22 January 2025

Caroline Layden
Quarterra
429 9th Street, Suite 300
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Subject: Willow Apartments
Preliminary Environmental Noise Study
Salter Project 24-0542

Dear Caroline:

We have conducted a preliminary environmental noise study for the project. The purpose of the study is to determine the noise environment at the project site, compare the measured data with applicable standards, and propose initial mitigation measures as necessary. This report summarizes the results of our study.

PROJECT CRITERIA

California Building Code (Title 24)

Section 1206.4 of the California Building Code (CBC) requires that the indoor noise level in residential units of multi-family dwellings not exceed DNL[1] 45 dB.

City of Hercules

Zoning Ordinance Chapter 13-31.300.11 states[2]:

- Indoor noise levels for new housing units are not to exceed DNL 45 dB, which is in agreement with Title 24.

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1 DNL (Day-Night Average Sound Level) – A descriptor for a 24-hour A-weighted average noise level. DNL accounts for the increased acoustical sensitivity of people to noise during the nighttime hours. DNL penalizes sound levels by 10 dB during the hours from 10 PM to 7 AM. DNL is sometimes written as Ldn.

2 https://www.codepublishing.com/CA/Hercules/#!/Hercules13/Hercules1331.html

- Single-event noise (e.g., train passbys) should not exceed L_{max}[3] 50 dB in bedrooms and 55 dB in other habitable rooms.
- Outdoor noise levels should not exceed DNL 60 dB for residential areas (larger areas like courtyards, but not small decks). DNL 65 dB might apply at the decks, at the City's discretion.
- The outdoor noise goal is DNL 70 dB when the noise source is a railroad.

CALGreen

CALGreen Code Section 5.507.4 addresses acoustical issues for non-residential spaces. If a building is exposed to an exterior $L_{eq}(h)$[4] of 65 dB during any hour of operation, the building envelope must reduce the interior noise environment to $L_{eq}(h)$ of 50 dB in occupied areas. We have assumed this will apply at the clubhouse.

NOISE ENVIRONMENT

The project site is along Willow Avenue, east of Interstate 80 (I-80), south of State Route 4 (CA-4), and north of the Burlington Northern Santa Fe (BNSF) railway. The noise environment at the site is predominantly controlled by traffic on Willow Avenue, the freeways, and the railway.

To quantify the existing noise environment, we conducted three long-term noise measurements between 6 and 8 January 2025 (see **Figure 1** for the measurement locations and measured noise levels). The noise monitors were at a height of 12 feet above grade, except for the on-site monitor, which was about 7-feet above grade.

A traffic analysis has not been provided for this project. We have added 1 dB to our measured noise levels to account for future traffic increases[5].

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[3] L_{max30} (Typical Maximum Sound Level) – There is no standardized metric to quantify "typical" maximum sound levels in an environment (instead of the absolute maximum sound level for a measurement period). The metric L_{max30} comes from a paper by Rob Greene ("Max Level Intrusive Noise Limit: 1982 National Conference on Environmental and Occupational Noise"). It is based on the logarithmic average of the noisiest 30 percent of single events (e.g., train passbys, aircraft flyovers).

[4] $L_{eq}(h)$ – The equivalent steady-state A-weighted sound level that in an hour would contain the same acoustic energy as the time-varying sound level during that hour.

[5] The California Department of Transportation (DOT) assumes a traffic volume increase of three-percent per year, which corresponds to a 1 dB increase in DNL over a ten-year period.

RECOMMENDATIONS

Interior Noise (Code)

Using site plan drawings dated 18 October 2024, we calculated the window and exterior door STC[6] ratings needed to meet the project criteria, as shown in **Figure 2.** For our calculations, we have assumed the following:

- All spaces will have hard-surfaced (non-carpeted) flooring
- Bedrooms will be 12 feet by 10 feet and living rooms will be 15 feet by 12 feet
- Ceilings will be 9-feet high
- Windows will account for 50% of the facade
- The exterior wall achieves minimum STC 45 (equivalent to 7/8-inch-thick stucco over wood sheathing)

At some locations, an upgraded exterior wall (achieving STC 50) will be necessary to meet Code. These locations are indicated in **Figure 2.**

The recommended STC ratings are for full window and door assemblies (glass and frame) rather than just the glass itself. Tested sound-rated assemblies should be used. For reference, typical one-inch glazing assemblies (two 1/4-inch-thick panes with 1/2-inch airspace) typically achieve an STC rating of 32. STC ratings above 32 should include laminated glass. STC ratings above 38 might require an IGU greater than one-inch thick. This will vary depending on the window manufacturer.

Where windows need to be closed to achieve an indoor DNL of 45 dB, an alternative method of supplying fresh air (e.g., mechanical ventilation) should be considered. This applies to all locations. This issue should be discussed with the project mechanical engineer.

Interior Noise (Single-Event Noise)

To meet the single-event criteria, it will be necessary to provide upgraded exterior wall assemblies at the southern facades of Buildings 5 and 6. With these upgrades, windows and exterior doors in these facades would need STC ratings up to STC 46. When the project design is more developed, we can provide more detailed STC ratings in the final environmental noise study.

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6 STC (Sound Transmission Class) – A single-number rating defined in ASTM E90 that quantifies the airborne sound insulating performance of a partition under laboratory conditions. Increasing STC ratings correspond to improved airborne sound insulation.

Exterior Noise

There are no common outdoor-use areas shown in the plans. If that changes, we can provide recommendations as part of the later final environmental noise study.

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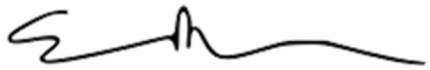
This concludes our preliminary environmental noise study for the project. Please feel free to reach out with any questions you may have.

Best,

SALTER

Zamar Bravo Tapia
Consultant



Eric Mori, PE
Executive Vice President

MEMORANDUM

DATE: 18 November 2025

NAME: Jason Winterboer

COMPANY: Quarterra

EMAIL: Jason.winterboer@quarterra.com

FROM: Brian Wourms and Eric Mori, PE

SUBJECT: Emblem Hercules
Review of Project Exterior HVAC Noise

PROJECT: 24-0542

As requested, we have reviewed the project-generated HVAC noise and compared it with the City of Hercules Municipal Code. This memo presents our findings.

CRITERIA

The City of Hercules Zoning Ordinance Chapter 13.31.11.A.5 states that for non-transportation related noise sources, outdoor noise levels within a residential property should not exceed the limits in Table 7 of the Noise Element.

The Hercules Noise Element Table 7 requires noise at a receiving residential land-use property line to not exceed an hourly L_{eq} of 50 dBA during the day and 45 dBA at night. Also, Table 7 Note 5 provides a provision that allowable levels shall be raised to ambient noise levels where the ambient levels exceed the allowable levels.

The project is not directly adjacent to any other properties. The closest residential receiver is approximately 600 feet to the northeast of the site, across Highway 4.

EXPECTED NOISE LEVELS

The project will use interior fan-coils with outdoor heat pumps at each residence. Quarterra provided cutsheets for the heat pumps (attached) indicating the maximum noise level is 60 dBA at 1 meter for the loudest unit. At the closest residential receiver 600 feet away, heat pump noise would be approximately 15 dBA. This is well below the 45 dBA nighttime limit, and the expected ambient noise level near a highway. Therefore, the project will meet the stationary noise requirements of the Zoning Ordinance.

This concludes our comments on this issue. Let us know if you have any questions.

Submittal Data Sheet

R-32 1.5-Ton, 2-Port Heat Pump, Ductless ODU

2MXM18AVJU9

EFFICIENCY

	SEER2	EER2	HSPF2	COP
Non-Ducted:	21.00	12.00	10.00	
Ducted:				
Mixed:	10.50	6.00	5.00	0

PERFORMANCE

COOLING:		HEATING:	
Rated (Btu/hr):	17,200	Rated (Btu/hr):	18,500
Operating Range:	14°F - 115°F	Operating Range:	5°F - 60°F
Rated Cooling Conditions:		Rated Heating Conditions:	
Indoor (°F DB/DB): 80 / 67 Ambient (°F DB/WB): 95 / 75		Indoor (°F DB/WB): 70 / 60 Ambient (°F DB/WB): 47 / 43	

ELECTRICAL

Power Supply (V/Hz/Ph): *See Engineering Manuals for other voltages.	*208-230 / 60 / 1
System MCA: (Min.circuit amps)	15.6
System MFA: (Max.fuse amps)	20.0
Compressor RLA: (Rated load amps)	14.0
Outdoor fan motor FLA: (Full load amps)	0.3
Outdoor fan motor W: (Rated output watts)	150.0

PIPING

Max. System Piping Length: (feet):	164	Gas Conn. (inch):	3/8
Max. Interunit Piping Length: (feet):	164	Liquid Conn. (inch):	1/4
Max. Height Difference IDU to ODU (feet):	49.25	Drain Conn. (inch):	5/8
Max. Height Difference IDU to IDU (feet):			
Refrigerant Pre-Charged Pipe Length (ft):	98.4		

SPECIFICATIONS

Compressor Type:	Swing	Compressor Stage:	Inverter
Refrigerant Type:		Refrigerant Oil:	PVE (FVC50K)
Factory Charge (Lbs):	3.3	Additional Refrigerant Charge (Ozs/ft):	.22

COOLING - Airflow Rate (cfm):		HEATING - Airflow Rate (cfm):	
High:	2,112	High:	2,140
Med:	2,112	Med:	2,140
Low:	1,911	Low:	1,561
Sound Level (dBA):	52	Sound Level (dBA):	54
Dimensions (HxWxD) (in):	29-1/2 x 34-1/4 x 12-5/8	Net Weight (lb):	127

Submittal Data Sheet

2.0-Ton R-32, 3-Port Heat Pump, Ductless ODU

3MXM24AVJU9

EFFICIENCY

	SEER2	EER2	HSPF2	COP
Non-Ducted:	21.00	12.00	10.00	
Ducted:				
Mixed:	10.50	6.00	5.00	0

PERFORMANCE

COOLING:		HEATING:	
Rated (Btu/hr):	23,000	Rated (Btu/hr):	24,000
Operating Range:	14°F - 115°F	Operating Range:	5°F - 60°F
Rated Cooling Conditions:		Rated Heating Conditions:	
Indoor (°F DB/DB): 80 / 67 Ambient (°F DB/WB): 95 / 75		Indoor (°F DB/WB): 70 / 60 Ambient (°F DB/WB): 47 / 43	

ELECTRICAL

Power Supply (V/Hz/Ph): *See Engineering Manuals for other voltages.	*208-230 / 60 / 1
System MCA: (Min.circuit amps)	19.9
System MFA: (Max.fuse amps)	25.0
Compressor RLA: (Rated load amps)	17.0
Outdoor fan motor FLA: (Full load amps)	
Outdoor fan motor W: (Rated output watts)	150.0

PIPING

Max. System Piping Length: (feet):	230	Gas Conn. (inch):	3/8
Max. Interunit Piping Length: (feet):	230	Liquid Conn. (inch):	1/4
Max. Height Difference IDU to ODU (feet):	49.25	Drain Conn. (inch):	5/8
Max. Height Difference IDU to IDU (feet):			
Refrigerant Pre-Charged Pipe Length (ft):	131.25		

SPECIFICATIONS

Compressor Type:	Swing	Compressor Stage:	Inverter
Refrigerant Type:		Refrigerant Oil:	PVE (FVC50K)
Factory Charge (Lbs):	4.9	Additional Refrigerant Charge (Ozs/ft):	0.22

COOLING - Airflow Rate (cfm):		HEATING - Airflow Rate (cfm):	
High:	2,462	High:	2,140
Med:	2,055	Med:	2,140
Low:	1,939	Low:	1,070
Sound Level (dBA):	52	Sound Level (dBA):	54
Dimensions (HxWxD) (in):	29-1/2 x 34-1/4 x 12-5/8	Net Weight (lb):	146

Submittal Data Sheet

3.0-Ton R-32, 4-Port Heat Pump, Ductless ODU

4MXM36AVJU9

EFFICIENCY

	SEER2	EER2	HSPF2	COP
Non-Ducted:	20.00	10.00	9.50	
Ducted:				
Mixed:	10.00	5.00	4.75	0

PERFORMANCE

COOLING:		HEATING:	
Rated (Btu/hr):	34,200	Rated (Btu/hr):	34,600
Operating Range:	14°F - 115°F	Operating Range:	5°F - 60°F
Rated Cooling Conditions:		Rated Heating Conditions:	
Indoor (°F DB/DB): 80 / 67 Ambient (°F DB/WB): 95 / 75		Indoor (°F DB/WB): 70 / 60 Ambient (°F DB/WB): 47 / 43	

ELECTRICAL

Power Supply (V/Hz/Ph): *See Engineering Manuals for other voltages.	*208-230 / 60 / 1
System MCA: (Min.circuit amps)	24.1
System MFA: (Max.fuse amps)	25.0
Compressor RLA: (Rated load amps)	18.5
Outdoor fan motor FLA: (Full load amps)	
Outdoor fan motor W: (Rated output watts)	150.0

PIPING

Max. System Piping Length: (feet):	230	Gas Conn. (inch):	3/8
Max. Interunit Piping Length: (feet):	230	Liquid Conn. (inch):	1/4
Max. Height Difference IDU to ODU (feet):	49.25	Drain Conn. (inch):	5/8
Max. Height Difference IDU to IDU (feet):			
Refrigerant Pre-Charged Pipe Length (ft):	131.25		

SPECIFICATIONS

Compressor Type:	Swing	Compressor Stage:	Inverter
Refrigerant Type:		Refrigerant Oil:	PVE (FVC50K)
Factory Charge (Lbs):	4.9	Additional Refrigerant Charge (Ozs/ft):	0.22

COOLING - Airflow Rate (cfm):		HEATING - Airflow Rate (cfm):	
High:	2,896	High:	2,518
Med:	2,402	Med:	2,518
Low:	2,055	Low:	1,070
Sound Level (dBA):	56	Sound Level (dBA):	60
Dimensions (HxWxD) (in):	29-1/2 x 34-1/4 x 12-5/8	Net Weight (lb):	142