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**Subject: 555 Kelly Housing
Noise and Vibration Analysis
Salter Project 24-0036**

Dear Emma:

This report summarizes our analysis of the construction noise and vibration impacts related to the project. The project consists of a new multi-family residential development located along Kelly Avenue between Shoreline Plaza and the Our Lady of the Pillar church.

We quantified the existing ambient noise environment and analyzed future project noise and vibration sources. This includes noise and vibration from construction equipment, mechanical equipment, and traffic increases.

The site is located five miles from the Half Moon Bay Airport and is excluded from the Airport Land-Use Compatibility Plan¹. The site is outside the noise contours of the ALUC Plan, and therefore plane noise will not contribute to the noise environment.

CRITERIA

Construction Noise

The City of Half Moon Bay Noise Ordinance does not have specific construction noise criteria. Per Chapter 14.40.010 of the Municipal Code, construction hours are limited to 7 am to 6 pm Monday through Friday; 8 am to 6 pm Saturdays; and 10 am to 6 pm Sundays and holidays.

¹ The Airport Land Use Compatibility Plan only requires projects within two miles of the airport to consider air traffic noise.



Construction Vibration

The potential for the proposed project’s construction vibration to result in damage to adjacent structures is evaluated based on the Caltrans Transportation and Construction Vibration Guidance Manual. The Caltrans Manual states that there is a potential to damage structures when vibration levels exceed the peak particle velocity (PPV) listed in **Table 1** for various building types.

Table 1: Vibration Guidelines for Potential Damage to Structures²

Structure Type and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.0	0.50
Modern industrial/commercial buildings	2.0	0.50

Note: Transient sources create a single, isolated vibration event (e.g., blasting or drop balls). Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

We have assumed the adjacent buildings fall under the category of “commercial buildings”.

HVAC Equipment and Traffic Noise

The Ordinance does not include any goals for noise from HVAC equipment or traffic. Chapter 9.23 Noise, Subsection A, appears to be the only section related to noise:

“No person shall between the hours of ten p.m. and eight a.m. make, cause, suffer or permit to be made any offensive noise (1) which is made within one hundred feet of any building or place regularly used for sleeping purposes, or (2) which disturbs, or would tend to disturb, any person within hearing distance of such noise.”

² California Department of Transportation; Transportation and Construction Vibration Guidance Manual; Table 19; April 2020

EXISTING NOISE ENVIRONMENT

To quantify the ambient noise environment at the project site, we conducted two continuous long-term noise measurements between 20 and 25 March 2024. The measurement locations and lowest ambient noise levels, determined as the minimum hourly $L_{eq}(h)$ ³, during the expected construction hours and throughout the entire measurement are shown in **Figure 1**.

Existing Noise-Sensitive Receptors

The nearest buildings to the site are Shoreline Station to the west and the Our Lady of the Pillar to the east, which are approximately 60 feet and 15 feet away from the proposed development site boundaries, respectively.

CONSTRUCTION NOISE AND VIBRATION ANALYSES

This section addresses the potential for project-related construction noise and vibration sources to impact the surrounding area. The primary vibration-generating work is expected to last 10 months. The primary noise-generating work is expected to last 15 months.

Construction Noise

Construction of the proposed project would result in temporary elevated noise levels at existing adjacent land uses. Major construction is expected to include demolition, shoring, excavation, subgrading, construction of the foundation, and erecting the structure. In addition, construction would include structural framing, exterior finishes, interior framing, and interior finishes.

The noisiest of these activities is typically demolition, ground clearing, construction of the foundation, shoring, and framing, when heavy machinery would be in use and exterior construction would occur.

The demolition, ground clearing, and excavation phases typically involve the use of concrete saws, cranes, and heavy machinery such as tractors and excavators. The foundation and erection phases would include the use of forklifts, compressors, saws, and generators. Framing involves the use of pneumatic tools, such as nail guns, and other hand tools, such as hammers and saws. The final phase is interior work, which tends to be less intrusive since the noise occurs indoors after the building shell is in place.

Table 2 lists the typical noise levels of various construction equipment at 50 feet with their estimated usage factors based on the Caltrans Technical Noise Supplement. Expected hourly $L_{eq}(h)$ is calculated by the two "loudest" construction equipment from the center of the site to the nearest receptor.

³ L_{eq} – The equivalent steady-state A-weighted sound level that, in a stated period of time, would contain the same acoustic energy as the time-varying sound level during the same period.

Table 2: Calculated Construction Equipment Noise Levels

Schedule	Equipment	Sound Pressure Level (SPL, in dBA) at 50 Feet	Usage Factor (Percentage of Hour)	Calculated Hourly $L_{eq}(h)$, in dBA
August to December	Jack Hammer - Hoe Ram	82	50	84
	Large Excavator	81	40	
	Lime Treatment	82	30	
	Small Excavator	81	40	
	Concrete Pump	85	50	
	Forklift	75	40	
	Gradall	83	40	
January to May	Crane	88	16	83
	Air Compressor	81	40	
	Forklift	75	40	
	Gradall	83	40	
	Generator	83	50	
	Truck Deliveries	84	40	
June to October	Generator	83	50	83
	Truck Deliveries	84	40	

As shown in **Table 2**, equipment noise levels are calculated to be significantly higher than the existing ambient noise levels. However, there are no defined noise limits in the City Ordinance for construction equipment during the designated hours of construction.

Construction Vibration

The project would most likely use the following vibration-generating equipment:

- Jackhammers
- Hoe ram
- Excavators
- Gradall/Loaders

Typical construction equipment vibration levels (published in the Caltrans Manual) are shown in **Table 3**.

Table 3: Construction Equipment Vibration Levels

Equipment	Reference PPV (in/sec) at 25 Feet
Jackhammers	0.035
Large Bulldozer/Excavator	0.089
Small Bulldozer/Excavator	0.003
Loaded Truck ⁴	0.076
Jackhammer	0.035

We calculated vibration levels in PPV at the distances to the nearest buildings using the following equation, per the Caltrans Manual (Equation 12)⁵:

$$PPV_{\text{equipment}} = PPV_{\text{ref}} (25/D)^n$$

The “n” value is based on the soil type at the project site. Where the soil type is unknown, the Caltrans Manual suggests using 1.1 for “n”. For the hoe ram, we also calculated vibration levels in PPV (in/sec) at distances using the following equation, per the Caltrans Manual (Equation 11)⁶:

$$PPV_{\text{hoe ram}} = PPV_{\text{ref}} (25/D)^n \times (E_{\text{equip}}/E_{\text{ref}})^{0.5}$$

Table 4 summarizes the calculated PPV, per equipment type.

Table 4: Calculated PPV at Setbacks to the Nearest Structures

Equipment	PPV (in/sec)	
	At 15 Feet	At 60 Feet
Hoe Ram (8000 ft-lb)	0.53	0.12
Hoe Ram (3000 ft-lb)	0.33	0.07
Loaded Truck	0.13	0.032
Jackhammers	0.06	0.015

As shown in **Table 4**, vibration levels are calculated to meet the 0.50 in/sec criterion at both setbacks, provided that the hoe ram is limited to 3000 ft-lb where it will be used less than 15 feet to the nearest existing structures.

⁴ Based on the equipment proposed for the project, we used the “loaded truck” vibration levels as the worst-case data.

⁵ PPV_{ref} = reference PPV at 25 feet; D = distance from equipment to receiver in feet

⁶ E_{ref} = 5,000 ft-lbs; E_{equip} = rated energy of the hoe ram, in ft-lbs

MECHANICAL EQUIPMENT NOISE ANALYSIS

We reviewed noise from the proposed mechanical equipment for the project to the adjacent property lines. Since placement of the equipment has not been established, we have assumed the following:

- All mechanical equipment will be on the building rooftop
- The rooftop will have a solid parapet wall that is at least 4 feet high
- Multiple condensers will be grouped close together
- All equipment will be at least 10 feet from the parapet.
- The parapet will be at least 15 feet from the nearest property plane.

Table 5 summarizes the equipment sound power level data provided on 25 March 2024.

Table 5: Mechanical Equipment Sound Power Levels

Equipment	Sound Power Level, in dBA
Exhaust Fan	81
Heat Pump (Single)	74
Heat Pump (Group)	83

The calculated noise levels from the mechanical equipment to the adjacent property lines are summarized in **Table 6**.

Table 6: Mechanical Equipment Noise Levels at Property Lines

Property Line	Sound Pressure Level, in dBA
North	43
East	43
South	36
West	38

Noise levels from mechanical equipment are calculated to be within 1 dB of the minimum measured ambient noise level, which is an indiscernible difference.

PROJECT TRAFFIC NOISE ANALYSIS

Based on the traffic volume data provided in the 555 Kelly Avenue Transportation Impact Analysis memo dated 15 March 2024, we modeled the increase in noise at the adjacent property lines. The estimated project trip generation is noted in the memo to increase by 17 vehicles at peak traffic hour. Using the total peak traffic volumes of 719 vehicles and 736 vehicles (existing and existing plus future respectively), the expected increase in noise level is less than 1 dB, which is not considered noticeable.

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This concludes our analysis of project-generated noise for the project. Please call let us know if you have any questions or comments.

Best,

SALTER



Matthew Hsiung
Senior Consultant



Eric Mori, PE
Executive Vice President



LT-1: Construction Leq(h) min 53 dB
Ambient Leq(h) min 43 dB

LT-2: Construction Leq(h) min 47 dB
Ambient Leq(h) min 42 dB

Kelly Ave

Kelly Ave

Google Earth

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555 KELLY HOUSING MEASUREMENT LOCATIONS AND MEASURED NOISE LEVELS

FIGURE 1

Salter #
24-0085

MDH/EBM
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