory Accreditation Program (NVLAP). Labs shall be pre-approved by Veneklasen Associates. Tests shall be required to be performed in North America. Lab tests and lab reports shall be in compliance with ASTM standard E90 and be no more than 10 years old from the date of submission for this project.

If test reports are not available for a proposed assembly, the assembly, including frame, seals and hardware, shall be tested at an independent pre-approved NVLAP-accredited laboratory to demonstrate compliance with the requirements of this report. Veneklasen shall be invited to witness acoustical testing completed and reserves the right to exclude test reports from laboratories that are not pre-approved by Veneklasen.