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Noise Analysis for the Alvarado Creek Specific Plan Project San Diego, California

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RECON Number 4167-2
July 13, 2018

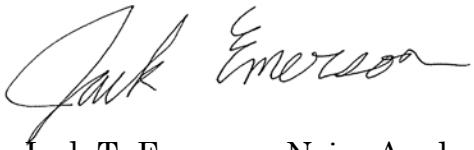

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

FIGURES

TABLES

ATTACHMENTS

Acronyms

Caltrans	California Department of Transportation
City	City of La Mesa
CNEL	community noise equivalent level
dB	decibel
dB(A)	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	heating, ventilation, and air conditioning
I-8	Interstate 8
L_{eq}	one-hour equivalent noise level
L_{pw}	sound power level
mph	miles per hour
project	Alvarado Specific Plan Project
SDMTS	San Diego Metropolitan Transit System
SEL	sound exposure level
VdB	vibration decibels

Executive Summary

The Alvarado Creek Specific Plan Project (project) site is located in the city of La Mesa, California, south of Alvarado Road and Interstate 8 (I-8) and north and east of Alvarado Creek. The site is developed with the San Diego RV (recreational vehicle) Resort. The project would construct one six-story building and three eight-story buildings with a total of 846 multi-family dwelling units and amenities on the 12-acre site.

This report discusses potential noise impacts from the construction and operation of the project. As part of this assessment, noise levels due to vehicle and trolley traffic were calculated and evaluated against City of La Mesa (City) noise and land use compatibility guidelines. In addition to compatibility, the potential for noise to impact adjacent receivers from future on-site sources and construction activity was assessed. Where impacts were identified, measures have been identified to comply with the City's noise standards. A summary of the findings is provided below.

Construction Noise

Project construction noise would be generated by diesel engine-driven construction equipment used for site preparation and grading, building construction, loading, unloading, and placing materials and paving. Construction noise would potentially result in short-term impacts to surrounding properties. Proximate residential developments include the La Cuesta Apartments, Colony Mobile Plaza, Comanche Hills Apartments, and single family residences are located south of the project site (across Alvarado Creek and the San Diego Metropolitan Transit System Green Line). The Colony Park Project proposes additional apartments to the south of the project (immediately west of Colony Mobile Plaza).

As calculated in this analysis, construction noise levels would range from 61 to 68 one-hour equivalent A-weighted decibels [dB(A) L_{eq}] at the adjacent residential property lines. Although the existing adjacent residences would be exposed to construction noise levels that could be heard above ambient conditions, the exposure would be temporary and would not be considered adverse. Additionally, construction activities are not anticipated to exceed 75 dB(A) L_{eq}. According to Section 10.80.100 of the La Mesa Municipal Code, construction activities are prohibited between the hours of 10:00 p.m. and 7:00 a.m. and on Sundays. Construction activities would generally occur over the period between 7:00 a.m. and 5:00 p.m. on weekdays. Because construction activities associated with the project would comply with the applicable regulation for construction, temporary increases in noise levels from construction activities would be less than significant.

Noise Compatibility

The main source of noise at the project site is vehicle traffic on I-8 and Alvarado Road. Additional noise is generated by trolley traffic on the adjacent San Diego Metropolitan Transit System Green Line. For multi-family residential uses, community noise equivalent

levels (CNEL) up to 65 dB(A) are considered normally acceptable, and noise levels up to 70 CNEL are considered conditionally acceptable. Where exterior noise levels would not conform to compatibility standards, the City requires a noise insulation features that reduce interior noise levels to less than 45 CNEL be included in the design.

As calculated in this analysis, exterior noise levels are projected to reach up to 80 CNEL at proposed outdoor use areas and at building façades. Noise abatement measure NOI-1 requires that the project incorporate design features that reduce interior noise levels at all habitable rooms to 45 CNEL or less and outlines noise insulation features that would achieve this requirement. With incorporation of abatement measure NOI-1, the project would comply with City interior noise compatibility standards.

Exterior use areas associated with the project include podium level courtyards and rooftop sky decks. City exterior noise compatibility standards require that projects minimize the effects of noise by incorporating noise reduction features to reduce noise levels at multi-family outdoor use areas to 65 CNEL. Noise abatement measure NOI-2 requires that the project incorporate design features that reduce exterior noise levels at outdoor use areas to 65 CNEL or less and outlines the design of noise barriers that would achieve this requirement. With incorporation of abatement measure NOI-2, the project would comply with City exterior noise compatibility standards.

Off-site Traffic Noise Increases

Ambient noise levels along Alvarado Road are primarily attributable to vehicle traffic on I-8 rather than vehicle traffic on Alvarado Road itself. The project would contribute to substantial traffic volume increases on Alvarado Road; however vehicle traffic on I-8 would be anticipated to remain dominant due to the relative speed of vehicle traffic. Ambient noise increases would be anticipated to be less than 3 dB(A).

On-site Generated Noise

The noise sources on the project site after completion of construction are anticipated to be those that would be typical of any residential complex, such as vehicles arriving and leaving, children at play, and landscape maintenance machinery. None of these noise sources are anticipated to violate the La Mesa Municipal Code or result in a substantial permanent increase in existing noise levels.

Additionally, the project would include heating, ventilating, and air conditioning (HVAC) units with a roof-mounted condenser unit for each apartment, which could exceed the City standards. On-site generated noise sources were modeled and resulting noise levels were predicted at the project site property lines. On-site generated noise levels would range from 35 to 45 dB(A) L_{eq}. The most restrictive noise level limits are 55 dB(A) L_{eq} during daytime hours and 50 dB(A) L_{eq} at night, thus noise levels would not exceed the applicable Noise Ordinance limits at the property lines.

Vibration

Because of the proximity to trolley operations on the adjacent railroad tracks, the project could expose the proposed residential uses to groundborne vibration and noise. The analysis of vibration impacts follows the guidance provided in the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment document. Based on the procedure outlined in the document, trolley pass-bys were estimated to generate a vibration level of 67 vibration decibels (VdB) at the location of future residences. Trolley vibration levels would not exceed the FTA's impact criteria of 72 VdB for frequent events. Thus, vibration impacts due to railroad operations would be less than significant.

1.0 Introduction

1.1 Project Description

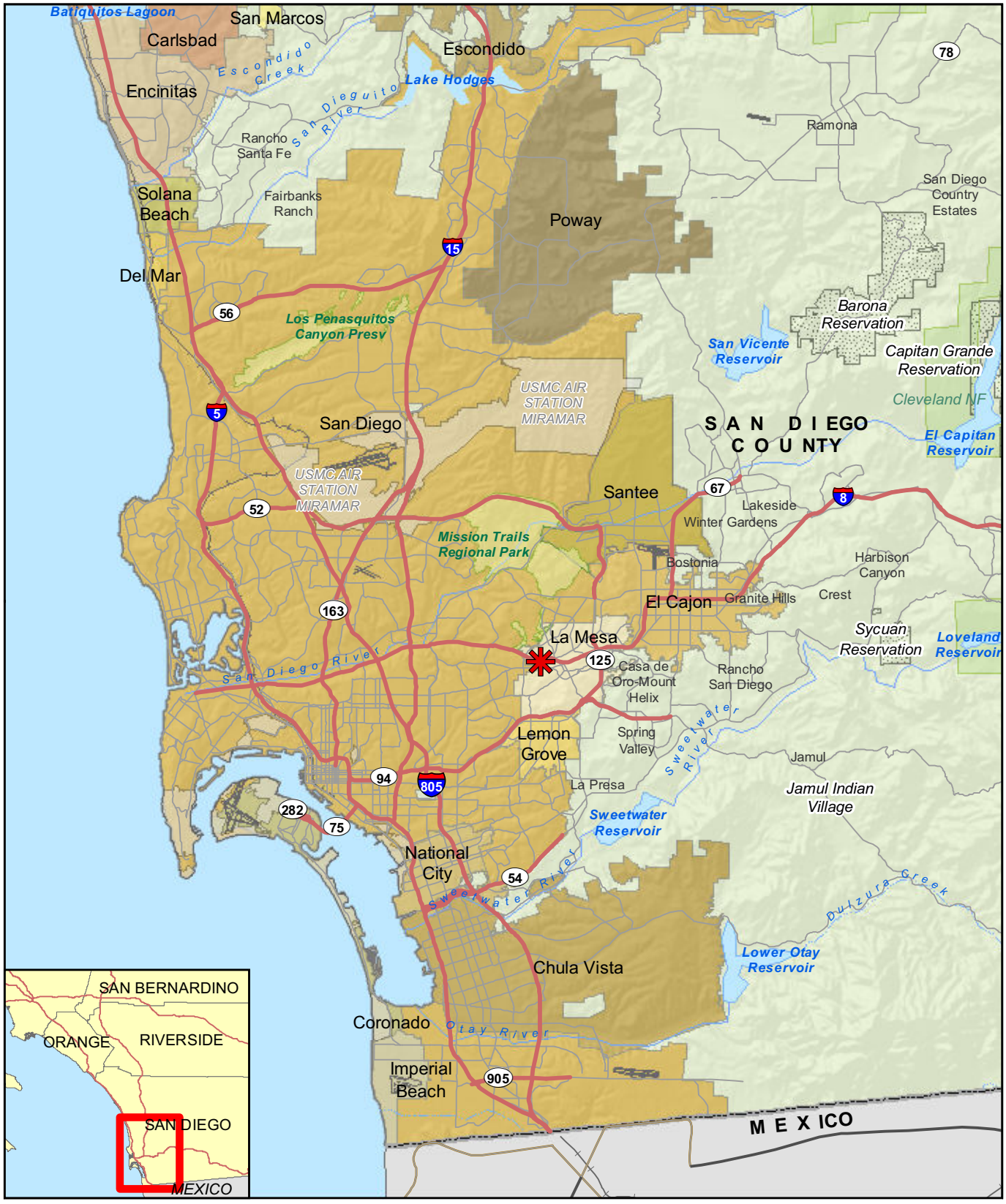
The Alvarado Creek Specific Plan Project (project) site is a master plan for a multi-family "transit-oriented development" on approximately 12 acres located south of Interstate 8 (I-8) along Alvarado Road generally between 70th Street on the west and Guava Avenue on the east within the city of La Mesa. Figure 1 shows the project site's regional location.

The project is proposed by the property owner, RV Communities, which has operated an RV (recreational vehicle) campground on the site since 1998. Prior to 1998, the site was operated as a mobile-home park since the 1950's. Figure 2 shows an aerial photograph of the project vicinity.

Generally, the land use and development standards in the Specific Plan outline a "form-based" development concept for multi-family housing on each of the development parcels (i.e., Buildings 1, 2, 3, and 4).

Building 1 would include five floors of residential wood frame construction atop a 1-level concrete parking garage with an attached café. The upper floors of Building 1 would include studio, one-bedroom, and two-bedroom units. A patio area would be located above the proposed café and a "sky decks" would be located at each the western and eastern end of the sixth floor.

Buildings 2, 3, and 4 would include five floors of residential wood frame construction atop a 3-level concrete parking garage podium with an attached leasing office for each building and several liner units along the southern building façades. The upper floors of Buildings 2, 3, and 4 would include loft, studio, one-bedroom, and two-bedroom units and the podium story would include site amenities such as courtyards with swimming pools. Buildings 2, 3, and 4 would each include interior project amenity spaces and active outdoor spaces on the podium level. Additional sky decks would be located atop the western corner of Building 2 and atop both the northwestern and northeastern corners of Buildings 3 and 4.



Project Location

FIGURE 1
Regional Location

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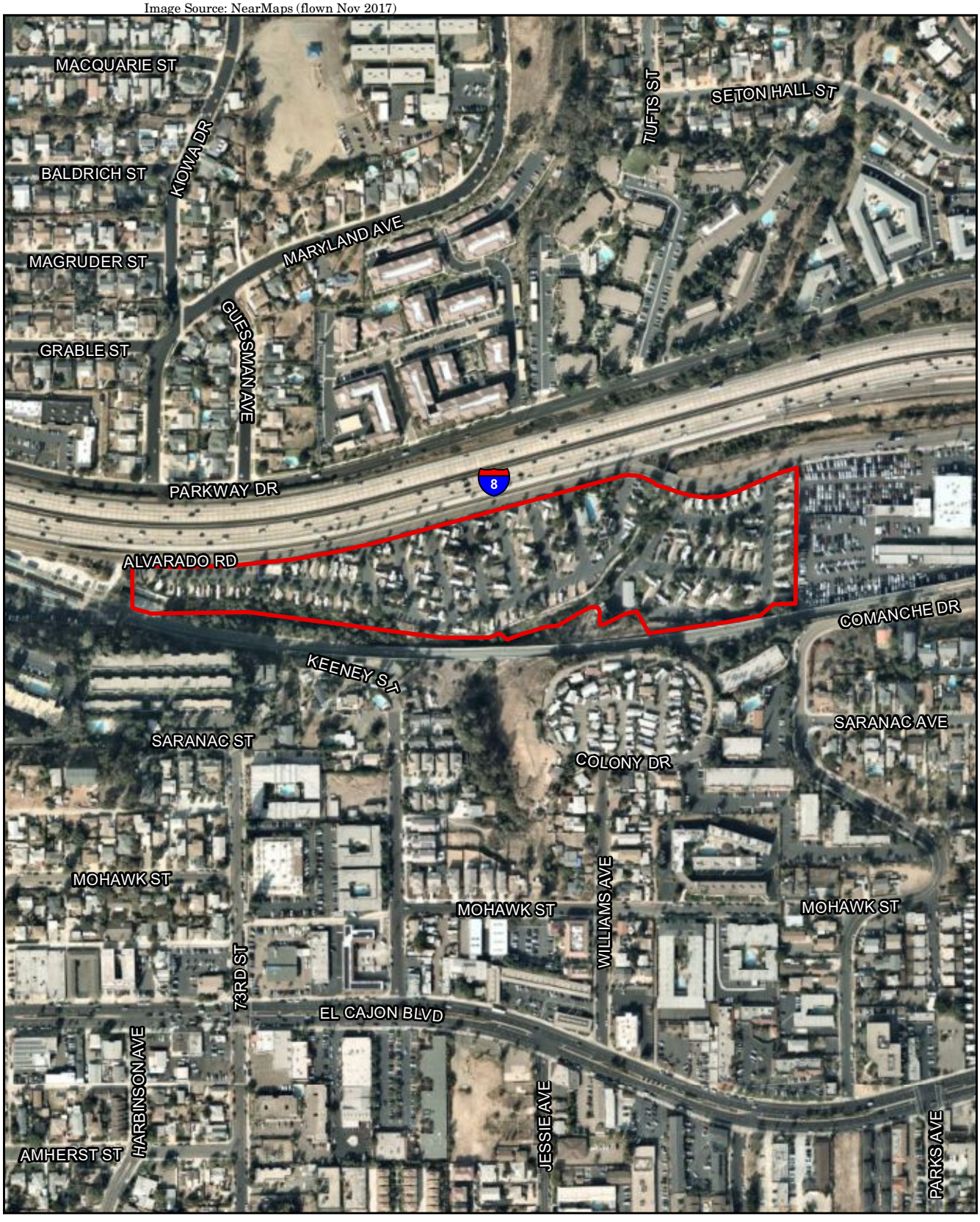
Image Source: NearMaps (flown Nov 2017)



Project Boundary

FIGURE 2

Project Location on Aerial Photograph

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Overall the project would include a total of 846 multi-family dwelling units. Units in Building 1 (60 units), Building 3 (307 units) and Building 4 (303 units) would be market-rate housing, while units in Building 2 (176 units) would be dedicated student housing. Figure 3 shows the proposed site plan.

1.2 Fundamentals of Noise

Sound levels are described in units called the decibel (dB). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3 dB decrease.

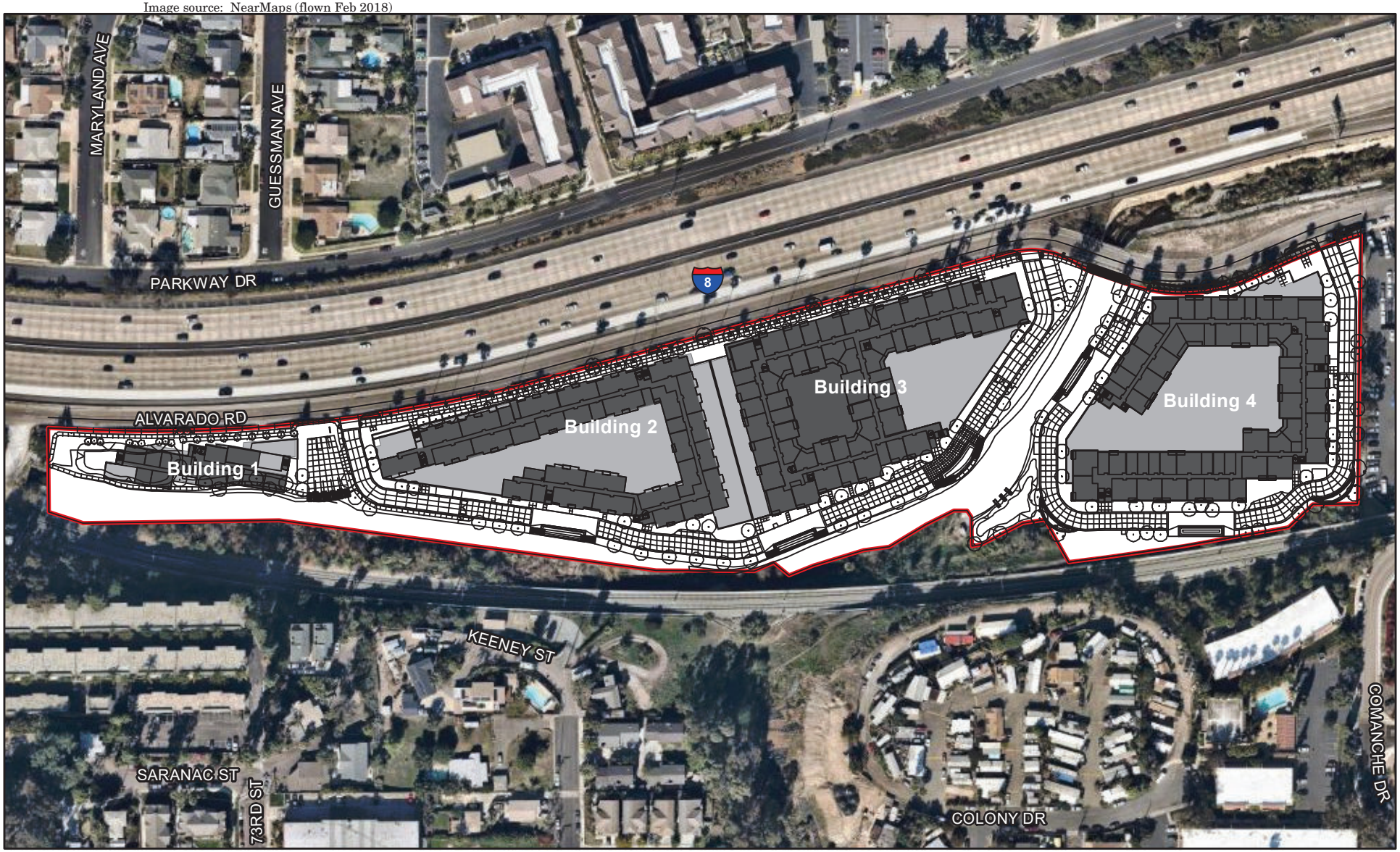
Additionally, in technical terms, sound levels are described as either a "sound power level" or a "sound pressure level," which while commonly confused are two distinct characteristics of sound. Both share the same unit of measure, the dB. However, sound power, expressed as L_{pw}, is the energy converted into sound by the source. The L_{pw} is used to estimate how far a noise will travel and to predict the sound levels at various distances from the source. As sound energy travels through the air, it creates a sound wave that exerts pressure on receivers such as an eardrum or microphone and is the sound pressure level. Noise measurement instruments only measure sound pressure, and noise level limits used in standards are generally sound pressure levels.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are designated with the notation dB(A).

The impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors has been developed. The noise descriptors used for this study are the one-hour equivalent noise level (L_{eq}), the community noise equivalent level (CNEL), and the sound exposure level (SEL). The CNEL is a 24-hour equivalent sound level. The CNEL calculation applies an additional 5 dB(A) penalty to noise occurring during evening hours, between 7:00 p.m. and 10:00 p.m., and an additional 10 dB(A) penalty is added to noise occurring during the night, between 10:00 p.m. and 7:00 a.m. These increases for certain times are intended to account for the added sensitivity of humans to noise during the evening and night. The SEL is a noise level over a stated period of time or event and normalized to one second.

Sound from a small, localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern, known as geometric spreading. The sound level decreases or drops off at a rate of 6 dB(A) for each doubling of the distance.

Image source: NearMaps (flown Feb 2018)



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Project Boundary

Site Plan Lines

Proposed Buildings

Podium-Level

Residential Upper Floors

FIGURE 3

Site Plan

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Traffic noise is not a single, stationary point source of sound. The movement of vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. The drop-off rate for a line source is 3 dB(A) for each doubling of distance.

The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site (such as parking lots or smooth bodies of water) receives no additional ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading of the source. A soft site (such as soft dirt, grass, or scattered bushes and trees) receives an additional ground attenuation value of 1.5 dB(A) per doubling of distance. Thus, a point source over a soft site would attenuate at 7.5 dB(A) per doubling of distance.

Human perception of noise has no simple correlation with acoustical energy. A change in noise levels is generally perceived as follows: 3 dB(A) barely perceptible, 5 dB(A) readily perceptible, and 10 dB(A) perceived as a doubling or halving of noise (California Department of Transportation [Caltrans] 2013).

2.0 Applicable Standards

2.1 California Code of Regulations

Interior noise levels for habitable rooms are regulated also by Title 24 of the California Code of Regulations California Noise Insulation Standards. Title 24, Chapter 12, Section 1207.4, of the California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 CNEL in any habitable room within a residential structure. A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (24 California Code of Regulations 1207).

2.2 Federal Transit Administration and Federal Railroad Administration

Although the FTA standards are intended for federally funded mass transit projects, the impact assessment procedures and criteria included in the Transit Noise and Vibration Impact Assessment (FTA 2006) are routinely used for projects proposed by local jurisdictions. The FTA and Federal Railroad Administration have published guidelines for assessing the impacts of groundborne vibration associated with rail projects.

Table 1 presents vibration impact criteria that account for variation in receptor types as well as the frequency of events. The project proposes residential uses and the land use would fall under Category 2 and the adjacent San Diego Metropolitan Transit System (SDMTS) Green Line trolley service involves frequent events.

Table 1
Groundborne Vibration and Noise Impact Criteria

Land Use Category	Groundborne Vibration Impact Levels			Groundborne Noise Impact Levels		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

VdB = vibration decibels; N/A = Not Applicable; dBA = A-weighted decibels
SOURCE: FTA 2006.
[1] "Frequent Events" is defined as more than 70 vibration events of the same source per day.
[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
[3] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.
[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating, ventilation, and air conditioning system and stiffened floors.
[5] Vibration-sensitive equipment is generally not sensitive to groundborne noise.

2.3 La Mesa General Plan

The Noise Element of the City's General Plan establishes acceptable noise compatibility noise levels for various land uses. For multi-family residential uses, exterior noise levels up to 65 CNEL are considered "normally acceptable" and noise levels up to 70 CNEL are considered "conditionally acceptable." According to the Noise Element, in conditionally acceptable areas, "new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design." It further states that "conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice" (City of La Mesa 2012). The Noise Element also specifies an interior noise standard of 45 CNEL for multi-family uses.

The Noise Element similarly states that exterior noise levels between 70 and 75 CNEL are considered "normally unacceptable" and that noise levels above 75 CNEL are considered "clearly unacceptable." Where exterior noise levels are normally unacceptable, "a detailed analysis of noise reduction requirements must be made and needed noise insulation features must be included in the design."

2.4 La Mesa Municipal Code

2.4.1 Stationary Noise

Section 10.80.040 of the La Mesa Municipal Code sets noise limits for on-site generated noise. The Code states that "the noise level to be observed in all measurements shall be that specified for the zone applicable to the property adjoining that on which the noise is generated and closest to the noise source." The applicable noise limits are summarized in Table 2.

Table 2
La Mesa Municipal Code Noise Level Limits

Zone or Land Use Designation	Time of Day	Sound Level [dB(A) L_{eq}]
R1 (Urban Residential) and R2 (Medium Low Density Residential)	7:00 a.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
R3 (Multiple Unit Residential) and RB (Residential Business)	7:00 a.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	55
C (General Commercial), CN (Neighborhood Commercial), CD (Downtown Commercial), and CM (Light Industrial and Commercial Service)	7:00 a.m. to 10:00 p.m.	65
	10:00 p.m. to 7:00 a.m.	60
M (Industrial Service and Manufacturing)	Anytime	70
dB(A)L_{eq} = one-hour equivalent A-weighted decibels.		

The project includes a Specific Plan that outlines a development concept for multi-family housing on the 12-acre site. The intensity of proposed multi-family in-fill development would not fit into the existing land use zoning categories. For the purposes of this analysis, the proposed development was translated to the nearest equivalent zoning category, which would be Multiple Unit Residential (R3).

Zoning designations for adjoining properties to the south include Urban Residential (R1) and Multiple Unit Residential (R3). The zoning designation for the adjoining property to the west is Light Industrial and Commercial Service (CM).

2.4.2 Construction Noise

Section 10.80.100 of the La Mesa Municipal Code states:

> It shall be unlawful for any person within a residential zone or CN [Neighborhood Commercial] zone, or within a radius of five hundred feet therefrom, to operate equipment or perform any outside construction or repair work on buildings, structures, or projects or to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction-type devices between the hours of 10:00 p.m. of one day and 7:00 a.m. of the next day or on Sundays unless a special permit authorizing the activity has been duly obtained from the chief building official. No permit shall be required to perform emergency work as defined in this chapter.

3.0 Existing Conditions

Existing noise levels at the project site were measured on February 1, 2018, using Larson-Davis LxT Sound Expert Sound Level Meter, serial number 3829. The following parameters were used:

Filter:	A-weighted
Response:	Slow
Time History Period:	5 seconds
Height of Instrument:	5 feet above ground level

The meter was calibrated before and after each measurement. Three 15-minute noise level measurements were made in the vicinity of the project site, as summarized in Table 3. The locations of the noise level measurements are shown on Figure 4, and the noise measurement data are contained in Attachment 1.

Table 3
Noise Measurements

Measurement	Location	Time	Noise Sources	L_{eq}
1	On the project site, 300 feet south of I-8	11:44 a.m.–11:59 a.m.	Vehicle traffic on I-8, trolley.	64.1
2	Along Alvarado Road, 120 feet south of I-8	12:16 p.m.–12:31 p.m.	Vehicle traffic on I-8, Alvarado Road	72.4
3	70th Street Trolley Station, 115 feet south of I-8	12:50 p.m.–1:05 p.m.	Vehicle traffic on I-8, trolley, bus	70.2

I-8 = Interstate 8; L_{eq} = one-hour equivalent sound level
Note: Noise measurement data is contained in Attachment 1.

Measurement 1 was located between the proposed location of Building 2 and Alvarado Creek, and approximately 300 feet south of I-8. The main source of noise at this location was vehicle traffic on I-8. Secondary sources of noise included trolley pass-bys and bird vocalizations. During the 15-minute measurement period, one westbound trolley and one eastbound trolley passed the project site.

Measurement 2 was located north of the proposed location of Building 4, at the southeast corner of the intersection of Alvarado Road and Alvarado Creek, and approximately 120 feet south of I-8. The main source of noise at this location was vehicle traffic on I-8. Secondary sources of noise included vehicle traffic on I-8. Traffic counts of eastbound I-8 were taken concurrently with Measurement 2; during the 15-minute period vehicle traffic on I-8 included 1,464 passenger vehicles, 20 medium trucks, 14 heavy trucks, 2 buses, and five motorcycles.

Measurement 3 was located west of the proposed location of Building 1, at the eastern end of the 70th Street Trolley Station, and approximately 115 feet south of I-8. The main source of noise at this location was vehicle traffic on I-8. Secondary sources of noise included trolley pass-bys and horns, trolley crossing bells, and bus activity.

Image source: NearMaps (flown Nov 2017)

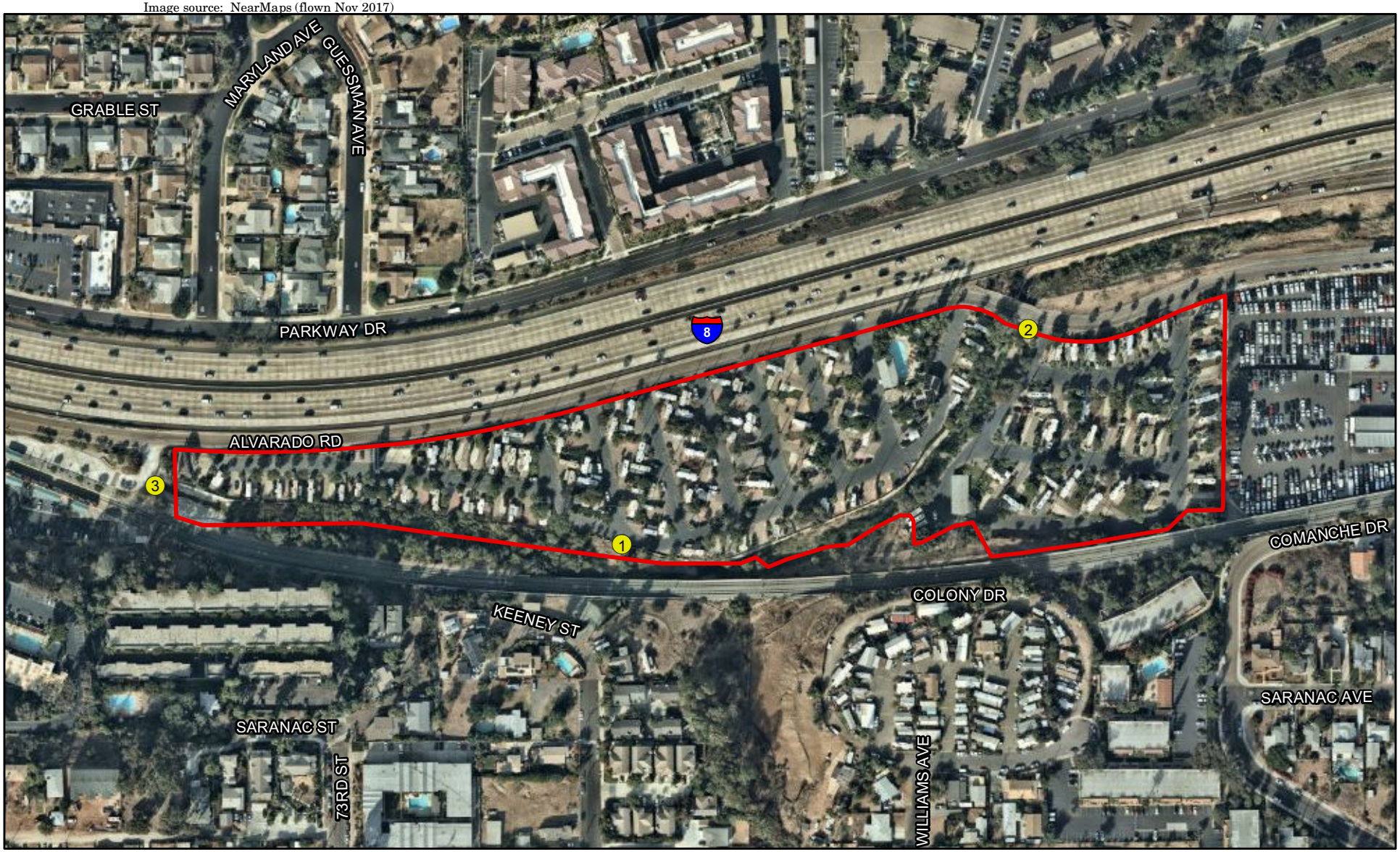

FIGURE 4

Measurements

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4.0 Analysis Methodology

Noise level predictions and contour mapping were developed using noise modeling software, SoundPlan Essential (SoundPlan), version 4.1 (Navcon Engineering 2018). SoundPLAN calculates noise propagation based on algorithms and reference levels published by various government agencies, such as the FTA, Federal Highway Administration (FHWA), and the International Standards Organization (ISO). The model uses various input parameters, such as distances between sources, barriers, and receivers; and shielding provided by intervening terrain, barriers, and structures. Receivers, sources, and barriers were input into the model using three-dimensional coordinates. The model outputs include noise level contours and noise levels at specific receivers. In all cases, receivers were modeled at 5 feet above ground or floor elevation, which represents the average height of the human ear.

4.1 Construction Noise Analysis

Project construction noise would be generated by diesel engine-driven construction equipment used for site preparation and grading, building construction, loading, unloading, and placing materials and paving. Diesel engine-driven trucks also would bring materials to the site and remove the soils from excavation.

Construction equipment with a diesel engine typically generates maximum noise levels from 80 to 90 dB(A) L_{eq} at a distance of 50 feet (FTA 2006). Table 4 summarizes typical construction equipment noise levels.

Table 4
Typical Construction Equipment Noise Levels

Equipment	Noise Level at 50 Feet [dB(A) L_{eq}]
Air compressor	81
Backhoe	80
Compactor	82
Concrete mixer	85
Crane, derrick	88
Dozer	85
Grader	85
Jack hammer	88
Loader	85
Paver	89
Pump	76
Roller	74
Scraper	89
Truck	88

dB(A)L_{eq} = one-hour equivalent A-weighted decibels.
SOURCE: Federal Transit Administration 2006.

During excavation, grading, and paving operations, equipment moves to different locations and goes through varying load cycles, and there are breaks for the operators and for non-equipment tasks, such as measurement. Although maximum noise levels may be 85 to 90 dB(A) at a distance of 50 feet during most construction activities, hourly average noise

levels from the grading phase of construction would be 82 dB(A) L_{eq} at 50 feet from the center of construction activity when assessing the loudest pieces of equipment working simultaneously. Noise propagation was modeled based on ISO 9613-2–Acoustics, Attenuation of Sound during Propagation Outdoors.

4.2 Traffic Noise Analysis

Noise generated by future traffic was modeled using FHWA's Traffic Noise Model algorithms and reference levels. The model uses various input parameters, such as projected hourly average traffic rates; vehicle mix, distribution, and speed; roadway lengths and gradients; distances between sources, barriers, and receivers; and shielding provided by intervening terrain, barriers, and structures. Receivers, roadways, and barriers were input into the model using three-dimensional coordinates. The locations of future buildings were obtained from project drawings.

The main source of traffic noise at the project site is vehicle traffic on I-8. For the purpose of the future traffic noise compatibility analysis, the noisiest condition is represented as the maximum level of service (LOS) C/minimum LOS D traffic volume. This condition represents a condition where the maximum number of vehicles are using the roadway at the maximum speed. LOS A and B categories allow full travel speed but do not have as many vehicles, while LOS E and F have a greater number of vehicles, but due to the traffic volume travel at reduced speeds, thus generating less noise. Eastbound I-8 has four mainline lanes and one auxiliary lane, and westbound I-8 has four mainline lanes. Using a capacity of 1,800 vehicles per lane per hour for mainlines and 1,200 vehicles per hour for auxiliary lines (Linscott, Law & Greenspan 2017), it was calculated that I-8 has a capacity of 15,600 vehicles per hour. The maximum LOS C/minimum LOS D volume is 80 percent of the total capacity, or 12,480 vehicles per hour.

Additional traffic noise would be generated by Alvarado Road. Based on Sam Diego Association of Governments (SANDAG) Traffic Forecast Information Center data, Alvarado Road has a future year 2035 annual average daily traffic (ADT) volume of 6,300 vehicles and a speed limit of 35 miles per hour (mph; SANDAG 2013). Peak hour traffic volumes on I-8 were modeled as 10 percent of the total ADT.

The vehicle classification mix for I-8 was obtained from Caltrans truck counts. Based on these truck counts, I-8 carries 96.8 percent automobiles, 2.0 percent medium trucks, and 1.2 percent heavy trucks (Caltrans 2015). Truck counts are not available for local roadways; Alvarado Road was also modeled with the same vehicle classification mix as I-8. Table 5 summarizes the vehicle traffic parameters used for modeling on-site noise levels.

Table 5 Traffic Parameters						
				Vehicle Mix (Percent)		
Roadway	Lanes	Volume (vehicles/hour)	Speed	Autos	Medium Trucks	Heavy Trucks
Westbound Interstate 8	4 Mainline	5,760	65	96.8	2.0	1.2
Eastbound Interstate 8	4 Mainline 1 Auxiliary	6,720	65	96.8	2.0	1.2
Alvarado Road	2 lanes	6,300	35	96.8	2.0	1.2

4.3 Trolley Noise Analysis

The SDMTS trolley Green Line is located south of the project site. Noise generated by the trolley was modeled using the SoundPLAN program. SoundPLAN calculates trolley noise levels based on trolley speed, length, and the number of pass-bys that occur during the daytime, evening, and nighttime hours. The trolleys were modeled at 30 mph. This speed is based on the distances between trolley stations and the average timing between stations obtained from published trolley schedules. Adjacent to the project site, there are 96 daytime pass-bys, 18 evening pass-bys, and 23 nighttime pass-bys on weekdays. There are fewer trolley pass-bys on Saturdays and Sundays, therefore, the worst-case weekday scenario was modeled.

4.4 On-site Generated Noise Analysis

The noise sources on the project site after completion of construction are anticipated to be those that would be typical of any residential complex, such as vehicles arriving and leaving, children at play, and landscape maintenance machinery. None of these noise sources is anticipated to violate the La Mesa Municipal Code or result in a substantial permanent increase in existing noise levels. However, the project would include heating residential heating, ventilation, and air conditioning (HVAC) units with a roof-mounted condenser unit for each apartment. The condensers mounted on the roofs have the potential to produce noise in excess of City limits (see Table 2).

It is not known at this time which manufacturer, brand, or model of unit or units would be selected for use in the project. For the purposes of this analysis, to determine what general noise levels the HVAC units would generate, it was assumed that the rooftop units would be similar to a 5-ton Carrier 25HHA4 units with a sound power level of 72 dB(A). The unit specification sheets are included in Attachment 2.

Roof-mounted condenser units would be clustered on the roof; with each condenser unit array having between 6 and 52 units (most commonly 8 units per array). Each condenser unit array was modeled as a point source 0.5 meters above the rooftop height with a composite sound power level between 79.8 and 89.3 dB(A), depending on the number of units in the array.

Rooftop features such as parapet walls typically provide noise attenuation. As the height and orientation of rooftop features has not been finalized, all rooftops were conservatively modeled as flat, with no features to obstruct noise propagation. For a worst-case analysis, it was assumed that the air handling units would be continuously operated at maximum capacity.

4.5 Trolley Vibration

Because of the proximity to trolley operations on the adjacent railroad tracks, the project could expose the residential uses to groundborne vibration and noise levels equal to or in excess of the levels shown in Table 1. The analysis of vibration impacts to future residences follows the guidance provided in the FTA's Transit Noise and Vibration Impact Assessment document (FTA 2006). The analysis follows the general assessment procedure outlined in the document. The general level of assessment uses generalized data to develop a curve of vibration level as a function of distance from the track. The vibration levels at specific buildings are estimated and adjustments are applied to account for factors such as track support system, vehicle speed, type of building, and track and wheel condition. The FTA has developed base curves for three standard transportation systems: locomotive-powered passenger or freight trains, rapid transit or light rail vehicles, and rubber-tired vehicles.

Typical ground-surface vibration levels calculated by the FTA assume equipment is in good condition and travels at speeds of 50 mph for the rail systems (locomotive freight and rapid transit or light rail vehicles) and 30 mph for buses (rubber-tired vehicles). The levels of groundborne vibration and noise vary approximately as 20 times the logarithm of speed. This means that doubling, or halving, train speed would increase, or decrease, the vibration levels approximately 6 decibels. As discussed in Section 4.3, trolleys (light rail vehicles) were modeled at 30 mph in the vicinity of the project. Thus, to determine the vibration level at the project site, the FTA generalized ground surface vibration curves were used and then adjusted for speed using the following equation:

$$adjustment\ (VdB) = 20 \times log \frac{speed}{speed_{ref}}$$

Where,

speed = speed of trolley = 30 mph
$speed_{ref}$ = reference speed = 50 mph

5.0 Future Acoustical Environment and Impacts

5.1 Construction Noise

Noise associated with the grading, building, and paving for the project would potentially result in short-term impacts to surrounding properties. Proximate residential developments include the La Cuesta Apartments, Colony Mobile Plaza, Comanche Hills Apartments, and

single-family residences are located south of the project site (across Alvarado Creek and the SDMTS Green Line). The Colony Park Project proposes additional apartments to the south of the project (immediately west of Colony Mobile Plaza).

The Bob Stall Chevrolet car dealership is east of the project site and the 70th Street Trolley Station is west of the site; these uses are not noise sensitive. Additional residential uses are located north of the project site across I-8; however construction noise would not be anticipated to exceed ambient traffic noise at these residences.

A variety of noise-generating equipment would be used during the construction phase of the project, such as excavators, backhoes, front-end loaders, and concrete saws, along with others. The exact number and pieces of construction equipment required are not known at this time. Although maximum noise levels may be 85 to 90 dB(A) at a distance of 50 feet during most construction activities, hourly average noise levels would be lower when taking into account the equipment usage factors. The loudest phase of construction would be the grading/excavation phase and would include dozers, loaders, and excavators. Construction noise levels were calculated assuming up to nine pieces of heavy equipment being active simultaneously.

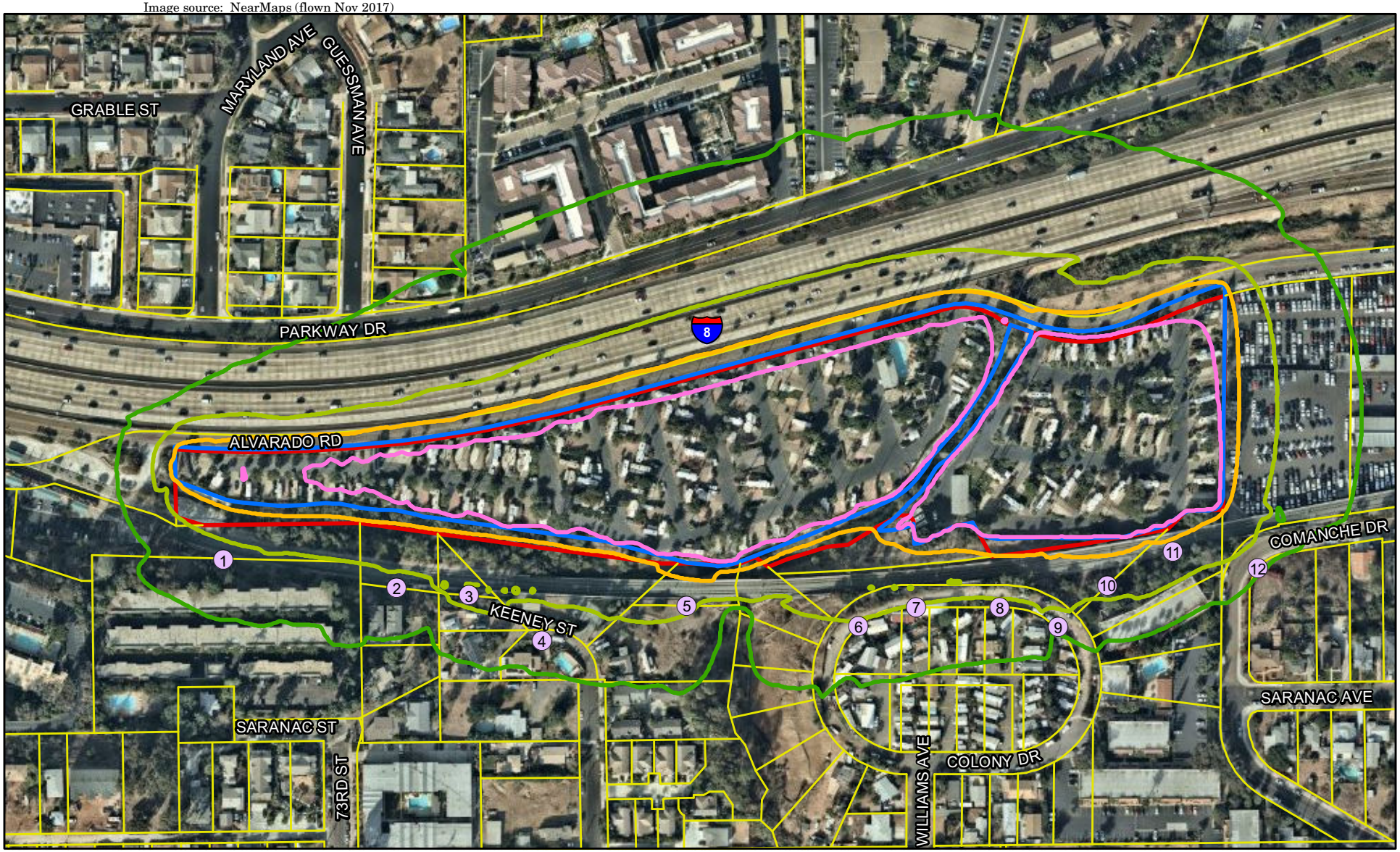
Construction noise is considered a point source and would attenuate at approximately 6 dB(A) for every doubling of distance. Average hourly noise levels due to simultaneous activity would be 86.8 dB(A) L_{eq} at 50 feet, or a sound power level of approximately 118.4 dB(A). To reflect the nature of grading and construction activities, equipment was modeled as an area source distributed over the project footprint. The total sound energy of the area source was modeled with all pieces of equipment operating simultaneously. Noise levels were modeled at a series of 12 receivers located at the adjacent property lines. The results are summarized in Table 6. Modeled receiver locations and construction noise contours are shown in Figure 5. SoundPLAN data is contained in Attachment 3.

Table 6
Construction Noise Levels

Receiver	Property Description	Noise Level [dB(A) L_{eq}]
1	Creaser & Warwick Apartments	64
2	5107 73rd Street Units	64
3	North end of Keeney Street	65
4	5084 Keeney Street	62
5	5061 Keeney Street	66
6	Colony Mobile Plaza	64
7		64
8		64
9		61
10	Comanche Hills Apartments	66
11		68
12	7570 Saranac Avenue	61

dB(A)L_{eq} = one-hour equivalent A-weighted decibels.

Image source: NearMaps (flown Nov 2017)



Project Boundary
Limits of Construction
Property Lines
Receivers

Construction Noise Contours

60 Leq
65 Leq
70 Leq
75 Leq

0 Feet 250

FIGURE 5

Construction Noise Contours

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As shown, construction noise levels at adjacent residential property lines would range from 61 to 68 dB(A) L_{eq}. Although the existing adjacent residences would be exposed to construction noise levels that could be heard above ambient conditions, the exposure would be temporary and would not be considered adverse. Additionally, construction activities are not anticipated to exceed 75 dB(A)L_{eq}. According to Section 10.80.100 of the La Mesa Municipal Code, construction activities are prohibited between the hours of 10:00 p.m. and 7:00 a.m. and on Sundays. Construction activities would generally occur over the period between 7:00 a.m. and 5:00 p.m. on weekdays. Because construction activities associated with the project would comply with the applicable regulation for construction, temporary increases in noise levels from construction activities would be less than significant.

5.2 Transportation Noise Compatibility

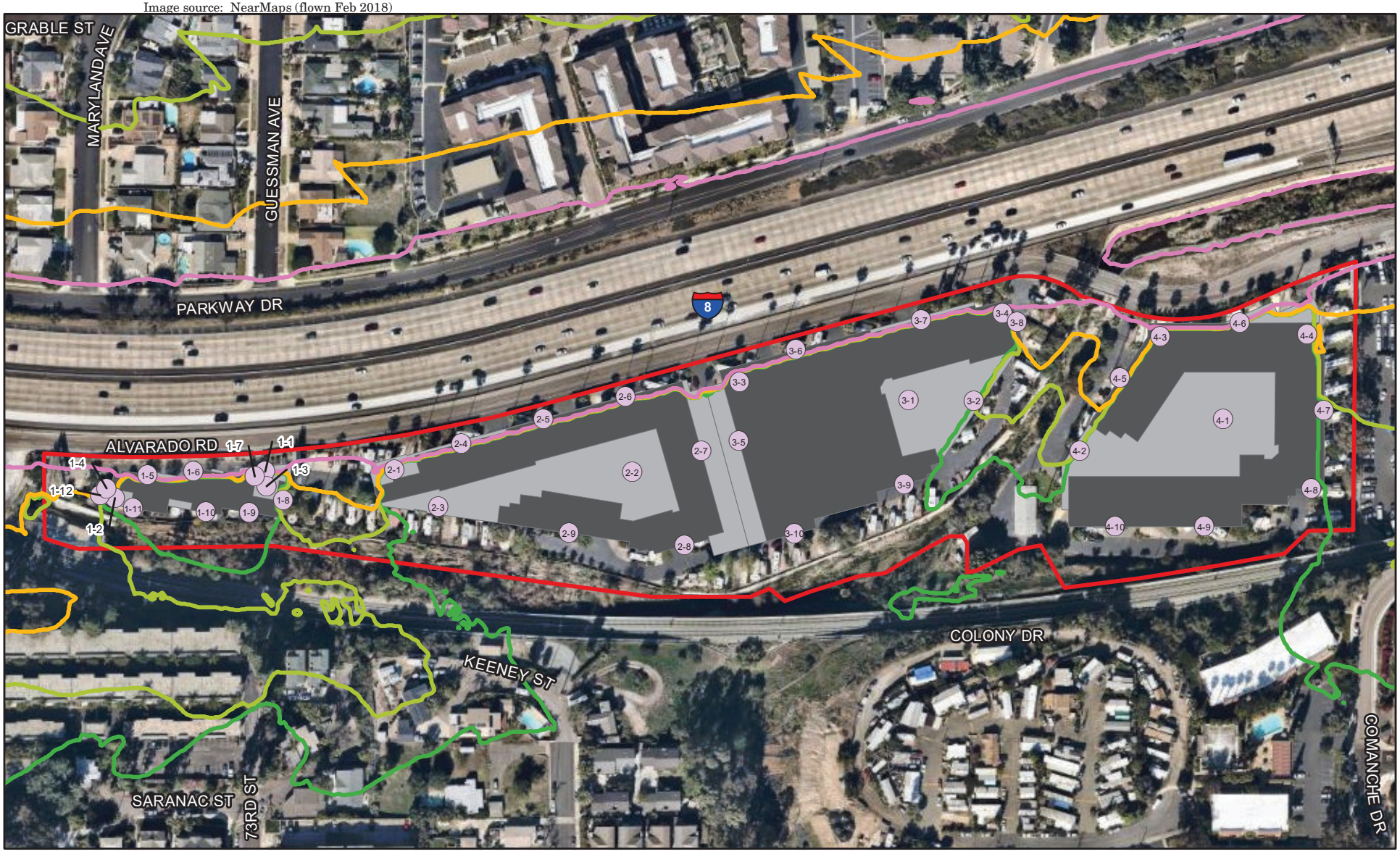
On-site traffic noise contours were developed using the SoundPLAN program. Noise level contours were modeled at the ground-floor level. These contours take into account shielding provided by proposed buildings, topography, and proposed grading. Future vehicle traffic noise contours are shown in Figure 6. SoundPLAN data are contained in Attachment 3. As shown in Figure 6, first-floor exterior noise levels are projected to range from approximately 60 to 75 CNEL across the project site.

To refine the noise analysis and determine noise levels at outdoor use areas (patio above café, podium level courtyards, and top-floor sky decks) and building façades, exterior noise levels were calculated at a series of receiver locations throughout the project site. No specific receiver locations were modeled for the concrete parking garage podiums (one story for Building 1 and three stories for Buildings 2, 3, and 4) because they would not include noise-sensitive areas. Modeled receiver locations are shown in Figure 6. Table 7 summarizes the projected future traffic noise levels at the 41 modeled receivers.

Daytime noise contours due to trolleys were developed using the SoundPLAN program. Noise level contours were modeled at the first-floor level. These contours take into account shielding provided by proposed buildings, topography, and proposed grading. Future trolley noise contours are shown in Figure 7. Noise levels were also modeled at the 41 specific receiver locations discussed in Section 5.2.1. Table 8 summarizes the projected future trolley noise levels at the 41 modeled receivers. SoundPLAN data are contained in Attachment 3. As shown, trolley noise levels are projected to be 60 CNEL or less at all modeled receivers.

Vehicle traffic and trolley noise levels were summed to calculate combined transportation noise levels. Table 9 summaries the combined vehicle traffic and trolley noise levels at the modeled receivers.

Image source: NearMaps (flown Feb 2018)



Project Boundary

Proposed Buildings

Podium-Level

Residential Upper Floors

Receivers

Traffic Noise Contours

60 CNEL

65 CNEL

70 CNEL

75 CNEL

0 Feet 200

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FIGURE 6

Vehicle Traffic Noise Contours

Table 7 Future Vehicle Traffic Noise Levels						
		Exterior Noise Level (CNEL)				
Receiver	Description	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
1-1	Building 1 Patio Above Café	80	--	--	--	--
1-2	Building 1 Western Sky Deck	--	--	--	--	70
1-3	Building 1 Eastern Sky Deck	--	--	--	--	75
1-4	Building 1 Façade North	78	78	78	78	--
1-5	Building 1 Façade North	79	80	80	79	79
1-6	Building 1 Façade North	79	80	80	80	79
1-7	Building 1 Façade North	78	79	79	79	78
1-8	Building 1 Façade East	71	73	73	73	73
1-9	Building 1 Façade South	33	35	37	41	46
1-10	Building 1 Façade South	36	35	38	41	46
1-11	Building 1 Façade South	72	72	72	72	71
1-12	Building 1 Façade West	75	75	75	75	--
		Fourth Floor	Fifth Floor	Sixth Floor	Seventh Floor	Eighth Floor
2-1	Building 2 Western Sky Deck	--	--	--	--	68
2-2	Building 2 Podium Courtyard	35	--	--	--	--
2-3	Building 2 Podium Periphery	35	--	--	--	--
2-4	Building 2 Façade North	79	79	79	78	78
2-5	Building 2 Façade North	79	79	79	79	78
2-6	Building 2 Façade North	79	79	79	79	78
2-7	Building 2 Façade East	62	67	69	70	70
2-8	Building 2 Façade South	30	36	36	37	40
2-9	Building 2 Façade South	31	32	33	38	40
3-1	Building 3 Podium Courtyard	58	--	--	--	--
3-2	Building 3 Podium Periphery	67	--	--	--	--
3-3	Building 3 Western Sky Deck	--	--	--	--	67
3-4	Building 3 Eastern Sky Deck	--	--	--	--	71
3-5	Building 3 Façade West	64	68	70	69	70
3-6	Building 3 Façade North	79	79	79	79	78
3-7	Building 3 Façade North	79	79	79	78	78
3-8	Building 3 Façade Northeast	75	75	75	75	75
3-9	Building 3 Façade East	55	56	53	47	44
3-10	Building 3 Façade South	44	45	45	43	42
4-1	Building 4 Podium Courtyard	36	--	--	--	--
4-2	Building 4 Podium Periphery	68	--	--	--	--
4-3	Building 4 Western Sky Deck	--	--	--	--	70
4-4	Building 4 Eastern Sky Deck	--	--	--	--	70
4-5	Building 4 Façade Northwest	73	73	73	73	73
4-6	Building 4 Façade North	76	76	76	76	76
4-7	Building 4 Façade East	68	68	69	69	69
4-8	Building 4 Façade South	38	39	41	42	44
4-9	Building 4 Façade South	29	30	32	34	41
4-10	Building 4 Façade South	28	30	31	34	39

CNEL = Community Noise Equivalent Level
"--" denotes where the receiver does not exist on a floor (e.g. sky decks only exist on the top floor)

Image source: NearMaps (flown Feb 2018)

Project Boundary

Proposed Buildings

Podium-Level

Residential Upper Floors

Receivers

Trolley Noise Contours

60 Leq

65 Leq

0 Feet 200

FIGURE 7

Daytime Trolley Noise Contours

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Table 8 Trolley Noise Levels						
		Exterior Noise Level (CNEL)				
Receiver	Description	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
1-1	Building 1 Patio Above Café	44	--	--	--	--
1-2	Building 1 Western Sky Deck	--	--	--	--	53
1-3	Building 1 Eastern Sky Deck	--	--	--	--	40
1-4	Building 1 Façade North	38	38	39	40	--
1-5	Building 1 Façade North	35	36	36	37	38
1-6	Building 1 Façade North	34	35	35	36	38
1-7	Building 1 Façade North	41	41	42	42	41
1-8	Building 1 Façade East	54	55	55	55	55
1-9	Building 1 Façade South	58	58	58	58	58
1-10	Building 1 Façade South	58	59	59	58	58
1-11	Building 1 Façade South	59	59	59	59	59
1-12	Building 1 Façade West	56	56	56	56	--
		Fourth Floor	Fifth Floor	Sixth Floor	Seventh Floor	Eighth Floor
2-1	Building 2 Western Sky Deck	--	--	--	--	44
2-2	Building 2 Podium Courtyard	36	--	--	--	--
2-3	Building 2 Podium Periphery	57	--	--	--	--
2-4	Building 2 Façade North	35	35	35	36	36
2-5	Building 2 Façade North	34	35	35	35	36
2-6	Building 2 Façade North	34	34	34	35	35
2-7	Building 2 Façade East	46	46	48	49	50
2-8	Building 2 Façade South	57	58	58	58	58
2-9	Building 2 Façade South	58	58	58	58	57
3-1	Building 3 Podium Courtyard	45	--	--	--	--
3-2	Building 3 Podium Periphery	50	--	--	--	--
3-3	Building 3 Western Sky Deck	--	--	--	--	39
3-4	Building 3 Eastern Sky Deck	--	--	--	--	43
3-5	Building 3 Façade West	45	47	48	49	49
3-6	Building 3 Façade North	32	32	32	33	34
3-7	Building 3 Façade North	31	31	32	32	33
3-8	Building 3 Façade Northeast	34	32	33	35	36
3-9	Building 3 Façade East	53	55	55	55	56
3-10	Building 3 Façade South	56	57	57	57	57
4-1	Building 4 Podium Courtyard	33	--	--	--	--
4-2	Building 4 Podium Periphery	47	--	--	--	--
4-3	Building 4 Western Sky Deck	--	--	--	--	39
4-4	Building 4 Eastern Sky Deck	--	--	--	--	46
4-5	Building 4 Façade Northwest	41	41	42	42	43
4-6	Building 4 Façade North	25	26	27	29	32
4-7	Building 4 Façade East	52	52	53	53	53
4-8	Building 4 Façade South	58	58	58	58	58
4-9	Building 4 Façade South	60	60	59	59	59
4-10	Building 4 Façade South	58	59	59	59	58

CNEL = Community Noise Equivalent Level
"--" denotes where the receiver does not exist on a floor (e.g. sky decks only exist on the top floor)

Table 9 Combined Vehicle Traffic and Trolley Noise Levels						
		Exterior Noise Level (CNEL)				
Receiver	Description	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
1-1	Building 1 Patio Above Café	80	--	--	--	--
1-2	Building 1 Western Sky Deck	--	--	--	--	70
1-3	Building 1 Eastern Sky Deck	--	--	--	--	75
1-4	Building 1 Façade North	78	78	78	78	--
1-5	Building 1 Façade North	79	80	80	79	79
1-6	Building 1 Façade North	79	80	80	80	79
1-7	Building 1 Façade North	78	79	79	79	78
1-8	Building 1 Façade East	71	73	73	73	73
1-9	Building 1 Façade South	58	58	58	58	58
1-10	Building 1 Façade South	58	59	59	59	59
1-11	Building 1 Façade South	72	72	72	72	72
1-12	Building 1 Façade West	75	75	75	75	--
		Fourth Floor	Fifth Floor	Sixth Floor	Seventh Floor	Eighth Floor
2-1	Building 2 Western Sky Deck	--	--	--	--	68
2-2	Building 2 Podium Courtyard	39	--	--	--	--
2-3	Building 2 Podium Periphery	57	--	--	--	--
2-4	Building 2 Façade North	79	79	79	78	78
2-5	Building 2 Façade North	79	79	79	79	78
2-6	Building 2 Façade North	79	79	79	79	78
2-7	Building 2 Façade East	62	67	69	70	70
2-8	Building 2 Façade South	57	58	58	58	58
2-9	Building 2 Façade South	58	58	58	58	58
3-1	Building 3 Podium Courtyard	58	--	--	--	--
3-2	Building 3 Podium Periphery	67	--	--	--	--
3-3	Building 3 Western Sky Deck	--	--	--	--	67
3-4	Building 3 Eastern Sky Deck	--	--	--	--	71
3-5	Building 3 Façade West	64	68	70	69	70
3-6	Building 3 Façade North	79	79	79	79	78
3-7	Building 3 Façade North	79	79	79	78	78
3-8	Building 3 Façade Northeast	75	75	75	75	75
3-9	Building 3 Façade East	57	58	57	56	56
3-10	Building 3 Façade South	57	57	58	58	57
4-1	Building 4 Podium Courtyard	38	--	--	--	--
4-2	Building 4 Podium Periphery	68	--	--	--	--
4-3	Building 4 Western Sky Deck	--	--	--	--	70
4-4	Building 4 Eastern Sky Deck	--	--	--	--	70
4-5	Building 4 Façade Northwest	73	73	73	73	73
4-6	Building 4 Façade North	76	76	76	76	76
4-7	Building 4 Façade East	68	68	69	69	69
4-8	Building 4 Façade South	58	58	58	58	58
4-9	Building 4 Façade South	60	60	59	59	59
4-10	Building 4 Façade South	58	59	59	59	58

CNEL = Community Noise Equivalent Level
"--" denotes where the receiver does not exist on a floor (e.g. sky decks only exist on the top floor)

5.2.1 City Noise Compatibility Standards

As discussed in Section 2.1, for multi-family residential uses, exterior noise levels up to 65 CNEL are clearly acceptable. Exterior noise levels up to 70 CNEL are considered conditionally acceptable and conventional construction with fresh air supply systems or air conditioning will normally suffice. The project would include HVAC units for each apartment, therefore, noise exposure levels up to 70 CNEL are considered conditionally acceptable.

Exterior noise levels at Building 1 would be considered conditionally acceptable at the western sky deck (70 CNEL) and along the eastern half of the southern building façade (58 to 70 CNEL). Without mitigation, exterior noise levels along the northern, western, and eastern façades, as well as the western half of the southern façade would exceed noise compatibility standards (71 to 80 CNEL). Additionally, without mitigation exterior noise levels at the patio above the café (80 CNEL) and eastern sky deck (75 CNEL) would exceed noise compatibility standards.

Exterior noise levels at Building 2 would be considered acceptable in the podium courtyard (39 CNEL) and at the periphery of the podium level (57 CNEL) and would be considered conditionally acceptable at the western sky deck (68 CNEL), and along southern and eastern building façades (57 to 70 CNEL). Without mitigation, exterior noise levels along the northern façades would exceed noise compatibility standards (79 to 80 CNEL).

Exterior noise levels at Building 3 would be considered acceptable in the podium courtyard (58 CNEL) and would be considered conditionally acceptable at the periphery of the podium level (67 CNEL), at the western sky deck (67 CNEL), and along western, southern, and eastern building façades (56 to 70 CNEL). Without abatement, exterior noise levels along the northern and northeastern façades (75 to 80 CNEL) and at the eastern sky deck (71 CNEL) would exceed noise compatibility standards.

Exterior noise levels at Building 4 would be considered acceptable in the podium courtyard (38 CNEL) and would be considered conditionally acceptable at the periphery of the podium level (68 CNEL), at both sky decks (70 CNEL), and along southern and eastern building façades (58 to 69 CNEL). Without abatement, exterior noise levels along the northern and northwestern façades (73 to 76 CNEL) would exceed noise compatibility standards.

Where exterior noise levels are normally unacceptable, "a detailed analysis of noise reduction requirements must be made and needed noise insulation features must be included in the design." These noise insulation features must reduce interior noise levels to less than 45 CNEL be included in the design. As shown in Table 9, transportation noise levels at the northern, western, and eastern façades, as well as the western half of the southern façade of Building 1; at the northern façade of building 2; at the northern and northeastern façades of Building 3; and at the northern and northwestern façades of Building 4 would range from 71 to 80 CNEL. Based on studies conducted by the FHWA, standard wood frame construction would achieve an exterior-to-interior noise reduction of 25 dB(A) (FHWA 2011). Thus, interior noise levels for units along these building façades would reach 55 CNEL and would exceed interior noise standards.

As clarified by Noise Element Policy NS-1.1.3, noise compatibility standards also require that projects minimize the effects of noise by incorporating noise reduction features to reduce exterior noise levels at multi-family outdoor use areas to 65 CNEL (i.e. clearly acceptable). As shown in Table 9, transportation noise levels at the patio above the café in Building 1 (80 CNEL); the sky decks in Building 1 (70 and 75 CNEL), Building 2 (68 CNEL), Building 3 (67 and 71 CNEL), and Building 4 (70 CNEL); and at the periphery of the podium levels in Building 3 (67 CNEL) and Building 4 (68 CNEL) would thereby exceed the standard of 65 CNEL.

5.2.2 Noise Abatement

The following abatement measures would be required to achieve consistency with City noise compatibility standards:

NOI-1: Sound-Attenuating Windows and Doors

Prior to the issuance of a construction permit, the project applicant or agent thereof, shall demonstrate to the satisfaction of the City Community Development Department staff that site design would incorporate design features that reduce interior noise levels at all habitable rooms to 45 CNEL or less.

Construction shall incorporate sound-attenuating features for walls comprising the northern, western, and eastern façades of Building 1, as well as the western half of the southern façade. Construction for walls comprising the northern façades of Building 2, 3, and 4, the northeastern façade of Building 3, and the northwestern façade of Building 4 with components that achieve a combined sound transmission class rating of 35 would be anticipated to reduce interior noise levels at all habitable rooms to 45 CNEL or less. The walls requiring a combined sound transmission class rating of 35 are identified in Figure 8 of this report. Alternative noise reduction measures may also be substituted to reduce interior noise levels at all habitable rooms to 45 CNEL or less.

NOI-2: Outdoor Use Area Sound Walls

Prior to the issuance of a construction permit, the project applicant or agent thereof, shall demonstrate to the satisfaction of the City Community Development Department staff that site design would incorporate design features that reduce exterior noise levels at all outdoor use areas to 65 CNEL or less.

Incorporation of sound walls will reduce exterior noise levels at outdoor use areas to 65 CNEL or less. Sound walls would need to be a sufficient height of above floor-level, be free of gaps, and be constructed of a material with a minimum weight of two pounds per square foot (e.g. masonry, acrylic glass, or combination). Heights would need to be 12-feet for walls encompassing the patio above the café in Building 1, 6-feet for the walls encompassing the eastern sky deck in Building 1, and 5-feet for walls encompassing the remaining sky decks and podium periphery. The location of sound walls are identified in Figure 8 of this report. Alternative noise reduction measures may also be substituted to reduce exterior noise levels at outdoor use areas to 65 CNEL or less.

Image source: NearMaps (flown Feb 2018)

Project Boundary

Proposed Buildings

Podium-Level

Residential Upper Floors

Sound-Resistant Assembly

12-Foot Sound Wall

6-Foot Sound Wall

5-Foot Sound Wall

0 Feet 200

FIGURE 8

Abatement Measures

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The recommended height for the wall encompassing the patio above the café in Building 1 may be infeasible. The recommended 12-foot wall height would be required to reduce noise levels at the elevation of standing receivers (5 feet above floor) to 65 CNEL. A reduced, 10-foot wall height would be required reduce noise levels at the elevation of seated receivers (3 feet above floor) to 65 CNEL. In the event this area is repurposed and would no longer be a residential outdoor use area, sound walls would no longer be required.

5.2.3 Reduced Transportation Noise Levels

With incorporation of abatement measure NOI-1 the interior noise level at all habitable rooms would be reduced to levels that comply with the City interior noise compatibility standards. Prescriptive actions which may achieve the required noise level reduction include design features that achieve a composite sound transmission class rating of 35 through sound-attenuating components such as windows, doors, finish (such as stucco or wood siding), wall assembly (i.e., framing), etc. Exterior noise levels of 80 CNEL would thereby be reduced to interior noise levels of 45 CNEL. With incorporation of abatement measure NOI-1 the project would comply with the City interior noise compatibility standards.

With incorporation of abatement measure NOI-2 the exterior noise level at all outdoor use areas (patio above café, podium-level courtyards, and rooftop sky decks) would be reduced to levels that comply with the City exterior noise compatibility standards. Prescriptive actions which may achieve the required noise level reduction include incorporation of sound walls around outdoor use areas at the periphery of the podium levels and the sky decks of each building. Noise levels were remodeled with incorporation of sound walls around these outdoor use areas. Table 10 summarizes the projected transportation noise levels after incorporation of NOI-2. As shown, reduced transportation noise levels at outdoor use areas would range from 37 to 65 CNEL, which would comply with the City exterior noise compatibility standards. With incorporation of abatement measure NOI-2 the project would comply with the City exterior noise compatibility standards.

5.3 Off-site Traffic Noise Increases

The project site is accessed exclusively via Alvarado Road, thus project-generated traffic would contribute to increased traffic noise levels along Alvarado Road. Trip generation rates from the Institute of Transportation Engineers' 9th Edition Trip Generation Handbook indicate that mid-rise apartment buildings typically generate 6.65 trips per weekday per dwelling unit (Institute of Transportation Engineers 2012). Therefore, the project would generate approximately 5,626 ADT and would thereby approximately double the existing and forecasted (2035) traffic volumes on Alvarado Road (SANDAG 2013).

Ambient noise levels along Alvarado Road are primarily attributable to vehicle traffic on I-8 rather than vehicle traffic on Alvarado Road itself. The project would contribute to substantial traffic volume increases on Alvarado Road; however vehicle traffic on I-8 would be anticipated to remain dominant due to the relative volume and speed of vehicle traffic (vehicles on I-8 typically travel at 65 mph and the speed limit for Alvarado Road is 35 mph). Although the project would contribute to increase traffic volumes along Alvarado Road, ambient noise increases would be anticipated to be less than 3 dB(A).

Table 10 Reduced Transportation Noise Levels						
		Exterior Noise Level (CNEL)				
Receiver	Description	Second Floor	Third Floor	Fourth Floor	Fifth Floor	Sixth Floor
1-1	Building 1 Patio Above Café	65	--	--	--	--
1-2	Building 1 Western Sky Deck	--	--	--	--	63
1-3	Building 1 Eastern Sky Deck	--	--	--	--	65
1-4	Building 1 Façade North	78	78	78	78	--
1-5	Building 1 Façade North	79	80	80	79	79
1-6	Building 1 Façade North	79	80	80	80	79
1-7	Building 1 Façade North	63	76	79	79	78
1-8	Building 1 Façade East	70	72	73	73	73
1-9	Building 1 Façade South	58	58	58	58	58
1-10	Building 1 Façade South	58	59	59	59	59
1-11	Building 1 Façade South	72	72	72	72	72
1-12	Building 1 Façade West	75	75	75	75	--
		Fourth Floor	Fifth Floor	Sixth Floor	Seventh Floor	Eighth Floor
1	Building 2 Western Sky Deck	--	--	--	--	63
2	Building 2 Podium Courtyard	39	--	--	--	--
3	Building 2 Podium Periphery	57	--	--	--	--
4	Building 2 Façade North	79	79	79	78	78
5	Building 2 Façade North	79	79	79	79	78
6	Building 2 Façade North	79	79	79	79	78
7	Building 2 Façade East	62	67	69	70	70
8	Building 2 Façade South	57	58	58	58	58
9	Building 2 Façade South	58	58	58	58	58
10	Building 3 Podium Courtyard	56	--	--	--	--
11	Building 3 Podium Periphery	61	--	--	--	--
12	Building 3 Western Sky Deck	--	--	--	--	61
13	Building 3 Eastern Sky Deck	--	--	--	--	64
14	Building 3 Façade West	64	68	70	69	70
15	Building 3 Façade North	79	79	79	79	78
16	Building 3 Façade North	79	79	79	78	78
17	Building 3 Façade Northeast	75	75	75	75	75
18	Building 3 Façade East	57	59	59	58	56
19	Building 3 Façade South	57	57	58	58	58
20	Building 4 Podium Courtyard	37	--	--	--	--
21	Building 4 Podium Periphery	60	--	--	--	--
22	Building 4 Western Sky Deck	--	--	--	--	64
23	Building 4 Eastern Sky Deck	--	--	--	--	63
24	Building 4 Façade Northwest	73	73	73	73	73
25	Building 4 Façade North	76	76	76	76	76
26	Building 4 Façade East	68	68	69	69	69
27	Building 4 Façade South	58	58	58	58	58
28	Building 4 Façade South	60	60	59	59	59
29	Building 4 Façade South	58	59	59	59	58

CNEL = Community Noise Equivalent Level
"--" denotes where the receiver does not exist on a floor (e.g. sky decks only exist on the top floor)

5.4 On-site Generated Noise

The noise sources on the project site after completion of construction are anticipated to be those that would be typical of any residential complex, such as vehicles arriving and leaving, children at play, and landscape maintenance machinery. None of these noise sources is anticipated to violate the La Mesa Municipal Code or result in a substantial permanent increase in existing noise levels.

Additionally, the project would include HVAC units with a roof-mounted condenser unit for each apartment, which could exceed the City standards. Using the on-site noise source parameters discussed in Section 4.4, noise levels were modeled at a series of 12 receivers located at the property line.

The location of each condenser unit array was obtained from the roof plan drawings for the project. Noise generated by HVAC equipment would occur on an intermittent basis, primarily during the day and evening hours and less frequently during the nighttime hours. For a worst-case analysis, it was assumed that the HVAC units would operate continuously. Modeled receivers and the locations of the HVAC units are shown in Figure 9. Modeled data is included in Attachment 3. Future projected noise levels are summarized in Table 11.

Table 11
Heating, Ventilation, and Air Conditioning Noise Levels

Receiver	Property Description	Noise Level [dB(A) L_{eq}]	Noise Level Limit [dB(A) L_{eq}]	
			Daytime	Nighttime
1	Creaser & Warwick Apartments	39	60	55
2	5107 73rd Street Units	40	60	55
3	North end of Keeney Street	41	55	50
4	5084 Keeney Street	44	55	50
5	5061 Keeney Street	42	60	55
6	Colony Mobile Plaza	45	55	50
7		45	55	50
8		45	55	50
9		44	55	50
10	Comanche Hills Apartments	41	60	55
11		39	60	55
12	7570 Saranac Avenue	41	55	50

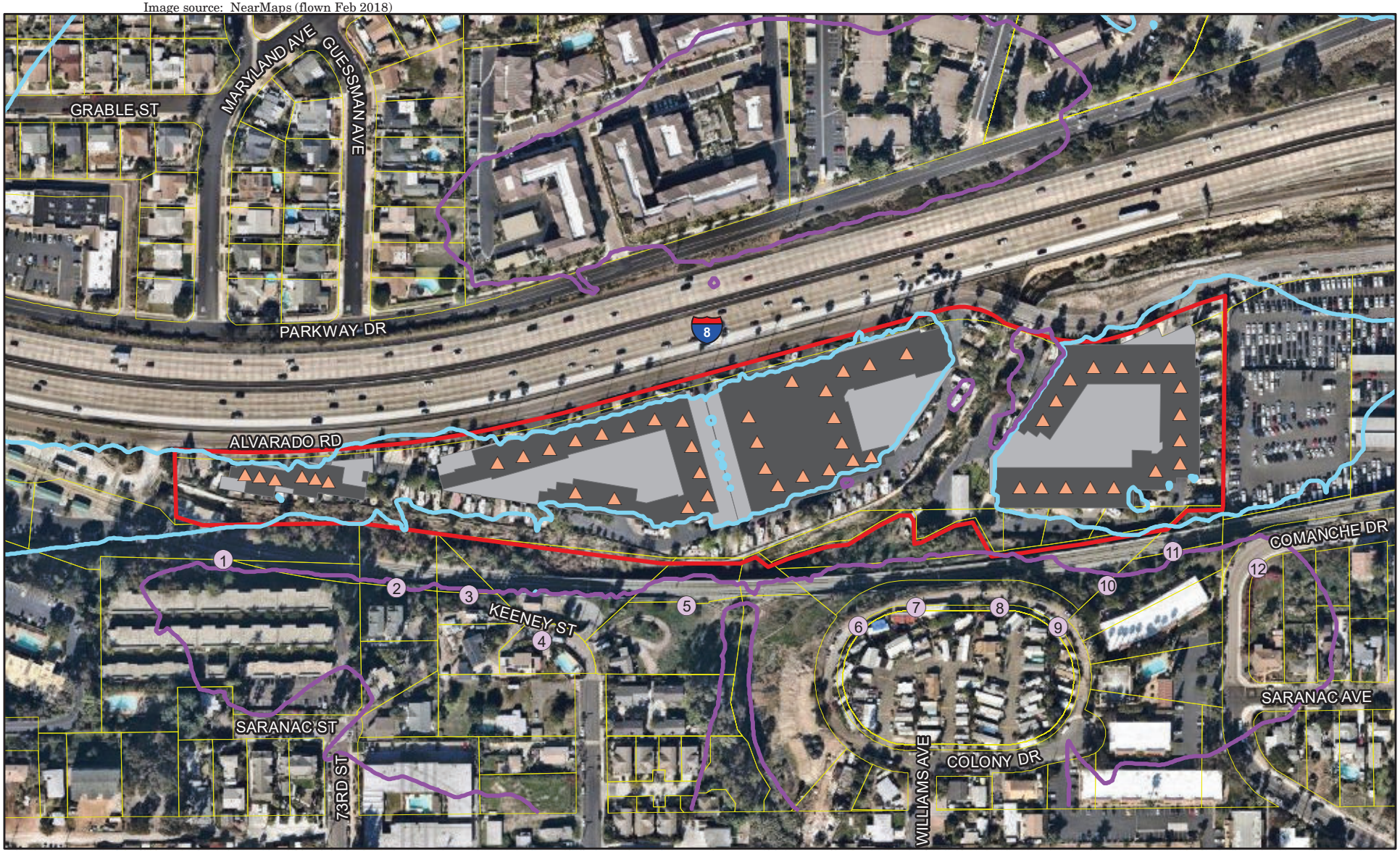
dB(A)L_{eq} = one-hour equivalent A-weighted decibels.

As shown, on-site generated noise levels would range from 35 to 45 dB(A) L_{eq} at the adjacent property lines. Noise levels would not exceed the applicable Noise Ordinance limits.

5.5 Trolley Vibration

Trolley pass-bys generate certain peak vibration levels. As discussed previously, to determine the vibration level at the project site, the FTA generalized ground surface vibration curves (modeled at a reference speed of 50 mph) were used and then adjusted for speed using the equation shown in Section 5.5. Figure 10 shows the FTA generalized ground surface vibration curves.

Image source: NearMaps (flown Feb 2018)



Project Boundary

Proposed Buildings

Podium-Level

Residential Upper Floors

Condenser Arrays

Property Lines

Receivers

On-site Generated Noise Contours

35 Leq

40 Leq

0 Feet 250

FIGURE 9

On-site Generated Noise Contours

RECON

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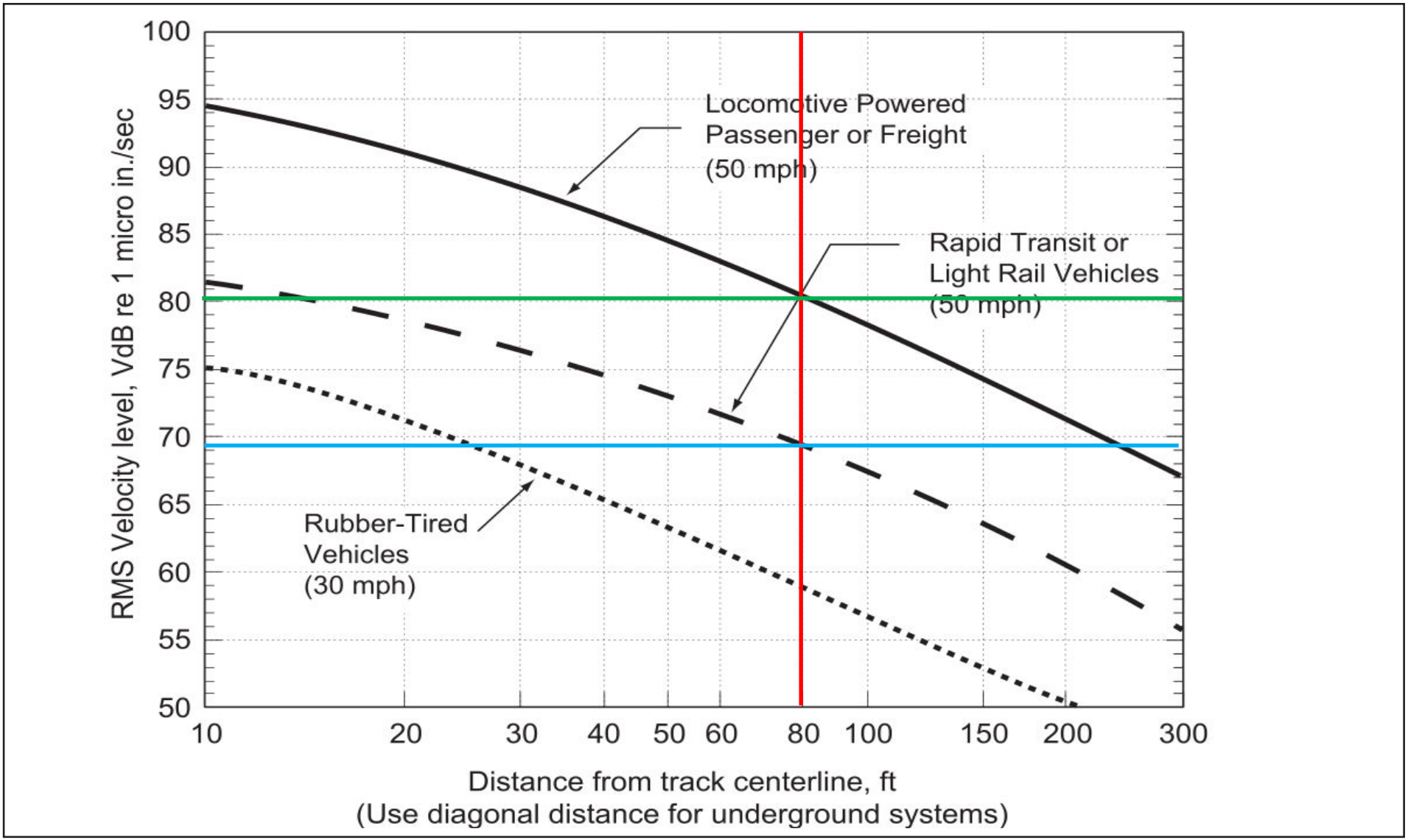

FIGURE 10

Reference Vibration Levels

RECON

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The closest proposed building façade (Building 4 southern façade) is approximately 65 feet from the railroad centerline. As shown on Figure 10, at 65 feet, trolleys traveling at 50 mph would generate a vibration of 71 vibration decibels (VdB). Adjusting these levels for speed results in an estimated vibration level of 67 VdB for trolleys. As shown in Table 1, the groundborne vibration impact criteria for Category 2 residential uses is 72 VdB for frequent events, which is defined as more than 70 vibration events of the same source per day. The trolley vibration level of 67 VdB would not exceed the impact criteria of 72 VdB. Thus, vibration levels at the project site would be less than the impact criteria, and vibration impacts would be less than significant.

6.0 Conclusions

6.1 Construction Noise

As shown in Table 6, construction noise levels would range from 61 to 68 dB(A) L_{eq} at the adjacent residential property lines. Although the existing adjacent residences would be exposed to construction noise levels that could be heard above ambient conditions, the exposure would be temporary. Additionally, construction activities are not anticipated to exceed 75 dB(A)L_{eq}. According to Section 10.80.100 of the La Mesa Municipal Code, construction activities are prohibited between the hours of 10:00 p.m. and 7:00 a.m. and on Sundays. Construction activities would generally occur over the period between 7:00 a.m. and 5:00 p.m. on weekdays. Because construction activities associated with the project would comply with the applicable regulation for construction, temporary increases in noise levels from construction activities would be less than significant.

6.2 Noise Compatibility

The main source of noise at the project site is vehicle traffic on I-8 and Alvarado Road. Additional noise is generated by trolley traffic on the adjacent Green Line. For multi-family residential uses, exterior noise levels up to 65 CNEL are considered normally acceptable, and noise levels up to 70 CNEL are considered conditionally acceptable. Where exterior noise levels would not conform to compatibility standards, the City requires a noise insulation features that reduce interior noise levels to less than 45 CNEL be included in the design.

As shown in Table 9, exterior noise levels are projected to reach up to 80 CNEL at proposed outdoor use areas and at building façades. Noise abatement measure NOI-1 requires that the project incorporate design features that reduce interior noise levels at all habitable rooms to 45 CNEL or less and outlines noise insulation features that would achieve this requirement. With incorporation of abatement measure NOI-1, the project would comply with City interior noise compatibility standards.

City exterior noise compatibility standards require that projects minimize the effects of noise by incorporating noise reduction features to reduce noise levels at multi-family outdoor use areas to 65 CNEL. Noise abatement measure NOI-2 requires that the project

incorporate design features that reduce exterior noise levels at outdoor use areas to 65 CNEL or less and outlines the design of noise barriers that would achieve this requirement. With incorporation of abatement measure NOI-2, the project would comply with City exterior noise compatibility standards.

6.3 Off-site Traffic Noise Increases

Ambient noise levels along Alvarado Road are primarily attributable to vehicle traffic on I-8 rather than vehicle traffic on Alvarado Road itself. The project would contribute to substantial traffic volume increases on Alvarado Road; however vehicle traffic on I-8 would be anticipated to remain dominant due to the relative speed of vehicle traffic. Ambient noise increases would be anticipated to be less than 3 dB(A).

6.4 On-site Generated Noise

The noise sources on the project site after completion of construction are anticipated to be those that would be typical of any residential complex, such as vehicles arriving and leaving, children at play, and landscape maintenance machinery. None of these noise sources is anticipated to violate the La Mesa Municipal Code or result in a substantial permanent increase in existing noise levels.

Additionally, the project would include HVAC units with a roof-mounted condenser unit for each apartment, which could exceed the City standards. On-site generated noise sources were modeled and resulting noise levels were predicted at the project site property lines. As shown, on-site generated noise levels would range from 35 to 45 dB(A) L_{eq}. The most restrictive noise levels limits are 55 dB(A) L_{eq} during daytime hours and 50 dB(A) L_{eq} at night, thus noise levels would not exceed the applicable Noise Ordinance limits at the property lines.

6.5 Vibration

Because of the proximity to trolley operations on the adjacent railroad tracks, the project could expose the proposed residential uses to groundborne vibration and noise. As discussed in Section 4.5, this analysis of vibration impacts follows the guidance provided in the FTA's Transit Noise and Vibration Impact Assessment document. Based on the procedure outlined in the document, trolley pass-bys were estimated to generate a vibration level of 67 VdB at the location of future residences. Trolley vibration levels would not exceed the FTA's impact criteria of 72 VdB for frequent events.

7.0 References Cited

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ATTACHMENTS

ATTACHMENT 1

Noise Measurement Data

Summary

Filename	LxT_Data.019
Serial Number	3829
Model	SoundExpert™ LxT
Firmware Version	2.301
User	
Location	
Job Description	
Note	
Measurement Description	
Start	2018/02/01 11:44:12
Stop	2018/02/01 11:59:29
Duration	0:15:17.4
Run Time	0:15:17.4
Pause	0:00:00.0
Pre Calibration	2018/02/01 11:42:34
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRMLxT1L
Microphone Correction	Off
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	At Lmax
Overload	122.0 dB

	A	C	Z
Under Range Peak	**78.3**	75.3	80.3 dB
Under Range Limit	**26.1**	25.3	32.1 dB
Noise Floor	16.3	16.1	22.1 dB

Results

LAeq	64.1 dB	
LAE	93.7 dB	
EA	262.567 µPa²h	
LApeak (max)	2018/02/01 11:58:27	83.0 dB
LASmax	2018/02/01 11:54:43	69.3 dB
LASmin	2018/02/01 11:44:19	61.1 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**
	64.1	64.1	-99.9	64.1	64.1	-99.9	-99.9

LCeq	71.1 dB
LAeq	64.1 dB
LCeq - LAeq	7.0 dB
LAleq	64.7 dB
LAeq	64.1 dB
LAleq - LAeq	0.6 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	65.6 dB
LAS10.00	65.1 dB
LAS33.30	64.3 dB
LAS50.00	64.0 dB
LAS66.60	63.5 dB
LAS90.00	62.7 dB

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
Direct	2017/01/31 6:59:36	-26.0
Direct	2017/01/31 6:35:22	-26.0
PRMLxT1L	2018/02/01 11:42:29	-28.3
PRMLxT1L	2018/01/24 14:54:59	-28.3
PRMLxT1L	2018/01/24 13:40:06	-28.4
PRMLxT1L	2018/01/03 13:59:50	-28.3
PRMLxT1L	2018/01/03 11:48:39	-28.3
PRMLxT1L	2017/12/06 15:04:18	-28.4
PRMLxT1L	2017/12/06 14:48:23	-28.3
PRMLxT1L	2017/12/06 14:33:07	-28.4
PRMLxT1L	2017/12/06 14:16:13	-28.3
PRMLxT1L	2017/12/06 14:08:26	-28.4
PRMLxT1L	2017/12/06 13:52:48	-28.4

Summary

Filename	LxT_Data.020
Serial Number	3829
Model	SoundExpert™ LxT
Firmware Version	2.301
User	
Location	
Job Description	
Note	
Measurement Description	
Start	2018/02/01 12:15:58
Stop	2018/02/01 12:31:00
Duration	0:15:02.6
Run Time	0:15:02.6
Pause	0:00:00.0
Pre Calibration	2018/02/01 12:13:19
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRMLxT1L
Microphone Correction	Off
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	At Lmax
Overload	122.0 dB

	A	**C**	**Z**
Under Range Peak	**78.2**	75.2	80.2 dB
Under Range Limit	**26.1**	25.3	32.1 dB
Noise Floor	16.3	16.1	22.0 dB

Results

LAeq	72.4 dB	
LAE	102.0 dB	
EA	1.757 mPa²h	
LApeak (max)	2018/02/01 12:19:09	92.2 dB
LASmax	2018/02/01 12:19:10	76.7 dB
LASmin	2018/02/01 12:23:12	68.2 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**
	72.4	72.4	-99.9	72.4	72.4	-99.9	-99.9

LCeq	77.2 dB
LAeq	72.4 dB
LCeq - LAeq	4.7 dB
LAleq	73.0 dB
LAeq	72.4 dB
LAleq - LAeq	0.6 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	74.5 dB
LAS10.00	73.9 dB
LAS33.30	72.7 dB
LAS50.00	72.3 dB
LAS66.60	71.8 dB
LAS90.00	70.4 dB

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
Direct	2017/01/31 6:59:36	-26.0
Direct	2017/01/31 6:35:22	-26.0
PRMLxT1L	2018/02/01 12:13:17	-28.2
PRMLxT1L	2018/02/01 11:59:51	-28.3
PRMLxT1L	2018/02/01 11:42:29	-28.3
PRMLxT1L	2018/01/24 14:54:59	-28.3
PRMLxT1L	2018/01/24 13:40:06	-28.4
PRMLxT1L	2018/01/03 13:59:50	-28.3
PRMLxT1L	2018/01/03 11:48:39	-28.3
PRMLxT1L	2017/12/06 15:04:18	-28.4
PRMLxT1L	2017/12/06 14:48:23	-28.3
PRMLxT1L	2017/12/06 14:33:07	-28.4
PRMLxT1L	2017/12/06 14:16:13	-28.3

Summary

Filename	LxT_Data.021
Serial Number	3829
Model	SoundExpert™ LxT
Firmware Version	2.301
User	
Location	
Job Description	
Note	
Measurement Description	
Start	2018/02/01 12:50:06
Stop	2018/02/01 13:05:15
Duration	0:15:08.9
Run Time	0:15:08.9
Pause	0:00:00.0
Pre Calibration	2018/02/01 12:49:00
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRMLxT1L
Microphone Correction	Off
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	At Lmax
Overload	121.9 dB

	A	C	Z
Under Range Peak	**78.2**	75.2	80.2 dB
Under Range Limit	**26.1**	25.3	32.1 dB
Noise Floor	16.3	16.1	22.0 dB

Results

LAeq	70.2 dB	
LAE	99.8 dB	
EA	1.065 mPa²h	
LApeak (max)	2018/02/01 12:51:13	90.3 dB
LASmax	2018/02/01 12:53:49	75.6 dB
LASmin	2018/02/01 12:58:50	66.7 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**
	70.2	70.2	-99.9	70.2	70.2	-99.9	-99.9

LCeq	76.2 dB
LAeq	70.2 dB
LCeq - LAeq	5.9 dB
LAleq	70.9 dB
LAeq	70.2 dB
LAleq - LAeq	0.7 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	71.9 dB
LAS10.00	71.5 dB
LAS33.30	70.6 dB
LAS50.00	70.1 dB
LAS66.60	69.6 dB
LAS90.00	68.7 dB

Calibration History

Preamp	**Date**	**dB re. 1V/Pa**
Direct	2017/01/31 6:59:36	-26.0
Direct	2017/01/31 6:35:22	-26.0
PRMLxT1L	2018/02/01 12:48:59	-28.2
PRMLxT1L	2018/02/01 12:32:13	-28.3
PRMLxT1L	2018/02/01 12:13:17	-28.2
PRMLxT1L	2018/02/01 11:59:51	-28.3
PRMLxT1L	2018/02/01 11:42:29	-28.3
PRMLxT1L	2018/01/24 14:54:59	-28.3
PRMLxT1L	2018/01/24 13:40:06	-28.4
PRMLxT1L	2018/01/03 13:59:50	-28.3
PRMLxT1L	2018/01/03 11:48:39	-28.3
PRMLxT1L	2017/12/06 15:04:18	-28.4
PRMLxT1L	2017/12/06 14:48:23	-28.3

ATTACHMENT 2

Carrier Specifications Sheet

38HDR
Performance™ Series Air Conditioner with Puron® Refrigerant
1–1/2 to 5 Nominal Tons

Carrier
turn to the experts

Product Data

Puron
the environmentally sound refrigerant

Performance SERIES

Carrier's Air Conditioners with Puron® refrigerant provide a collection of features unmatched by any other family of equipment. The 38HDR has been designed utilizing Carrier's Puron refrigerant. The environmentally sound refrigerant allows you to make a responsible decision in the protection of the earth's ozone layer.

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. Refer to the combination ratings in the Product Data for system combinations that meet Energy Star® guidelines.

NOTE: Ratings contained in this document are subject to change at any time. Always refer to the AHRI directory (www.ahridirectory.org) for the most up-to-date ratings information.

INDUSTRY LEADING FEATURES / BENEFITS

Energy Efficiency

- 13 - 15 SEER/10.9 - 12.5 EER

Sound

- Levels as low as 68 dBA

Design Features

- New aesthetics
- Small footprint, same as old model and "stackable"
- WeatherArmor™ cabinet
  - — All steel cabinet construction
  - — Baked on powder paint
  - — Mesh coil guard

Reliability, Quality and Toughness

- Scroll compressor
- Crankcase Heater standard on sizes 030-060
- Factory-supplied filter drier
- High pressure switch
- Low pressure switch
- Line lengths up to 250' (76.2 m)
- Low ambient operation (down to -20°F/-28.9°C) with low ambient accessories.

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12	13
N	N	A	A	A/N	N	N	N	A/N	A/N	A/N	N	N
3	8	H	D	R	0	1	8	A	0	0	3	0
Product Series	HDR = Horizontal Discharge Condensing Unit			Cooling Capacity				Variations	Open	Open	Voltage	Minor Series
38=AC/HP	Major Model			1,000 Btuh Nominal				A=Standard	0=Not Defined	0=Not Defined	3=208/230–1 5=208/230–3 6=460/3	0, 1, 2...

Puron™
the environmentally sound refrigerant

AHRI CERTIFIED™ www.ahridirectory.org

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

Certified System™
ISO 9001
QMI-SAI Global

c UL us

energy ENERGY STAR

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow all manufacturing refrigerant charging and air flow instructions. **Failure to confirm proper charge and air flow may reduce energy efficiency and shorten equipment life.**

PHYSICAL DATA

UNIT 38HDR	018	024	030	036	048	060
NOMINAL CAPACITY (Tons)	1.5	2.0	2.50	3.0	4.0	5.0
OPERATING WEIGHT lb (kg)	155 (70.3)	180 (81.6)	200 (90.7)	218 (98.9)	284 (128.8)	294 (133.4)
REFRIGERANT TYPE	R–410A					
METERING DEVICE	TXV					
CHARGE lb (kg)	6.3 (2.86)	6.0 (2.73)	8.7 (3.95)	8.7 (3.95)	11.5 (5.23)	12.0 (5.45)
COMPRESSOR						
Type	Scroll					
Oil Charge (POE –oz)	25.0	25.0	25.0	25.0	42.0	42.0
Crankcase Heater (watts)	—	—	40	40	40	40
OUTDOOR FAN						
Rpm/Cfm	840/1720	840/1720	850/3900	850/3900	850/3900	850/3900
Diameter in. (mm)	18 (457)	18 (457)	24 (610)	24 (610)	24 (610)	24 (610)
No. Blades	3	3	3	3	3	3
Motor hp (w)	1/8 (93)	1/8 (93)	1/4 (187)	1/4 (187)	1/4 (187)	1/4 (187)
OUTDOOR COIL						
Face Area (sq ft)	5.8	7.3	12.1	12.1	14.1	14.1
No. Rows	2	2	2	2	2	2
FPI	20	20	20	20	20	20
HIGH PRESSURE SWITCH						
Cut–In (psig) Cutout (psig)	420 ± 25 650 ± 10	420 ± 25 650 ± 10	420 ± 25 650 ± 10	420 ± 25 650 ± 10	420 ± 25 650 ± 10	420 ± 25 650 ± 10
LOW PRESSURE SWITCH						
Cut–In (psig) Cutout (psig)	45 ± 25 20 ± 5	45 ± 25 20 ± 5	45 ± 25 20 ± 5	45 ± 25 20 ± 5	45 ± 25 20 ± 5	45 ± 25 20 ± 5
REFRIGERANT LINES						
Connection Type	Sweat					
Max. Liquid Line* (in.) OD	3/8	3/8	3/8	3/8	3/8	3/8
Rated Vapor Line† (in.) OD	5/8	5/8	3/4	3/4	7/8	1–1/8**
CONTROLS						
Control Voltage‡	24 vac					
System Voltage	208/230 v	208/230 v	208/230 v	208/230 v, Single and 3 Phase, 460 v, 3 Phase		
FINISH	Gray					

* See *Liquid Line Sizing For Cooling Only Systems with Puron Refrigerant* tables.

† Units are rated with 25 ft (7.6 m) of lineset length. See *Vapor Line Sizing and Cooling Capacity Loss* table when using other sizes and lengths of lineset.

‡ 24 v and a minimum of 40 va is provided in the fan coil unit.

** Vapor connection size is 7/8 inch.

FPI – Fins Per Inch

POE – Polyol Ester

REFRIGERANT PIPING LENGTH LIMITATIONS

Liquid Line Sizing and Maximum Total Equivalent Lengths† for Cooling Only Systems with Puron® Refrigerant:

The maximum allowable length of a residential split system depends on the liquid line diameter and vertical separation between indoor and outdoor units.

See Table below for liquid line sizing and maximum lengths :

Maximum Total Equivalent Length
Outdoor Unit BELOW Indoor Unit

Size	Liquid Line Connection	Liquid Line Diam. w/ TXV	AC with Puron Refrigerant Maximum Total Equivalent Length†: Outdoor unit BELOW Indoor Vertical Separation ft (m)								
			0–5 (0–1.5)	6–10 (1.8–3.0)	11–20 (3.4–6.1)	21–30 (6.4–9.1)	31–40 (9.4–12.2)	41–50 (12.5–15.2)	51–60 (15.5–18.3)	61–70 (18.6–21.3)	71–80 (21.6–24.4)
018 AC with Puron	3/8	1/4	150	150	125	100	100	75	– –	– –	– –
		5/16	250*	250*	250*	250*	250*	250*	250*	225*	150
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*
024 AC with Puron	3/8	1/4	75	75	75	50	50	– –	– –	– –	– –
		5/16	250*	250*	250*	250*	250*	225*	175	125	100
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*
030 AC with Puron	3/8	1/4	30	– –	– –	– –	– –	– –	– –	– –	– –
		5/16	175	225*	200	175	125	100	75	– –	– –
		3/8	250*	250*	250*	250*	250*	250*	250*	250*	250*
036 AC with Puron	3/8	5/16	175	150	150	100	100	100	75	– –	– –
		3//8	250*	250*	250*	250*	250*	250*	250*	250*	250*
048 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	230	160	– –
060 AC with Puron	3/8	3/8	250*	250*	250*	225*	190	150	110	– –	– –

*** Maximum actual length not to exceed 200 ft (61 m)**

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

– – = outside acceptable range

Maximum Total Equivalent Length
Outdoor Unit ABOVE Indoor Unit

Size	Liquid Line Connection	Liquid Line Diam. w/ TXV	AC with Puron Refrigerant Maximum Total Equivalent Length†: Outdoor unit ABOVE Indoor Vertical Separation ft (m)							
			25 (7.6)	26–50 (7.9–15.2)	51–75 (15.5–22.9)	76–100 (23.2–30.5)	101–125 (30.8–38.1)	126–150 (38.4–45.7)	151–175 (46.0–53.3)	176–200 (53.6–61.0)
018 AC with Puron	3/8	1/4	175	250*	250*	250*	250*	250*	250*	250*
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
024 AC with Puron	3/8	1/4	100	125	175	200	225*	250*	250*	250*
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
030 AC with Puron	3/8	1/4	30	– –	– –	– –	– –	– –	– –	– –
		5/16	250*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
036 AC with Puron	3/8	5/16	225*	250*	250*	250*	250*	250*	250*	250*
		3/8	250*	250*	250*	250*	250*	250*	250*	250*
048 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*
060 AC with Puron	3/8	3/8	250*	250*	250*	250*	250*	250*	250*	250*

*** Maximum actual length not to exceed 200 ft (61 m)**

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

– – = outside acceptable range

REFRIGERANT CHARGE ADJUSTMENTS

Liquid Line Size	Puron Charge oz/ft (g/m)
3/8	0.60 (17.74) (Factory charge for lineset = 9 oz / 266.16 g)
5/16	0.40 (11.83)
1/4	0.27 (7.98)

Units are factory charged for 15 ft (4.6 m) of 3/8" liquid line. The factory charge for 3/8" lineset 9 oz (266.16 g). When using other length or diameter liquid lines, charge adjustments are required per the chart above.

Charging Formula:

[(Lineset oz/ft x total length) – (factory charge for lineset)] = charge adjustment

Example 1: System has 15 ft of line set using existing 1/4" liquid line. What charge adjustment is required?

Formula: (.27 oz/ft x 15ft) – (9 oz) = (-4.95) oz.

Net result is to remove 4.95 oz of refrigerant from the system

Example 2: System has 45 ft of existing 5/16" liquid line. What is the charge adjustment?

Formula: (.40 oz/ft. x 45ft) – (9 oz.) = 9 oz.

Net result is to add 9 oz of refrigerant to the system

LONG LINE APPLICATIONS

An application is considered Long Line, when the refrigerant level in the system requires the use of accessories to maintain acceptable refrigerant management for systems reliability. See Accessory Usage Guideline table for required accessories. Defining a system as long line depends on the liquid line diameter, actual length of the tubing, and vertical separation between the indoor and outdoor units.

For Air Conditioner systems, the chart below shows when an application is considered Long Line.

AC WITH PURON® REFRIGERANT LONG LINE DESCRIPTION ft (m)
Beyond these lengths, long line accessories are required

Liquid Line Size	Units On Same Level	Outdoor Below Indoor	Outdoor Above Indoor
1/4	No accessories needed within allowed lengths	No accessories needed within allowed lengths	175 (53.3)
5/16	120 (36.6)	50 (15.2) vertical or 120 (36.6) total	120 (36.6)
3/8	80 (24.4)	35 (10.7) vertical or 80 24.4) total	80 (24.4)

Note: See Long Line Guideline for details

VAPOR LINE SIZING AND COOLING CAPACITY LOSS

Acceptable vapor line diameters provide adequate oil return to the compressor while avoiding excessive capacity loss. The suction line diameters shown in the chart below are acceptable for AC systems with Puron refrigerant:

Vapor Line Sizing and Cooling Capacity Losses — Puron® Refrigerant 1-Stage Air Conditioner Applications

Unit Nominal Size (Btuh)	Maximum Liquid Line Diameters (In. OD)	Vapor Line Diameters (In. OD)	Cooling Capacity Loss (%) Total Equivalent Line Length ft. (m)								
			26–50 (7.9–15.2)	51–80 (15.5–24.4)	81–100 (24.7–30.5)	101–125 (30.8–38.1)	126–150 (38.4–45.7)	151–175 (46.0–53.3)	176–200 (53.6–61.0)	201–225 (61.3–68.6)	226–250 (68.9–76.2)
018 1 Stage AC with Puron	3/8	1/2	1	2	3	5	6	7	8	9	11
		5/8	0	1	1	1	2	2	2	3	3
		3/4	0	0	0	0	1	1	1	1	1
024 1 Stage AC with Puron	3/8	5/8	0	1	2	2	3	3	4	5	5
		3/4	0	0	1	1	1	1	1	2	2
		7/8	0	0	0	0	0	1	1	1	1
030 1 Stage AC with Puron	3/8	5/8	1	2	3	3	4	5	6	7	8
		3/4	0	0	1	1	1	2	2	2	3
		7/8	0	0	0	0	1	1	1	1	1
036 1 Stage AC with Puron	3/8	5/8	1	2	4	5	6	8	9	10	12
		3/4	0	1	1	2	2	3	3	4	4
		7/8	0	0	0	1	1	1	1	2	2
048 1 Stage AC with Puron	3/8	3/4	0	1	2	3	4	5	5	6	7
		7/8	0	0	1	1	2	2	2	3	3
		1 1/8	0	0	0	0	0	0	0	1	1
060 1 Stage AC with Puron	3/8	3/4	1	2	4	5	6	7	9	10	11
		7/8	0	1	2	2	3	4	4	5	5
		1 1/8	0	0	0	1	1	1	1	1	1

Applications in this area may be long line and may have height restrictions. See the *Residential Piping and Long Line Guideline*.

ACCESSORY THERMOSTATS

THERMOSTAT / SUBBASE PKG.	DESCRIPTION
TP–PRH01–A	Programmable Thermidistat
TP–NRH01–A	Non–programmable Thermidistat
TP–PAC01	Performance Series Programmable AC Stat
TP–NAC01	Performance Series Non–programmable AC Stat
TSTATCCSEN01–B	Outdoor Air Temperature Sensor
TSTATXXBBP01	Backplate for Builder's Thermostat
TSTATXXNBP01	Backplate for Non–Programmable Thermostat
TSTATXXPBP01	Backplate for Programmable Thermostat
TSTATXXCNV10	Thermostat Conversion Kit (4 to 5 wires) – 10 Pack

ACCESSORIES

KIT NUMBER	KIT NAME	018	024	030	036	048	060
KAACH1401AAA	Crankcase Heater	X	X				
Standard	Crankcase Heater			S	S	S	S
KAAFT0101AAA	Evaporator Freeze Stat	X	X	X	X	X	X
KAATD0101TDR	Time Delay Relay	X	X	X	X	X	X
KAAWS0101AAA	Winter Start Kit (for low ambient)	X	X	X	X	X	X
53DS–900–––086	Low Ambient Control (Puron)	X	X	X	X	X	X
53DS–900–––070	Wind Baffle	X					
53DS–900–––087	Wind Baffle		X				
53DS–900–––071	Wind Baffle			X	X		
53DS–900–––088	Wind Baffle					X	X
53DS–900–––075	Stacking Kit	X	X				
53DS–900–––076	Stacking Kit			X	X	X	X
53DS–900–––077	Wall Mounting Kit	X	X				
53DS–900–––078	Wall Mounting Kit			X	X	X	X

X = Accessory, S = Standard

ACCESSORY USAGE GUIDELINE

ACCESSORY	REQUIRED FOR LOW–AMBIENT COOLING APPLICATIONS (Below 55°F/12.8°C)	REQUIRED FOR LONG LINE APPLICATIONS* (Over 80 ft. / 24.4 m)	REQUIRED FOR SEA COAST APPLICATIONS (Within 2 miles / 3.2 km)
Compressor Start Assist Capacitor and Relay	Yes	Yes	No
Crankcase Heater	Yes	Yes	No
Evaporator Freeze Thermostat	Yes	No	No
Hard Shutoff TXV	Yes	Yes	Yes
Liquid Line Solenoid Valve	No	See Longline Application Guideline	No
Low–ambient Control	Yes	No	No
Winter Start Control	Yes	No	No

* For tubing line sets between 80 and 200 ft. (24.38 and 60.96 m) and/or 35 ft. (10.7 m) vertical differential, refer to Residential Piping and Longline Guideline.

Accessory Description and Usage (Listed Alphabetically)

1. Crankcase Heater

An electric resistance heater which mounts to the base of the compressor to keep the lubricant warm during off cycles. Improves compressor lubrication on restart and minimizes the chance of liquid slugging.

Usage Guideline:

Required in low ambient cooling applications.

Required in long line applications.

Suggested in all commercial applications.

2. Evaporator Freeze Thermostat

An SPST temperature-actuated switch that stops unit operation when evaporator reaches freeze-up conditions.

Usage Guideline:

Required when low ambient kit has been added.

3. Low-Ambient Control

A fan-speed control device activated by a temperature sensor, designed to control condenser fan motor speed in response to the saturated, condensing temperature during operation in cooling mode only. For outdoor temperatures down to -20°F (-28.9°C), it maintains condensing temperature at 100°F ±10°F (37.8°C ± 5.5°C).

Usage Guideline:

A Low Ambient Controller must be used when cooling operation is used at outdoor temperatures below 55°F (12.8°C).

Suggested for all commercial applications.

4. Outdoor Air Temperature Sensor

Designed for use with Carrier Thermostats listed in this publication. This device enables the thermostat to display the outdoor temperature. This device also

is required to enable special thermostat features such as auxiliary heat lock out.

Usage Guideline:

Suggested for all Carrier thermostats listed in this publication.

5. Thermostatic Expansion Valve (TXV)

A modulating flow-control valve which meters refrigerant liquid flow rate into the evaporator in response to the superheat of the refrigerant gas leaving the evaporator.

Kit includes valve, adapter tubes, and external equalizer tube. Hard shut off types are available.

NOTE: When using a hard shut off TXV with single phase reciprocating compressors, a Compressor Start Assist Capacitor and Relay is required.

Usage Guideline:

Accessory required to meet AHRI rating and system reliability, where indoor not equipped.

Hard shut off TXV or LLS required in air conditioner long line applications.

Required for use on all zoning systems.

6. Time-Delay Relay

An SPST delay relay which briefly continues operation of indoor blower motor to provide additional cooling after the compressor cycles off.

NOTE: Most indoor unit controls include this feature. For those that do not, use the guideline below.

Usage Guideline:

Accessory required to meet AHRI rating, where indoor

not equipped.

7. Winter Start Control

This control is designed to alleviate nuisance opening of the low-pressure switch by bypassing it for the first 3 minutes of operation.

ELECTRICAL DATA

38HDR UNIT SIZE	V–PH–Hz	VOLTAGE RANGE*		COMPRESSOR		OUTDOOR FAN MOTOR			MIN CKT AMPS	FUSE/CKT BKR AMPS
		Min	Max	RLA	LRA	FLA	NEC Hp	kW Out		
018–31	208/230–1–60	187	253	9.0	48.0	0.8	0.125	0.09	12.1	20
024–32	208/230–1–60	187	253	13.5	58.3	0.8	0.125	0.09	17.7	25
030–31	208/230–1–60	187	253	14.1	73.0	1.5	0.250	0.19	19.1	30
036–31	208/230–1–60	187	253	14.1	77.0	1.5	0.250	0.19	19.1	30
	208/230–3–60	187	253	9.2	71.0	1.5	0.250	0.19	13.0	20
	460–3–60	414	506	5.6	38.0	0.8	0.250	0.19	7.9	10
048–32	208/230–1–60	187	253	19.9	109.0	1.5	0.250	0.19	26.4	40
	208/230–3–60	187	253	13.1	83.1	1.5	0.250	0.19	17.9	25
	460–3–60	414	506	6.1	41.0	0.8	0.250	0.19	8.4	15
060–32	208/230–1–60	187	253	26.4	134.0	1.5	0.250	0.19	34.5	60
	208/230–3–60	187	253	16.0	110.0	1.5	0.250	0.19	21.5	30
	460–3–60	414	506	7.8	52.0	0.8	0.250	0.19	10.6	15

* Permissible limits of the voltage range at which the unit will operate satisfactorily

FLA – Full Load Amps

HACR – Heating, Air Conditioning, Refrigeration

LRA – Locked Rotor Amps

NEC – National Electrical Code

RLA – Rated Load Amps (compressor)

NOTE: Control circuit is 24–V on all units and requires external power source. Copper wire must be used from service disconnect to unit. All motors/compressors contain internal overload protection.

Complies with 2007 requirements of ASHRAE Standards 90.1

A-WEIGHTED SOUND POWER (dBA)

Unit Size	Standard Rating (dBA)	Typical Octave Band Spectrum (dBA) (without tone adjustment)						
		125	250	500	1000	2000	4000	8000
018–31	68	52.0	57.5	60.5	63.5	60.5	57.5	46.5
024–32	69	57.5	61.5	63.0	61.0	60.0	56.0	45.0
030–31	72	56.5	63.0	65.0	66.0	64.0	62.5	57.0
036–31	72	65.0	61.5	63.5	65.0	64.5	61.0	54.5
048–32	72	58.5	61.0	64.0	67.5	66.0	64.0	57.0
060–32	72	63.0	61.5	64.0	66.5	66.0	64.5	55.5

NOTE: Tested in accordance with AHRI Standard 270–08 (not listed in AHRI).

CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

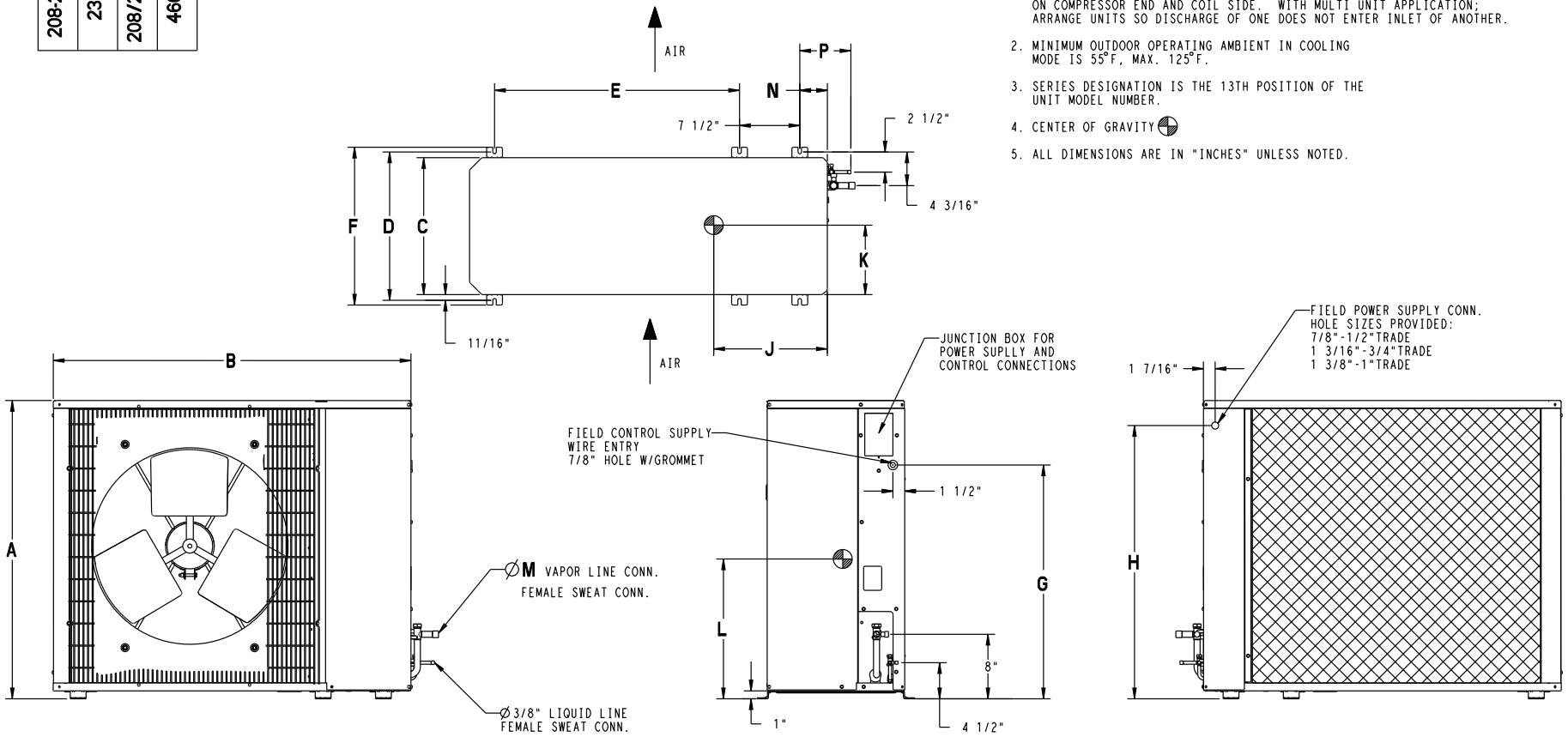
UNIT SIZE–VOLTAGE, SERIES	REQUIRED SUBCOOLING °F (°C)
018–31	12 (6.7)
024–32	12 (6.7)
030–31	12 (6.7)
036–31	12 (6.7)
048–32	12 (6.7)
060–32	12 (6.7)

DIMENSIONS - ENGLISH

UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	H	J	K	L	M	N	P	OPERATING WEIGHT(lbs)	SHIPPING WEIGHT(lbs)	SHIPPING DIMENSIONS (L x W x H)
38HDR018	1	X	O	O	O	25 1/8"	36 15/16"	14 9/16"	16"	23 7/16"	17 3/16"	17 1/8"	22"	13"	6 5/8"	11 1/4"	5/8"	2 15/16"	6"	155	171	42 9/10" X 18" X 28 1/10"
38HDR024	1,2	X	O	O	O	31 1/8"	36 15/16"	14 9/16"	16"	23 7/16"	17 3/16"	23 1/8"	28"	14"	6 3/4"	11 5/8"	5/8"	2 15/16"	6"	180	198	42 9/10" X 18" X 34 1/10"
38HDR030	1	X	O	O	O	37 3/16"	44 9/16"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	29 3/16"	34 1/16"	13 11/16"	8 1/8"	15 7/8"	3/4"	3 7/16"	6 1/2"	200	223	50 1/2" X 20 1/2" X 40 2/10"
38HDR036	1	X	O	X	X	37 3/16"	44 9/16"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	29 3/16"	34 1/16"	13 11/16"	8 1/8"	15 7/8"	3/4"	3 7/16"	6 1/2"	218	240	50 1/2" X 20 1/2" X 40 2/10"
38HDR048	1,2	X	O	X	X	43 3/16"	44 9/16"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	35 3/16"	40 1/16"	14 1/2"	8 1/2"	18 7/8"	7/8"	3 7/16"	6 1/2"	284	309	50 1/2" X 20 1/2" X 46 2/10"
38HDR060	1,2	X	O	X	X	43 3/16"	44 9/16"	17 1/16"	18 7/16"	30 1/2"	19 5/8"	35 3/16"	40 1/16"	14 1/2"	8 1/2"	18 7/8"	7/8"	3 7/16"	6 1/2"	294	319	50 1/2" X 20 1/2" X 46 2/10"
		208-230-1-60	230-1-60	208/230-3-60	460-3-60																	

X = YES
O = NO

1. REQUIRED CLEARANCES: WITH COIL FACING WALL; ALLOW 6" MIN CLEARANCE ON COIL SIDE AND COIL END AND 36" MIN CLEARANCE ON COMPRESSOR END AND FAN SIDE. WITH FAN FACING WALL; ALLOW 8" MIN CLEARANCE ON FAN SIDE AND COIL END AND 36" MIN CLEARANCE ON COMPRESSOR END AND COIL SIDE. WITH MULTI UNIT APPLICATION; ARRANGE UNITS SO DISCHARGE OF ONE DOES NOT ENTER INLET OF ANOTHER.
2. MINIMUM OUTDOOR OPERATING AMBIENT IN COOLING MODE IS 55°F, MAX. 125°F.
3. SERIES DESIGNATION IS THE 13TH POSITION OF THE UNIT MODEL NUMBER.
4. CENTER OF GRAVITY
5. ALL DIMENSIONS ARE IN "INCHES" UNLESS NOTED.



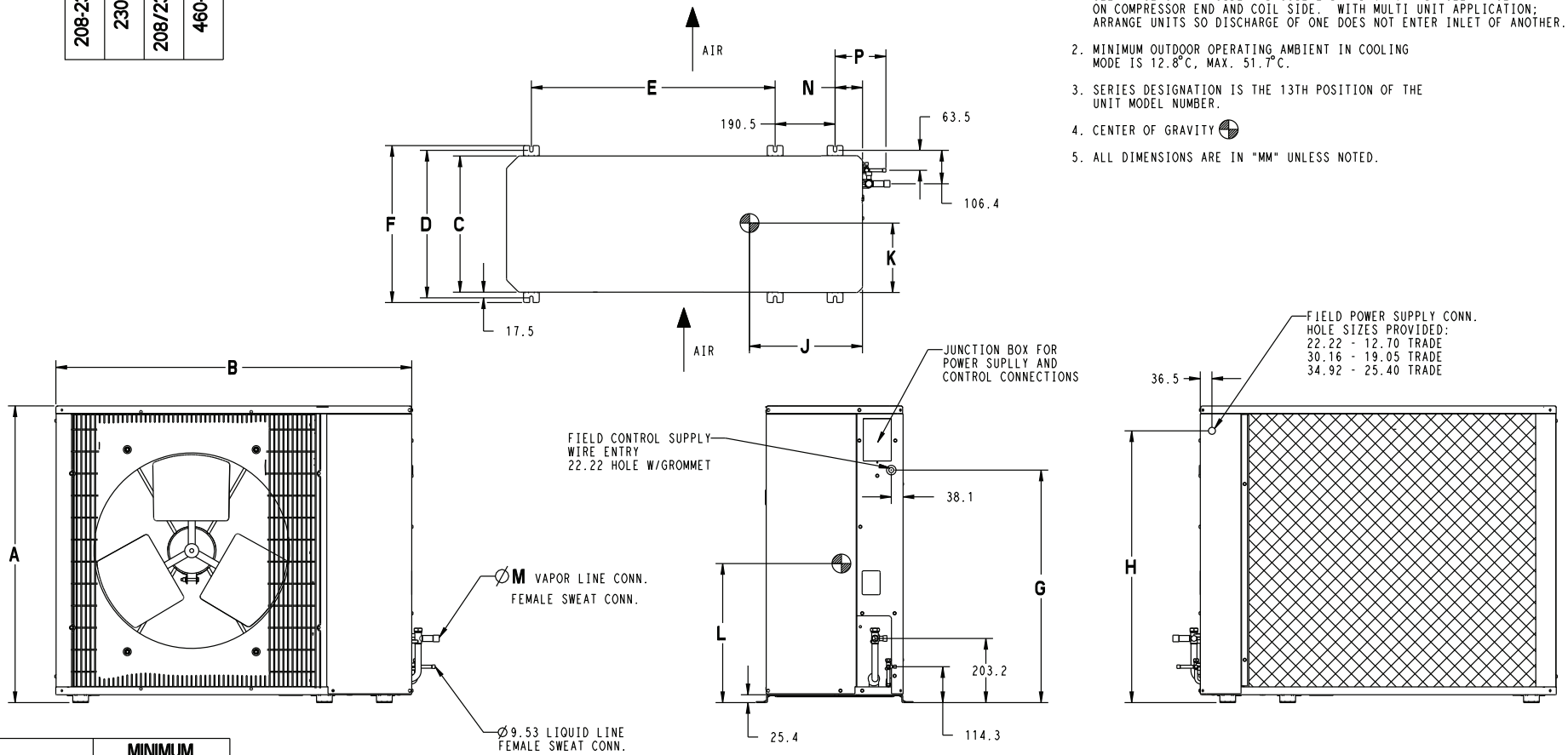
UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
18,24	23" X 42"
30,36,48,60	24" X 50"

DIMENSIONS - SI

UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	H	J	K	L	M	N	P	OPERATING WEIGHT(KG)	SHIPPING WEIGHT(KG)	SHIPPING DIMENSIONS (L x W x H)
38HDR018	1	X	O	O	O	638.2	938.2	369.9	406.4	595.3	436.6	435.0	558.8	330.2	168.3	285.8	15.9	74.6	152.4	70.4	77.7	1090.2 X 457.7 X 714.3
38HDR024	1,2	X	O	O	O	790.6	938.2	369.9	406.4	595.3	436.6	587.4	711.2	355.6	171.5	295.3	15.9	74.6	152.4	81.8	90.0	1090.2 X 457.7 X 866.7
38HDR030	1	X	O	O	O	944.6	1131.9	433.4	468.3	774.7	498.5	741.4	865.2	347.7	206.4	403.2	19.0	87.3	165.1	90.9	101.4	1282.7 X 520.7 X 1020.7
38HDR036	1	X	O	X	X	944.6	1131.9	433.4	468.3	774.7	498.5	741.4	865.2	347.7	206.4	403.2	19.0	87.3	165.1	99.0	109.0	1282.7 X 520.7 X 1020.7
38HDR048	1,2	X	O	X	X	1097.0	1131.9	433.4	468.3	774.7	498.5	893.8	1017.6	368.3	215.9	479.4	22.2	87.3	165.1	129.0	140.4	1282.7 X 520.7 X 1173.1
38HDR060	1,2	X	O	X	X	1097.0	1131.9	433.4	468.3	774.7	498.5	893.8	1017.6	368.3	215.9	479.4	22.2	87.3	165.1	133.6	145.0	1282.7 X 520.7 X 1173.1
		208-230-1-60	230-1-60	208/230-3-60	460-3-60																	

X = YES
O = NO

1. REQUIRED CLEARANCES: WITH COIL FACING WALL; ALLOW 152.4 MIN CLEARANCE ON COIL SIDE AND COIL END AND 914.4 MIN CLEARANCE ON COMPRESSOR END AND FAN SIDE. WITH FAN FACING WALL; ALLOW 203.2 MIN CLEARANCE ON FAN SIDE AND COIL END AND 914.4 MIN CLEARANCE ON COMPRESSOR END AND COIL SIDE. WITH MULTI UNIT APPLICATION; ARRANGE UNITS SO DISCHARGE OF ONE DOES NOT ENTER INLET OF ANOTHER.
2. MINIMUM OUTDOOR OPERATING AMBIENT IN COOLING MODE IS 12.8°C, MAX. 51.7°C.
3. SERIES DESIGNATION IS THE 13TH POSITION OF THE UNIT MODEL NUMBER.
4. CENTER OF GRAVITY
5. ALL DIMENSIONS ARE IN "MM" UNLESS NOTED.



UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
18,24	584.2 X 1066.8
30,36,48,60	609.6 X 1270.0

TESTED AHRI COMBINATION RATINGS*

NOTE: Ratings contained in this document are subject to change at any time.

For AHRI ratings certificates, please refer to the AHRI directory www.ahridirectory.org
Additional ratings and system combinations can be accessed via the Carrier database at:
http://cactaxcredits.info/carrier-ratings/ac_ratings_srch.php

Equipment performance calculator can be accessed at: http://rpmob.wrightsoft.com/

Model Number	Indoor Model	Furnace Model	Capacity	EER	SEER
38HDR024−32	CNPV*2414A**+TDR		23,400	11.0	13.0
38HDR030−31	CNPV*3014A**+TDR		28,000	11.0	13.0
38HDR036−31	CNPV*4221A**+TDR		33,400	11.0	13.0
38HDR036−51	CNPV*4221A**+TDR		33,400	11.0	13.0
38HDR036−61	CNPV*4221A**+TDR		33,400	11.0	13.0
38HDR048−32	CNPV*4821A**+TDR		47,000	11.0	13.0
38HDR048−52	CNPV*4821A**+TDR		47,000	11.0	13.0
38HDR048−62	CNPV*4821A**+TDR		47,000	11.0	13.0
38HDR060−32	CNPV*6024A**+TDR		57,000	11.0	13.0
38HDR060−52	CNPV*6024A**+TDR		57,000	11.0	13.0
38HDR060−62	CNPV*6024A**+TDR		57,000	11.0	13.0

***** AHRI = Air Conditioning, Heating & Refrigeration Institute
EER — Energy Efficiency Ratio
SEER — Seasonal Energy Efficiency Ratio
TDR — Time−Delay Relay. In most cases, only 1 method should be used to achieve TDR function. Using more than 1 method in a system may cause degradation in performance. Use either the accessory Time−Delay Relay KAATD0101TDR or a furnace equipped with TDR. Most Carrier furnaces are equipped with TDR.

NOTES:
1. Ratings are net values reflecting the effects of circulating fan motor heat. Supplemental electric heat is not included.
2. Tested outdoor/indoor combinations have been tested in accordance with DOE test procedures for central air conditioners. Ratings for other combinations are determined under DOE computer simulation procedures.
3. Determine actual CFM values obtainable for your system by referring to fan performance data in fan coil or furnace coil literature.
4. Do not apply with capillary tube coils as performance and reliability are significantly affected.

DETAILED COOLING CAPACITIES*

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR018 Outdoor Section With CNPV*1814A** Indoor Section																			
525	72 (22.2)	20.28	9.40	1.22	19.31	9.07	1.36	18.30	8.73	1.52	17.26	8.38	1.69	16.14	8.01	1.87	14.90	7.61	2.07
	67(19.4)	18.53	11.50	1.22	17.65	11.17	1.36	16.72	10.82	1.52	15.76	10.47	1.69	14.72	10.09	1.87	13.59	9.69	2.07
	62 (16.7)	16.93	13.58	1.23	16.13	13.24	1.37	15.29	12.89	1.52	14.43	12.52	1.69	13.57	13.57	1.87	12.71	12.71	2.07
	57 (13.9)	16.35	16.35	1.23	15.72	15.72	1.37	15.05	15.05	1.52	14.34	14.34	1.69	13.57	13.57	1.87	12.71	12.71	2.07
600	72(22.2)	20.65	9.87	1.25	19.63	9.53	1.39	18.59	9.18	1.54	17.50	8.83	1.71	16.34	8.46	1.90	15.05	8.05	2.10
	67(19.4)	18.90	12.25	1.25	17.97	11.91	1.39	17.00	11.56	1.55	16.00	11.20	1.72	14.93	10.82	1.90	13.75	10.41	2.10
	62 (16.7)	17.33	14.61	1.25	16.51	14.26	1.39	15.67	15.61	1.55	14.91	14.91	1.72	14.08	14.08	1.90	13.16	13.16	2.10
	57 (13.9)	17.07	17.07	1.25	16.39	16.39	1.39	15.67	15.67	1.55	14.91	14.91	1.72	14.08	14.08	1.90	13.16	13.16	2.10
675	72 (22.2)	20.91	10.30	1.27	19.86	9.96	1.41	18.78	9.61	1.57	17.67	9.26	1.74	16.47	8.88	1.93	15.15	8.46	2.13
	67 (19.4)	19.16	12.97	1.27	18.20	12.62	1.42	17.20	12.27	1.57	16.18	11.90	1.74	15.07	11.52	1.93	13.87	11.09	2.13
	62 (16.7)	17.70	17.52	1.28	16.94	16.94	1.42	16.17	16.17	1.57	15.37	15.37	1.74	14.49	14.49	1.93	13.52	13.52	2.13
	57(13.9)	17.67	17.67	1.28	16.94	16.94	1.42	16.17	16.17	1.57	15.37	15.37	1.74	14.49	14.49	1.93	13.52	13.52	2.13

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR024 Outdoor Section With CNPV*2414A** Indoor Section																			
700	72 (22.2)	28.11	13.59	1.69	26.70	13.09	1.89	25.17	12.55	2.10	23.54	11.98	2.33	21.76	11.38	2.58	19.78	10.71	2.84
	67(19.4)	25.68	16.61	1.68	24.41	16.11	1.87	23.04	15.58	2.09	21.58	15.02	2.32	19.98	14.42	2.57	18.21	13.77	2.83
	62 (16.7)	23.47	19.61	1.67	22.34	19.11	1.86	21.13	18.58	2.08	19.86	18.01	2.31	18.57	18.57	2.55	17.23	17.23	2.82
	57 (13.9)	22.67	22.67	1.67	21.77	21.77	1.86	20.81	20.81	2.07	19.75	19.75	2.31	18.57	18.57	2.55	17.23	17.23	2.82
800	72(22.2)	28.62	14.25	1.73	27.14	13.73	1.93	25.53	13.18	2.14	23.83	12.61	2.37	21.98	11.99	2.62	19.92	11.32	2.88
	67(19.4)	26.18	17.67	1.72	24.84	17.16	1.91	23.40	16.61	2.13	21.88	16.05	2.36	20.22	15.43	2.61	18.38	14.76	2.87
	62 (16.7)	24.02	21.07	1.71	22.85	20.54	1.90	21.63	21.51	2.12	20.48	20.48	2.35	19.20	19.20	2.60	17.75	17.75	2.86
	57 (13.9)	23.64	23.64	1.71	22.68	22.68	1.90	21.62	21.62	2.12	20.48	20.48	2.35	19.20	19.20	2.60	17.75	17.75	2.86
900	72 (22.2)	28.99	14.87	1.77	27.45	14.34	1.96	25.78	13.78	2.18	24.03	13.20	2.41	22.12	12.57	2.66	20.00	11.89	2.92
	67 (19.4)	26.54	18.68	1.76	25.15	18.16	1.95	23.66	17.61	2.17	22.09	17.03	2.40	20.38	16.40	2.65	18.50	15.71	2.91
	62 (16.7)	24.51	22.41	1.75	23.41	23.41	1.94	22.28	22.28	2.16	21.06	21.06	2.39	19.70	19.70	2.64	18.15	18.15	2.91
	57(13.9)	24.45	24.45	1.75	23.41	23.41	1.94	22.28	22.28	2.16	21.06	21.06	2.39	19.70	19.70	2.64	18.15	18.15	2.91

See notes on pg. 13

DETAILED COOLING CAPACITIES* (CONT.)

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR030 Outdoor Section With CNPV*3014A** Indoor Section																			
875	72 (22.2)	33.74	16.03	2.06	32.29	15.52	2.29	30.76	14.99	2.54	29.12	14.43	2.81	27.36	13.84	3.11	25.42	13.19	3.44
	67(19.4)	30.65	19.58	2.06	29.32	19.06	2.29	27.90	18.51	2.54	26.39	17.94	2.81	24.76	17.34	3.11	22.97	16.69	3.43
	62 (16.7)	28.07	23.01	2.07	26.73	22.59	2.29	25.47	22.03	2.54	24.10	21.45	2.81	22.76	22.72	3.11	21.45	21.45	3.43
	57 (13.9)	27.14	27.14	2.07	26.16	26.16	2.29	25.11	25.11	2.53	24.01	24.01	2.80	22.78	22.78	3.11	21.43	21.43	3.43
1000	72(22.2)	34.29	16.79	2.11	32.87	16.29	2.34	31.28	15.69	2.58	29.58	15.18	2.86	27.57	14.54	3.17	25.64	13.91	3.49
	67(19.4)	31.27	20.81	2.11	29.84	20.29	2.34	28.40	19.75	2.58	26.82	19.17	2.86	24.99	18.52	3.16	23.21	17.87	3.49
	62 (16.7)	28.72	24.92	2.11	27.38	24.26	2.34	26.11	26.11	2.58	24.94	24.94	2.85	23.54	23.54	3.16	22.22	22.22	3.48
	57 (13.9)	28.28	28.28	2.11	27.23	27.23	2.34	26.13	26.13	2.58	24.94	24.94	2.85	23.54	23.54	3.16	22.22	22.22	3.48
1125	72 (22.2)	34.76	17.52	2.16	33.30	17.00	2.39	31.65	16.46	2.63	29.90	15.89	2.91	28.03	15.27	3.21	25.95	14.60	3.53
	67 (19.4)	31.86	21.48	2.16	30.25	21.46	2.38	28.76	20.92	2.63	27.14	20.32	2.90	25.39	19.69	3.21	23.44	18.98	3.54
	62 (16.7)	29.27	29.04	2.16	28.12	28.12	2.38	26.98	26.98	2.63	25.71	25.71	2.90	24.35	24.35	3.20	22.84	22.84	3.53
	57(13.9)	29.23	29.23	2.16	28.13	28.13	2.38	26.99	26.99	2.63	25.71	25.71	2.90	24.23	24.23	3.21	22.85	22.85	3.53

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR036 Outdoor Section With CNPV*4221A** Indoor Section																			
1050	72 (22.2)	39.85	18.85	2.42	38.03	18.23	2.68	36.08	17.58	2.98	33.99	16.89	3.30	31.72	16.14	3.65	29.20	15.33	4.03
	67(19.4)	36.33	23.19	2.42	34.67	22.57	2.68	32.91	21.91	2.98	31.02	21.23	3.30	28.99	20.49	3.65	26.73	19.69	4.04
	62 (16.7)	33.23	27.51	2.42	31.75	26.88	2.68	30.20	26.20	2.98	28.60	28.45	3.30	27.06	27.06	3.65	25.34	25.34	4.03
	57 (13.9)	32.46	32.46	2.42	31.26	31.26	2.68	29.98	29.98	2.98	28.59	28.59	3.30	27.06	27.06	3.65	25.34	25.34	4.03
1200	72(22.2)	40.51	19.77	2.48	38.61	19.14	2.74	36.57	18.47	3.04	34.40	17.77	3.36	32.04	17.01	3.71	29.42	16.18	4.09
	67(19.4)	36.97	24.67	2.48	35.23	24.04	2.74	33.40	23.38	3.04	31.45	22.68	3.36	29.33	21.93	3.71	27.00	21.10	4.09
	62 (16.7)	34.01	29.52	2.48	32.53	32.23	2.74	31.11	31.11	3.04	29.61	29.61	3.36	27.97	27.97	3.71	26.12	26.12	4.09
	57 (13.9)	33.78	33.78	2.48	32.49	32.49	2.74	31.11	31.11	3.04	29.62	29.62	3.36	27.97	27.97	3.71	26.12	26.12	4.09
1350	72 (22.2)	40.99	20.64	2.54	39.02	19.99	2.80	36.91	19.31	3.09	34.67	18.60	3.42	32.24	17.83	3.77	29.54	16.99	4.15
	67 (19.4)	37.43	26.09	2.54	35.65	25.45	2.80	33.76	24.78	3.10	31.75	24.06	3.42	29.58	23.29	3.77	27.20	22.42	4.15
	62 (16.7)	34.86	34.86	2.54	33.49	33.49	2.80	32.02	32.02	3.10	30.44	30.44	3.42	28.70	28.70	3.77	26.73	26.73	4.15
	57(13.9)	34.86	34.86	2.54	33.49	33.49	2.80	32.03	32.03	3.10	30.44	30.44	3.42	28.70	28.70	3.77	26.73	26.73	4.15

See notes on pg. 13

DETAILED COOLING CAPACITIES* (CONT.)

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR048 Outdoor Section With CNPV*4821A** Indoor Section																			
1460	72 (22.2)	57.22	27.09	3.31	54.16	26.03	3.74	50.83	24.90	4.20	47.23	23.69	4.69	43.24	22.38	5.21	38.87	20.99	5.76
	67(19.4)	52.21	33.21	3.33	49.49	32.17	3.76	46.57	31.08	4.22	43.40	29.91	4.71	39.95	28.66	5.23	36.03	27.26	5.77
	62 (16.7)	47.74	39.31	3.35	45.37	38.29	3.78	42.88	37.19	4.23	40.25	39.91	4.72	37.64	37.64	5.23	34.63	34.63	5.78
	57 (13.9)	46.44	46.44	3.36	44.53	44.53	3.78	42.48	42.48	4.23	40.21	40.21	4.72	37.65	37.65	5.23	34.63	34.63	5.78
1650	72(22.2)	58.13	28.26	3.37	54.91	27.17	3.81	51.42	26.01	4.27	47.67	24.78	4.76	43.52	23.45	5.28	39.26	22.10	5.84
	67(19.4)	53.07	35.09	3.40	50.21	34.03	3.83	47.16	32.91	4.29	43.87	31.73	4.78	40.28	30.44	5.30	36.23	28.99	5.85
	62 (16.7)	48.75	41.89	3.42	46.32	40.79	3.85	43.85	43.85	4.30	41.42	41.42	4.79	38.64	38.64	5.31	35.37	35.37	5.85
	57 (13.9)	48.17	48.17	3.43	46.11	46.11	3.85	43.88	43.88	4.30	41.42	41.42	4.79	38.64	38.64	5.31	35.37	35.37	5.85
1850	72 (22.2)	58.83	29.41	3.45	55.48	28.31	3.88	51.86	27.12	4.35	47.97	25.87	4.84	43.73	24.52	5.36	39.89	23.26	5.92
	67 (19.4)	53.74	36.97	3.48	50.78	35.90	3.91	47.62	34.76	4.37	44.22	33.55	4.86	40.51	32.22	5.38	36.39	30.70	5.93
	62 (16.7)	49.74	44.35	3.50	47.48	47.48	3.92	45.09	45.09	4.38	42.44	42.44	4.87	39.46	39.46	5.38	35.96	35.96	5.93
	57(13.9)	49.69	49.69	3.50	47.49	47.49	3.92	45.09	45.09	4.38	42.45	42.45	4.87	39.46	39.46	5.38	35.97	35.97	5.93

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
38HDR060 Outdoor Section With CNPV*6024A** Indoor Section																			
1750	72 (22.2)	68.88	33.36	4.20	65.13	32.05	4.64	60.97	30.62	5.12	56.47	29.10	5.64	51.66	27.52	6.20	46.31	25.80	6.80
	67(19.4)	63.28	41.18	4.15	59.98	39.91	4.59	56.34	38.52	5.08	52.38	37.05	5.60	48.00	35.44	6.17	43.23	33.69	6.77
	62 (16.7)	58.24	48.95	4.11	55.37	47.69	4.55	52.27	46.30	5.04	48.91	48.85	5.57	45.63	45.63	6.15	41.69	41.69	6.76
	57 (13.9)	56.77	56.77	4.09	54.45	54.45	4.54	51.86	51.86	5.03	48.95	48.95	5.57	45.63	45.63	6.15	41.69	41.69	6.76
2000	72(22.2)	69.89	34.93	4.31	65.94	33.59	4.75	61.58	32.12	5.23	56.96	30.59	5.74	52.01	29.02	6.31	47.30	27.45	6.92
	67(19.4)	64.28	43.75	4.26	60.81	42.45	4.70	57.00	41.04	5.18	52.88	39.53	5.71	48.32	37.86	6.27	43.82	36.17	6.88
	62 (16.7)	59.48	52.47	4.22	56.55	51.08	4.66	53.58	53.58	5.15	50.40	50.40	5.68	46.78	46.78	6.26	42.62	42.62	6.87
	57 (13.9)	58.96	58.96	4.21	56.42	56.42	4.66	53.58	53.58	5.15	50.40	50.40	5.68	46.78	46.78	6.26	42.60	42.60	6.87
2250	72 (22.2)	70.60	36.41	4.42	66.50	35.04	4.86	61.97	33.55	5.33	57.25	32.02	5.85	52.14	30.44	6.41	48.41	29.01	7.04
	67 (19.4)	65.01	46.21	4.37	61.41	44.89	4.81	57.46	43.44	5.29	53.20	41.88	5.81	48.56	40.17	6.37	44.28	38.42	6.99
	62 (16.7)	60.67	60.67	4.33	58.00	58.00	4.78	54.94	54.94	5.26	51.52	51.52	5.79	47.63	47.63	6.36	43.18	43.18	6.98
	57(13.9)	60.73	60.73	4.33	58.00	58.00	4.78	54.94	54.94	5.26	51.52	51.52	5.79	47.63	47.63	6.36	43.14	43.14	6.98

NOTE: When the required data fall between the published data, interpolation may be performed. Extrapolation is not an acceptable practice.

* Detailed cooling capacities are based on indoor and outdoor unit at the same elevation per the latest edition of AHRI standard 210/240. If additional tubing length and/or indoor unit is located above outdoor unit, a slight variation in capacity may occur.

† Total and sensible capacities are net capacities. Blower motor heat has been subtracted.

‡ Sensible capacities shown are based on 80° F (27° C) entering air at the indoor coil. For sensible capacities at other than 80° F (27° C), deduct 835 Btuh (245 kW) per 1000 CFM (480 L/S) of indoor coil air for each degree below 80° F (27° C), or add 835 Btuh (245 kW) per 1000 CFM (480 L/S) of indoor coil air per degree above 80° F (27° C). When the required data fall between the published data, interpolation may be performed.

** Total system kW is total of indoor and outdoor unit kilowatts.

CONDENSER ONLY RATINGS*

SST °F (°C)		CONDENSER ENTERING AIR TEMPERATURES °F (°C)							
		55 (12.8)	65 (18.3)	75 (23.9)	85 (29.4)	95 (35)	105 (40.6)	115 (46.1)	125 (51.7)
38HDR018–31									
30 (–1.6)	TCG	16.20	15.30	14.30	13.40	12.40	11.40	10.30	9.20
	SDT	67.40	77.00	86.50	96.00	105.50	114.90	124.40	133.70
	KW	0.86	0.98	1.11	1.26	1.42	1.59	1.77	1.96
35 (1.7)	TCG	17.90	16.90	15.90	14.80	13.80	12.70	11.60	10.40
	SDT	68.50	78.00	87.50	97.00	106.40	115.80	125.20	134.50
	KW	0.86	0.98	1.11	1.26	1.42	1.59	1.78	1.98
40 (4.4)	TCG	19.70	18.60	17.50	16.40	15.20	14.10	12.90	11.60
	SDT	69.70	79.10	88.60	98.00	107.40	116.80	126.10	135.30
	KW	0.85	0.97	1.11	1.26	1.42	1.60	1.79	1.99
45 (7.2)	TCG	21.60	20.40	19.20	18.00	16.80	15.50	14.20	12.80
	SDT	70.90	80.30	89.70	99.00	108.40	117.70	127.00	136.10
	KW	0.85	0.97	1.11	1.26	1.42	1.60	1.79	2.00
50 (10)	TCG	23.60	22.30	21.10	19.70	18.40	17.00	15.60	14.10
	SDT	72.20	81.50	90.80	100.10	109.40	118.60	127.80	136.90
	KW	0.85	0.97	1.11	1.26	1.42	1.60	1.79	2.00
55 (12.8)	TCG	25.70	24.30	22.90	21.50	20.00	18.60	17.00	15.40
	SDT	73.50	82.70	92.00	101.20	110.40	119.60	128.70	137.70
	KW	0.85	0.97	1.10	1.25	1.42	1.60	1.79	2.00
38HDR024–32									
30 (–1.6)	TCG	22.10	20.90	19.60	18.30	16.90	15.50	14.00	12.40
	SDT	69.00	78.50	88.00	97.40	106.80	116.10	125.30	134.50
	KW	1.08	1.24	1.41	1.60	1.80	2.02	2.25	2.48
35 (1.7)	TCG	24.30	23.00	21.70	20.30	18.80	17.20	15.60	13.80
	SDT	70.30	79.80	89.20	98.60	107.90	117.10	126.30	135.40
	KW	1.09	1.24	1.42	1.61	1.82	2.04	2.28	2.52
40 (4.4)	TCG	26.80	25.30	23.90	22.30	20.70	19.00	17.20	15.30
	SDT	71.70	81.10	90.50	99.80	109.10	118.20	127.30	136.30
	KW	1.10	1.26	1.43	1.62	1.83	2.06	2.30	2.55
45 (7.2)	TCG	29.40	27.80	26.20	24.50	22.70	20.90	18.90	16.70
	SDT	73.20	82.60	91.90	101.10	110.20	119.30	128.30	137.10
	KW	1.11	1.27	1.44	1.64	1.85	2.08	2.32	2.57
50 (10)	TCG	32.10	30.40	28.60	26.80	24.80	22.70	20.50	18.10
	SDT	74.80	84.10	93.30	102.40	111.50	120.40	129.20	137.90
	KW	1.12	1.28	1.46	1.65	1.86	2.09	2.33	2.59
55 (12.8)	TCG	35.00	33.10	31.20	29.10	26.90	24.60	22.20	19.50
	SDT	76.40	85.60	94.70	103.80	112.70	121.50	130.20	138.60
	KW	1.13	1.29	1.47	1.66	1.88	2.10	2.35	2.60
38HDR030–31									
30 (–1.6)	TCG	26.20	24.70	23.20	21.70	20.10	18.40	16.80	15.30
	SDT	72.00	82.30	92.90	103.80	115.00	126.90	139.00	148.90
	KW	1.30	1.48	1.69	1.92	2.19	2.50	2.84	3.12
35 (1.7)	TCG	28.80	27.30	25.70	24.10	22.40	20.60	18.90	17.40
	SDT	73.10	83.50	94.00	104.80	116.10	127.70	139.50	149.30
	KW	1.30	1.49	1.69	1.93	2.21	2.52	2.86	3.15
40 (4.4)	TCG	31.70	30.10	28.40	26.60	24.80	23.00	21.20	19.60
	SDT	74.30	84.70	95.20	105.90	117.10	128.60	140.00	149.70
	KW	1.31	1.49	1.70	1.94	2.22	2.53	2.87	3.18
45 (7.2)	TCG	34.80	33.10	31.20	29.40	27.40	25.50	23.60	21.90
	SDT	75.60	85.90	96.40	107.10	118.10	129.40	140.60	150.10
	KW	1.31	1.50	1.71	1.95	2.22	2.54	2.88	3.19
50 (10)	TCG	38.20	36.20	34.30	32.30	30.30	28.20	26.20	24.40
	SDT	76.90	87.20	97.60	108.20	119.20	130.30	141.10	150.50
	KW	1.32	1.50	1.71	1.95	2.23	2.55	2.89	3.20
55 (12.8)	TCG	41.70	39.70	37.60	35.50	33.30	31.10	29.00	27.10
	SDT	78.30	88.50	98.90	109.40	120.20	131.20	141.80	150.90
	KW	1.32	1.51	1.72	1.96	2.24	2.55	2.89	3.20
38HDR036–31									
30 (–1.6)	TCG	30.10	28.50	26.80	25.10	23.30	21.50	19.60	17.60
	SDT	70.90	80.80	90.90	101.00	111.20	121.60	132.30	143.30
	KW	1.50	1.71	1.94	2.20	2.50	2.83	3.19	3.58
35 (1.7)	TCG	33.20	31.50	29.70	27.80	25.90	24.00	21.90	19.90
	SDT	72.00	82.00	92.00	102.10	112.30	122.80	133.30	143.80
	KW	1.50	1.71	1.95	2.21	2.52	2.85	3.21	3.60
40 (4.4)	TCG	36.50	34.60	32.70	30.70	28.70	26.60	24.40	22.30
	SDT	73.30	83.20	93.20	103.20	113.40	123.60	134.10	144.50
	KW	1.51	1.72	1.95	2.22	2.52	2.85	3.23	3.63
45 (7.2)	TCG	40.10	38.10	36.00	33.80	31.70	29.40	27.10	24.80
	SDT	74.60	84.40	94.40	104.50	113.80	124.50	135.20	145.30
	KW	1.51	1.72	1.96	2.23	2.51	2.86	3.26	3.65
50 (10)	TCG	43.90	41.70	39.50	37.10	34.90	32.40	30.00	27.60
	SDT	75.90	85.80	95.70	105.90	115.50	125.90	136.20	146.00
	KW	1.52	1.73	1.97	2.24	2.54	2.89	3.27	3.66
55 (12.8)	TCG	48.00	45.70	43.30	40.70	38.30	35.70	33.10	30.50
	SDT	77.40	87.10	97.00	107.10	116.70	126.80	137.00	146.70
	KW	1.53	1.74	1.98	2.25	2.55	2.89	3.28	3.66

See notes on page 15

CONDENSER ONLY RATINGS* CONTINUED

SST °F (°C)		CONDENSER ENTERING AIR TEMPERATURES °F (°C)							
		55 (12.8)	65 (18.3)	75 (23.9)	85 (29.4)	95 (35)	105 (40.6)	115 (46.1)	125 (51.7)
38HDR048–32									
30 (–1.6)	TCG	48.40	45.50	42.50	39.50	36.20	32.90	30.60	28.10
	SDT	67.90	77.30	86.70	96.00	105.40	114.70	124.30	133.80
	KW	2.05	2.39	2.75	3.15	3.56	4.01	4.49	5.00
35 (1.7)	TCG	53.40	50.20	46.90	43.40	39.60	35.70	34.00	25.50
	SDT	69.10	78.40	87.80	97.00	106.20	115.40	125.10	133.00
	KW	2.02	2.37	2.74	3.14	3.56	4.01	4.51	4.99
40 (4.4)	TCG	58.70	55.10	51.40	47.50	43.10	38.30	33.00	27.10
	SDT	70.40	79.60	88.90	98.00	107.10	116.10	124.80	133.40
	KW	1.99	2.35	2.72	3.13	3.55	4.01	4.49	4.99
45 (7.2)	TCG	64.30	60.30	56.20	51.60	46.90	41.20	35.20	28.90
	SDT	71.80	80.90	90.00	99.10	108.10	116.80	125.40	133.80
	KW	1.96	2.32	2.70	3.11	3.54	4.00	4.48	4.99
50 (10)	TCG	70.30	65.80	61.10	55.80	50.40	44.20	37.30	34.60
	SDT	73.30	82.30	91.20	100.10	108.90	117.50	125.90	135.30
	KW	1.92	2.29	2.68	3.09	3.52	3.98	4.46	5.01
55 (12.8)	TCG	76.50	71.40	66.00	60.30	54.00	47.00	50.70	41.10
	SDT	74.80	83.60	92.50	101.20	109.80	118.20	129.40	137.00
	KW	1.88	2.25	2.64	3.06	3.49	3.95	4.57	5.05
38HDR060–32									
30 (–1.6)	TCG	59.30	55.30	50.90	46.20	40.40	37.90	33.80	30.30
	SDT	70.10	79.30	88.40	97.40	106.20	115.80	124.90	134.20
	KW	2.59	2.93	3.31	3.73	4.19	4.72	5.31	5.90
35 (1.7)	TCG	64.70	60.20	55.50	50.00	43.30	42.40	31.50	33.10
	SDT	71.40	80.50	89.50	98.40	106.90	116.90	124.20	134.90
	KW	2.62	2.97	3.34	3.76	4.21	4.76	5.25	5.93
40 (4.4)	TCG	69.90	65.30	60.10	53.80	55.90	47.40	31.70	35.60
	SDT	72.70	81.70	90.60	99.30	110.10	118.10	124.20	135.50
	KW	2.66	3.00	3.38	3.78	4.34	4.81	5.24	5.96
45 (7.2)	TCG	76.00	70.80	64.80	57.40	56.00	54.60	48.50	47.70
	SDT	74.10	83.00	91.80	100.20	110.00	119.90	128.60	138.80
	KW	2.71	3.04	3.40	3.80	4.32	4.89	5.43	6.08
50 (10)	TCG	82.20	76.70	69.30	70.90	61.80	58.60	30.50	52.10
	SDT	75.60	84.40	92.80	103.40	111.40	120.90	123.80	139.80
	KW	2.75	3.09	3.42	3.99	4.38	4.93	5.16	6.13
55 (12.8)	TCG	95.20	87.70	88.40	74.60	75.40	53.90	46.10	60.30
	SDT	78.80	87.10	97.50	104.30	114.70	119.50	127.70	141.70
	KW	2.85	3.13	3.74	3.95	4.56	4.78	5.33	6.25

* AHRI listing applies only to systems shown in Combination Ratings table.

KW – Outdoor Unit Kilowatts Only.

SDT – Saturated Temperature Leaving Compressor (°F)

SST – Saturated Temperature Entering Compressor (°F/°C)

TCG – Gross Cooling Capacity (1000 Btuh)

GUIDE SPECIFICATIONS
GENERAL

System Description

Outdoor-mounted, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation. Unit consists of a hermetic compressor, an air-cooled coil, propeller-type condenser fan, and a control box. Unit will discharge supply air horizontally as shown on contract drawings. Unit will be used in a refrigeration circuit to match up to a packaged fan coil or coil unit.

Quality Assurance

- — Unit will be rated in accordance with the latest edition of AHRI Standard 210.
- — Unit will be certified for capacity and efficiency, and listed in the latest AHRI directory.
- — Unit construction will comply with latest edition of ANSI/ ASHRAE and with NEC.
- — Unit will be constructed in accordance with UL standards and will carry the UL label of approval. Unit will have c-UL approval.
- — Unit cabinet will be capable of withstanding Federal Test
  Method Standard No. 141 (Method 6061) 500-hr salt spray test.
- — Air-cooled condenser coils will be leak tested and pressure tested
- — Unit constructed in ISO9001 approved facility.

Delivery, Storage, and Handling

- — Unit will be shipped as single package only and is stored and handled per unit manufacturer's recommendations.

Warranty (for inclusion by specifying engineer)

- — U.S. and Canada only.

PRODUCTS

Equipment

- — Factory assembled, single piece, air-cooled air conditioner unit. Contained within the unit enclosure is all factory wiring, piping, controls, compressor, refrigerant charge Puron® (R-410A), and special features required prior to field start-up.

Unit Cabinet

- — Unit cabinet will be constructed of galvanized steel, bonderized, and coated with a powder coat paint.

Fans

- — Condenser fan will be direct-drive propeller type, discharging air horizontally.
- — Condenser fan motors will be totally enclosed, 1-phase type with class B insulation and permanently lubricated bearings. Shafts will be corrosion resistant.
- — Fan blades will be statically and dynamically balanced.
- — Condenser fan openings will be equipped with coated steel wire safety guards.

Compressor

- — Compressor will be hermetically sealed.
- — Compressor will be mounted on rubber vibration isolators.

Condenser Coil

- — Condenser coil will be air cooled.
- — Coil will be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned, dehydrated, and sealed.

Refrigeration Components

- — Refrigeration circuit components will include liquid-line front-seating shutoff valve with sweat connections, vapor-line front-seating shutoff valve with sweat connections, system charge of Puron® (R-410A) refrigerant, and compressor oil.
- — Unit will be equipped with high-pressure switch, low pressure switch and filter drier for Puron refrigerant.

Operating Characteristics

- — The capacity of the unit will meet or exceed _____ Btuh at a suction temperature of _____ °F/°C. The power consumption at full load will not exceed _____ kW.
- — Combination of the unit and the evaporator or fan coil unit will have a total net cooling capacity of _____ Btuh or greater at conditions of _____ CFM entering air temperature at the evaporator at _____ °F/°C wet bulb and _____ °F/°C dry bulb, and air entering the unit at _____ °F/°C.
- — The system will have a SEER of _____ Btuh/watt or greater at DOE conditions.

Electrical Requirements

- — Nominal unit electrical characteristics will be _____ v, single phase, 60 hz. The unit will be capable of satisfactory operation within voltage limits of _____ v to _____ v.
- — Nominal unit electrical characteristics will be _____ v, three phase, 60 hz. The unit will be capable of satisfactory operation within voltage limits of _____ v to _____ v.
- — Unit electrical power will be single point connection.
- — Control circuit will be 24v.

Special Features

- — Refer to section of this literature identifying accessories and descriptions for specific features and available enhancements.

SYSTEM DESIGN SUMMARY

1. Intended for outdoor installation with free air inlet and outlet. Outdoor fan external static pressure available is less than 0.01-in. wc.
2. Minimum outdoor operating air temperature without low-ambient operation accessory is 55°F (12.8°C).
3. Maximum outdoor operating air temperature is 125°F (51.7°C).
4. For reliable operation, unit should be level in all horizontal planes.
5. For interconnecting refrigerant tube lengths greater than 80 ft (23.4 m) and/or 35 ft (10.7 m) vertical differential, consult Residential Piping and Longline Guideline and Service Manual available from equipment distributor.
6. If any refrigerant tubing is buried, provide a 6 in. (152.4 mm) vertical rise to the valve connections at the unit. Refrigerant tubing lengths up to 36 in. (914.4 mm) may be buried without further consideration. Do not bury refrigerant lines longer than 36 in. (914.4 mm).
7. Use only copper wire for electric connection at unit. Aluminum and clad aluminum are not acceptable for the type of connector provided.
8. Do not apply capillary tube indoor coils to these units.
9. Factory-supplied filter drier must be installed.

Edition Date: 09/12

Catalog No: 38HDR–6PD

Replaces: 38HDR–3PD

ATTACHMENT 3

SoundPLAN Data

Construction Equipment Noise Levels

Noise Levels

Sound Level From One Working Area (three loudest Pieces of Equipment)	Directionality Factor (1 = in air) (2 = over flat plane) (4 = against wall) (8 = corner of a room)	Sound Power Level From One Working Area (dBA)	Sound Power Level From Three Working Areas (dBA)
82.0 dB(A) at 50 feet	2	113.6	118.4

SoundPlan Parameters

Source name	Reference	Sound Power Level dB(A)
Disturbance Area	Lw/unit	118.4

SoundPlan Output

No.	Receiver name	Coordinates (in meters)			Noise Level dB(A)
		X	Y	Height	
1	1	496,144.90	3,625,986.56	129.80	63.5
2	2	496,239.51	3,625,971.95	131.40	64.1
3	3	496,279.30	3,625,968.11	135.60	65.4
4	4	496,319.62	3,625,943.50	142.90	62.4
5	5	496,398.35	3,625,963.39	134.60	65.6
6	6	496,492.66	3,625,952.90	146.30	64.2
7	7	496,524.08	3,625,963.47	146.30	64.3
8	8	496,569.99	3,625,963.64	148.70	64.1
9	9	496,602.15	3,625,953.05	148.10	61.0
10	10	496,628.73	3,625,976.15	140.70	65.6
11	11	496,664.53	3,625,994.87	139.50	68.4
12	12	496,710.88	3,625,985.93	145.30	60.5

Emissions Transportation Noise

SoundPlan Vehicle Traffic Parameters

Stationing (km)	ADT (Veh/24h)	Traffic values Vehicles type	Vehicle name	day (Veh/h)	Speed (km/h)	Control device	Constr. Speed (km/h)	Affect. veh. (%)		Road surface	Gradient Min / Max (%)
I-8 Eastbound Traffic direction: In entry direction											
0+139	100800	Total	-	6720	-	-	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Automobiles	-	6498	-	105	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Medium trucks	-	134	-	105	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Heavy trucks	-	87	-	105	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Buses	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Motorcycles	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.165
0+139	100800	Auxiliary vehicle	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-1.165
2+165	-	-	-	-	-	-					
I-8 Westbound Traffic direction: In entry direction											
0+139	86400	Total	-	5760	-	-	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Automobiles	-	5570	-	105	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Medium trucks	-	115	-	105	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Heavy trucks	-	75	-	105	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Buses	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Motorcycles	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.747
0+139	86400	Auxiliary vehicle	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.747
2+175	-	-	-	-	-	-					
Alvarado Road Traffic direction: In entry direction											
0+139	94500	Total	-	6300	-	-	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Automobiles	-	6092	-	56	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Medium trucks	-	126	-	56	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Heavy trucks	-	82	-	56	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Buses	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Motorcycles	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.866
0+139	94500	Auxiliary vehicle	-	-	-	-	none	-	-	Average (of DGAC and PCC)	-0.866
1+444	-	-	-	-	-	-					

SoundPlan Trolley Parameters

Track Station (km)	Coordinates of track axis			Number of trains			Length per Train (m)	Speed (km/h)	Corrected Emission level dB(A)		
	X	Y	Z	Day	Evening	Night			Day	Evening	Night
SDMTS Green Line1 Rail track: Direction: Section: 1 Km: 0+995 Lm,E25: 60.6 / 59.4 / 55.7											
0+995	495,610.756	3,626,244.691	128.49	96	18	23	100	48	60.6	59.4	55.7
2+785	497,330.025	3,626,093.413	131.22	-	-	-	-	-	60.6	59.4	55.7
									60.6	59.4	55.7

Emissions On-site Generated Noise

Noise Levels

Number of Units	Sound Power Level (dBA)
1.0-unit(s)	72.0
6.0-unit(s)	79.8
8.0-unit(s)	81.0
10.0-unit(s)	82.0
12.0-unit(s)	82.8
14.0-unit(s)	83.5
16.0-unit(s)	84.0
22.0-unit(s)	85.4
24.0-unit(s)	85.8
30.0-unit(s)	86.8
36.0-unit(s)	87.6
54.0-unit(s)	89.3

SoundPlan Parameters

Source name	Reference	Sound Power Level dB(A)
Building 1 Array 1	Lw/unit	82.0
Building 1 Array 2	Lw/unit	82.0
Building 1 Array 3	Lw/unit	82.0
Building 1 Array 4	Lw/unit	82.0
Building 1 Array 5	Lw/unit	82.0
Building 1 Array 6	Lw/unit	82.0
Building 2 Array 1	Lw/unit	84.0
Building 2 Array 2	Lw/unit	84.0
Building 2 Array 3	Lw/unit	84.0
Building 2 Array 4	Lw/unit	84.0
Building 2 Array 5	Lw/unit	84.0
Building 2 Array 6	Lw/unit	84.0
Building 2 Array 7	Lw/unit	84.0
Building 2 Array 8	Lw/unit	84.0
Building 2 Array 9	Lw/unit	84.0
Building 2 Array 10	Lw/unit	84.0
Building 2 Array 11	Lw/unit	82.8
Building 2 Array 12	Lw/unit	85.4
Building 2 Array 13	Lw/unit	87.6
Building 2 Array 14	Lw/unit	82.8
Building 3 Array 1	Lw/unit	89.3
Building 3 Array 2	Lw/unit	84.0
Building 3 Array 3	Lw/unit	84.0
Building 3 Array 4	Lw/unit	84.0
Building 3 Array 5	Lw/unit	84.0
Building 3 Array 6	Lw/unit	84.0
Building 3 Array 7	Lw/unit	84.0
Building 3 Array 8	Lw/unit	84.0
Building 3 Array 9	Lw/unit	81.0
Building 3 Array 10	Lw/unit	84.0
Building 3 Array 11	Lw/unit	84.0
Building 3 Array 12	Lw/unit	84.0
Building 3 Array 13	Lw/unit	84.0
Building 3 Array 14	Lw/unit	84.0
Building 3 Array 15	Lw/unit	86.8
Building 4 Array 1	Lw/unit	83.5
Building 4 Array 2	Lw/unit	84.0
Building 4 Array 3	Lw/unit	84.0
Building 4 Array 4	Lw/unit	84.0
Building 4 Array 5	Lw/unit	84.0
Building 4 Array 6	Lw/unit	84.0
Building 4 Array 7	Lw/unit	79.8
Building 4 Array 8	Lw/unit	84.0
Building 4 Array 9	Lw/unit	84.0
Building 4 Array 10	Lw/unit	84.0
Building 4 Array 11	Lw/unit	82.8
Building 4 Array 12	Lw/unit	85.8
Building 4 Array 13	Lw/unit	84.0
Building 4 Array 14	Lw/unit	84.0
Building 4 Array 15	Lw/unit	84.0
Building 4 Array 16	Lw/unit	84.0
Building 4 Array 17	Lw/unit	82.8

Emissions Traffic Noise

SoundPlan Output

No.	Receiver name		Coordinates (in meters)				Unmitigated Noise Level dB(A)	Mitigated Noise Level dB(A)
			X	Y	Height	Floor		
1	1-1	Building 1 Patio Above Cafe	496,214.85	3,626,039.78	129.06	GF	80	65
2	1-2	Building 1 Western Sky Deck	496,149.17	3,626,027.83	141.76	GF	70	63
3	1-3	Building 1 Eastern Sky Deck	496,215.31	3,626,033.52	141.80	GF	75	65
4	1-4	Building 1 Facade North	496145.39	3626032.18	129.10	GF	78	78
					132.30	1.Fl	78	78
					135.50	2.Fl	78	78
					138.70	3.Fl	78	78
5	1-5	Building 1 Facade North	496163.21	3626038.09	129.10	GF	79	79
					132.30	1.Fl	80	80
					135.50	2.Fl	80	80
					138.70	3.Fl	79	79
					141.90	4.Fl	79	79
6	1-6	Building 1 Facade North	496183.32	3626039.9	129.10	GF	79	79
					132.30	1.Fl	80	80
					135.50	2.Fl	80	80
					138.70	3.Fl	80	80
					141.90	4.Fl	79	79
7	1-7	Building 1 Facade North	496210.31	3626037.72	129.10	GF	78	63
					132.30	1.Fl	79	76
					135.50	2.Fl	79	79
					138.70	3.Fl	79	79
					141.90	4.Fl	78	78
8	1-8	Building 1 Facade East	496222.71	3626027.61	129.10	GF	71	70
					132.30	1.Fl	73	72
					135.50	2.Fl	73	73
					138.70	3.Fl	73	73
					141.90	4.Fl	73	73
9	1-9	Building 1 Facade South	496207.84	3626021.95	129.10	GF	33	33
					132.30	1.Fl	35	35
					135.50	2.Fl	37	37
					138.70	3.Fl	41	41
					141.90	4.Fl	46	46
10	1-10	Building 1 Facade South	496189.06	3626021.92	129.10	GF	36	36
					132.30	1.Fl	35	35
					135.50	2.Fl	38	38
					138.70	3.Fl	41	41
					141.90	4.Fl	46	46
11	1-11	Building 1 Facade South	496156.97	3626023.33	252.48	GF	72	72
					255.68	1.Fl	72	72
					258.88	2.Fl	72	72
					262.08	3.Fl	72	72
					265.28	4.Fl	71	71
12	1-12	Building 1 Facade West	496142.78	3626029.13	129.10	GF	75	75
					132.30	1.Fl	75	75
					135.50	2.Fl	75	75
					138.70	3.Fl	75	75
13	2-1	Building 2 Western Sky Deck	496,271.42	3,626,041.29	153.60	GF	68	63
14	2-2	Building 2 Podium Courtyard	496,375.71	3,626,040.89	136.10	GF	35	35
15	2-3	Building 2 Podium Periphery	496,290.84	3,626,024.86	136.10	GF	35	34
16	2-4	Building 2 Facade North	496300.54	3626052.81	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	78	78
					150.00	4.Fl	78	78
17	2-5	Building 2 Facade North	496336.5	3626064	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	79	79
					150.00	4.Fl	78	78
18	2-6	Building 2 Facade North	496372.36	3626074.02	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	79	79
					150.00	4.Fl	78	78
19	2-7	Building 2 Facade East	496405.72	3626050.42	137.60	GF	62	62
					140.70	1.Fl	67	67
					143.80	2.Fl	69	69
					146.90	3.Fl	70	70
					150.00	4.Fl	70	70
20	2-8	Building 2 Facade South	496398.7	3626008.82	137.65	GF	30	30
					140.75	1.Fl	36	36
					143.85	2.Fl	36	36
					146.95	3.Fl	37	37
					150.05	4.Fl	40	40
21	2-9	Building 2 Facade South	496348.04	3626013.89	137.60	GF	31	30
					140.70	1.Fl	32	32
					143.80	2.Fl	33	33
					146.90	3.Fl	38	37
					150.00	4.Fl	40	40
22	3-1	Building 3 Podium Courtyard	496,496.53	3,626,073.29	137.60	GF	58	55
23	3-2	Building 3 Podium Periphery	496,525.17	3,626,073.20	137.60	GF	67	61
24	3-3	Building 3 Western Sky Deck	496,422.24	3,626,080.78	155.10	GF	67	61
25	3-4	Building 3 Eastern Sky Deck	496,537.21	3,626,111.72	155.10	GF	71	64
26	3-5	Building 3 Facade West	496422.3	3626054.68	139.10	GF	64	64
					142.20	1.Fl	68	68
					145.30	2.Fl	70	70
					148.40	3.Fl	69	69
					151.50	4.Fl	70	70
27	3-6	Building 3 Facade North	496446.72	3626094.79	139.10	GF	79	79
					142.20	1.Fl	79	79
					145.30	2.Fl	79	79
					148.40	3.Fl	79	79
					151.50	4.Fl	78	78
28	3-7	Building 3 Facade North	496501.49	3626108.41	139.10	GF	79	79
					142.20	1.Fl	79	79
					145.30	2.Fl	79	79
					148.40	3.Fl	78	78
					151.50	4.Fl	78	78
29	3-8	Building 3 Facade Northeast	496543.65	3626107.67	139.10	GF	75	75
					142.20	1.Fl	75	75
					145.30	2.Fl	75	75
					148.40	3.Fl	75	75
					151.50	4.Fl	75	75
30	3-9	Building 3 Facade East	496494.74	3626036.35	139.11	GF	55	55
					142.21	1.Fl	56	56
					145.31	2.Fl	53	57
					148.41	3.Fl	47	53
					151.51	4.Fl	44	49
31	3-10	Building 3 Facade South	496446.93	3626014.41	139.10	GF	44	44
					142.20	1.Fl	45	45
					145.30	2.Fl	45	46
					148.40	3.Fl	43	47
					151.50	4.Fl	42	45
32	4-1	Building 4 Podium Courtyard	496,634.12	3,626,065.69	140.70	GF	36	35
33	4-2	Building 4 Podium Periphery	496,571.42	3,626,051.59	140.70	GF	68	60
34	4-3	Building 4 Western Sky Deck	496,606.50	3,626,101.81	157.00	GF	70	64
35	4-4	Building 4 Eastern Sky Deck	496,670.69	3,626,103.08	157.00	GF	70	63
36	4-5	Building 4 Facade Northwest	496589.08	3626083.66	142.20	GF	73	73
					145.30	1.Fl	73	73
					148.40	2.Fl	73	73
					151.50	3.Fl	73	73
					154.60	4.Fl	73	73
37	4-6	Building 4 Facade North	496641.09	3626108.08	142.20	GF	76	76
					145.30	1.Fl	76	76
					148.40	2.Fl	76	76
					151.50	3.Fl	76	76
					154.60	4.Fl	76	76
38	4-7	Building 4 Facade East	496678.3	3626070.05	142.20	GF	68	68
					145.30	1.Fl	68	68
					148.40	2.Fl	69	69
					151.50	3.Fl	69	69
					154.60	4.Fl	69	69
39	4-8	Building 4 Facade South	496672.66	3626035.34	140.70	GF	38	38
					143.80	1.Fl	39	39
					146.90	2.Fl	41	41
					150.00	3.Fl	42	42
					153.10	4.Fl	44	44
40	4-9	Building 4 Facade South	496626.15	3626018.78	142.23	GF	29	29
					145.33	1.Fl	30	30
					148.43	2.Fl	32	32
					151.53	3.Fl	34	34
					154.63	4.Fl	41	41
41	4-10	Building 4 Facade South	496587.29	3626018.5	142.22	GF	28	28
					145.22	1.Fl	30	30
					148.22	2.Fl	31	31
					151.22	3.Fl	34	34
					154.22	4.Fl	39	39

Emissions Trolley Noise

SoundPlan Output

No.		Receiver name	Coordinates (in meters)				Unmitigated Noise Level dB(A)				Mitigated Noise Level dB(A)			
			X	Y	Height	Floor	Day	Evening	Night	CNEL	Day	Evening	Night	CNEL
1	1-1	Building 1 Patio Above Cafe	496,214.85	3,626,039.78	129.06	GF	41	39	36	44	37	35	32	40
2	1-2	Building 1 Western Sky Deck	496,149.17	3,626,027.83	141.76	GF	50	49	45	53	50	49	45	53
3	1-3	Building 1 Eastern Sky Deck	496,215.31	3,626,033.52	141.80	GF	37	36	32	40	37	36	32	40
4	1-4	Building 1 Facade North	496145.39	3626032.18	129.10	GF	35	33	30	38	35	33	30	38
					132.30	1.Fl	35	34	30	38	35	34	30	38
					135.50	2.Fl	36	34	31	39	36	34	31	39
					138.70	3.Fl	37	35	32	40	37	35	32	40
5	1-5	Building 1 Facade North	496163.21	3626038.09	129.10	GF	32	31	27	35	32	31	27	35
					132.30	1.Fl	33	31	28	36	33	31	28	36
					135.50	2.Fl	33	32	28	36	33	32	28	36
					138.70	3.Fl	34	33	29	37	34	33	29	37
					141.90	4.Fl	35	34	30	38	35	34	30	38
6	1-6	Building 1 Facade North	496183.32	3626039.9	129.10	GF	32	30	27	34	32	30	27	34
					132.30	1.Fl	32	31	27	35	32	31	27	35
					135.50	2.Fl	32	31	27	35	32	31	27	35
					138.70	3.Fl	33	32	28	36	33	32	28	36
					141.90	4.Fl	35	33	30	38	35	33	30	38
7	1-7	Building 1 Facade North	496210.31	3626037.72	129.10	GF	38	36	33	41	34	32	29	37
					132.30	1.Fl	38	37	33	41	37	36	32	40
					135.50	2.Fl	39	37	34	42	39	37	34	42
					138.70	3.Fl	39	38	34	42	39	38	34	42
					141.90	4.Fl	38	36	33	41	38	36	33	41
8	1-8	Building 1 Facade East	496222.71	3626027.61	129.10	GF	51	50	46	54	51	50	46	54
					132.30	1.Fl	52	50	47	55	52	50	47	55
					135.50	2.Fl	52	51	47	55	52	51	47	55
					138.70	3.Fl	52	51	47	55	52	51	47	55
					141.90	4.Fl	52	50	47	55	52	50	47	55
9	1-9	Building 1 Facade South	496207.84	3626021.95	129.10	GF	55	54	50	58	55	54	50	58
					132.30	1.Fl	55	54	50	58	55	54	50	58
					135.50	2.Fl	55	54	50	58	55	54	50	58
					138.70	3.Fl	55	54	50	58	55	54	50	58
					141.90	4.Fl	55	54	50	58	55	54	50	58
10	1-10	Building 1 Facade South	496189.05	3626021.91	129.10	GF	55	54	50	58	55	54	50	58
					132.30	1.Fl	56	54	51	59	56	54	51	59
					135.50	2.Fl	56	54	51	59	56	54	51	59
					138.70	3.Fl	56	54	51	58	56	54	51	58
					141.90	4.Fl	55	54	51	58	55	54	51	58
11	1-11	Building 1 Facade South	496156.96	3626023.31	129.10	GF	56	55	51	59	56	55	51	59
					132.30	1.Fl	56	55	52	59	56	55	52	59
					135.50	2.Fl	56	55	51	59	56	55	51	59
					138.70	3.Fl	56	55	51	59	56	55	51	59
					141.90	4.Fl	56	55	51	59	56	55	51	59
12	1-12	Building 1 Facade West	496142.78	3626029.13	129.10	GF	53	52	48	56	53	52	48	56
					132.30	1.Fl	53	52	48	56	53	52	48	56
					135.50	2.Fl	54	52	49	56	54	52	49	56
					138.70	3.Fl	53	52	48	56	53	52	48	56
13	2-1	Building 2 Western Sky Deck	496,271.42	3,626,041.29	153.60	GF	41	40	36	44	39	38	34	42
14	2-2	Building 2 Podium Courtyard	496,375.71	3,626,040.89	136.10	GF	33	32	28	36	33	32	28	36
15	2-3	Building 2 Podium Periphery	496,290.84	3,626,024.86	136.10	GF	54	53	49	57	54	53	49	57
16	2-4	Building 2 Facade North	496300.54	3626052.81	137.60	GF	32	30	27	35	32	30	27	35
					140.70	1.Fl	32	31	27	35	32	31	27	35
					143.80	2.Fl	32	31	27	35	32	31	27	35
					146.90	3.Fl	33	31	28	36	33	31	28	36
					150.00	4.Fl	34	32	29	36	34	32	29	36
17	2-5	Building 2 Facade North	496336.5	3626064	137.60	GF	31	30	26	34	31	30	26	34
					140.70	1.Fl	32	30	27	35	32	30	27	35
					143.80	2.Fl	32	31	27	35	32	31	27	35
					146.90	3.Fl	32	31	27	35	32	31	27	35
					150.00	4.Fl	33	32	28	36	33	32	28	36
18	2-6	Building 2 Facade North	496372.36	3626074.02	137.60	GF	31	29	26	34	31	29	26	34
					140.70	1.Fl	31	30	26	34	31	30	26	34
					143.80	2.Fl	31	30	26	34	31	30	26	34
					146.90	3.Fl	32	30	27	35	32	30	27	35
					150.00	4.Fl	32	31	27	35	32	31	27	35
19	2-7	Building 2 Facade East	496405.72	3626050.42	137.60	GF	43	42	38	46	43	42	38	46
					140.70	1.Fl	43	42	38	46	43	42	38	46
					143.80	2.Fl	45	44	40	48	45	44	40	48
					146.90	3.Fl	46	45	41	49	46	45	41	49
					150.00	4.Fl	47	46	42	50	47	46	42	50
20	2-8	Building 2 Facade South	496398.7	3626008.82	137.60	GF	54	52	49	57	54	52	49	57
					140.70	1.Fl	55	54	50	58	55	54	50	58
					143.80	2.Fl	55	54	50	58	55	54	50	58
					146.90	3.Fl	55	54	50	58	55	54	50	58
					150.00	4.Fl	55	54	50	58	55	54	50	58
21	2-9	Building 2 Facade South	496348.04	3626013.89	137.60	GF	55	54	50	58	55	54	50	58
					140.70	1.Fl	55	54	50	58	55	54	50	58
					143.80	2.Fl	55	53	50	58	55	53	50	58
					146.90	3.Fl	55	53	50	58	55	53	50	58
					150.00	4.Fl	54	53	50	57	54	53	50	57
22	3-1	Building 3 Podium Courtyard	496,496.53	3,626,073.29	137.60	GF	42	41	37	45	41	40	36	44
23	3-2	Building 3 Podium Periphery	496,525.17	3,626,073.20	137.60	GF	47	46	42	50	46	44	41	48
24	3-3	Building 3 Western Sky Deck	496,422.24	3,626,080.78	155.10	GF	36	35	31	39	35	34	30	38
25	3-4	Building 3 Eastern Sky Deck	496,537.21	3,626,111.72	155.10	GF	40	39	35	43	39	37	34	42
26	3-5	Building 3 Facade West	496422.3	3626054.68	139.10	GF	42	41	37	45	42	41	37	45
					142.20	1.Fl	44	43	39	47	44	43	39	47
					145.30	2.Fl	46	44	41	48	46	44	41	48
					148.40	3.Fl	46	45	41	49	46	45	41	49
					151.50	4.Fl	46	45	41	49	46	45	41	49
27	3-6	Building 3 Facade North	496446.72	3626094.79	139.10	GF	29	28	24	32	29	28	24	32
					142.20	1.Fl	29	28	24	32	29	28	24	32
					145.30	2.Fl	29	28	25	32	29	28	24	32
					148.40	3.Fl	30	29	25	33	30	29	25	33
					151.50	4.Fl	31	29	26	34	31	29	26	34
28	3-7	Building 3 Facade North	496501.49	3626108.41	139.10	GF	28	27	23	31	28	27	23	31
					142.20	1.Fl	28	27	23	31	28	27	23	31
					145.30	2.Fl	29	27	24	32	29	27	24	32
					148.40	3.Fl	29	28	24	32	29	28	24	32
					151.50	4.Fl	30	29	25	33	30	29	25	33
29	3-8	Building 3 Facade Northeast	496543.65	3626107.67	139.10	GF	31	29	26	34	29	28	24	32
					142.20	1.Fl	29	28	24	32	28	27	23	31
					145.30	2.Fl	30	29	25	33	30	28	25	33
					148.40	3.Fl	32	31	27	35	30	29	25	33
					151.50	4.Fl	33	32	28	36	32	31	27	35
30	3-9	Building 3 Facade East	496494.74	3626036.35	139.11	GF	51	49	46	53	51	49	46	53
					142.21	1.Fl	52	51	47	55	52	51	47	55
					145.31	2.Fl	52	51	47	55	52	51	47	55
					148.41	3.Fl	52	51	48	55	52	51	48	55
					151.51	4.Fl	53	51	48	56	53	51	48	56
31	3-10	Building 3 Facade South	496446.93	3626014.41	139.10	GF	54	52	49	56	54	52	49	56
					142.20	1.Fl	54	53	49	57	54	53	49	57
					145.30	2.Fl	55	53	50	57	55	53	50	57
					148.40	3.Fl	54	53	50	57	54	53	50	57
					151.50	4.Fl	54	53	49	57	54	53	49	57
32	4-1	Building 4 Podium Courtyard	496,634.12	3,626,065.69	140.70	GF	31	29	26	33	30	29	25	33
33	4-2	Building 4 Podium Periphery	496,571.42	3,626,051.59	140.70	GF	44	42	39	47	42	41	37	45
34	4-3	Building 4 Western Sky Deck	496,606.50	3,626,101.81	157.00	GF	36	35	31	39	35	34	30	38
35	4-4	Building 4 Eastern Sky Deck	496,670.69	3,626,103.08	157.00	GF	43	42	38	46	39	38	34	42
36	4-5	Building 4 Facade Northwest	496589.08	3626083.66	142.20	GF	38	37	33	41	38	37	33	41
					145.30	1.Fl	38	37	33	41	38	37	33	41
					148.40	2.Fl	39	38	34	42	39	38	34	42
					151.50	3.Fl	40	38	35	42	40	38	35	42
					154.60	4.Fl	40	39	36	43	40	39	36	43
37	4-6	Building 4 Facade North	496641.09	3626108.08	142.20	GF	22	21	17	25	22	21	17	25
					145.30	1.Fl	23	22	18	26	23	22	18	26
					148.40	2.Fl	24	23	19	27	24	23	19	27
					151.50	3.Fl	26	24	21	29	26	24	21	28
					154.60	4.Fl	29	28	24	32	29	27	24	32
38	4-7	Building 4 Facade East	496678.3	3626070.05	142.20	GF	49	48	44	52	49	48	44	52
					145.30	1.Fl	49	48	44	52	49	48	44	52
					148.40	2.Fl	50	49	45	53	50	49	45	53
					151.50	3.Fl	50	49	45	53	50	49	45	53
					154.60	4.Fl	50	49	45	53	50	49	45	53
39	4-8	Building 4 Facade South	496673.01	3626035.48	142.18	GF	55	54	50	58	55	54	50	58
					145.28	1.Fl	55	54	50	58	55	54	50	58
					148.38	2.Fl	55	54	50	58	55	54	50	58
					151.48	3.Fl	55	54	50	58	55	54	50	58
					154.58	4.Fl	55	54	50	58	55	54	50	58
40	4-9	Building 4 Facade South	496626.15	3626018.78	142.23	GF	57	56	52	60	57	56	52	60
					145.33	1.Fl	57	55	52	60	57	55	52	60
					148.43	2.Fl	56	55	51	59	56	55	51	59
					151.53	3.Fl	56	55	51	59	56	55	51	59
					154.63	4.Fl	56	55	51	59	56	55	51	59
41	4-10	Building 4 Facade South	496587.29	3626018.5	142.22	GF	55	54	50	58	55	54	50	58
					145.32	1.Fl	56	54	51	59	56	54	51	59
					148.42	2.Fl	56	55	51	59	56	55	51	59
					151.52	3.Fl	56	54	51	59	56	54	51	59
					154.62	4.Fl	55	54	51	58	55	54	51	58

Combined Transportation Noise Exposure

No.	Receiver name		Coordinates (in meters)				Unmitigated Noise Level dB(A)	Mitigated Noise Level dB(A)
			X	Y	Height	Floor		
1	1-1	Building 1 Patio Above Cafe	496,214.85	3,626,039.78	129.06	GF	80	65
2	1-2	Building 1 Western Sky Deck	496,149.17	3,626,027.83	141.76	GF	70	63
3	1-3	Building 1 Eastern Sky Deck	496,215.31	3,626,033.52	141.80	GF	75	65
4	1-4	Building 1 Facade North	496145.39	3626032.18	129.10	GF	78	78
					132.30	1.Fl	78	78
					135.50	2.Fl	78	78
					138.70	3.Fl	78	78
5	1-5	Building 1 Facade North	496163.21	3626038.09	129.10	GF	79	79
					132.30	1.Fl	80	80
					135.50	2.Fl	80	80
					138.70	3.Fl	79	79
					141.90	4.Fl	79	79
6	1-6	Building 1 Facade North	496183.32	3626039.9	129.10	GF	79	79
					132.30	1.Fl	80	80
					135.50	2.Fl	80	80
					138.70	3.Fl	80	80
					141.90	4.Fl	79	79
7	1-7	Building 1 Facade North	496210.31	3626037.72	129.10	GF	78	63
					132.30	1.Fl	79	76
					135.50	2.Fl	79	79
					138.70	3.Fl	79	79
					141.90	4.Fl	78	78
8	1-8	Building 1 Facade East	496222.71	3626027.61	129.10	GF	71	70
					132.30	1.Fl	73	72
					135.50	2.Fl	73	73
					138.70	3.Fl	73	73
					141.90	4.Fl	73	73
9	1-9	Building 1 Facade South	496207.84	3626021.95	129.10	GF	58	58
					132.30	1.Fl	58	58
					135.50	2.Fl	58	58
					138.70	3.Fl	58	58
					141.90	4.Fl	58	58
10	1-10	Building 1 Facade South	496189.05	3626021.91	129.10	GF	58	58
					132.30	1.Fl	59	59
					135.50	2.Fl	59	59
					138.70	3.Fl	59	59
					141.90	4.Fl	59	59
11	1-11	Building 1 Facade South	496156.96	3626023.31	129.10	GF	72	72
					132.30	1.Fl	72	72
					135.50	2.Fl	72	72
					138.70	3.Fl	72	72
					141.90	4.Fl	72	72
12	1-12	Building 1 Facade West	496142.78	3626029.13	129.10	GF	75	75
					132.30	1.Fl	75	75
					135.50	2.Fl	75	75
					138.70	3.Fl	75	75
13	2-1	Building 2 Western Sky Deck	496,271.42	3,626,041.29	153.60	GF	68	63
14	2-2	Building 2 Podium Courtyard	496,375.71	3,626,040.89	136.10	GF	39	39
15	2-3	Building 2 Podium Periphery	496,290.84	3,626,024.86	136.10	GF	57	57
16	2-4	Building 2 Facade North	496300.54	3626052.81	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	78	78
					150.00	4.Fl	78	78
17	2-5	Building 2 Facade North	496336.5	3626064	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	79	79
					150.00	4.Fl	78	78
18	2-6	Building 2 Facade North	496372.36	3626074.02	137.60	GF	79	79
					140.70	1.Fl	79	79
					143.80	2.Fl	79	79
					146.90	3.Fl	79	79
					150.00	4.Fl	78	78
19	2-7	Building 2 Facade East	496405.72	3626050.42	137.60	GF	62	62
					140.70	1.Fl	67	67
					143.80	2.Fl	69	69
					146.90	3.Fl	70	70
					150.00	4.Fl	70	70
20	2-8	Building 2 Facade South	496398.7	3626008.82	137.60	GF	57	57
					140.70	1.Fl	58	58
					143.80	2.Fl	58	58
					146.90	3.Fl	58	58
					150.00	4.Fl	58	58
21	2-9	Building 2 Facade South	496348.04	3626013.89	137.60	GF	58	58
					140.70	1.Fl	58	58
					143.80	2.Fl	58	58
					146.90	3.Fl	58	58
					150.00	4.Fl	58	58
22	3-1	Building 3 Podium Courtyard	496,496.53	3,626,073.29	137.60	GF	58	56
23	3-2	Building 3 Podium Periphery	496,525.17	3,626,073.20	137.60	GF	67	61
24	3-3	Building 3 Western Sky Deck	496,422.24	3,626,080.78	155.10	GF	67	61
25	3-4	Building 3 Eastern Sky Deck	496,537.21	3,626,111.72	155.10	GF	71	64
26	3-5	Building 3 Facade West	496422.3	3626054.68	139.10	GF	64	64
					142.20	1.Fl	68	68
					145.30	2.Fl	70	70
					148.40	3.Fl	69	69
					151.50	4.Fl	70	70
27	3-6	Building 3 Facade North	496446.72	3626094.79	139.10	GF	79	79
					142.20	1.Fl	79	79
					145.30	2.Fl	79	79
					148.40	3.Fl	79	79
					151.50	4.Fl	78	78
28	3-7	Building 3 Facade North	496501.49	3626108.41	139.10	GF	79	79
					142.20	1.Fl	79	79
					145.30	2.Fl	79	79
					148.40	3.Fl	78	78
					151.50	4.Fl	78	78
29	3-8	Building 3 Facade Northeast	496543.65	3626107.67	139.10	GF	75	75
					142.20	1.Fl	75	75
					145.30	2.Fl	75	75
					148.40	3.Fl	75	75
					151.50	4.Fl	75	75
30	3-9	Building 3 Facade East	496494.74	3626036.35	139.11	GF	57	57
					142.21	1.Fl	58	59
					145.31	2.Fl	57	59
					148.41	3.Fl	56	58
					151.51	4.Fl	56	56
31	3-10	Building 3 Facade South	496446.93	3626014.41	139.10	GF	57	57
					142.20	1.Fl	57	57
					145.30	2.Fl	58	58
					148.40	3.Fl	58	58
					151.50	4.Fl	57	58
32	4-1	Building 4 Podium Courtyard	496,634.12	3,626,065.69	140.70	GF	38	37
33	4-2	Building 4 Podium Periphery	496,571.42	3,626,051.59	140.70	GF	68	60
34	4-3	Building 4 Western Sky Deck	496,606.50	3,626,101.81	157.00	GF	70	64
35	4-4	Building 4 Eastern Sky Deck	496,670.69	3,626,103.08	157.00	GF	70	63
36	4-5	Building 4 Facade Northwest	496589.08	3626083.66	142.20	GF	73	73
					145.30	1.Fl	73	73
					148.40	2.Fl	73	73
					151.50	3.Fl	73	73
					154.60	4.Fl	73	73
37	4-6	Building 4 Facade North	496641.09	3626108.08	142.20	GF	76	76
					145.30	1.Fl	76	76
					148.40	2.Fl	76	76
					151.50	3.Fl	76	76
					154.60	4.Fl	76	76
38	4-7	Building 4 Facade East	496678.3	3626070.05	142.20	GF	68	68
					145.30	1.Fl	68	68
					148.40	2.Fl	69	69
					151.50	3.Fl	69	69
					154.60	4.Fl	69	69
39	4-8	Building 4 Facade South	496673.01	3626035.48	142.18	GF	58	58
					145.28	1.Fl	58	58
					148.38	2.Fl	58	58
					151.48	3.Fl	58	58
					154.58	4.Fl	58	58
40	4-9	Building 4 Facade South	496626.15	3626018.78	142.23	GF	60	60
					145.33	1.Fl	60	60
					148.43	2.Fl	59	59
					151.53	3.Fl	59	59
					154.63	4.Fl	59	59
41	4-10	Building 4 Facade South	496587.29	3626018.5	142.22	GF	58	58
					145.32	1.Fl	59	59
					148.42	2.Fl	59	59
					151.52	3.Fl	59	59
					154.62	4.Fl	58	58

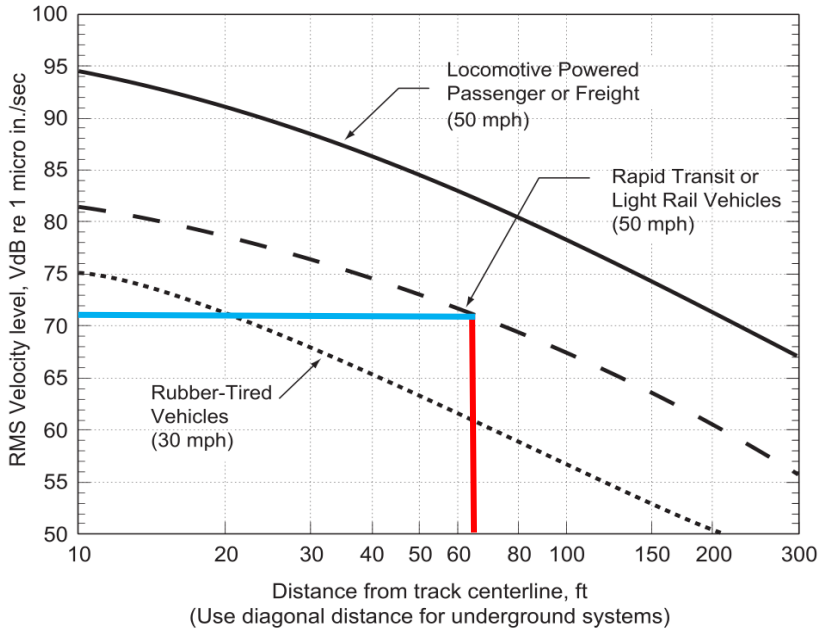
Emissions HVAC Noise

SoundPlan Output

No.	Receiver name	Coordinates (in meters)			Noise Level dB(A)
		X	Y	Height	
1	1	496,144.90	3,625,986.56	129.80	39
2	2	496,239.51	3,625,971.95	131.40	40
3	3	496,279.30	3,625,968.11	135.60	41
4	4	496,319.62	3,625,943.50	142.90	44
5	5	496,398.35	3,625,963.39	134.60	42
6	6	496,492.66	3,625,952.90	146.30	45
7	7	496,524.08	3,625,963.47	146.30	45
8	8	496,569.99	3,625,963.64	148.70	45
9	9	496,602.15	3,625,953.05	148.10	44
10	10	496,628.73	3,625,976.15	140.70	41
11	11	496,664.53	3,625,994.87	139.50	39
12	12	496,710.88	3,625,985.93	145.30	41

Trolley Vibration Levels

Reference Vibration Levels



Distance from Centerline	65	feet
Reference Vibration Level at 50 mph	71	VdB
Reference Speed	50	mph
Model Speed	30	mph
Adjustment	-4	VdB
Estimbated Vibration Level	67	VdB