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MEMORANDUM

DATE: November 5, 2025

TO: Danny Morris, Development Director, Asset Strategy

FROM: Jason Lui, Associate/Senior Noise Specialist

SUBJECT: Noise and Vibration Impact Analysis for the Extra Space Storage Sullivan Street Project in Santa Ana, California (LSA Project No. 20241631)

INTRODUCTION

This Noise and Vibration Impact Analysis has been prepared to evaluate the potential noise and vibration impacts associated with the proposed Extra Space Storage Sullivan Street Project (project) in Santa Ana, California. This memorandum has been prepared in compliance with the requirements of the City of Santa Ana (City) and the California Environmental Quality Act (CEQA). Attachment A includes all references cited in this memorandum.

PROJECT LOCATION

The project site is at 212 and 280 North Sullivan Street in Santa Ana, California. The 5.72-acre, 249,152 square-foot (sf) project site is west of Sullivan Street between First and Fifth streets in the western part of the city. The project site consists of Assessor's Parcel Numbers 007-141-11, 007-141-78, and 007-141-79. The regional location is shown in Figure 1 (all figures provided in Attachment B).

PROJECT DESCRIPTION

The project site is currently developed with 67,899 sf of self-storage uses (13 one-story buildings), including one rental office and a manager apartment, a recreational vehicle (RV) parking lot, an Extra Space Storage facility sign, and perimeter landscaping. The project site is generally flat in elevation. Vehicular access to the project site is currently provided via two driveways along Sullivan Street (the southernmost driveway is for emergency access only) and two driveways along Fifth Street. Both of the Fifth Street driveways are currently used for emergency access only.

The proposed project would provide improvements on 2.45 acres of the 5.72-acre site. The proposed project would demolish an existing rental office and manager apartment (a total of 1,214 sf) in the southeastern portion of the project site and replace it with a three-story, 84,197 sf, self-storage building. The proposed project would provide 15 additional parking stalls and restripe the existing RV parking area to provide 57 RV spaces. All other existing uses on site, including the other self-storage buildings (66,685 sf in total) and 3 parking stalls, would remain. Under post-development conditions, the total self-storage square footage on site (including the existing

66,685 sf of self-storage uses to remain) would be 150,882 sf and include 18 total parking stalls. The net increase in building area under post-development conditions would be 82,983 sf.

Figure 2, Conceptual Site Plan, provides an overview of the proposed site plan, including the locations of the existing buildings to remain, the proposed building, vehicular access, the RV parking lot, the trash enclosure, and landscaping. The trash enclosure would be on the northeast corner of the RV parking lot, west of the proposed building. No changes to the office hours of operation or storage gate hours are proposed. Office hours are currently Monday through Saturday, from 9:30 a.m. to 6:00 p.m. (closed on Sundays). Customer access hours are currently Monday through Sunday, from 6:00 a.m. to 8:00 p.m.

Construction of the proposed project is anticipated to commence around July to September 2026 and extend over a period of approximately 12 months.[1] Construction would include demolition of the existing rental office and manager apartment and construction of a new building along Sullivan Street. It is anticipated that construction workers would make a total of 8 trips per day during construction activities. Site preparation, grading, and building activities would involve the use of standard earthmoving equipment such as large excavators, cranes, and other related equipment.

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave resulting in the tone's range from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment and is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale, which is a scale based on powers of 10.

[1] The air quality emission modeling completed for the project assumes that project construction would commence in May 2025 and extend over a period of 18 months. Although the project schedule has since been adjusted to start in May 2026 and continue over a shorter time period of 12 months, the analysis remains conservative in that an earlier start date represents a worst-case scenario for air pollutant emissions because it assumes the greater use of older equipment that does not incorporate cleaner technologies.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the loudness of the sound. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels generate from a source, and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment; however, line source noise in a relatively flat environment with absorptive vegetation decreases 4.5 dB for each doubling of distance.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and community noise equivalent level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. L_{max} is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise

level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear (the threshold of pain). A sound level of 160–165 dBA will result in dizziness or loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas. Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter deemphasizes the very low- and very high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 PM to 10:00 PM and after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 PM and 7:00 AM.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time; usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	—
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2015).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 vibration velocity decibels (VdB) or less. This is an order of magnitude below the damage threshold for normal buildings. Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (see the Federal Transit Administration's [FTA] 2018 *Transit Noise and Vibration Impact Assessment Manual*). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, both construction of a project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise. Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause cosmetic building damage, it is not uncommon for heavy-duty construction processes (e.g., blasting and pile driving) to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or PPV. The RMS is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the VdB, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

REGULATORY SETTING

Federal Guidelines

Federal Transit Administration

The construction noise criteria included in the *Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual* (2018) were used to evaluate potential construction noise impacts because the City does not have construction noise level limits. Table C shows the FTA's Detailed Assessment Daytime Construction Noise Criteria based on the composite noise levels for each construction phase.

Table C: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 8-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

State Guidelines

California Department of Transportation

Vibration standards included in the 2020 California Department of Transportation (Caltrans) Transportation and Construction Vibration Guidance Manual (Caltrans Manual) are used to evaluate ground-borne vibration impacts for building damage potential even though the City exempts vibration levels generated from construction. The criteria for environmental impact from ground-borne vibration are based on the maximum levels for a single event vibration level. Table D lists the potential vibration building damage criteria associated with construction activities, as suggested in the Caltrans Manual.

Table D: Construction Vibration Damage Criteria

Structure / Condition	PPV (in/sec)
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.10
Historic and some old buildings	0.25
Older residential structures	0.30
New residential structures	0.50
Modern industrial / commercial buildings	0.50

Source: Table 19, *Transportation and Construction Vibration Guidance Manual* (Caltrans 2020).
Caltrans = California Department of Transportation
in/sec = inch/inches per second
PPV = peak particle velocity

Local Regulations

City of Santa Ana General Plan

The City's General Plan Noise Element (City of Santa Ana 2010) has established interior and exterior noise standards for various land uses (shown in Table E), as well as objectives and policies to meet the City's noise-related goals. The General Plan Noise Element goal, objectives, and policies are listed below.

Table E: Interior and Exterior Noise Standards

Categories	Land Use Categories	Noise Level (dBA CNEL)	
		Interior[1]	Exterior[2]
Residential	Single-family, duplex, multifamily	45[3]	65
Institutional	Hospital, school classroom/playgrounds	45	65
	Church, library	45	--
Open Space	Parks	--	65

Source: City of Santa Ana General Plan Noise Element, Table 1 (2010)

[1] Interior areas (to include but are not limited to: bedrooms, bathrooms, kitchens, living rooms, dining rooms, closets, corridors/ hallways, private offices, and conference rooms.

[2] Exterior areas shall mean: private yards of single-family homes, park picnic areas, school playgrounds, common areas, private open space, such as atriums on balconies, shall be excluded form exterior areas provided sufficient common area is included within the project.

[3] Interior noise level requirements contemplate a closed window condition. Mechanical ventilation system or other means of natural ventilation shall be provided per Chapter 12, Section 1305 of the Uniform Building Code.

CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels

Goal 1: Prevent significant increases in noise levels in the community and minimize the adverse effects of currently-existing noise sources.

Objectives

1.1 Prevent creation of new and additional sources of noise.
1.2 Reduce current noise levels to acceptable standards.

Policies

- Require consideration of noise generation potential and susceptibility to noise impacts in the sitting, design and construction of new developments.

- Require mitigating site and building design features, traffic circulation alternatives, insulation, and other noise prevention measures of those new developments which generate high noise levels.
- Sound insulate and/or buffer sensitive land uses such as housing from adverse noise impacts in noise-prone areas.
- Minimize noise generation in residential neighborhoods through control or elimination of truck traffic and through-traffic from these areas.

City of Santa Ana Municipal Code

Section 18-312 of the City's Municipal Code limits exterior noise levels from stationary noise sources for all residential property shown in Table F.

Table F: Exterior Noise Standards

Noise Zone	Time of Day	Base Noise Levels (dBA)	Noise Level (dBA)				
			L_{50}	L_{25}	L_8	L_2	L_{max}
Residential	7:00 a.m. to 10:00 p.m.	55	55	60	65	70	75
	10:00 p.m. to 7:00 a.m.	50	50	55	60	65	70

Source: City of Santa Ana Municipal Code, Section 18-312 (2025).
Note: In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by 5 dBA. In the event the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.
dBA = A-weighted decibel(s)
L_{50} = The noise standard for a cumulative period of more than 30 minutes in any hour.
L_{25} = The noise standard plus 5 dBA for a cumulative period of more than 15 minutes in any hour.
L_8 = The noise standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour.
L_2 = The noise standard plus 15 dBA for a cumulative period of more than 1 minute in any hour.
L_{max} = The noise standard plus 20 dBA for any period of time.

Section 18-314(e) of the City's Municipal Code exempts noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or any time on Sunday or a federal holiday.

THRESHOLDS OF SIGNIFICANCE

Based on the *Guidelines for the Implementation of the California Environmental Quality Act* (*State CEQA Guidelines*), Appendix G, , a project will normally have a significant effect on the environment related to noise if it will substantially increase the ambient noise levels for adjoining areas or conflict with adopted environmental plans and the goals of the community in which it is located.

The *State CEQA Guidelines* indicate that a project would have a significant impact on noise if it would result in:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generation of excessive ground-borne vibration or ground-borne noise levels; or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels.

EXISTING SETTING

Overview of the Existing Noise Environment

The primary existing noise sources in the project area are transportation facilities. Traffic on Sullivan Street, First Street, Fifth Street, and other roadways in the project area contributes to the ambient noise levels in the project vicinity. Also, commercial and industrial activities contribute to the noise environment in the project area.

Land Uses in the Project Vicinity

The project site is generally surrounded by a mixture of residential, industrial, and commercial uses. The project site is immediately bounded to the north by a single-family residential structure and industrial uses, to the east by industrial uses across Sullivan Street, to the south by commercial and industrial uses, and to the west by part of the existing storage facility to remain and industrial uses further west.

Ambient Noise Measurements

Two long-term (24-hour) noise level measurements (LT-1 and LT-2) were conducted on September 3, 2025, using Larson Davis Spark 706RC dosimeters to document the existing noise environment within the project area. Table G summarizes the results of the long-term noise level measurements along with a description of the measurement locations and noise sources that occurred during the measurements. As shown in Table G, the calculated CNEL levels at LT-1 and LT-2 were 60.9 and 67.3 dBA, respectively. In addition, the daytime noise levels ranged from 57.4 to 66.2 dBA L_{eq} and nighttime average noise levels ranged from 48.1 to 63.0 dBA L_{eq}. Also, the daytime maximum instantaneous noise levels ranged from 75.3 to 91.2 dBA L_{max} and the nighttime maximum instantaneous noise levels ranged from 66.2 to 90.0 dBA L_{max}. The long-term noise level measurement survey sheets along with the hourly L_{eq} and L_{max} results are provided in Attachment C. Figure 3 shows the long-term monitoring locations.

Existing Aircraft Noise

The closest airport to the project site is John Wayne Airport (JWA), which is approximately 5 miles southeast of the project site. The project site is well outside the JWA Airport 60 dBA CNEL noise contour (JWA 2024). Also, there are no private airstrips within 2 miles of the project site. Therefore, the project would not expose people working in the project vicinity to aviation-related excessive noise levels, and this topic is not further discussed.

Table G: Long-Term Ambient Noise Monitoring Results

Monitoring No.	Location	Noise Level (dBA)					Noise Source
		L_{eq}		L_{max}			
		Daytime[1]	Nighttime[2]	Daytime	Nighttime	CNEL	
LT-1	280 North Sullivan Street, Santa Ana, CA. On security camera pole near the entrance. Approximately 70 ft from Sullivan Street centerline.	57.4-63.2 (61.2)[3]	48.1-62.2 (56.7)[4]	75.3-90.2	66.2-86.7	60.9	Light traffic on Sullivan Street and noise from occasional vehicles entering the storage facility.
LT-2	402 North Sullivan St, Santa Ana, CA. Near the sidewalk, in a tree. Approximately 24 ft from Sullivan Street centerline.	60.0-66.2 (64.1)[3]	51.7-63.0 (59.4)[4]	78.0-91.2	72.4-90.0	67.3	Traffic on 5th Street and light traffic on Sullivan Street.

Source: Compiled by LSA (2025).
Note: The long-term (24-hour) noise level measurements were conducted on September 3, 2025.
[1] Daytime hours are from 7:00 a.m. to 10:00 p.m.
[2] Nighttime hours are from 10:00 p.m. to 7:00 a.m.
[3] Average of daytime noise level.
[4] Average nighttime noise level.
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level

IMPACTS

Short-Term Construction Noise Impacts

Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site, and would incrementally raise noise levels on roadways leading to the site. The pieces of construction equipment for construction activities would move on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 84 dBA (as shown in Table H), the effect on longer-term (daily) ambient noise levels would be small because the daily construction-related vehicle trips are small compared to the existing daily traffic volume on Sullivan Street, First Street, and Fifth Street, which would be used to access the project site. The results of the California Emissions Estimator Model (CalEEMod)(version 2022.1) contained in Attachment B of the *Air Quality Technical Memorandum for the Extra Space Storage Sullivan Street Project* (LSA 2024a) indicate that the grading phase would generate the most trips out of all of the construction phases and have an acoustical equivalent traffic volume of 579 passenger car equivalent vehicles. The existing average daily traffic (ADT) volumes on Sullivan Street, First Street, and Fifth Street in the project area are 5,934, 29,230, and 9,822, respectively, based on the 2015 ADT volumes obtained from the City's GIS Open Data (City of Santa Ana 2018). Based on the information above and the calculations provided in Attachment D, construction-related traffic would increase noise levels by up to 0.4 dBA. A noise level increase of less than 1 dBA would not be perceptible to the human ear in

Table H: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 ft[2]
Backhoes	40	80
Compactor (ground)	20	80
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Saw	20	90
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Manlift (Forklift)	20	85
Front-end Loaders	40	80
Generator	50	82
Graders	40	85
Jackhammers	20	85
Pavement Scarifier	20	85
Paver	50	85
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Welder/Torch	40	73

Source: Table 1, *FHWA Roadway Construction Noise Model User's Guide* (FHWA 2006b).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
L_{max} = maximum instantaneous sound level
ft = foot/feet

an outdoor environment. Therefore, short-term construction-related noise impacts associated with worker commutes and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related noise generated from construction activities. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. The proposed project anticipates demolition, site preparation, grading, building construction, paving, and architectural coating phases of construction. These various sequential phases change the character of the noise generated on a project site. Therefore, the noise levels vary as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists the L_{max} recommended for noise impact assessments for typical construction equipment included in the Federal Highway Administration (FHWA) *Highway Construction Noise Handbook* (2006a), based on a distance of 50 ft between the equipment and a noise receptor.

Table I lists the anticipated construction equipment for each construction phase based on the CalEEMod (Version 2022.1) results contained in Attachment B of the *Air Quality Technical Memorandum for the Extra Space Storage Sullivan Street Project* (LSA 2024a). Table I shows the combined noise level at 50 ft from all of the equipment in each phase and the L_{eq} noise level for each equipment type at 50 ft based on the quantity, reference instantaneous maximum (L_{max}) noise level at 50 ft, and acoustical use factor. As shown in Table I, construction noise levels would reach up to 87.1 L_{eq} at a distance of 50 ft.

Table I: Summary of Construction Phase, Equipment, and Noise Levels

Construction Phase	Construction Equipment	Quantity	Reference Noise Level at 50 ft (dBA L_{max})	Acoustical Use Factor[1] (%)	Noise Level[2] at 50 ft (dBA L_{eq})	Combined Noise Level[3] at 50 ft (dBA L_{eq})
Demolition	Concrete Saw	1	90	20	83.0	86.5
	Front End Loader	3	80	40	80.8	
	Dozer	1	85	40	81.0	
Site Preparation	Grader	1	85	40	81.0	84.7
	Scraper	1	85	40	81.0	
	Front End Loader	1	80	40	76.0	
Grading	Grader	1	85	40	81.0	85.2
	Dozer	1	85	40	81.0	
	Front End Loader	2	80	40	79.0	
Building Construction	Crane	1	85	16	77.0	85.1
	Man Lift	2	85	20	81.0	
	Generator	1	82	50	79.0	
	Front End Loader	1	80	40	76.0	
	Welder / Torch	3	73	40	73.8	
Paving	Concrete Mixer Truck	1	85	40	81.0	87.1
	Paver	1	85	50	82.0	
	Pavement Scarafier	1	85	20	78.0	
	Roller	2	85	20	81.0	
	Front End Loader	1	80	40	76.0	
Architectural Coating	Compressor (air)	1	80	40	76.0	76.0

Source: Compiled by LSA (2025).

Note: The hourly L_{eq} noise level is equivalent to the 8-hour L_{eq} noise level when project construction of the same phase lasts for an 8-hour day.

[1] The acoustical use factor is the percentage of time during a construction noise operation that a piece of construction equipment operates at full power.

[2] The formula for calculating the noise level for each construction equipment based on the quantity and acoustical use factor is provided in the FHWA *Roadway Construction Noise Model User's Guide* (2006b).

[3] The combined noise level is calculated using the following formula: SPL = 10*log(10^(L_1/10) + 10^(L_2/10) … + 10^(L_n/10)). L_1, L_2,…L_n are the individual noise levels.

dBA = A-weighted decibel(s)
FHWA = Federal Highway Administration
ft = foot/feet
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level

The closest residential property line is approximately 160 ft from the center of the proposed building. At a distance of 160 ft, noise would be attenuated by 10.1 dBA compared to the distance of 50 ft. Based on the above, the closest residential property line may be subject to short-term

construction noise reaching 77.0 dBA L_{eq}[2] generated by construction activities in the project area. Construction noise is temporary and would stop once project construction is completed. Project construction activities would be limited to between the hours of 7:00 a.m. and 8:00 p.m., pursuant to Section 18-314(e) of the City's Municipal Code, and would ensure construction-related noise would not be generated during the more sensitive nighttime hours. Furthermore, construction-related noise levels would be below the FTA noise level standard of 80 dBA L_{eq} for residential uses. Therefore, noise levels generated from project construction would be less than significant. No mitigation measures are required.

Short-Term Construction Vibration Impacts

This construction vibration impact analysis assesses the potential for building damage using vibration levels in PPV (in/sec). Vibration levels in PPV are best for characterizing damage potential. Table J shows the reference vibration levels at a distance of 25 ft for each type of standard construction equipment from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Project construction is expected to require the use of bulldozers, loaded trucks, and jackhammers, which would generate ground-borne vibration levels of up to 0.089, 0.076, and 0.035 PPV (in/sec), respectively, when measured at 25 ft.

Table J: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV (in/sec) at 25 ft
Pile Driver (Impact), Typical	0.644
Pile Driver (Sonic), Typical	0.170
Vibratory Roller	0.210
Hoe Ram	0.089
Large Bulldozer[1]	**0.089**
Caisson Drilling	0.089
Loaded Trucks	**0.076**
Jackhammer	**0.035**
Small Bulldozer	0.003

Sources: *Transportation and Construction Vibration Guidance Manual, Table 18* (Caltrans 2020) *and Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

[1] The equipment shown in **bold** is expected to be used on site.

ft = foot/feet
in/sec = inches per second
FTA = Federal Transit Administration
PPV = peak particle velocity

The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project construction boundary) because vibration impacts normally occur within the buildings.

[2] The hourly L_{eq} noise level is equivalent to the 8-hour L_{eq} noise level when project construction of the same phase lasts for an 8-hour day. The noise level at 160 ft is calculated using the following formula: $dBA_2 = dBA_1 - 20*\log(D_2/D_1)$. Where dBA_1 is the noise level at distance D_1 and dBA_2 is the noise level at distance D_2. The calculated noise level at 160 ft is also 87.1 dBA – 10.1 dBA = 77.0 dBA.

The formula for vibration transmission is provided below:

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.1}$$

Table K lists the projected vibration levels from various construction equipment expected to be used on the project site at the project construction boundary to the nearest buildings in the project vicinity. As shown in Table K, the closest residential and industrial buildings are approximately 25 feet from the project construction boundary and would experience a vibration level of up to 0.089 PPV (in/sec). This vibration level would not have the potential to result in building damage because these neighboring buildings were conservatively assumed to be built to the same (or more stringent) building standards and materials as older residential structures, and the anticipated project-related vibration levels would not exceed the Caltrans vibration damage threshold of 0.30 PPV (in/sec). Other existing buildings that surround the project site would experience lower vibration levels because they are farther away and are also conservatively assumed to be built to the same (or more stringent) standard as older residential structures, and the anticipated project-related vibration levels would not exceed the Caltrans vibration damage threshold of 0.30 PPV (in/sec). Therefore, construction vibration impacts during project construction would be less than significant. No mitigation measures are required.

Table K: Potential Construction Vibration Damage

Land Use	Direction	Equipment/Activity	Reference Vibration Level at 25 ft	Distance to Structure (ft)[1]	Vibration Level
			PPV (in/sec)		PPV (in/sec)
Residential	North	Large Bulldozers	0.089	25	0.089
		Loaded Trucks	0.076	25	0.076
		Jackhammers	0.035	25	0.035
Industrial	East	Large Bulldozers	0.089	75	0.027
		Loaded Trucks	0.076	75	0.023
		Jackhammers	0.035	75	0.010
Industrial	South	Large Bulldozers	0.089	25	0.089
		Loaded Trucks	0.076	25	0.076
		Jackhammers	0.035	25	0.035
Industrial	West	Large Bulldozers	0.089	180	0.010
		Loaded Trucks	0.076	180	0.009
		Jackhammers	0.035	180	0.004

Source: Compiled by LSA (2025).
Note: The vibration damage threshold is 0.3 PPV (in/sec) for older residential structures.
ft = foot/feet
in/sec = inches per second
PPV = peak particle velocity

Long-Term Traffic Noise Impacts

The proposed project is estimated to generate a net new average daily trip of 88 based on the *Trip Generation and Vehicle Miles Traveled Assessment for the Extra Space Storage Sullivan Street Project* (LSA 2024b). The existing ADT volumes on Sullivan Street, First Street, and Fifth Street in the project area are 5,934, 29,230, and 9,822, respectively, based on the 2015 ADT volumes obtained from the City's GIS Open Data (City of Santa Ana 2018). Based on the information above, project-related

traffic on Sullivan Street and Fifth Street would increase traffic noise levels by less than 0.1 dBA. A noise level increase of less than 1 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, traffic noise impacts from project-related traffic on off-site sensitive receptors would be less than significant. No mitigation measures are required.

Long-Term Stationary Source Noise Impacts

Operation of the proposed project would include heating, ventilation, and air conditioning (HVAC) equipment and parking lot activities that have the potential to result in stationary noise impacts as described below. The following provides a detailed noise analysis and discussion of each stationary noise source.

Recreational Vehicle Parking Activities

The existing and proposed project would generate noise from RV parking activities between the hours of 6:00 a.m. and 8:00 p.m. RV parking activities would include noise generated by vehicles traveling at slow speeds, engine start-up noise, car door slams, car horns, car alarms, and tire squeals. Representative parking activities would generate a noise level of 68.3 dBA L_{eq} at 50 feet based on measurements conducted by LSA (2016). The proposed project would reduce the number of RV parking spaces to 54 spaces from 127 existing spaces. Existing RV parking activities on the project site based on the existing trip generation (LSA 2024b) are estimated to be 61 RV vehicles daily, with 4 RV vehicles during the AM peak hour and 5 RV vehicles during the PM peak hour. Based on this information, it is estimated that there would be up to 5 RV vehicles per hour during both daytime and nighttime hours. Assuming each RV vehicle would generate noise levels for up to 5 minutes, each hour would generate noise levels for a cumulative period of 25 minutes in any hour, which would be 64.5 dBA at a distance of 50 ft. Similarly, proposed RV parking activities on the project site based on the proposed project trip generation (LSA 2024b) are estimated to be 26 RV vehicles daily, with 2 RV vehicles during the AM peak hour and 2 RV vehicles during the PM peak hour. Based on this information, it is estimated that there would be up to 2 RV vehicles per hour during both daytime and nighttime hours. Assuming each RV vehicle would generate noise levels for up to 5 minutes, each hour would generate noise levels for a cumulative period of 10 minutes in any hour, which would be 60.5 dBA at a distance of 50 ft.

Heating, Ventilation, and Air Conditioning Noise

The existing project has one rooftop HVAC unit on the existing rental office building and the proposed project would include up to four rooftop HVAC units. The existing and proposed HVAC equipment is assumed to operate 24 hours per day. Noise generated from existing HVAC equipment is estimated to be 44.4 dBA L_{eq} at a distance of 50 ft. Noise generated from one proposed HVAC unit is estimated to be 62.4 dBA L_{eq} at a distance of 50 ft. A total of four proposed HVAC units operating simultaneously would generate a noise level of 68.4 dBA L_{eq}. The specifications of typical existing and proposed HVAC equipment, including the reference noise level, are provided in Attachment E. In addition, the proposed HVAC units would include a 5 ft high screen based on the project plans and would be shielded by the roofline, which would provide a minimum noise reduction of 8 dBA based on the noise reduction calculation provided in Attachment F.

Stationary Noise Impact Summary

Table L lists the individual stationary noise source along with the daytime and nighttime reference noise level at 50 ft, distance from the source to the residential property line, distance attenuation, attenuation from shielding, noise level of each noise source at the residential property line, and the combined noise level at the residential property line for both the existing and proposed project.

Table L: Stationary Daytime and Nighttime Noise Levels

Scenario	Land Use	Direction	Noise Source	Reference Noise Level at 50 ft (dBA L_{eq})	Distance (ft)	Distance Attenuation (dBA)	Shielding (dBA)	Noise Level (dBA L_{eq})	Combined Noise Level (dBA L_{eq})
Existing	Residence	North	RV Parking Activity	66.2	188	11.5	0	54.7	55.0
			HVAC	44.4	60	1.6	0	42.8	
Proposed	Residence	North	RV Parking Activity	62.2	200	12.0	0	50.2	52.5
			HVAC	68.4	192	11.7	8[1]	48.7	

Source: Compiled by LSA (2025).

[1] The proposed HVAC units would include a 5 ft high screen based on the project plans and would be shielded by the roofline, which would provide a minimum noise reduction of 8 dBA based on the noise reduction calculation provided in Attachment E.

dBA = A-weighted decibels

ft = foot/feet

HVAC = heating, ventilation, and air conditioning

L_{eq} = equivalent continuous sound level

RV = recreational vehicle

Table M shows that daytime noise levels generated from existing and proposed project operations would not exceed the City's daytime 30-minute noise standard of 55.0 dBA. Because the daytime 30-minute noise standard of 55.0 dBA would not be exceeded, the City's daytime 15-minute, 5-minute, 1-minute, and anytime noise standards of 60, 65, 70, and 75 dBA (respectively) would also not be exceeded. Although nighttime noise levels generated from existing and proposed project operations would exceed the City's nighttime 30-minute noise standard of 50 dBA, the City's nighttime 15-minute, 5-minute, 1-minute, and anytime noise standards of 55, 60, 65, and 70 dBA (respectively) would not be exceeded. In addition, although nighttime noise from the proposed project would exceed the City's 30-minute nighttime standard of 50 dBA, it is expected to be 1.8 dBA lower than noise generated from existing operations as shown in Table M. Therefore, noise generated from project operations would be less than significant. No mitigation measures are required.

Table M: Stationary Impact Summary

Scenario	Land Use	Direction	Combined Noise Level (dBA L_{eq})	Daytime/Nighttime Noise Standard (dBA)	Exceed?	Noise Level Change (dBA)	Impact?
Existing	Residence	North	55.0	55/50	No/Yes	--	--
Proposed	Residence	North	52.5	55/50	No/Yes	-1.8	No

Source: Compiled by LSA (2025).

dBA = A-weighted decibels

L_{eq} = equivalent continuous sound level

Long-Term Vibration Impacts

The proposed project would not generate vibration. In addition, vibration levels generated from project-related traffic on the roadways (Sullivan Street, First Street, and Fifth Street) leading to the project site are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Vibration generated from operations of the project would be minimal to negligible. Therefore, vibration impacts from project-related operations would be less than significant. No mitigation measures are required.

REGULATORY COMPLIANCE MEASURES

Compliance with the following measure would ensure that construction noise would be generated only during allowable times:

- The construction contractor shall limit construction activities to between the hours of 7:00 a.m. and 8:00 p.m. on weekdays and Saturdays pursuant to City's hours of construction specified in Section 18-314(e) of the City's Municipal Code (City of Santa Ana 2025). Construction is prohibited outside of these hours and any time on Sunday or a federal holiday.

Attachments:
A: References
B: Figures
C: Noise Survey Sheets
D: Construction Traffic Noise Calculation
E: Existing and Proposed HVAC Specifications
F: Noise Reduction Calculation

ATTACHMENT A

REFERENCES

California Department of Transportation (Caltrans). 2020. Transportation and Construction Vibration Guidance Manual. April. Website: https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tcvgm-apr2020-a11y.pdf (accessed November 2025).

City of Santa Ana. 2010. General Plan Noise Element. September 20. Website: https://general-plan-santa-ana-ca.proudcity.com/documents/noise-element/ (accessed November 2025).

_____. 2018. GIS Open Data, Traffic Volumes. August 21. Website: https://gis-santa-ana.opendata.arcgis.com/datasets/927f0b948fcf400eaf1c13d35239a7b1/explore (accessed November 2025).

_____. 2025. Municipal Code. August 4.

Federal Highway Administration (FHWA). 2006a. *Highway Construction Noise Handbook*. Roadway Construction Noise Model, FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. NTIS No. PB2006-109012. August.

_____. 2006b. *Roadway Construction Noise Model User's Guide*. FHWA-HEP-05-054. DOT-VNTSC-FHWA-05-01. January.

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. FTA Report No. 0123. September. Website: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf (accessed November 2025).

Harris, Cyril M., Editor. 1991. *Handbook of Acoustical Measurements and Noise Control*. Third Edition.

John Wayne Airport (JWA). 2024. Annual CNEL Noise Contours. Website: https://www.ocair.com/about/administration/access-noise/reports-resources/ (accessed November 2025).

LSA Associates, Inc. (LSA). 2016. *Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center*. May.

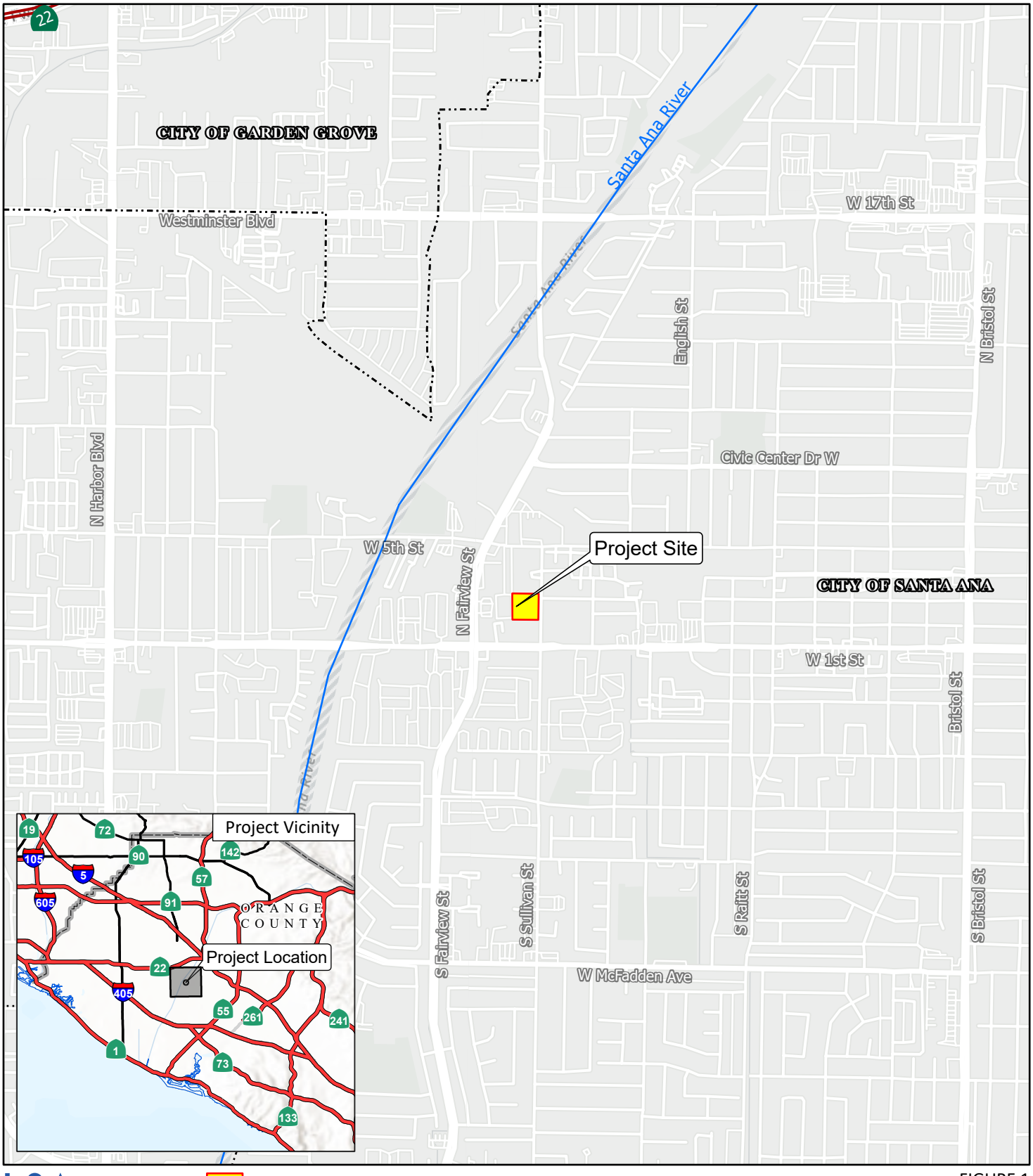
_____. 2024a. *Air Quality Technical Memorandum for the Extra Space Storage Sullivan Street Project*. September 27.

_____. 2024b. *Trip Generation and Vehicle Miles Traveled Assessment for the Extra Space Storage Sullivan Street Project*. July 17.

ATTACHMENT B

FIGURES

Figure 1: Regional Location
Figure 2: Conceptual Site Plan
Figure 3: Noise Monitoring Locations



LSA

FIGURE 1

SOURCE: Esri Light Gray Canvas (2024)

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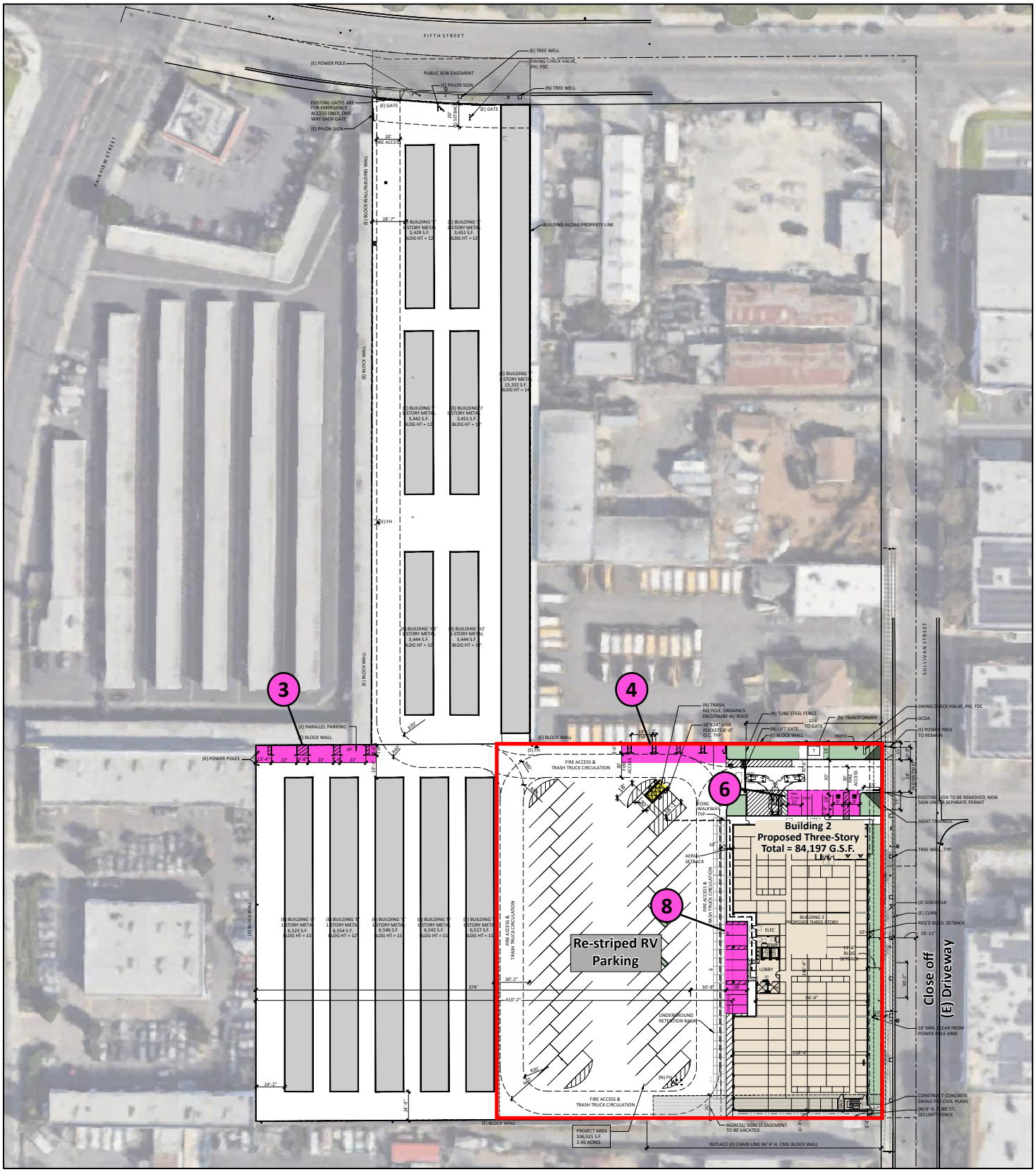
Extra Space Storage Sullivan Street Project

Regional Location



LSA

FIGURE 2

LEGEND

- Project Site
- Trash Enclosure
- Proposed Parking Stalls On-Site (21 Total)

N

0 68 136

FEET

SOURCE: KSP Studios

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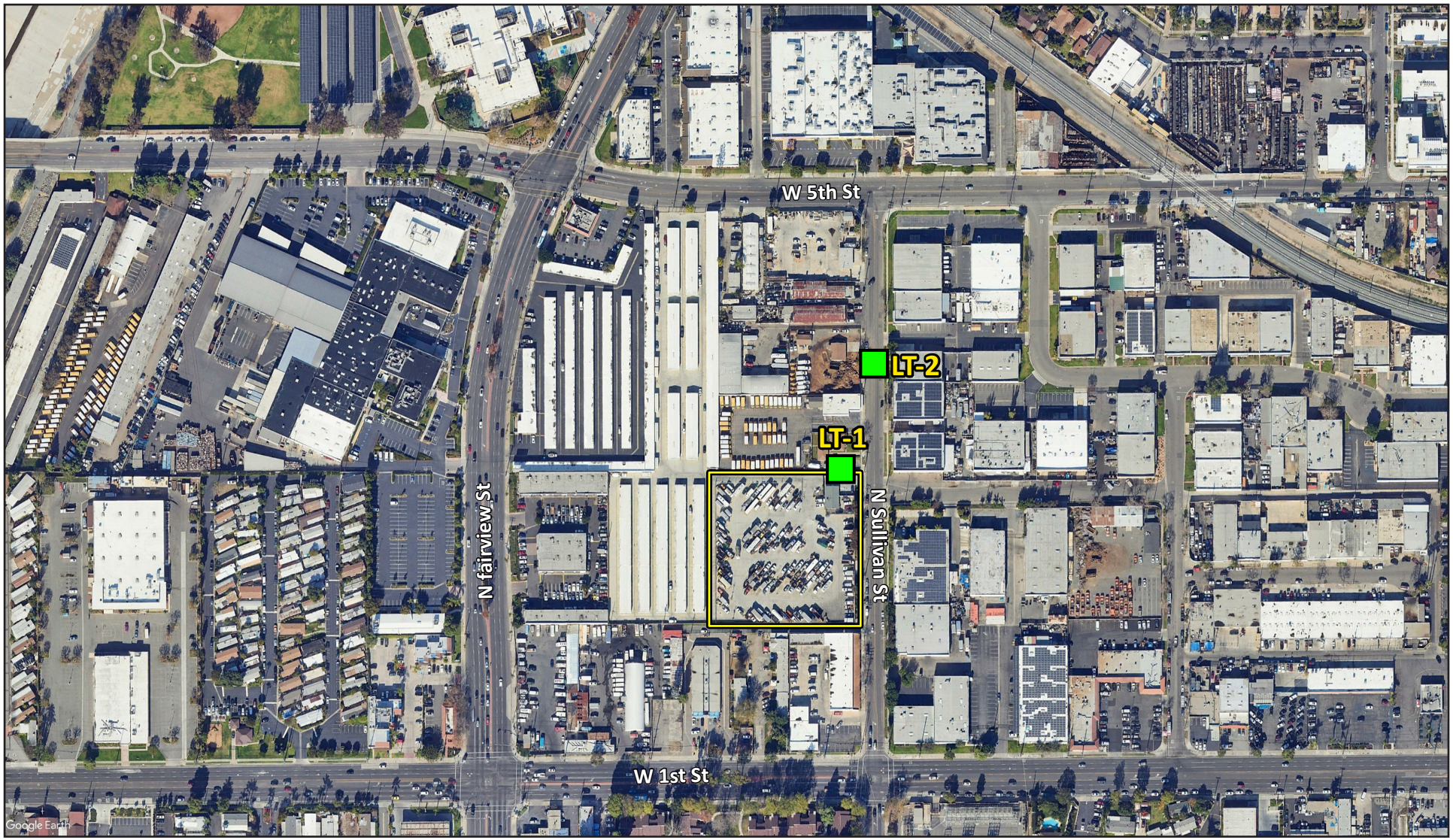
Extra Space Storage Sullivan Street Project

Conceptual Site Plan



LSA

FIGURE 3

LEGEND

Project Site Boundary

LT-X Long-term Noise Monitoring Location

N

0 150 300

FEET

SOURCE: Google Earth 2025

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Extra Space Storage Sullivan Street Project

Noise Monitoring Locations

ATTACHMENT C

NOISE SURVEY SHEETS

Noise Measurement Survey – 24 HR

Project Number: 20241631
Project Name: ESS Sullivan Street

Test Personnel: Corey Knips
Equipment: LD Spark 706RC (SN: 17637)

Site Number: LT-1

Start Date: 9/3/2025
Time: From 12:00 a.m. To 12:00 a.m.

Site Location: Extra Space Storage, 280 North Sullivan Street, Santa Ana, CA. On security camera pole at entrance, approximately 70 feet from the Sullivan Street centerline.

Primary Noise Sources: Light traffic on Sullivan Street and occasional vehicles entering the Extra Space Storage facility.

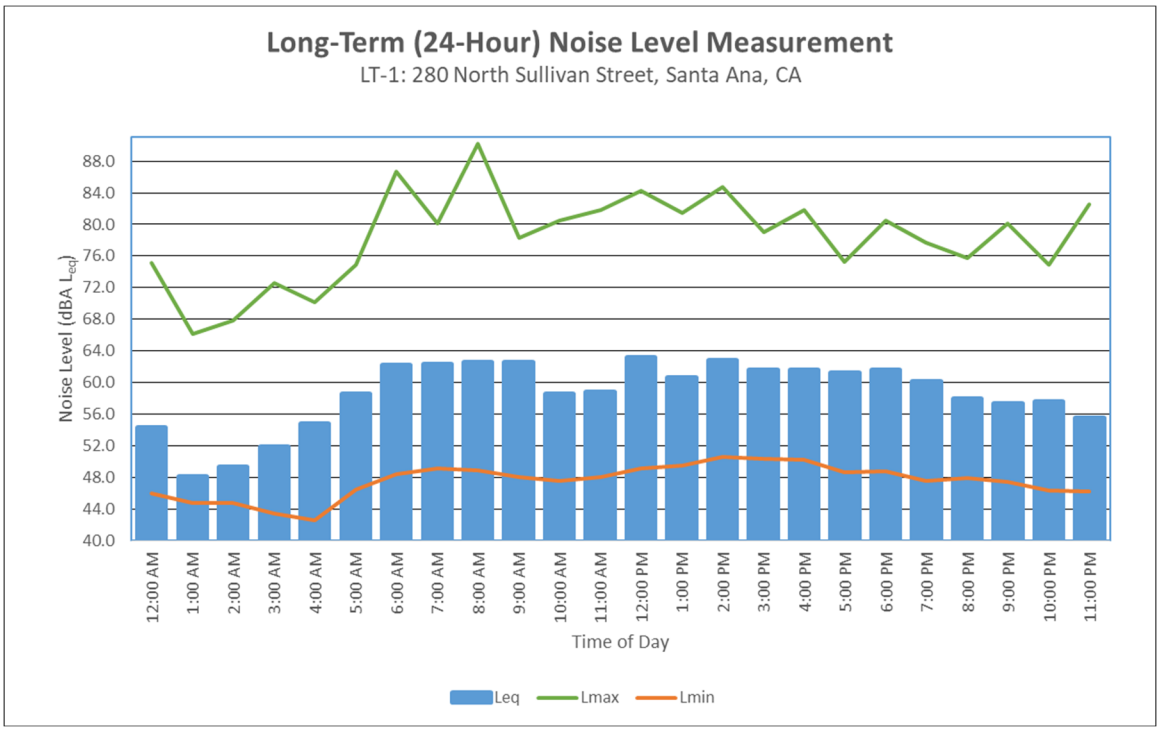
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
12:00 AM	9/3/2025	54.3	75.1	46.0
1:00 AM	9/3/2025	48.1	66.2	44.8
2:00 AM	9/3/2025	49.3	67.8	44.8
3:00 AM	9/3/2025	51.9	72.6	43.4
4:00 AM	9/3/2025	54.8	70.2	42.6
5:00 AM	9/3/2025	58.6	74.9	46.4
6:00 AM	9/3/2025	62.2	86.7	48.4
7:00 AM	9/3/2025	62.4	80.1	49.1
8:00 AM	9/3/2025	62.6	90.2	48.9
9:00 AM	9/3/2025	62.6	78.3	48.0
10:00 AM	9/3/2025	58.5	80.5	47.5
11:00 AM	9/3/2025	58.8	81.8	48.0
12:00 PM	9/3/2025	63.2	84.2	49.1
1:00 PM	9/3/2025	60.6	81.4	49.5
2:00 PM	9/3/2025	62.8	84.8	50.6
3:00 PM	9/3/2025	61.6	79.0	50.4
4:00 PM	9/3/2025	61.5	81.8	50.2
5:00 PM	9/3/2025	61.2	75.3	48.6
6:00 PM	9/3/2025	61.5	80.5	48.8
7:00 PM	9/3/2025	60.1	77.7	47.6
8:00 PM	9/3/2025	58.0	75.8	47.9
9:00 PM	9/3/2025	57.4	80.1	47.4
10:00 PM	9/3/2025	57.6	74.9	46.3
11:00 PM	9/3/2025	55.5	82.5	46.2

Source: Compiled by LSA Associates, Inc. (2025).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: 20241631
Project Name: ESS Sullivan Street

Test Personnel: Corey Knips
Equipment: LD Spark 703+ (SN: 20224)

Site Number: LT-2

Start Date: 9/3/2025
Time: From 12:00 a.m. To 12:00 a.m.

Site Location: 402 North Sullivan St, Santa Ana, CA. On the tree in front of home, just east of the sidewalk. Approximately 24 feet from the Sullivan Street centerline.

Primary Noise Sources: Traffic on 5th Street and light traffic on Sullivan Street.

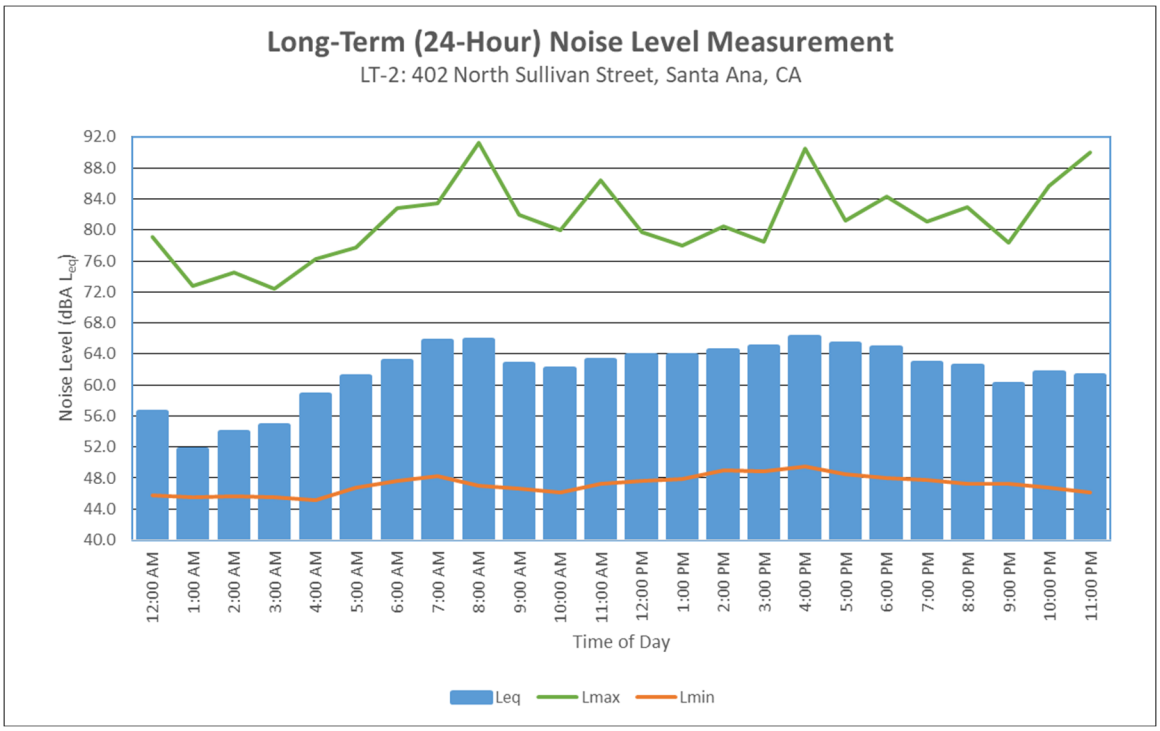
Comments:

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
12:00 AM	9/3/2025	56.4	79.1	45.8
1:00 AM	9/3/2025	51.7	72.8	45.5
2:00 AM	9/3/2025	53.9	74.5	45.6
3:00 AM	9/3/2025	54.7	72.4	45.5
4:00 AM	9/3/2025	58.7	76.3	45.2
5:00 AM	9/3/2025	61.1	77.8	46.7
6:00 AM	9/3/2025	63.0	82.8	47.6
7:00 AM	9/3/2025	65.6	83.4	48.3
8:00 AM	9/3/2025	65.8	91.2	47.0
9:00 AM	9/3/2025	62.6	81.9	46.6
10:00 AM	9/3/2025	62.1	80.0	46.1
11:00 AM	9/3/2025	63.2	86.4	47.3
12:00 PM	9/3/2025	63.8	79.7	47.6
1:00 PM	9/3/2025	63.8	78.0	47.9
2:00 PM	9/3/2025	64.4	80.5	49.0
3:00 PM	9/3/2025	64.9	78.5	48.9
4:00 PM	9/3/2025	66.2	90.5	49.5
5:00 PM	9/3/2025	65.3	81.2	48.5
6:00 PM	9/3/2025	64.7	84.3	48.0
7:00 PM	9/3/2025	62.8	81.1	47.8
8:00 PM	9/3/2025	62.4	82.9	47.3
9:00 PM	9/3/2025	60.0	78.4	47.3
10:00 PM	9/3/2025	61.5	85.7	46.8
11:00 PM	9/3/2025	61.3	90.0	46.1

Source: Compiled by LSA Associates, Inc. (2025).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



ATTACHMENT D

CONSTRUCTION TRAFFIC NOISE CALCULATION

Construction Traffic Noise Calculator

Construction Phase	Start Date	End Date	One Way Trip Per Day			Days per Phase	Total Trips Per Day	Equivalent One Way Trip Per Day			Total Equivalent Trips Per Day	Overlap?	Overlap Trips
			Worker	Vendor	Haul			Worker	Vendor	Haul			
Demolition	5/5/25	5/30/25	12.50	0.00	4.70	20	17	13	0	188	201		
Site Preparation	6/2/25	6/13/25	7.50	0.00	0.00	10	8	8	0	0	8		
Grading	6/16/25	6/27/25	10.00	0.00	14.20	10	24	10	0	566	576		
Building Construction	6/30/25	10/16/26	39.04	15.23	0.00	340	54	40	400	0	440	x	440
Paving	10/19/26	10/30/26	15.00	0.00	0.00	10	15	15	0	0	15		
Architectural Coating	3/16/26	11/6/26	7.81	0.00	0.00	170	8	8	0	0	8	x	8
Maximum							**54**				**576**		**448**

Speed (mph)	MT Factor	HT Factor
25	12.6	39.8
30	8.9	26.3
35	7.1	19.1
40	5.8	15.1
45	5	12.9
50	4.5	11.5
55	4.1	10.4
60	3.7	9.6

Note: Based on FHWA REMEL database and vehicle definitions.
MT = Medium Trucks.
HT = Heavy Trucks.

Roadway	Speed	Existing Volume	MT Factor	HT Factor	Total Equivalent Vehicles	Noise Increase (dBA)
Sullivan Street	25	5,934	12.6	39.8	576	0.40

Construction Phase	Start Date	End Date	One Way Trip Per Day			Days per Phase	Total Trips Per Day	Equivalent One Way Trip Per Day			Total Equivalent Trips Per Day	Overlap?	Overlap Trips
			Worker	Vendor	Haul			Worker	Vendor	Haul			
Demolition	5/5/25	5/30/25	13	0	5	20	17	13	0	71	84		
Site Preparation	6/2/25	6/13/25	8	0	0	10	8	8	0	0	8		
Grading	6/16/25	6/27/25	10	0	14	10	24	10	0	215	225		
Building Construction	6/30/25	10/16/26	39	15	0	340	54	40	160	0	200	x	200
Paving	10/19/26	10/30/26	15	0	0	10	15	15	0	0	15		
Architectural Coating	3/16/26	11/6/26	8	0	0	170	8	8	0	0	8	x	8
Maximum							**54**				**225**		**208**

Speed (mph)	MT Factor	HT Factor
25	12.6	39.8
30	8.9	26.3
35	7.1	19.1
40	5.8	15.1
45	5	12.9
50	4.5	11.5
55	4.1	10.4
60	3.7	9.6

Roadway	Speed	Existing Volume	MT Factor	HT Factor	Total Equivalent Vehicles	Noise Increase (dBA)
First Street	40	29,943	5.8	15.1	225	0.03

Construction Phase	Start Date	End Date	One Way Trip Per Day			Days per Phase	Total Trips Per Day	Equivalent One Way Trip Per Day			Total Equivalent Trips Per Day	Overlap?	Overlap Trips
			Worker	Vendor	Haul			Worker	Vendor	Haul			
Demolition	5/5/25	5/30/25	13	0	5	20	17	13	0	90	103		
Site Preparation	6/2/25	6/13/25	8	0	0	10	8	8	0	0	8		
Grading	6/16/25	6/27/25	10	0	14	10	24	10	0	272	282		
Building Construction	6/30/25	10/16/26	39	15	0	340	54	40	200	0	240	x	240
Paving	10/19/26	10/30/26	15	0	0	10	15	15	0	0	15		
Architectural Coating	3/16/26	11/6/26	8	0	0	170	8	8	0	0	8	x	8
Maximum							**54**				**282**		**248**

Speed (mph)	MT Factor	HT Factor
25	12.6	39.8
30	8.9	26.3
35	7.1	19.1
40	5.8	15.1
45	5	12.9
50	4.5	11.5
55	4.1	10.4
60	3.7	9.6

Roadway	Speed	Existing Volume	MT Factor	HT Factor	Total Equivalent Vehicles	Noise Increase (dBA)
Fifth Street	35	9,822	7.1	19.1	282	0.12

ATTACHMENT E

EXISTING AND PROPOSED HVAC SPECIFICATIONS

Existing HVAC Equipment

The new degree of comfort.™

Rheem *Classic*® Series Air Conditioners

RA14 Series

Efficiencies up to 14 SEER/11.5 EER
Nominal Sizes 1½ to 5 Ton [5.28 to 17.6 kW]
Cooling Capacities 17.3 to 60.5 kBTU
[5.7 to 17.7 kW]

"Proper sizing and installation of equipment is critical to achieve optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet Energy Star. Ask your Contractor for details or visit www.energystar.gov."

- Composite base pan – dampens sound, captures louver panels, eliminates corrosion and reduces number of fasteners needed
- Powder coat paint system – for a long lasting professional finish
- Scroll compressor – uses 70% fewer moving parts for higher efficiency and increased reliability
- Modern cabinet aesthetics – increased curb appeal with visually appealing design
- Curved louver panels – provide ultimate coil protection, enhance cabinet strength, and increased cabinet rigidity
- Optimized fan orifice – optimizes airflow and reduces unit sound
- Rust resistant screws – confirmed through 1500-hour salt spray testing
- PlusOne™ **Expanded Valve Space** – 3"-4"-5" service valve space – provides a minimum working area of 27-square inches for easier access
- PlusOne™ **Triple Service Access** – 15" wide, industry leading corner service access – makes repairs easier and faster. The two fastener removable corner allows optimal access to internal unit components. Individual louver panels come out once fastener is removed, for faster coil cleaning and easier cabinet reassembly
- Diagnostic service window with two-fastener opening – provides access to the high and low pressure.
- External gauge port access – allows easy connection of "low-loss" gauge ports
- Single-row condenser coil – makes unit lighter and allows thorough coil cleaning to maintain "out of the box" performance
- 35% fewer cabinet fasteners and fastener-free base – allow for faster access to internal components and hassle-free panel removal
- Service trays – hold fasteners or caps during service calls
- QR code – provides technical information on demand for faster service calls
- Fan motor harness with extra long wires allows unit top to be removed without disconnecting fan wire.

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Standard Feature Table

STANDARD FEATURES							
Feature	**18**	**24**	**30**	**36**	**42**	**48**	**60**
R-410a Refrigerant	√	√	√	√	√	√	√
Maximum SEER	15.5	15	15.5	15.5	15	15	14
Maximum EER	13	13	13	13	13	13	12
Scroll Compressor	√	√	√	√	√	√	√
Field Installed Filter Drier	√	√	√	√	√	√	√
Front Seating Service Valves	√	√	√	√	√	√	√
Internal Pressure Relief Valve	√	√	√	√	√	√	√
Internal Thermal Overload	√	√	√	√	√	√	√
Long Line capability	√	√	√	√	√	√	√
Low Ambient capability with Kit	√	√	√	√	√	√	√
3-4-5 Expanded Valve Space	√	√	√	√	√	√	√
Composite Basepan	√	√	√	√	√	√	√
2 Screw Control Box Access	√	√	√	√	√	√	√
15" Access to Internal Components	√	√	√	√	√	√	√
Quick release louver panel design	√	√	√	√	√	√	√
No fasteners to remove along bottom	√	√	√	√	√	√	√
Optimized Venturi Airflow	√	√	√	√	√	√	√
Single row condenser coil	√	√	√	√	√	√	√
Powder coated paint	√	√	√	√	√	√	√
Rust resistant screws	√	√	√	√	√	√	√
QR code	√	√	√	√	√	√	√
External gauge ports	√	√	√	√	√	√	√
Service trays	√	√	√	√	√	√	√

√ = Standard

Available SKUs

Available Models	Description
RA1418AJ1NA	*Classic*® Series 1 1/2 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1418AJ1NB	*Classic*® Series 1 1/2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1424BJ1NA	*Classic*® Series 2 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1424BJ1NB	*Classic*® Series 2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1430AJ1NA	*Classic*® Series 2 1/2 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1430AJ1NB	*Classic*® Series 2 1/2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1436AC1NB	*Classic*® Series 3 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1436AD1NB	*Classic*® Series 3 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-460/3/60
RA1436AJ1NA	*Classic*® Series 3 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1436AJ1NB	*Classic*® Series 3 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1442AD1NB	*Classic*® Series 3 1/2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-460/3/60
RA1442CC1NB	*Classic*® Series 3 1/2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1442CJ1NA	*Classic*® Series 3 1/2 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1442CJ1NB	*Classic*® Series 3 1/2 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1448AC1NB	*Classic*® Series 4 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1448AD1NB	*Classic*® Series 4 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-460/3/60
RA1448AJ1NA	*Classic*® Series 4 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1448AJ1NB	*Classic*® Series 4 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1460AD1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-460/3/60
RA1460BC1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1460BJ1NA	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1460BJ1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1460CC1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60
RA1460CD1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-460/3/60
RA1460CJ1NA	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner-208/230/1/60
RA1460CJ1NB	*Classic*® Series 5 ton 14 SEER Single-Stage Air Conditioner w/ High/Low Pressure-208/230/1/60

Accessories

Model No.		RA1418	RA1424	RA1430	RA1436	RA1442	RA1448	RA1460
Compressor crankcase heater*		44-17402-44	44-17402-44	44-17402-44	44-17402-44	44-17402-45	44-17402-45	44-17402-45
Low ambient control		RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08	RXAD-A08
Compressor sound cover		68-23427-26	68-23427-26	68-23427-26	68-23427-26	68-23427-25	68-23427-25	68-23427-25
Compressor hard start kit		SK-A1	SK-A1	SK-A1	SK-A1	SK-A1	SK-A1	SK-A1
Compressor time delay		RXMD-B01	RXMD-B01	RXMD-B01	RXMD-B01	RXMD-B01	RXMD-B01	RXMD-B01
Low pressure control		RXAC-A07	RXAC-A07	RXAC-A07	RXAC-A07	RXAC-A07	RXAC-A07	RXAC-A07
High pressure control		RXAB-A07	RXAB-A07	RXAB-A07	RXAB-A07	RXAB-A07	RXAB-A07	RXAB-A07
Liquid Line Solenoid (24 VAC, 50/60 Hz)	Solenoid Valve	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD3T3TVLC	200RD3T3TVLC
	Solenoid Coil	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V	61-AMG24V
Liquid Line Solenoid (120/240 VAC, 50/60 Hz)	Solenoid Valve	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD2T3TVLC	200RD3T3TVLC	200RD3T3TVLC
	Solenoid Coil	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V	61-AMG120/240V
Classic Top Cap w/Label		91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21	91-101123-21

*Crankcase Heater recommended with Low Ambient Kit.

Weighted Sound Power Level (dBA)

A-WEIGHTED SOUND POWER LEVEL (dBA)								
Unit Size - Voltage, Series	Standard Rating (dBA)	TYPICAL OCTAVE BAND SPECTRUM (dBA without tone adjustment)						
		125	250	500	1000	2000	4000	8000
RA1418	76.0	51.4	59.6	65.2	65.9	64.3	58.5	53.7
RA1424	75.0	50.0	59.5	63.2	64.4	61.4	56.8	52.6
RA1430	74.0	48.8	57.5	63.5	64	61.9	56.1	51
RA1436	76.0	52.2	61.3	65.4	65.3	62.4	57.3	53.1
RA1442	73.0	51.5	54.7	63.5	63.3	59.4	54.9	48.4
RA1448	76.0	52.3	59.1	66.7	65.7	62.4	59.3	55.9
RA1460	74.6	50.1	55.1	65.6	64.8	63.2	57.4	56.4

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

Proposed HVAC Equipment

Product Catalog

Packaged Rooftop Air Conditioners Voyager™ Light Commercial — Cooling, Gas/Electric

12.5 to 25 Tons, 60 Hz

December 2021 **RT-PRC028AH-EN**

Introduction

Packaged Rooftop Air Conditioners

Through the years, Trane has designed and developed the most complete line of Packaged Rooftop products available in the market today. Trane was the first to introduce the Micro—microelectronic unit controls—and has continued to improve and revolutionize this design concept.

The ReliaTel™control platform offers the same great features and functionality as the original Micro, with additional benefits for greater application flexibility.

Voyager™ continues to provide the highest standards in quality and reliability, comfort, ease of service, and the performance of Trane light commercial products.

Trane customers demand products that provide exceptional reliability, meet stringent performance requirements, and are competitively priced. Trane delivers with Voyager.

Voyager features cutting edge technologies: reliable compressors, Trane engineered ReliaTel™ controls, computer-aided run testing, and Integrated Comfort™ Systems. So, whether you're the contractor, the engineer, or the owner, you can be certain Voyager products are built to meet your needs.

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Trademarks

Revision History

Updated General data—25 tons high efficiency table in General Data chapter.

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Features and Benefits

Note: *Packaged Rooftop units cooling, heating capacities, and efficiencies are AHRI certified within scope of AHRI Standard 340-360 (I-P) and ANSIZ21.47 and 10 CFR Part 431 pertaining to Commercial Warm Air Furnaces (gas heating units).*

Standard Features and Available Options

Table 1. Voyager™ Light Commercial control features — standard and optional

	Standard Features	Options[a]		
		Factory Installed	Factory or Field Installed	Field Installed
BACnet® Communications Interface (BCI)			X	
Discharge Line Thermostat	X			
Humidity Sensor				X
LonTalk® Communications Interface (LCI)			X	
ReliaTel™ Microprocessor Controls	X			
ReliaTel™ Options Module			X	
Thermostat				X
Trane® Air-Fi® Wireless Communication Interface		X		
Trane® Communications Interface (TCI)			X	
Wireless Zone Sensor				X
Zone Sensors and Remote Zone Sensors				X

(a) Refer to model number description for option availability

Table 2. Voyager™ Light Commercial features - standard and optional

	Standard Features	Options[a]		
		Factory Installed	Factory or Field Installed	Field Installed
1-year Limited Parts Warranty	X			
5-year Limited Compressor Warranty	X			
5-year Limited Heat Exchanger Warranty (12½–17½ Tons); 1 Year on 20 and 25 Tons	X			
2-in MERV 8 Filters or 2-in MERV 13 Filters with Filter Removal Tool		X		
2-in throwaway filters	X			
3 Stages of Cooling Capability on 12½–20 Tons, 4 Stages of Cooling Capability on 25 Tons (High Efficiency Units Only)	X			
Anti-Short Cycle Timer	X			
Barometric Relief[b]	X			
Belt Drive Motors	X			
Clogged Filter/Fan Failure Switch			X	
CO_2 Sensor				X
CO_2 Sensor Wiring (Wiring Only)		X		
Colored and Numbered Wiring	X			
Complete Coat™ Microchannel Condenser Coil		X		
Condensate Overflow Switch		X		
Crankcase Heaters	X			
Dedicated Airflow	X			

Table 2. Voyager™ Light Commercial features - standard and optional (continued)

	Standard Features	Options[a]		
		Factory Installed	Factory or Field Installed	Field Installed
Dehumidification (Hot Gas Reheat)		X		
Digital Display Zone Sensor				X
Discharge Air Temperature Sensing Kit			X	
Easy Access Low Voltage Terminal Board (LTB)	X			
Economizer - Standard, Downflow			X	
Economizer - Standard, Horizontal				X
Electric Heaters			X	
Fault Detection and Diagnostics (FDD)		X		
Foil-Faced and Edge Captured Insulation	X			
Frostat™			X	
High and Low Static Drive Kits				X
High Efficiency Drum and Tube Heat Exchanger	X			
High Efficiency Gas Heat with Hot Surface Ignition	X			
High Efficiency Motors		X		
High Pressure Cutout	X			
High Short Circuit Current Rated (SCCR) Electrical Subsystem		X		
Hinged Access Doors		X		
Human Interface - 5 inch Color Touchscreen		X		
IAQ Sloped Condensate Drain Pan	X			
Indoor Fan Motor Shaft Grounding Ring			X	
Liquid Line Refrigerant Drier	X			
Low Ambient Cooling to 0°F	X			
Low Leak Economizer - Downflow			X	
Low Leak Economizer - Downflow and Horizontal				X
LP Conversion Kit				X
Manual Outside Air Dampers				X
Microchannel Type Condenser Coils	X			
Microchannel Type Evaporator Coils (Standard Efficiency Only)	X			
Modulating Gas Heat Furnace with a 2.5:1 Turndown Ratio		X		
Motorized Outside Air Dampers				X
Multi-Speed Indoor Fans		X		
Multiple Zone Variable Air Volume (MZVAV)		X		
Operating Charge of R-410A	X			
Outside Air Measuring/Monitoring Control (Traq Dampers)				X
Oversized Motors			X	
Phase Monitor	X			
Powered Exhaust				X
Powered or Unpowered Convenience Outlet		X		
Provisions for Through-the-Base Gas Connections	X			
Quick Access Panels	X			
Quick Adjust Idler Arm Pulley	X			
Reference or Comparative Enthalpy			X	

Table 2. Voyager™ Light Commercial features - standard and optional (continued)

	Standard Features	Options[a]		
		Factory Installed	Factory or Field Installed	Field Installed
Remote Potentiometer				X
Roof Curb (Downflow Only)				X
Single Point Power	X			
Single Side Service	X			
Single Zone Variable Air Volume (SZ VAV)		X		
Stainless Steel Drain Pan		X		
Stainless Steel Heat Exchanger with 10 Year Warranty		X		
Standardized Components	X			
Supply and/or Return Air Smoke Detector		X		
Thermal Expansion Valve	X			
Through the Base Electrical Access		X		
Through the Base Electrical with Circuit Breaker		X		
Through the Base Electrical with Disconnect Switch		X		
Through the Base Gas Piping		X		
Tool-less Hail Guards			X	
U-shaped Airflow Pattern	X			
Variable Frequency Drive (Multispeed Indoor Fan, VAV, and Single Zone VAV)	X			
Ventilation Override Accessory				X

(a) Refer to model number description for option availability.
(b) Barometric relief comes standard with economizers.

Note: *Most Factory Installed Options (FIOPS) available for Downflow Air Discharge units only. Please verify with ordering system for availability.*

Standard Features

Anti-Short Cycle Timer

Provides a 3 minute minimum “ON” time and 3 minute “OFF” time for compressors to enhance compressor reliability by assuring proper oil return.

Barometric Relief

Designed to be used on downflow units, barometric relief is an unpowered means of relieving excess building pressure.

Colored and Numbered Wiring

Save time and money tracing wires and diagnosing the unit.

General Data

Table 3. General data—cooling 12½–15 tons standard efficiency

	12½ Tons Downflow and Horizontal Units		15 Tons Downflow and Horizontal Units	
	TS*150G3,4,W,K	**YS*150G3,4,W,K**	**TS*180G3,4,W,K**	**YS*180G3,4,W,K**
Cooling Performance[a]				
Gross Cooling Capacity	150,000	150,000	186,000	186,000
EER (Downflow/Horizontal)[b]	11	11	11	11
Nominal Airflow CFM / AHRI Rated CFM	5,000 / 4,000	5,000 / 4,000	6,000 / 5,400	6,000 / 5,400
AHRI Net Cooling Capacity	140,000	140,000	176,000	176,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	12.4/13.5	12.2/13.5	12.4/13.2	12.2/13.2
Percent Capacity @ part load (Stage 1/Stage 2)	66/100	66/100	67/100	67/100
System Power (kW)	12.73	12.73	16.00	16.00
Compressor				
Number/Type	2 / Scrolls	2 / Scrolls	2 / Scrolls	2 / Scrolls
Sound				
Outdoor Sound Rating (BELS)[d]	9.2	9.2	9.2	9.2
Outdoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Coil Width (in.)	0.71	0.71	0.71	0.71
Face Area (sq. ft.)	25.9	25.9	35.2	35.2
Rows/FPI (DF/HZ)	1/23	1/23	1/23	1/23
Indoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Coil Width (in.)	1.00	1.00	0.81	0.81
Face Area (sq. ft.)	17.30	17.30	23.00	23.00
Rows/FPI	2/16	2/16	2/16	2/16
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used/Diameter (in.)	2 / 26	2 / 26	2 / 26	2 / 26
Drive Type/No. Speeds	Direct / 1	Direct / 1	Direct / 1	Direct / 1
cfm	11,000	11,000	11,000	11,000
Number Motors/hp	2 / 0.50	2 / 0.50	2 / 0.50	2 / 0.50
Motor rpm	1,100	1,100	1,100	1,100
Indoor Fan				
Type	FC Centrifugal	FC Centrifugal	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 15x15	1 / 15x15	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1	Belt / 1	Belt / 1
Number Motors	1	1	1	1
Motor hp (Standard/Oversized)[e]	3.0 / 5.0	3.0 / 5.0	3.0 / 5.0 or 7.5[f]	3.0 / 5.0 or 7.5[f]
Motor rpm (Standard/Oversized)	1,740 / 3,450	1,740 / 3,450	1,740 / 3,450	1,740 / 3,450
Motor Frame Size (Standard/Oversized)	56HZ / 56HZ	56HZ / 56HZ	184TZ / 56HZ/184TZ	56HZ / 56HZ/184TZ

Table 3. General data—cooling 12½–15 tons standard efficiency (continued)

	12½ Tons Downflow and Horizontal Units		15 Tons Downflow and Horizontal Units	
	TS*150G3,4,W,K	YS*150G3,4,W,K	TS*180G3,4,W,K	YS*180G3,4,W,K
Filters				
Type Furnished[g]	Throwaway	Throwaway	Throwaway	Throwaway
Number Size Recommended				
Downflow	(2)20x20x2 (4)20x25x2	(2)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2
Horizontal	(2)20x20x2 (4)20x25x2	(2)20x20x2 (4)20x25x2	(8)20x25x2	(8)20x25x2
Refrigerant Charge (Pounds of R-410A)[h]				
Cir#1 / Cir#2 (DF)	8.1/5.1	8.1/5.1	9.0/5.0	9.0/5.0
Cir#1 / Cir#2 (HZ)	8.1/5.2	8.1/5.2	9.2/5.1	9.2/5.1

(a) Cooling Performance is rated at 95°F ambient, 80°F entering dry bulb, 67°F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Units are suitable for operation to ±20% of nominal cfm. Certified in accordance with the Unitary Large Equipment Certification Program, which is based on AHRI Standard 340/360.
(b) EER is rated at AHRI conditions and in accordance with AHRI Standard 210/240 or 340/360.
(c) Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 340/360.
(d) Outdoor Sound Rating shown is tested in accordance with AHRI Standard 270 or 370.
(e) For 380V/60Hz units, the oversized motor (Indoor Fan) is used as the standard motor. Refer to oversized motor data.
(f) Offered only as a field installed accessory.
(g) An optional 2-inch pleated filter is also available.
(h) Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
* Indicates both downflow and horizontal units.

Table 4. General data—heating—12½–15 tons standard efficiency

	12½ Tons Downflow and Horizontal Units			15 Tons Downflow and Horizontal Units		
	Heating Performance[a] (Gas/Electric Only)					
Heating Models	**Low**	**High**	**Modulating Turn Down = 2.5:1**	**Low**	**High**	**Modulating Turn Down = 2.5:1**
Heating Input (Btu/h)	150,000	250,000	350,000	250,000	350,000	350,000
1st Stage (Btu)	100,000	175,000	140,000	175,000	250,000	140,000
Heating Output (Btu/h)	120,000	200,000	280,000	200,000	280,000	280,000
1st Stage (Btu)	80,000	140,000	112,000	140,000	200,000	112,000
Steady State Efficiency%	80	80	80	80	80	80
No. Burners	1	1	1	1	1	1
No. Stages	2	2	N/A	2	2	N/A
Gas Supply Line Pressure (in. wc)	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0
Natural or LP (minimum/maximum)	Natural or LP	Natural or LP	Natural Only	Natural or LP	Natural or LP	Natural Only
Gas Connection Pipe Size (in.)	1/2	1/2	3/4	1/2	3/4	3/4

(a) Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 2000 feet. For elevations above 2000 feet, ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

Table 5. General data—17½–20 tons standard efficiency

	17½ Tons Downflow and Horizontal Units		20 Tons Downflow and Horizontal Units	
	TS*210G3,4,W,K	**YS*210G3,4,W,K**	**TS*240G3,4,W,K**	**YS*240G3,4,W,K**
Cooling Performance[a]				
Gross Cooling Capacity	210,000	210,000	259,000	259,000
EER (Downflow/Horizontal)[b]	11	11	10	10
Nominal Airflow CFM / AHRI Rated CFM	7,000 / 6,125	7,000 / 6,125	8,000 / 6,400	8,000 / 6,400
AHRI Net Cooling Capacity	196,000	196,000	240,000	240,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	12.4/13.2	12.2/13.2	11.6/12.4	11.4/12.4
Percent Capacity @ part load (Stage 1/Stage 2)	67/100	67/100	67/100	67/100
System Power (kW)	17.82	17.82	24.00	24.00
Compressor				
Number/Type	2 / Scrolls	2 / Scrolls	2 / Scrolls	2 / Scrolls
Sound				
Outdoor Sound Rating (BELS)[d]	9.4	9.4	9.4	9.4
Outdoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Coil Width (in.)	1.00	1.00	1.0	1.0
Face Area (sq. ft.)	35.2	35.2	35.2	35.2
Rows/FPI (DF/HZ)	1/20	1/20	1/23 / 1/20	1/23 / 1/20
Indoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Tube Size (in.) ID	1.00	1.00	1.00	1.00
Face Area (sq. ft.)	23.00	23.00	23.00	23.00
Rows/FPI	2 / 16	2 / 16	2 / 16	2 / 16
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used/Diameter (in.)	2 / 26	2 / 26	2 / 26	2 / 26
Drive Type/No. Speeds	Direct / 1	Direct / 1	Direct / 1	Direct / 1
cfm	14,500	14,500	15,500	15,500
Number Motors/hp	2 / 1.0	2 / 1.0	2 / 1.0	2 / 1.0
Motor rpm	1125	1125	1125	1125
Indoor Fan				
Type	FC Centrifugal	FC Centrifugal	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 18x18	1 / 18x18	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1	Belt / 1	Belt / 1
Number Motors	1	1	1	1
Motor hp (Standard/Oversized)[e]	5.0 / 7.5	5.0 / 7.5	5.0 / 7.5	5.0 / 7.5
Motor rpm (Standard/Oversized)	3,450 / 3,470	3,450 / 3,470	3,450 / 3,470	3,450 / 3,470
Motor Frame Size (Standard/Oversized)	56HZ / 184T	56HZ / 184T	56HZ / 184T	56HZ / 184T

Table 5. General data—17½–20 tons standard efficiency (continued)

	17½ Tons Downflow and Horizontal Units		20 Tons Downflow and Horizontal Units	
	TS*210G3,4,W,K	YS*210G3,4,W,K	TS*240G3,4,W,K	YS*240G3,4,W,K
Filters				
Type Furnished[f]	Throwaway	Throwaway	Throwaway	Throwaway
Number Size Recommended				
Downflow	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2
Horizontal	(8)20x25x2	(8)20x25x2	(8)20x25x2	(8)20x25x2
Refrigerant Charge (Pounds of R-410A)				
Cir#1/Cir#2 (DF)	12.6/6.8	12.6/6.8	12.4/7.2	12.4/7.2
Cir#1/Cir#2 (HZ)	12.0/6.8	12.0/6.8	11.7/6.8	11.7/6.8

(a) Cooling Performance is rated at 95°F ambient, 80°F entering dry bulb, 67°F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Units are suitable for operation to ±20% of nominal cfm. Certified in accordance with the Unitary Large Equipment Certification Program, which is based on AHRI Standard 340/360.
(b) EER is rated at AHRI conditions and in accordance with AHRI Standard 210/240 or 340/360.
(c) Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 340/360.
(d) Outdoor Sound Rating shown is tested in accordance with AHRI Standard 270 or 370.
(e) For 380V/60Hz units, the oversized motor (Indoor Fan) is used as the standard motor. Refer to oversized motor data.
(f) Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
* Indicates both downflow and horizontal units.

Table 6. General data—heating—17½–20 tons standard efficiency

	17½ Tons Downflow and Horizontal Units			20 Tons Downflow and Horizontal Units		
	Heating Performance[a] (Gas/Electric Only)					
Heating Models	**Low**	**High**	**Modulating Turn Down = 2.5:1**	**Low**	**High**	**Modulating Turn Down = 2.5:1**
Heating Input (Btu/h)	250,000	350,000	350,000	250,000	400,000	350,000
1st Stage (Btu)	175,000	250,000	140,000	175,000	300,000	140,000
Heating Output (Btu/h)	200,000	280,000	280,000	200,000	320,000	280,000
1st Stage (Btu)	140,000	200,000	112,000	140,000	240,000	112,000
Steady State Efficiency%	80	80	80	80	80	80
No. Burners	1	1	1	1	1	1
No. Stages	2	2	N/A	2	2	N/A
Gas Supply Line Pressure (in. wc)	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0	2.5/14.0
Natural or LP (minimum/maximum)	Natural or LP	Natural or LP	Natural Only	Natural or LP	Natural or LP	Natural Only
Gas Connection Pipe Size (in.)	1/2	3/4	3/4	1/2	3/4	3/4

(a) Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 2000 feet. For elevations above 2000 feet, ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

Table 7. General data—25 tons standard efficiency

	25 Tons Downflow and Horizontal Units	
	TS*300G3,4,W,K	**YS*300G3,4,W,K**
Cooling Performance[a]		
Gross Cooling Capacity	285,300	285,300
EER (Downflow/Horizontal)[b]	10	10
Nominal Airflow CFM / AHRI Rated CFM	10,000 / 8,000	10,000 / 8,000
AHRI Net Cooling Capacity	266,000	266,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	11.6/12.4	11.4/12.4
Percent Capacity @ part load (Stage 1/Stage 2)	66/100	66/100
System Power (kW)	27	27
Compressor		
Number/Type	2 / Scrolls	2 / Scrolls
Sound		
Outdoor Sound Rating (BELS)[d]	9.4	9.4
Outdoor Coil		
Type	Microchannel	Microchannel
Coil Width (in.)	1.0	1.0
Face Area (sq. ft.)	35.2	35.2
Rows/FPI (DF/HZ)	1/23 / 1/20	1/23 / 1/20
Indoor Coil		
Type	Microchannel	Microchannel
Tube Size (in.) ID	1.00	1.00
Face Area (sq. ft.)	23.00	23.00
Rows/FPI	2 / 16	2 / 16
Refrigerant Control	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT
Outdoor Fan		
Type	Propeller	Propeller
Number Used/Diameter (in.)	2 / 28	2 / 28
Drive Type/No. Speeds	Direct / 1	Direct / 1
cfm	16,100	16,100
Number Motors/hp	2 / 1.0	2 / 1.0
Motor rpm	1125	1125
Indoor Fan		
Type	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1
Number Motors	1	1
Motor hp (Standard/Oversized)	7.5 / N/A	7.5 / N/A
Motor rpm (Standard/Oversized)	3,470 / N/A	3,470 / N/A
Motor Frame Size (Standard/Oversized)	184T / N/A	184T / N/A

Table 7. General data—25 tons standard efficiency (continued)

	25 Tons Downflow and Horizontal Units	
	TS*300G3,4,W,K	**YS*300G3,4,W,K**
Filters		
Type Furnished[e]	Throwaway	Throwaway
Number Size Recommended		
Downflow	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2
Horizontal	(8)20x25x2	(8)20x25x2
Refrigerant Charge (Pounds of R-410A)[f]		
Cir#1/Cir#2 (DF)	12.5/6.7	12.5/6.7
Cir#1/Cir#2 (HZ)	11.7/6.7	11.7/6.7

(a) Cooling Performance is rated at 95°F ambient, 80°F entering dry bulb, 67°F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Units are suitable for operation to ±20% of nominal cfm. Certified in accordance with the Unitary Large Equipment Certification Program, which is based on AHRI Standard 340/360.
(b) EER is rated at AHRI conditions and in accordance with AHRI Standard 210/240 or 340/360.
(c) Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 340/360.
(d) Outdoor Sound Rating shown is tested in accordance with AHRI Standard 270 or 370.
(e) An optional 2-inch pleated filter is also available.
(f) Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
* Indicates both downflow and horizontal units.

Table 8. General data—heating—25 tons

	25 Tons Downflow and Horizontal Units		
	Heating Performance[a] (Gas/Electric Only)		
Heating Models	**Low**	**High**	**Modulating Turn Down = 2.5:1**
Heating Input (Btu/h)	250,000	400,000	350,000
1st Stage (Btu)	175,000	300,000	140,000
Heating Output (Btu/h)	200,000	320,000	280,000
1st Stage (Btu)	140,000	240,000	112,000
Steady State Efficiency%	80	80	80
No. Burners	1	1	1
No. Stages	2	2	N/A
Gas Supply Line Pressure (in. wc)	2.5 / 14.0	2.5 / 14.0	2.5 / 14.0
Natural or LP (minimum/maximum)	Natural or LP	Natural or LP	Natural Only
Gas Connection Pipe Size (in.)	½	¾	¾

(a) Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 2000 feet. For elevations above 2000 feet, ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

Table 9. General data—12½–15 tons high efficiency

	12½ Tons Downflow and Horizontal Units		15 Tons Downflow and Horizontal Units	
	TH*150G3,4,W	YH*150G3,4,W	TH*180G3,4,W	YH*180G3,4,W
Cooling Performance[a]				
Gross Cooling Capacity	152,400	152,400	180,500	180,500
EER[b]	12.1	12.1	12.1	12.1
Nominal CFM / AHRI Rated CFM	5,000 / 4,000	5,000 / 4,000	6,000 / 5,250	6,000 / 5,250
AHRI Net Cooling Capacity	144,000	144,000	174,000	174,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	13.5/15.0	13.5/15.0	14.0/15.0	14.0/15.0
Percent Capacity @ part load (Stage 1/Stage 2/Stage 3)[d]	30/70/100	30/70/100	32/68/100	32/68/100
System Power (kW)	11.90	11.90	14.38	14.38
Compressor				
Number/Type	2 / Scrolls	2 / Scrolls	2 / Scrolls	2 / Scrolls
Sound				
Outdoor Sound Rating (BELS)[e]	9.2	9.2	9.2	9.2
Outdoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Coil Width (in.)	1.0	1.0	1.0	1.0
Face Area (sq. ft.)	35.2	35.2	42.6	42.6
Rows/FPI	1 / 20	1 / 20	1 / 20	1 / 20
Indoor Coil				
Type	Hi-Performance	Hi-Performance	Hi-Performance	Hi-Performance
Tube Size (in.) ID	0.3125	0.3125	0.3125	0.3125
Face Area (sq. ft.)	26.00	26.00	31.42	31.42
Rows/FPI	4 / 15	4 / 15	4 / 15	4 / 15
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used/Diameter (in.)	2 / 26	2 / 26	2 / 26	2 / 26
Drive Type/No. Speeds	Direct / 1	Direct / 1	Direct / 1	Direct / 1
cfm	11,400	11,400	11,700	11,700
Number Motors/hp	2 / 0.50	2 / 0.50	2 / 0.50	2 / 0.50
Motor rpm	1,100	1,100	1,100	1,100
Indoor Fan				
Type	FC Centrifugal	FC Centrifugal	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 18x18	1 / 18x18	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1	Belt / 1	Belt / 1
Number Motors	1	1	1	1
Motor hp (Standard/Oversized)	3.0 / 5.0	3.0 / 5.0	3.0 / 5.0	3.0 / 5.0
Motor rpm (Standard/Oversized)	1,740 / 3,450	1,740 / 3,450	1,740 / 3,450	1,740 / 3,450
Motor Frame Size (Standard/Oversized)	145T / 145T	145T / 145T	145T / 145T	145T / 145T

Table 9. General data—12½–15 tons high efficiency (continued)

	12½ Tons Downflow and Horizontal Units		15 Tons Downflow and Horizontal Units	
	TH*150G3,4,W	YH*150G3,4,W	TH*180G3,4,W	YH*180G3,4,W
Filters				
Type Furnished(f)	Throwaway	Throwaway	Throwaway	Throwaway
Number Size Recommended				
Downflow	(4)20x20x2 (4)20x25x2	(4)20x20x2 (4)20x25x2	(8)20x20x2 (4)20x16x2	(8)20x20x2 (4)20x16x2
Horizontal	(8)20x25x2	(8)20x25x2	(12)20x20x2	(12)20x20x2
Refrigerant Charge (Pounds of R-410A) (g)				
Downflow and Horizontal (Cir#1/Cir#2)	12.5/7.1	12.5/7.1	13.0/8.5	13.0/8.5
Optional Hot Gas Reheat Coil (Cir#1/Cir#2)	9.2 / 6.9	9.2 / 6.9	10.9 / 8.9	10.9 / 8.9

(a) Cooling Performance is rated at 95°F ambient, 80°F entering dry bulb, 67°F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Units are suitable for operation to ±20% of nominal cfm. Certified in accordance with the Unitary Large Equipment Certification Program, which is based on AHRI Standard 340/360.
(b) EER is rated at AHRI conditions and in accordance with AHRI Standard 210/240 or 340/360.
(c) Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 340/360.
(d) 3 stages not available with Reheat models.
(e) Outdoor Sound Rating shown is tested in accordance with AHRI Standard 270 or 370.
(f) An optional 2 inch pleated filter is also available.
(g) Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
* Indicates both downflow and horizontal units.

Table 10. General data—heating—12½-15 tons high efficiency

	12½ Tons Downflow and Horizontal Units			15 Tons Downflow and Horizontal Units		
	Heating Performance(a) (Gas/Electric Only)					
Heating Models	**Low**	**High**	**Modulating Turn Down = 2.5:1**	**Low**	**High**	**Modulating Turn Down = 2.5:1**
Heating Input (Btu/h)	150,000	250,000	350,000	250,000	350,000	350,000
1st Stage (Btu)	100,000	175,000	140,000	175,000	250,000	140,000
Heating Output (Btu/h)	120,000	200,000	280,000	200,000	280,000	280,000
1st Stage (Btu)	80,000	140,000	112,000	140,000	200,000	112,000
Steady State Efficiency%	80	80	80	80	80	80
No. Burners	1	1	1	1	1	1
No. Stages	2	2	N/A	2	2	N/A
Gas Supply Line Pressure (in. wc)	2.5 / 14.0	2.5 / 14.0	2.5 / 14.0	2.5 / 14.0	2.5 / 14.0	2.5 / 14.0
Natural or LP (minimum/maximum)			Natural Only			Natural Only
Gas Connection Pipe Size (in.)	½	½	¾	½	¾	¾

(a) Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 2000 feet. For elevations above 2000 feet, ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

Table 11. General data—17½–20 tons high efficiency

	17½ Tons Downflow and Horizontal Units		20 Tons Downflow and Horizontal Units	
	TH*210G3,4,W	**YH*210G3,4,W**	**TH*240G3,4,W**	**YH*240G3,4,W**
Cooling Performance[a]				
Gross Cooling Capacity	214,800	214,800	248,500	248,500
EER[b]	11.8	11.8	11.0	11.0
Nominal CFM / AHRI Rated CFM	7,000 / 5,600	7,000 / 5,600	8,000 / 6,400	8,000 / 6,400
AHRI Net Cooling Capacity	204,000	204,000	234,000	234,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	13.0/14.0	13.0/14.0	12.4/14.0	12.4/14.0
Percent Capacity @ part load (Stage 1/Stage 2/Stage 3)[d]	31/69/100	31/69/100	30/70/100	30/70/100
System Power (kW)	17.29	17.29	21.27	21.27
Compressor				
Number/Type	2 / Scrolls	2 / Scrolls	2 / Scrolls	2 / Scrolls
Sound				
Outdoor Sound Rating (BELS)[e]	9.2	9.2	9.4	9.4
Outdoor Coil				
Type	Microchannel	Microchannel	Microchannel	Microchannel
Coil Width (in.)	1.0	1.0	1.0	1.0
Face Area (sq. ft.)	42.6	42.6	42.6	42.6
Rows/FPI	1 / 20	1 / 20	1 / 20	1 / 20
Indoor Coil				
Type	Hi-Performance	Hi-Performance	Hi-Performance	Hi-Performance
Tube Size (in.) ID	0.3125	0.3125	0.3125	0.3125
Face Area (sq. ft.)	31.42	31.42	31.42	31.42
Rows/FPI	4 / 15	4 / 15	4 / 15	4 / 15
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT	1/1.00 NPT
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used/Diameter (in.)	2 / 26	2 / 26	2 / 28	2 / 28
Drive Type/No. Speeds	Direct / 1	Direct / 1	Direct / 1	Direct / 1
cfm	15,800	15,800	16,500	16,500
Number Motors/hp	2 / 1.0	2 / 1.0	2 / 1.0	2 / 1.0
Motor rpm	1,125	1,125	1,125	1,125
Indoor Fan				
Type	FC Centrifugal	FC Centrifugal	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 18x18	1 / 18x18	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1	Belt / 1	Belt / 1
Number Motors	1	1	1	1
Motor hp (Standard/Oversized)	5.0 / 7.5	5.0 / 7.5	5.0 / 7.5	5.0 / 7.5
Motor rpm (Standard/Oversized)	3,450 / 3,470	3,450 / 3,470	3,450 / 3,470	3,450 / 3,470
Motor Frame Size (Standard/Oversized)	145T / 184T	145T / 184T	145T / 184T	145T / 184T

Table 11. General data—17½–20 tons high efficiency (continued)

	17½ Tons Downflow and Horizontal Units		20 Tons Downflow and Horizontal Units	
	TH*210G3,4,W	YH*210G3,4,W	TH*240G3,4,W	YH*240G3,4,W
Filters				
Type Furnished[f]	Throwaway	Throwaway	Throwaway	Throwaway
Number Size Recommended				
Downflow	(8)20x20x2 (4)20x16x2	(8)20x20x2 (4)20x16x2	(8)20x20x2 (4)20x16x2	(8)20x20x2 (4)20x16x2
Horizontal	(12)20x20x2	(12)20x20x2	(12)20x20x2	(12)20x20x2
Refrigerant Charge (Pounds of R-410A)[g]				
Downflow and Horizontal (Cir#1/Cir#2)	14.0 / 7.3	14.0 / 7.3	15.5 / 7.5	15.5 / 7.5
Optional Hot Gas Reheat Coil (Cir#1/Cir#2)	12.2/8.9	12.2/8.9	11.9 / 9.6	11.9 / 9.6

(a) Cooling Performance is rated at 95°F ambient, 80°F entering dry bulb, 67°F entering wet bulb. Gross capacity does not include the effect of fan motor heat. AHRI capacity is net and includes the effect of fan motor heat. Units are suitable for operation to ±20% of nominal cfm. Certified in accordance with the Unitary Large Equipment Certification Program, which is based on AHRI Standard 340/360.
(b) EER is rated at AHRI conditions and in accordance with AHRI Standard 210/240 or 340/360.
(c) Integrated Energy Efficiency Ratio (IEER) is rated in accordance with AHRI standard 210/240 or 340/360.
(d) 3 stages not available with Reheat models.
(e) Outdoor Sound Rating shown is tested in accordance with AHRI Standard 270 or 370.
(f) An optional 2 inch pleated filter is also available.
(g) Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
* Indicates both downflow and horizontal units.

Table 12. General data—heating—17½–20 tons high efficiency

	17½ Tons Downflow and Horizontal Units			20 Tons Downflow and Horizontal Units		
	Heating Performance[a] (Gas/Electric Only)					
Heating Models	**Low**	**High**	**Modulating Turn Down = 2.5:1**	**Low**	**High**	**Modulating Turn Down = 2.5:1**
Heating Input (Btu/h)	250,000	350,000	350,000	250,000	400,000	350,000
1st Stage (Btu)	175,000	250,000	140,000	175,000	300,000	140,000
Heating Output (Btu/h)	200,000	280,000	280,000	200,000	320,000	280,000
1st Stage (Btu)	140,000	200,000	112,000	140,000	240,000	112,000
Steady State Efficiency%	80	80	80	80	80	80
No. Burners	1	1	1	1	1	1
No. Stages	2	2	N/A	2	2	N/A
Gas Supply Line Pressure (in. wc)	2.5 / 14.0	2.5 / 14.0	2.5/14.0	2.5 / 14.0	2.5 / 14.0	2.5/14.0
Natural or LP (minimum/maximum)			Natural Only			Natural Only
Gas Connection Pipe Size (in.)	½	¾	¾	½	¾	¾

(a) Heating Performance limit settings and rating data were established and approved under laboratory test conditions using American National Standards Institute standards. Ratings shown are for elevations up to 2000 feet. For elevations above 2000 feet, ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

Table 13. General data—25 tons high efficiency

	25 Tons Downflow and Horizontal Units	
	TH*300G3,4,W	YH*300G3,4,W
Cooling Performance[a]		
Gross Cooling Capacity	292,300	292,300
EER[b]	10.6	10.6
Nominal CFM / AHRI Rated CFM	10,000 / 8,000	10,000 / 8,000
AHRI Net Cooling Capacity	274,000	274,000
Integrated Energy Efficiency Ratio (IEER) (One Speed Fan / Multi or Variable Speed Fan)[c]	12.4/15.0	12.4/15.0
Percent Capacity @ part load (Stage 1/Stage 2/Stage 3/Stage 4)[d]	25/50/75/100	25/50/75/100
System Power (kW)	25.85	25.85
Compressor		
Number[e]/Type	3 / Scrolls	3 / Scrolls
Sound		
Outdoor Sound Rating (BELS)[f]	9.4	9.4
Outdoor Coil		
Type	Microchannel	Microchannel
Coil Width (in.)	1.0	1.0
Face Area (sq. ft.)	42.58	42.58
Rows/FPI	1 / 20	1 / 20
Indoor Coil		
Type	Hi-Performance	Hi-Performance
Tube Size (in.) ID	0.3125	0.3125
Face Area (sq. ft.)	31.42	31.42
Rows/FPI	4 / 15	4 / 15
Refrigerant Control	TXV	TXV
Drain Connection Number/Size (in.)	1/1.00 NPT	1/1.00 NPT
Outdoor Fan		
Type	Propeller	Propeller
Number Used/Diameter (in.)	2 / 28	2 / 28
Drive Type/No. Speeds	Direct / 1	Direct / 1
cfm	16,500	16,500
Number Motors/hp	2 / 1.0	2 / 1.0
Motor rpm	1,125	1,125
Indoor Fan		
Type	FC Centrifugal	FC Centrifugal
Number Used/Diameter (in.)	1 / 18x18	1 / 18x18
Drive Type/No. Speeds	Belt / 1	Belt / 1
Number Motors	1	1
Motor hp (Standard)	7.5	7.5
Motor rpm (Standard)	3,470	3,470
Motor Frame Size (Standard)	184T	184T

ATTACHMENT F

NOISE REDUCTION CALCULATION

Noise Reduction Calculation for Stationary Noise Sources																	
Land Use	**Noise Source**	**Wall Height**	**Wall Elevation**	**Rec. elev.**	**Rec. Height**	**Source Elevation**	**Source Height**	**Source to Barrier**	**Rec. to Source dist.**	**Rec. to Barr. dist.**	**d1**	**d2**	**d3**	**delta**	**N**	**Calculated Noise Reduction**	**Noise Reduction Applied to Noise Analysis**
Residence	HVAC	5	35	0	5	35	3	10	192	182	194.82	185.33	10.20	0.72	0.70	9.3	8.0