PAPADIMOS GROUP
222 VALLEJO STREET, 4TH FLOOR
SAN FRANCISCO, CA 94111
TEL +1 (415) 986-9100
www.papadimosgroup.com

9 July 2018

Jenny C. Wong
Architectural Designer
GKW Architects
710 E. McGlincy Lane, Suite 109
Campbell, CA 95008

SUBJECT: 874 Lewelling Blvd. Residential Development – San Leandro, CA
Noise Study

Dear Jenny Wong:

As requested, this letter summarizes our traffic noise study for the proposed 6-unit, 3-story residential development at 874 Lewelling Blvd in response to the following comment from the City of San Leandro.

PLANNING: GRACE WU, 510-577-3479, GWU@SANLEANDRO.ORG

1. **Noise Study.** Please submit a Noise Statement or Study prepared by a qualified professional that addresses the necessary measures to lower decibel levels to residential City standards and will be put into place to mitigate for the noise from adjacent Lewelling Blvd and Interstate 880.

The City of San Leandro General Plan requires new residential developments limit traffic noise inside the building (per California Building Code) and this letter describes mitigation to meet these requirements.

SUMMARY

Unit 1 of the development requires acoustically-rated window assemblies (a minimum Outdoor-Indoor Transmission Class (OITC) of 27) to control noise from traffic on Lewelling Blvd. For all other units in the development, minimum code can be achieved with standard 1" insulating windows properly sealed to framing. The rest of the exterior building façades would achieve minimum code using standard weather sealed construction methods.

Additionally, a controlled means of fresh air other than an open sash will be required for Units 1 through 4, and suitable options for fresh-air intakes include properly designed sound

attenuating "Z" ducts on exterior elevations for each residential unit or a forced air mechanical ventilation system. Refer to Appendix A for definitions of common acoustical terms.

REGULATORY SETTING

The San Leandro General Plan contains the following noise compatibility requirement for residential developments (Chapter 7, section E):

> The California Building Code includes noise insulation standards to limit the extent of noise transmitted into habitable spaces. These standards indicate the extent to which walls, doors, floors, and ceilings must block or absorb sound between exterior and interior spaces. An interior standard of 45 dBA CNEL is required for any habitable room. The City requires an acoustical analysis to demonstrate how dwelling units have been designed to meet this standard on sites where the ambient exterior noise level exceeds 60 dBA CNEL.

This noise study and subsequent analysis and recommendations for exterior-to-interior noise control are based on the 45 dBA CNEL indoor requirement stated above and the following additional requirement outlined in the 2010 California Building Code (Title 24, Part 2):

> *SECTION 1207.12 COMPLIANCE: ...If interior allowable noise levels are met by requiring that windows be unopenable or closed, the design for the structure must also specify a ventilation or air-conditioning system to provide a habitable interior environment. The ventilation system must not compromise the dwelling unit or guest room noise reduction.*

Based on current drawings, the first floor of each unit consists of non-occupied interior spaces (garage, storage, unit entry) and this requirement would only apply to residential uses on Levels 2 and 3.

NOISE SURVEY

Survey Method

To assess traffic noise exposure at the project site, we conducted a noise survey between Monday, June 18th and Friday, June 22nd, 2018. The primary source of noise observed at the project site was traffic on Lewelling Blvd with background noise controlled by distant traffic, possibly from the nearby Interstate 880. Site noise exposure was assessed using both unattended, long-term monitoring at a fixed location for multiple days, and attended short-term noise readings on the project site. Refer to Figure 1 below for measurement positions.

Figure 1 – Noise Survey Measurement Positions

Existing Noise Exposure

To capture 24-hour noise exposure, a Larson Davis model 820 sound level meter was secured to a tree on the median of Lewelling Blvd. west of the project site (see Figure 1). The meter monitored for several days between Monday, June 18th and Friday, June 22nd, 2018 and recorded the average (Leq), maximum, minimum, and statistical noise metrics in 15-minute intervals. Complete measured data is shown graphically in Appendix B.

Measured data was subsequently used to calculate the Community Noise Equivalent Level (CNEL) at the unattended position for each full day as shown in Table 1 below.

TABLE 1 – Measured CNEL at LT-1

Date	CNEL (dBA)
Tuesday, June 19, 2018	77.9
Wednesday, June 20, 2018	78.2
Thursday, June 21, 2018	78.2
AVERAGE	**78.1**

Noise exposure at the future building facades would be lower than what was measured at the unattended position due to additional distance from the road and this adjustment was estimated using a short-term measurement at the project setback (ST-1) taken simultaneously with the unattended meter. Two additional simultaneous measurements (ST-2 and ST-3) were taken to document noise levels further away from the street. However, these positions were acoustically shielded by the existing wood fence (approximately 6 feet high) and not

representative of noise exposure at the occupied residential uses (Levels 2 & 3) and are included for information only.

Table 2 – Simultaneous Noise Measurement

METER	START TIME (DURATION)	NOISE LEVEL (dBA)							
		Leq	L99	L90	L33	L10	L1	Min	Max
ST-1	11:45 AM (15 min)	64.7	46.9	53.8	64.7	67.9	72.8	45.4	77.1
LT-1		74.6	-	-	-	-	-	-	-
ST-3	12:15 PM (15 min)	52.9	43.8	46.1	51.6	55.7	63.2	42.6	67.5
ST-4		50.2	44.2	45.2	48.6	51.9	60.1	43.8	66.7
LT-1		75.0	-	-	-	-	-	-	-

Based on the methodology described above and including a 1 dB increase in noise levels for upper floors, we predict the following existing traffic noise levels at the building facades:

- *Unit 1 closest to Lewelling Blvd:* *69 dBA CNEL*
- *All other units:* *66 dBA CNEL or less*

Future Noise Increases

According to the noise study conducted in 2015 for the San Leandro General Plan Update Draft EIR (dated June 1, 2016), traffic noise on Lewelling Blvd. near the project site will increase by 0.6 dB by 2035. For the purposes of this analysis we are conservatively assuming a 1 dB increase for future traffic noise levels, bearing in mind doubling the amount of traffic results in a 3 dB increase which is highly unlikely for an established urban area. On this basis, we predict the following future traffic noise levels at the building facades:

- *Unit 1 closest to Lewelling Blvd:* *70 dBA CNEL*
- *All other units:* *67 dBA CNEL or less*

RECOMMENDATIONS

The following calculation was used to determine the required sound transmission loss for exterior façades in terms of Outdoor-Indoor Transmission Class (OITC).

OITC = Exterior Noise Level – Interior Noise Limit – 10log(S/A) + ADJ

Where: *10log(S/A)* = reduction due to room effect
S = total room sound absorption (in Sabins)
A = exterior projected wall area (ft^2)
Note: The term *10log(S/A)* is typically close to zero
ADJ: up to 2 dB to account for non-diffuse noise sources

Based on this methodology, exterior facades must provide the following minimum OITC performance to control exterior noise inside residential units to 45 dBA CNEL per the San Leandro General Plan:

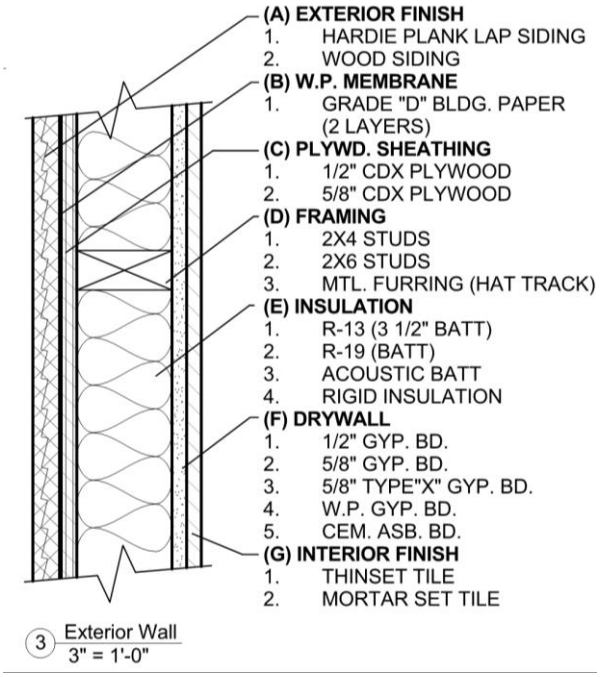
- *Unit 1 closest to Lewelling Blvd:* OITC 27
- *All other units:* OITC 24

Recommendations are described in the sections below based on the proposed constructions as shown on drawing A100 (drawing set dated 7/6/18), which include wood frame walls, operable windows, and doors.

Exterior Walls

The project proposes the following typical exterior wall assembly (Figure 2), which alone would have an acoustic performance of OITC 30 or higher and would meet minimum requirements for all units.

Figure 2 – Typical Exterior Wall Assembly



Windows

Unit 1 would require acoustically-rated window assemblies with a minimum Outdoor-Indoor Transmission Class (OITC) of 27. This may be achievable with standard 1” insulated glazing as this glazing alone typically provides OITC 28. Window selection for this area should be confirmed with an acoustic test report (per ASTM E90 and E1332) for the entire assembly, inclusive of glass, framing, hardware and seals.

Requirements for all other units (OITC 24) is easily achieved with standard weather sealed assemblies assuming 1” insulating glazing, sound rated assemblies are not required.

Unit Entry Doors

The project proposes solid-core wood doors, and these should be fully sealed to the frame using the following products or equal:

- Perimeter seals: Pemko S88
- Drop-seal: Pemko 430 or 434
- Threshold to insure proper drop seal closure

Ventilation Openings

Since partially open windows typically provide 10 to 15 dB of noise reduction, all units exposed to exterior noise levels of 55 dBA CNEL must have a controlled means of fresh air, which includes all units within 150 feet of the Lewelling Blvd. curb (Units 1 to 4). Suitable options for fresh-air intakes include properly designed sound attenuating "Z" ducts on exterior elevations for each residential unit or a forced air mechanical ventilation system.

* * *

I trust that you will find this information useful, but please do not hesitate to contact our office if you require further assistance.

Sincerely,
THE PAPADIMOS GROUP, INC.

Carter Howard
Staff Consultant

Reviewed By:

Nathan Sibon
Associate

APPENDIX A

DEFINITIONS OF COMMON ACOUSTICAL TERMS

Decibel, dB – A unit describing the amplitude of sound, defined as 20 times of the logarithm of the ratio of the sound pressure measured to the reference pressure (20 µPa).

A-weighted Sound Level, dBA – The sound pressure measured using the A-weighting filter network that de-emphasizes the very low and very high frequency components of the sound spectrum in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.

Ambient Noise – The sound level in a given environment, usually comprised of many sources near and far, with no particular sound dominant. It is often defined as L_{99} or the noise level exceeded 99% of the time.

Background Noise - The total noise from all sources other than the source of interest. It is often defined as L_{90} or the noise level exceeded 90% of the time.

Community Noise Equivalent Level, CNEL – The average, 24-hour A-weighted noise level, obtained by adding 5 dB to evening hours (7:00 pm to 10:00 pm) and 10 dB to night hours (10:00 pm and 7:00 am).

Day/Night Noise Level, L_{dn} (or DNL) – The average, 24-hour A-weighted noise level, obtained after adding 10 dB to levels measured at night (10:00 pm to 7:00 am).

Integrated or Equivalent Noise Level, L_{eq} – The energy average A-weighted noise level during the measurement.

Sound level meter - An instrument that measures sound in dB. Various instrument features include frequency bands, integration of sound over time and display of average, minimum, maximum and statistical levels.

Sound pressure level - the ratio, expressed in decibels, of the mean-square sound pressure to a reference mean-square sound pressure selected by convention to approximate the threshold of hearing (0.0002 µbar or 20 µPa).

Frequency – The number of times per second that the oscillation of a wave of sound or that of a vibrating body repeats itself, expressed in Hertz (Hz).

Octave band - The frequency range of one octave of sound frequencies. The upper limit is always twice the frequency of the lower limit. Octave bands are identified by the geometric mean frequency or center between the lower limit and the upper limit.

Outdoor-Indoor Transmission Class (OITC) – A single-number rating system based on laboratory testing performed in accordance with ASTM Standard E1332. It is used to define the sound isolating characteristics of exterior building elements using a standardized automobile traffic spectrum.

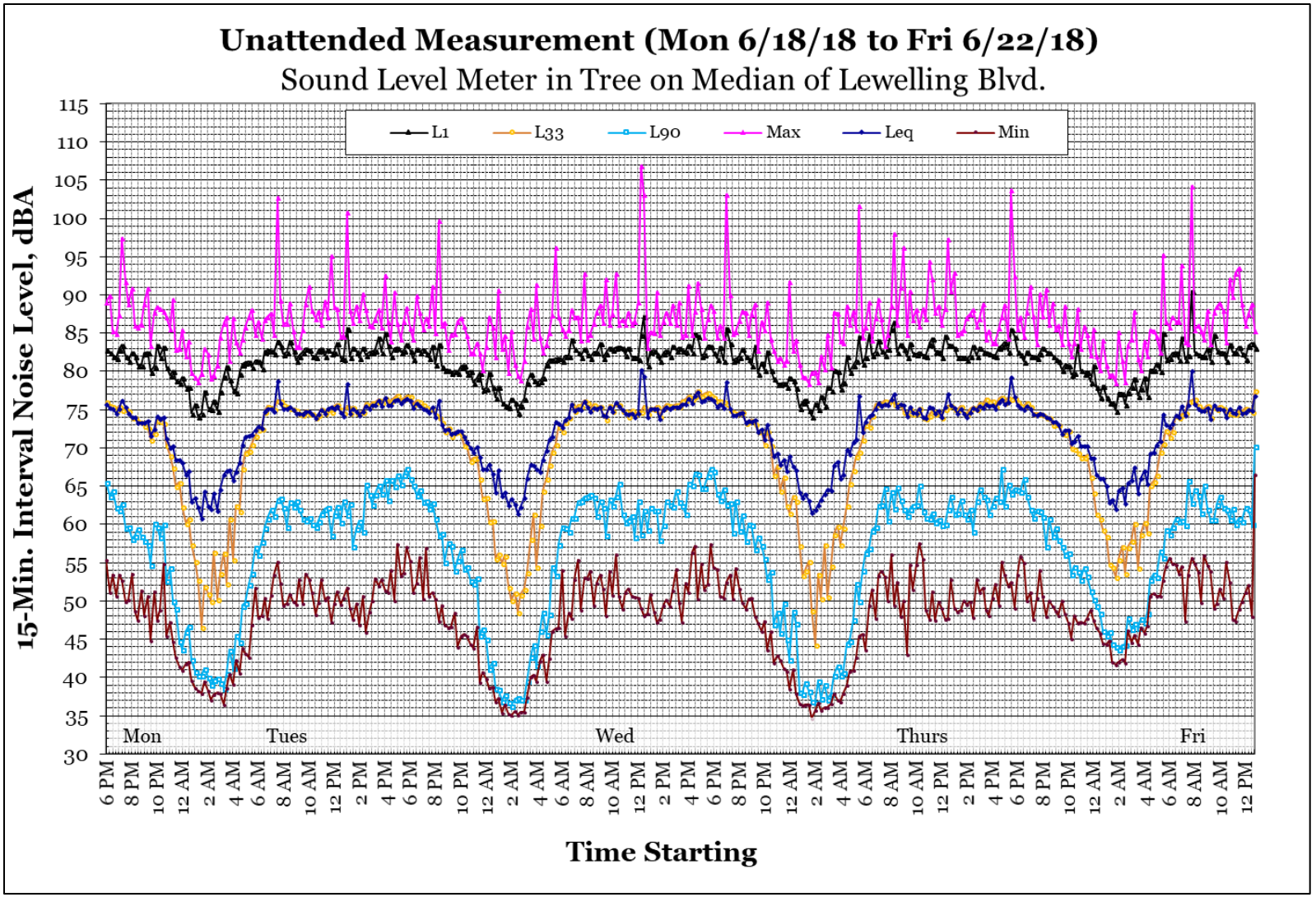
Sound Transmission Class (STC) – A single-number rating system based on laboratory testing per ASTM Standard E90. It is used to define the sound isolating characteristics of partitions separating occupied spaces.

Noise Isolation Class (NIC) - A single-number rating system based on field testing per ASTM Standard E336. It is used to compare the sound isolating characteristics of the total construction between two enclosed spaces.

Impact Insulation Class (IIC) – A single-number rating system based on laboratory testing per ASTM Standard E492. It used to compare the acoustic impact isolation characteristics of floor/ceiling partitions using a standardized tapping machine test method.

Field Impact Insulation Class (FIIC) – Similar to the IIC rating system except it is measured in the field.

APPENDIX B – Unattended Noise Monitoring Chart



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