



September 22, 2015

Warmington Residential, Northern California Division
2400 Camino Ramon, Suite 234
San Ramon, California

Attention: Don Babbitt

Subject: **Dollar Street**
Hayward, California
Exterior Envelope Acoustical Design
VA Project No. 5798-002

Dear Don:

Veneklasen Associates (VA) has completed our review of the Dollar Street project located in Hayward, California. This report represents the results of our findings.

1.0 INTRODUCTION

This study was conducted to determine the impact of the exterior noise sources on the Dollar Street project in Hayward, California. VA's scope of work included calculating the exterior noise levels impacting the site, 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 Hayward.

The project consists of approximately 42 three-story townhome units. The project is bounded by Dollar Street to the east, the railroad tracks to the west, existing industrial property to the north, and future residential property to the south.

2.0 NOISE CRITERIA

LDN 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-by, bus, 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.

2.1 Interior Noise Levels

The project site is part of the Mission Boulevard Corridor and planning is covered by the Specific Plan for that corridor. Noise Mitigation Measures are described in Chapter 15 of the EIR for the Specific Plan. Impact Noise-1 states that residential land uses can be expected to be exposed to noise levels in excess of 60 dBA. The following mitigation measures are relevant for the project.

Mitigation Measure Noise-1a. *An acoustical analysis shall be prepared by a qualified acoustical specialist to demonstrate that interior noise levels can be maintained below 45 dBA LDN.*

Mitigation Measure Noise-1c. *Within 200 feet of the railroad tracks...an acoustic analysis shall be prepared by a qualified acoustical specialist to demonstrate how interior noise levels can be maintained below 45 dBA LDN and the adopted single event residential limits set forth in the Noise Element.*



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For train sources, the single event limits in the Noise Element are defined in Guideline A.3, which requires that the maximum noise level from train pass-by events not exceed 50 dBA in bedrooms at night, and 55 dBA in other rooms and in bedrooms during the day.

Mitigation Measure Noise-2a. *New Development that is within 100 feet of the centerline of the existing BART tracks shall have a vibration analysis prepared by a qualified vibration specialist that specifies the vibration control measures...to reduce vibration levels at or below the guidelines of the Federal Transit Administration criteria.*

The referenced guidelines are those in the “Transit Noise and Vibration Impact Assessment” report from the Federal Transit Administration, U.S. Department of Transportation, dated May 2006 (“FTA Report”). The criterion presented in Table 8-1 of that report for frequent events (defined as more than 70 per day) in residences is that the vibration levels not exceed 72 VdB. (VdB is a measurement of ground velocity).

Note that the threshold of perception is usually assumed to be 65 VdB. Therefore, even if the requirements are met, the vibration from train pass-bys will be feelable to some occupants.

Exterior Noise Criteria. Additionally, the Noise Element states that the maximum acceptable noise level for the primary open space area of townhomes and multi-family apartments or condos (private rear yards, common courtyards, or gathering spaces) shall be an LDN of 65. This standard does not apply to secondary open space areas such as front yards, balconies, stoops, or and porches.

3.0 EXTERIOR NOISE ENVIRONMENT

3.1 Noise Measurements

VA visited the site on Wednesday, August 5, 2015 to measure the noise levels. VA also utilized noise and vibration measurements from September 2013 at the adjacent project site.

There are two tracks used by Bay Area Rapid Transit (BART) trains immediately to the west of the site, with the closer track approximately 20 feet from the property line. The trains pass at approximately 60 miles per hour. The tracks are elevated approximately 4 feet above the site grade.

Noise measurements were performed using a Bruel & Kjaer sound level meter which logged the average and maximum noise levels. The microphone was mounted at approximately five feet above the ground. In September 2013, measurements were performed near the western property line of the site approximately 15 feet from the property line. VA measured BART pass-bys ranging from 80–93 dBA. The average was 85 dBA and the 90th percentile was 88 dBA. The recent measurements at the site confirmed these levels and VA used 88 dBA for our analysis of the maximum noise levels. The calculated Ldn is 71 at this location, based on the scheduled number of BART trains.

VA reviewed an earlier noise report for the project site by Rosen Goldberg & Der dated February 14, 2005. The levels described in the RGD report are consistent with VA’s measurements.

There is a third railroad track that VA understands is a little-used freight line. No trains were observed during our measurements, and the RGD report also indicates that no freight trains were measured during several days of measurements in 2005. If freight activity occurs on this track it is very infrequent, and the noise impact to the site is dominated by BART trains. Therefore, VA did not include freight trains in the analysis.



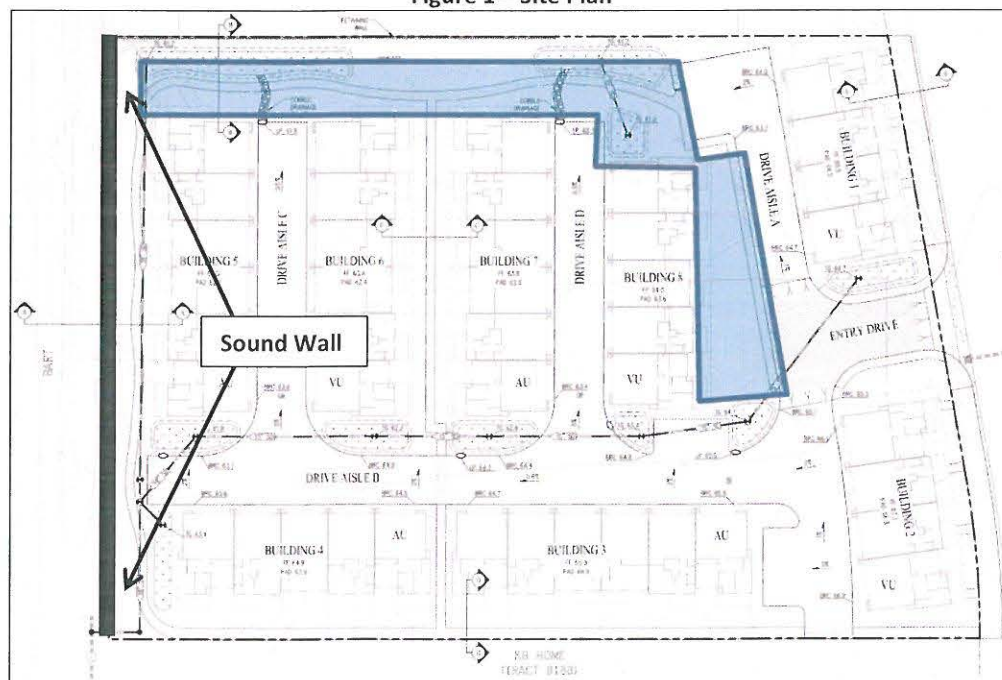
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3.2 Exterior Noise Exposure

VA understands that a concrete sound wall is planned along the western property line. The height of the sound wall will be based upon 8-feet from the finished floor elevation. The grading of the site slopes down near the property line, where the wall will be located. Therefore, the estimated total height of the wall ranges from 11-13 feet at this location. The southern property line will have a 3-foot high precast wall with wrought iron fences, which does not have significant acoustical effect.

VA's calculations indicate that, with the walls as planned, the noise level in the open spaces, shaded in blue in Figure 1, will be 65 Ldn or less. No mitigation is required.

Figure 1 – Site Plan



4.0 INTERIOR NOISE

VA understands that the exterior wall for the proposed buildings will consist of 3-coat stucco over sheathing on wood studs with insulation and one layer of gypsum board on the inside.

At some locations an upgraded exterior wall is required. The wall constructions used for the analysis are shown in Table 1.

Table 1 – Wall Assemblies

| Assembly | Construction |
|----------|---|
| Standard | 3-coat Stucco, plywood, studs, batt insulation, 1 layer gypsum board |
| Upgraded | 3-coat Stucco, plywood, 2x4 studs, batt insulation, resilient channel, 1 layer gypsum board |

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

VA utilized the glazing ratings (glass, frame and seals) shown in Appendix I.



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Table 2 and Figure 2, below, show the wall and windows/doors required to satisfy the interior noise requirements in section 2.1.

Figure 2 – Acoustical Zones for Mitigation

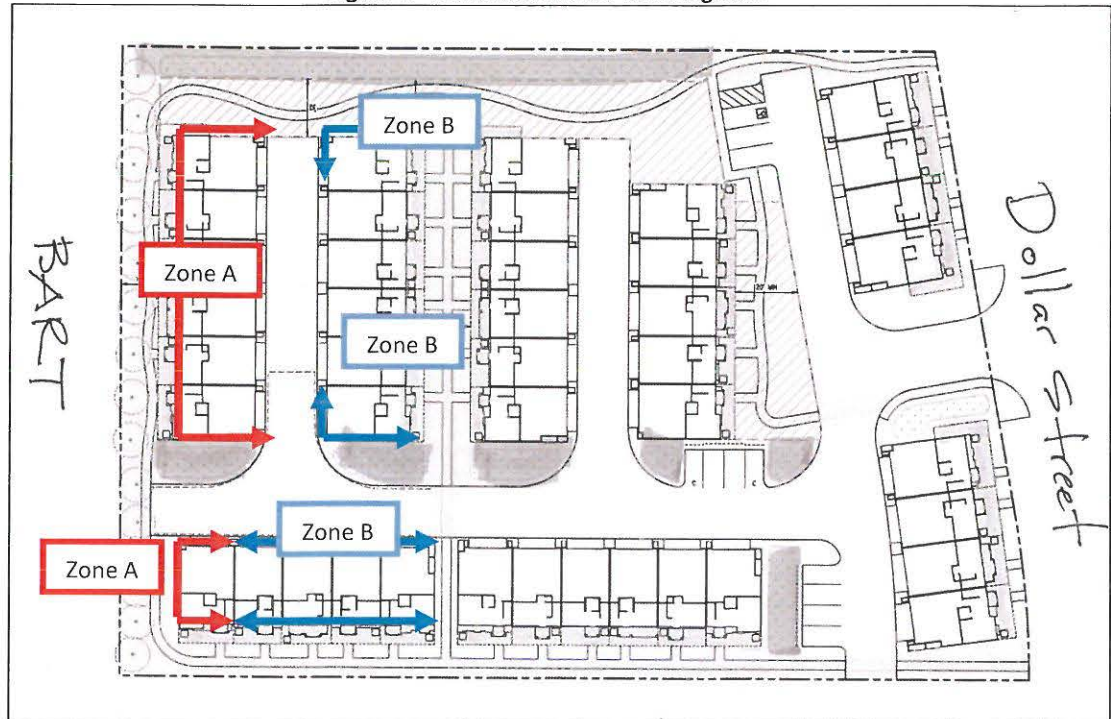


Table 2 – Interior Noise Level (LDN and Maximum)

| Location | Room | Exterior Wall | Window/ Patio Door | LDN | Maximum (dBA) |
|----------------------------|-------------|---------------|-----------------------|-----|------------------|
| Zone A (railroad exposure) | Bedroom | Upgraded | STC 43 | <40 | 50 |
| | Living Room | Standard | STC 38 | <40 | 55 |
| Zone B | All | Standard | STC 30 | 41 | 50 |
| Remainder of Units | - | - | STC 30* | - | - |

* - Not required by code but recommended. Any dual glazed window will satisfy Building Code requirements.

4.1 Mechanical Ventilation Requirement

Because the windows and doors must be kept closed to meet the noise requirements, mechanical ventilation or other means of natural ventilation is required for all units in Zones A and B. The mechanical ventilation shall meet all Code requirements. The ventilation system shall not compromise the sound insulation capability of the exterior facade assembly.

5.0 VIBRATION

VA previously performed measurements of ground vibration levels at the adjacent project site. Measurements were made at a distance of approximately 40 feet from the tracks. An accelerometer was attached to a metal stake driven into the soil and the vibration levels were logged by a Bruel & Kjaer type 2250. The average maximum vibration level from the train pass-bys was 68 VdB with a



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maximum of 71 VdB. This is below the recommended Federal guidelines, and no vibration mitigation is required.

Note that satisfying the FTA criteria does not imply that the vibration will not be feelable. Additionally, vibration can increase on the upper floors of lightweight structures due to structural resonances. Therefore, some vibration may be feelable for individuals. The proximity to the train tracks and the possibility of experiencing vibration should be disclosed to potential residents.

6.0 CONCLUSIONS

This report satisfies “an acoustic analysis shall be prepared by a qualified acoustical specialist” to address the noise and vibration at the project site. With a sound wall as shown in Figure 1 and exterior façade as described in Tables 1 and 2, Figure 2 and Appendix I, the project will comply with the relevant mitigation measures, summarized below.

Measure Noise-1a. As shown in Table 2, the noise level will be below Ldn 45 in all units, with the exterior façade as described in Table 1, Table 2, Figure 2 and Appendix I. Mechanical ventilation, or other means of natural ventilation, is required for the units in Zones A and B.

Measure Noise-1c. This applies to units exposed to noise from the railroad. As shown in Table 2, the maximum noise level from train pass-by does not exceed 50 dBA in bedrooms, and 55 dBA in other rooms, with the exterior façade as described in Table 1, Table 2, Figure 2 and Appendix I.

Measure Noise-2a. The ground vibration levels meet the FTA recommended vibration criteria. No mitigation is necessary.

We trust this information is satisfactory. If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
Veneklasen Associates, Inc.

John LoVerde
Principal

Wayland Dong
Associate Principal



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

| STC Rating | Nominal Thickness | Minimum Transmission Loss Octave Band Center Frequency (Hz) | | | | | | Min. STC Rating |
|------------|-----------------------|--|-----|-----|------|------|------|-----------------------|
| | | 125 | 250 | 500 | 1000 | 2000 | 4000 | |
| STC 30 | 1" dual | 20 | 18 | 27 | 33 | 36 | 32 | 30 |
| STC 38 | 1" dual | 24 | 28 | 37 | 40 | 42 | 45 | 38 |
| STC 43 | Storm (triple glazed) | 27 | 32 | 37 | 43 | 49 | 51 | 43 |

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

1. STC 30: 1/8" monolithic – 3/4" airspace – 1/8" monolithic
2. STC 38: 1/4" laminated – 1/2" airspace – 1/4" laminated
3. STC 43: 1/8" monolithic – 7/16" airspace – 1/4" monolithic – 2-1/2" airspace – 1/4" monolithic

However, it should be noted that an assembly's frame and seals may limit the performance of the overall system. The assemblies given above are provided as a basis of design, but regardless of construction, the octave band transmission loss of the particular system selected must meet the minimum values in Table 3 above. Similarly, it is permissible to use an alternate assembly construction if it meets the transmission loss requirements. Note that the systems shall not be selected on the basis of STC rating alone.

Acoustical test reports should be provided for review by the design team to ensure compliance with glazing acoustical performance requirements. The tests shall be performed on the entire assembly, including frame and seals.