HELIX
Environmental Planning

Victoria Greens Project

Acoustical Analysis Report

October 2018

Prepared for:

Integral Communities
888 San Clemente Drive, Suite 100
Newport Beach, CA 92660

Prepared by:

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Carson
CMU	concrete masonry unit
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibels
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
in/sec	inches per second
kHz	kilohertz
L_{DN}	Day-Night level
L_{EQ}	equivalent sound level
L_{MAX}	maximum noise level
mPa	micro-Pascals
NSLU	noise-sensitive land use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SPL	sound pressure level
SR	State Route
STC	Sound Transmission Class
S_{WL}	sound power level
TNM	Traffic Noise Model
USDOT	U.S. Department of Transportation

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EXECUTIVE SUMMARY

This report presents an assessment of potential construction and operational noise impacts associated with the proposed Victoria Greens project (project).

The project is located within the City of Carson (City) on a 8.07-acre site at the northeast corner of Victoria Street and Central Avenue. The project would construct 175 residential units.

Exterior noise levels from vehicular traffic would exceed the City's 65 Community Noise Equivalent Level (CNEL) threshold for the project's exterior use areas. Mitigation measure NOI-1 requires a 6-foot sound wall to protect the linear park exterior use area from noise generated by Victoria Street traffic.

Because noise levels at the building façades were modeled above 60 CNEL, interior noise levels may not comply with the City's interior noise standard of 45 CNEL. Mitigation Measure NOI-2 would ensure that interior noise levels do not exceed 45 CNEL and requires an exterior-to-interior analysis to be conducted upon completion of final building design.

Anticipated construction noise impacts would cause potentially significant noise impacts to surrounding residences. General construction equipment noise impacts would be reduced to less than significant levels with the implementation of mitigation measure NOI-3, which would require a temporary sound barrier between project construction equipment and a nearby daycare facility.

Vibration from construction equipment may be perceptible at the nearby daycare facility. Mitigation Measure NOI-4 would ensure that a vibratory roller is not used within 50 feet of the project edge.

Operational noise sources such as the project's heating, ventilation, and air conditioning (HVAC) noise would not exceed allowable City limits within the noise ordinance for operational sources at the nearest property lines.

The project would add traffic to nearby roadways, but transportation noise impacts to off-site land uses are expected to be less than significant. The noise analysis will be updated pending the receipt of the project's full traffic study.

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1.0 INTRODUCTION

1.1 PURPOSE OF THE PROJECT

This report analyzes potential noise and vibration impacts associated with the proposed Victoria Greens project (project). The analysis includes a description of existing conditions in the project vicinity, an assessment of potential impacts associated with project construction, and an evaluation of project operational impacts. Analysis within this report addresses the relevant issues listed in Appendix G of the California Environmental Quality Act (CEQA) Guidelines.

1.2 PROJECT LOCATION

The project is located on a 8.07-acre site at the northeast corner of the intersection of Victoria Street and Central Avenue in the City of Carson, California. See Figure 1, *Regional Location*, and Figure 2, *Aerial Vicinity*.

1.3 PROJECT DESCRIPTION

The project proposes the construction of a multi-family residential development. The project would contain 175 units. The project proposes 51 two-bedroom units and 124 three-bedroom units. Additionally, the project would include a club house, pool, linear park, and dog park. An existing Verizon control office and tower is surrounded on three sides by the project site. The proposed project would wrap around the northern, eastern, and southern sides of an existing Verizon facility. The project would include a concrete masonry unit (CMU) block walls to shield the site from the neighboring facility. See Figure 3, *Site Plan*.

The site is zoned as part of the Dominguez Hills Village Specific Plan with a General Plan land use designation of Mixed Use – Residential.

1.4 NOISE AND SOUND LEVEL DESCRIPTORS AND TERMINOLOGY

1.4.1 Descriptors

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration. The Community Noise Equivalent Level (CNEL) is a 24-hour average, where noise levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dBA weighting, and sound levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dBA weighting. This is similar to the Day-Night sound level (L_{DN}), which is a 24-hour average with an added 10 dBA weighting on the same nighttime hours but no added weighting on the evening hours. Sound levels expressed in CNEL are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, as well as for land use guidelines and enforcement of noise ordinances.

1.4.2 Terminology

1.4.2.1 Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

1.4.2.2 Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

1.4.2.3 Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this wide range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA. The threshold of hearing for the human ear is about 0 dBA, which corresponds to 20 mPa.

1.4.2.4 Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through standard arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than from one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dBA—rather, they would combine to produce 73 dBA. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dBA louder than one source.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dBA changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dBA are generally not perceptible. It is widely accepted, however, that people begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5 dBA increase is generally perceived as a distinctly noticeable increase, and a 10 dBA increase is generally perceived as a doubling of loudness.

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0 10 Miles

Source: Base Map Layers (ESRI, 2013)

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Regional Location

Figure 1

I:\PROJECTS\I\PQ\PQ-26_UrbanArena\Map\Noise\Fig2_AerialVicinity.mxd IPQ-26 10/30/2018- RP

0 300 Feet

Aerial Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Aerial Vicinity

Figure 2

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Source: Urban Arena 2017

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Site Plan

Figure 3

No known studies have directly correlated the ability of a healthy human ear to discern specific levels of change in traffic noise over a 24-hour period. Many ordinances, however, specify a change of 3 CNEL as the significant impact threshold. This is based on the concept of a doubling in noise energy resulting in a 3 dBA change in noise, which is the amount of change in noise necessary for the increase to be perceptible to the average healthy human ear.

1.5 NOISE-SENSITIVE LAND USES

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise, including residences, hospitals, schools, hotels, resorts, libraries, sensitive wildlife habitat, or similar facilities where quiet is an important attribute of the environment. Noise receptors are individual locations that may be affected by noise.

1.6 REGULATORY FRAMEWORK

1.6.1 California Noise Control Act

The California Noise Control Act is a section within the California Health and Safety Code that describes excessive noise as a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also finds that there is a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

1.6.2 California Noise Insulation Standards [California's Title 24 Noise Standards, Cal. Adm. Code Title 24, Chap. 2-35]

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for multi-family residential buildings (Title 24, Part 2, California Code of Regulations). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a residential building or structure is proposed to be located near an existing or adopted freeway route, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, and where such noise source or sources create an exterior CNEL (or L_{DN}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{DN}) of 45 dBA or less.

1.6.3 City of Carson General Plan, Noise Element

The Noise Element of the City's General Plan includes a noise and land use compatibility matrix (Table 1 below) for assessing the suitability of different categories of planned land uses based on exterior noise level exposure (Table N-2 from the City General Plan). For the project's proposed residential land use (Residential-Multiple Family), the Noise Element specifies exterior noise levels up to 60 CNEL as normally acceptable and up to 65 CNEL is conditionally acceptable. Noise levels exceeding 65 CNEL are generally unacceptable for multiple family residential uses.

Table 1
NOISE AND LAND USE COMPATIBILITY MATRIX

Land Use Category	Community Noise Exposure (CNEL)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential-Low Density	50-60	60-65	65-75	75-85
Residential-Multiple Family	50-60	60-65	65-75	75-85
Transient Lodging-Motel, Hotels	50-65	65-70	70-80	80-85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50-60	60-65	65-80	80-85
Auditoriums, Concert Halls, Amphitheaters	NA	50-65	NA	65-85
Sports Arenas, Outdoor Spectator Sports	NA	50-70	NA	70-85
Playgrounds, Neighborhood Parks	50-70	NA	70-75	75-85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50-70	NA	70-80	80-85
Office Buildings, Business Commercial and Professional	50-67.5	67.5-75	75-85	NA
Industrial, Manufacturing, Utilities, Agriculture	50-70	70-75	75-85	NA

Source: City of Carson General Plan, Noise Element (Table N-2). Modified from U.S. Department of Housing and Urban Development Guidelines and State of California Standards.
Notes:
NORMALLY ACCEPTABLE: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
CONDITIONALLY ACCEPTABLE: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
NORMALLY UNACCEPTABLE: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
CLEARLY UNACCEPTABLE: New construction or development should generally not be undertaken.
CNEL=Community Noise Equivalent Level; NA=Not Applicable

Section 3.4 of the City Noise Element identifies residences, public and private school/preschool classrooms, churches, hospitals, and elderly care facilities as noise sensitive receptors. The maximum interior exposure for these land uses is 45 dBA CNEL, with a maximum exterior exposure of 65 dBA CNEL.

1.6.4 City of Carson Noise Control Ordinance (Municipal Code, Article V Chapter 5)

Section 4100 (Unnecessary Noises) of Chapter 1, Article IV of the City Municipal Code pertain to the City noise requirements and enforcement of violations. The City has adopted the County of Los Angeles Noise Ordinance for the purpose of controlling excessive noise levels, including noise from construction activities. Table 2, *Noise Ordinance Standards*, displays the interior and exterior noise limits for all properties within designated noise zones.

Table 2
NOISE ORDINANCE STANDARDS

Noise Zone	Designated Noise Zone Land Use (Receptor Property)	Time Interval	Exterior Noise Level (dB)	Interior Noise Level (dB)
I	Noise Sensitive-Area	Anytime	45	-
II	Residential Properties	10:00 pm to 7:00 am (nighttime) 7:00 am to 10:00 pm (daytime)	45 50	- -
III	Commercial Properties	10:00 pm to 7:00 am (nighttime) 7:00 am to 10:00 pm (daytime)	55 60	- -
IV	Industrial Properties	Anytime	70	-
All Zones	Multi-family	10:00 pm – 7:00 am	-	40
	Residential	7:00 am – 10:00 pm	-	45
All Zones	Open Space/ Recreation Parks		65	-

Source: City of Carson Noise Ordinance; adopted from: Section 12.08.490 and 12.08.400 in County of Los Angeles Code. Nov. 2001.

Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real-property line, except for emergency work of public service utilities or by variance issued by the health officer is prohibited.

City standards for construction noise from mobile equipment is divided into two categories: non-scheduled, intermittent, short-term operations of 20 days or less and repetitively-scheduled and relatively long-term operations of 21 days or more. Table 3, *Maximum Exterior Noise Limits for Construction Noise*, shows the standard for both short- and long-term construction activities. Noise levels are assumed to be one-hour averages.

Table 3
MAXIMUM EXTERIOR NOISE LIMITS FOR CONSTRUCTION NOISE

Region	Short-term 7:00 a.m. to 8:00 p.m.	Short-term 8:00 p.m. to 7:00 a.m.[1]	Long-term 7:00 a.m. to 8:00 p.m.	Long-term 8:00 p.m. to 7:00 a.m.[1]
Single-family Residential	75 dBA	60 dBA	65 dBA	55 dBA
Multi-family Residential	80 dBA	64 dBA	70 dBA	60 dBA
Semi-residential/ Commercial	85 dBA	70 dBA	70 dBA	60 dBA

Source: Section 5502 City of Carson Noise Ordinance
[1] Includes all day Sunday and legal holidays
Note: Short-term is defined as construction lasting 20 days or less, and long-term is defined as 21 days or more.

For vibration, the operation or permitting the operation of any device creating vibration above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hz.

2.0 ENVIRONMENTAL SETTING

2.1 SURROUNDING LAND USES

The project site is within in an urban area. Industrial complexes are found immediately to the north of the site and across Victoria Street south of the site. One industrial complex on the north side has been converted into a child care facility. A currently unused Northrop Grumman facility is immediately to the east of the property and a multifamily residential neighborhood is located across Central Avenue to the west. An existing Verizon control office and tower is located on the parcel, which is not part of the project. The proposed project would wrap around on the northern, eastern, and southern sides of the Verizon facility. Numerous distribution warehouses are located in the surrounding area. State Route (SR) 91 is located a quarter of a mile to the north of the site.

2.2 EXISTING NOISE ENVIRONMENT

Existing noise sources include nine large air conditioners present on the northern side of the Verizon facility. Additionally, due to the numerous distribution warehouses in the surrounding area, heavy-duty trucks use Central Avenue, Victoria Street, and nearby SR-91 to transport goods twenty-four hours per day. The delivery truck activity is in addition to normal vehicular traffic. Airplanes from the Compton/Woodley Airport, located approximately 1.3 miles to the north, contribute to the existing noise environment as well.

2.2.1 Ambient Noise Survey

Three measurements were included in the ambient noise survey. The measured noise levels and related environmental conditions are shown in Table 4, *Noise Measurement Results*. See Figure 4, *24-hour Ambient Noise Measurement*.

The location for Measurement 1 (M1) is in the west side site entrance pocket on Central Avenue, approximately 15 feet east of the edge of the roadway and 600 feet north of the center of the intersection with Victoria Street. This measurement was taken to measure traffic noise from Central Avenue. Traffic counts were recorded for automobiles, medium-size trucks (double-tires/two axles), and heavy trucks (three or more axles). The traffic distribution of Sycamore Avenue includes a higher proportion of truck traffic than a typical residential road due to the roadway's use as a connection between industrial areas to the south and SR-91 to the north. Traffic counts for the timed measurement and the one-hour equivalent volume are shown in Table 5, *Recorded Traffic Volume and Vehicle Mix*. For Measurement 2 (M2), a 24-hour monitor measurement was taken in the same area of the project site, approximately 25 feet southeast from M1. M2 was located at the northeast corner of the entrance pocket next to an existing power pole. A third measurement was made within the site at approximately 15 feet from the edge of the Verizon building along the center area of the building air conditioning condenser units.

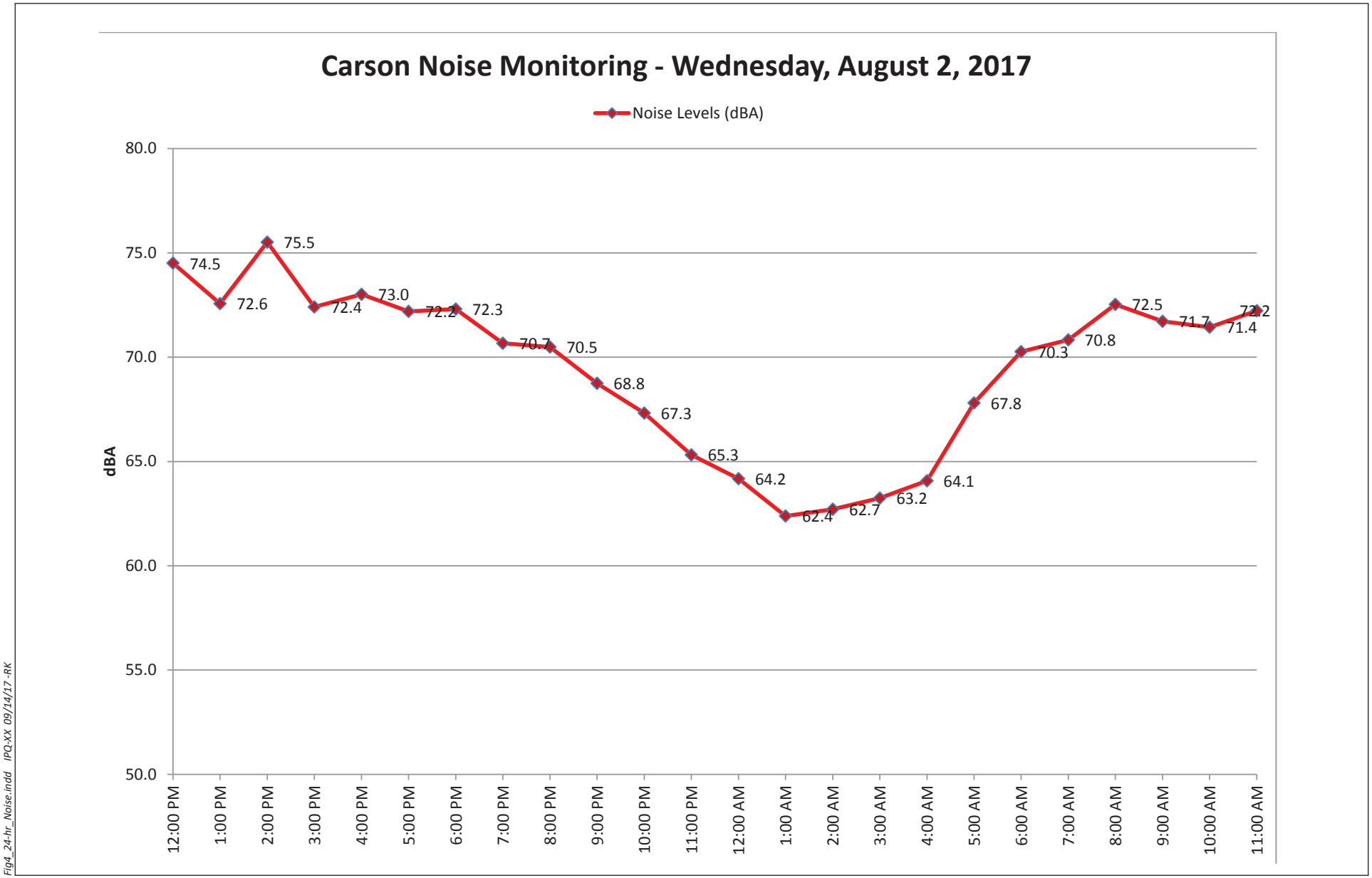

Fig4_24-hr_Noise.indd IPQ-XX 09/14/17 -RK

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24-hour Ambient Noise Measurement

Figure 4

Table 4
NOISE MEASUREMENT RESULTS

Measurement 1 - Traffic	
Date:	August 3, 2017
Conditions:	Temperature: 88°F. Wind Speed: 2 mph. 72 percent humidity. Sunny.
Time:	11:35 a.m. – 11:50 a.m.
Location:	West side site entrance pocket on Central Avenue, approximately 15 feet east of the edge of the roadway and 600 feet north of the center of the intersection with Victoria Street
Measured Noise Level:	71.7 dBA L_{EQ}
Notes:	High percentage of heavy-duty Truck traffic.
Measurement 2 - Ambient	
Date:	August 2, 2017 to August 3, 2017
Conditions:	Temperature: Varies. Wind Speed: low.
Time:	11 a.m. – 9:54 a.m.
Location:	Approximately 250 feet southeast of Measurement 1 location, and 310 feet from the roadway centerline of Sycamore Avenue.
Measured Noise Level:	62.4 up to 75.5 dBA L_{EQ} See Figure 4, *24-hour Ambient Noise Measurement*, for the graph with hourly noise levels.
Notes:	Traffic noise from Central Avenue.
Measurement 3 – Air Conditioners	
Date:	August 3, 2017
Conditions:	Temperature: 88°F. Wind Speed: 2 mph. 72 percent humidity. Sunny.
Time:	12:10 P.M.
Location:	15 feet from the edge of the Verizon building along the center area of the building air conditioning condenser units.
Measured Noise Level:	70.1 dBA L_{EQ}
Notes:	Approximately 18 out of a total of 22 fans were in operation.

Table 5
RECORDED TRAFFIC VOLUME AND VEHICLE MIX FOR MEASUREMENT 1

Roadway	Traffic	Autos	MT[1]	HT[2]
Central Avenue	15-minute Count	458	20	32
	One-hour Equivalent	1832	80	128
	Percent	**91.6%**	**3.2%**	**5.2%**

[1] Medium Trucks (double tires/two axles)
[2] Heavy Trucks (three or more axles)

3.0 ANALYSIS METHODOLOGY AND ASSUMPTIONS

3.1 METHODOLOGY

3.1.1 Ambient Noise Survey

The following equipment was used to measure existing noise levels at the project site:

- Larson Davis 831 Noise Meter
- Larson Davis Spark 703 Noise Meter
- Larson Davis Model CA250 Calibrator
- Windscreen and tripod for the sound level meter

The sound level meter was field-calibrated immediately prior to the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report were made with a sound level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI SI.4-1983 R2006). All instruments were maintained with National Institute of Standards and Technology traceable calibration per the manufacturers' standards.

3.1.2 Noise Modeling Software

Modeling of the exterior noise environment for this report was accomplished using two computer noise models: Computer Aided Noise Abatement (CadnaA) version 2017 and Traffic Noise Model (TNM) version 2.5. CadnaA is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project-related information, such as noise source data, barriers, structures, and topography to create a detailed CadnaA model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. CadnaA traffic noise prediction is based on the data and methodology used in the TNM. The TNM was released in February 2004 by the U.S. Department of Transportation (USDOT), and calculates the daytime average hourly L_{EQ} from three-dimensional model inputs and traffic data (California Department of Transportation [Caltrans] 2004). The TNM used in this analysis was developed from Computer Aided Design (CAD) plans provided by the project architect. Input variables included road alignment, elevation, lane configuration, area topography, existing and planned noise control features, projected traffic volumes, estimated truck composition percentages, and vehicle speeds.

The one-hour L_{EQ} noise level is calculated utilizing peak-hour traffic; peak-hour traffic volumes can be estimated based on the assumption that 10 percent of the average daily traffic would occur during a peak hour. The model-calculated one-hour L_{EQ} noise output is the equivalent to the CNEL (Caltrans Technical Noise Supplement, November 2009).

The truck traffic is distributed with 80 percent of the truck traffic driving in the outside lanes and 20 percent driving in the center roadway lanes with an assumed acceleration profile at 45 mph.

The measured noise level of 71.7 dBA L_{EQ} at the project site was compared to a modeled noise level in CadnaA, using the traffic counts and traffic mix for model calibration. The modeled traffic noise level for the same location was 70.6 dBA L_{EQ}. Given the 1.1 dBA variance, no adjustments to the model were made for traffic.

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

3.2 ASSUMPTIONS

3.2.1 Construction

3.2.1.1 General Equipment Assumptions

Construction would require the use of equipment throughout the site for the full term of construction. Standard equipment used on the site is assumed to include a backhoe, front-end loader, grader, dump truck, vibratory roller, and small bulldozer.

The site is mostly level and no significant materials import or export is assumed. Normal construction would require over excavation, refill, and compaction followed by foundation excavation. Foundation work would require a concrete pour with vertical construction after. Temporary noise impacts would be the loudest during the over excavation, refill, and compaction phase. The analysis is based on the use of a loader small dozer, and dump truck.

The most likely source of vibration during project construction would be a vibratory roller, which may be used to achieve soil compaction as part of foundation construction and fill compaction.

3.2.2 Operation

Anticipated project site operational noise sources include heating, ventilation, and air conditioning (HVAC) systems and vehicular traffic.

3.2.2.1 Residential Air Conditioners

Specific planning data for the future HVAC systems is not available at this stage of project design; however, analysis using a typical to larger-sized residential condenser mounted on the rooftop provides a reasonable basis for analysis. The unit used in this analysis is a Carrier 38HDR060 split system condenser (see Appendix A, *Carrier 38HDR060 Split System Condenser*). The manufacturer's noise data is provided below in Table 6, *Carrier HDR060 Condenser Noise.*

Table 6
CARRIER 38HDR060 CONDENSER NOISE

Noise Levels in Decibels[1] (dB) Measured at Octave Frequencies							Overall Noise Level in A-weighted Scale (dBA)[1]
125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
63.0	61.5	64.0	66.5	66.0	64.5	55.5	72.0

[1] Sound Power Levels (S_{WL})
Hz = Hertz; kHz = kilohertz

3.2.2.2 Vehicular Traffic

Traffic data for two main roadways in the project vicinity (Victoria Street and Central Avenue) are based on volumes found in the project's Traffic Impact Analysis (TIA; Fehr & Peers 2018). The TIA forecasts an annual growth rate of 0.5 percent. Personal communications with study author confirms that the peak hour traffic is approximately 10 percent of annual daily traffic (ADT). Therefore, the maximum peak hour (either AM or PM) is be used as a basis of planning CNEL.

To calculate the Year 2035 scenarios, the 0.5 percent growth rate was added to the project's 2020 peak hour values from the TIA. The full hourly traffic volumes used in this analysis are provided in Table 7, *Existing and Future Traffic Volumes*.

Table 7
EXISTING AND FUTURE TRAFFIC VOLUMES

Roadway Segment	Hourly Traffic Volumes (Peak Hour)			
	2020 No Project[1]	Project[1]	2035 No Project[2]	2035 + Project
Central Avenue	2,071	61	2,239	2,300
Victoria Street	1,234	8	1,339	1,347

[1] Peak hour and project volumes taken from project TIA
[2] Calculated using a 0.5 percent growth rate from 2020 volumes

Both Central Avenue and Victoria Street have higher than typical percentages of heavy truck traffic. The vehicle distribution observed during the noise survey for this project was used to model future traffic scenarios with a truck acceleration noise profile.

3.2.2.3 Off-site Sources

As noted in the ambient noise survey, the Verizon facility's air conditioning equipment was measured at approximately 15 feet inside the site property. During the survey, approximately 80 percent of the 22 cooling fans were operational. The units were only operating on and off at a single speed and are assumed to be operating at 50 percent during nighttime hours (10:00 p.m. to 7:00 a.m.) as single full speed fans.

A fan for a typical large cooling unit (as measured on a Carrier 30RB70 unit) is provided in Table 8 below. This represents a fan at 1,150 Revolutions per minute (RPM).

Table 8
TYPICAL UNIT FAN NOISE

Noise Levels in Decibels[1] (dB) Measured at Octave Frequencies in Hertz (Hz)								Overall Noise Level in A-weighted Scale (dBA)
Fan Type	63 Hz	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	
Single Fan 1,150 RPM	90.6	93.6	89.6	86.6	84.6	79.6	75.6	86.3

[1] Sound Power Levels (S_{WL})

While not audible during the ambient noise survey, the nearby commercial facilities have numerous rooftop mounted packaged air conditioners. These units are analyzed based on a typical 15-ton packaged unit noise of 85 dBA (Sound Power) assuming a 25 percent hourly operating profile during nighttime hours (10:00 p.m. to 7:00 a.m.).

Truck backup alarms at nearby facilities are modeled at ground level with the nearest activity occurring the back of the neighboring facility south of the project across Victoria Street. A typical backup alarm may run from 94 to 107 dBA at a distance of 4 feet (at a single frequency of 1 KHz, or 1,000 Hz,). Modeling is based on a single hourly incident of a 107 dBA alarm (S_{WL} 109.7 dBA) in use for 30 seconds in a given hour.

No other sources of significant off-site noise generation were observed during the site visit or assumed from aerial views.

3.3 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE

Threshold 1: Expose persons to or generate noise levels in excess of standards established in the Carson General Plan or noise ordinance.

Impacts would be significant if the project would expose proposed multi-family residential uses to exterior noise levels exceeding 65 CNEL, interior noise levels exceeding 45 CNEL, or generate noise levels at a common property line with a residential property that would exceed daytime limits (7:00 a.m. to 10:00 p.m.) of 50 dBA or nighttime (10:00 p.m. to 7:00 a.m.) limits of 45 dBA. For a commercial property, impacts would be significant if the project would generate noise levels exceeding daytime limits of 60 dBA, nighttime limits of 55 dBA, or 70 dBA at any time at industrial properties.

Threshold 2: Cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

For traffic-related noise, impacts are considered significant in areas where existing traffic noise exceeds 65 CNEL and implementation of a project would result in an increase of the noise level by 3 dBA or more.

Threshold 3: Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Construction activity would be considered significant for nearby commercial structures if it exceeds one-hour average noise levels of 85 dBA for daytime (7:00 a.m. to 7:00 p.m.) short-term (20 days or less) construction operations or 70 dBA for daytime long-term (21 days or more) construction operations. Construction activity is significant for nearby multi-family residences if it exceeds one-hour noise levels of 80 dBA for short-term construction and 65 dBA for long-term construction. The ordinance prohibits construction and building work between the hours of 7:00 p.m. and 7:00 a.m. of the next day, on Sundays, or on a holiday.

Threshold 4: Expose persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

Vibration caused by the project would be significant if it creates vibration at nearby properties with a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz.

Threshold 5: For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public use airport or private airstrip, expose people residing or working in the project area to excessive noise.

Excessive noise exposure is defined as noise levels that exceed the standards of 65 CNEL in the City General Plan for the project's residential land uses.

4.0 IMPACTS

4.1 ISSUE 1: CONSISTENCY WITH NOISE STANDARDS

Would the project expose persons to or generate noise levels in excess of standards established in the City of Carson General Plan or noise ordinance?

4.1.1.1 Off-site Transportation Noise Exposure

As noted in the assumptions, future traffic noise levels presented in this analysis are based on an annual 0.5 percent increase from existing traffic counts. Refer to Table 7 for the forecasted ADT data for existing and project-added traffic volumes. The 2035 conditions were used to conservatively estimate on-site traffic noise impacts.

Traffic levels in year 2035 conditions coupled with the high level of truck traffic create a generally high level of noise across the project site. This level of noise can be seen reflected in Figure 5, *Future Traffic Noise Contours, Receivers, and Proposed Barrier Location*, which provides the future site transportation noise contours for the existing conditions assuming level ground and no structures or topographic features. Noise levels on the site near Central Avenue would be as high as 73.5 CNEL prior to the construction of on-site buildings. Based on the site plan, this would exceed General Plan limits of 65 CNEL for allowable exterior use area noise levels.

The calculated receivers listed in Table 9 below generally start at the southeast corner of the site and move around in a clockwise direction to the northeast corner of the site on Central Avenue. Locations R7 and R8 are located within the site at specific locations based on the site plan. See Figure 5 for exact receiver locations.

Table 9
EXTERIOR NOISE LEVELS

Receiver	Location	Location Type	Noise Levels[1] (CNEL)	Noise Levels with 6-foot Barrier[1] (CNEL)
P1	Pool Use Area	Exterior Use Area	65.7	57.0
LP1	Linear Park	Exterior Use Area	56.8	N/A
D1	Dog Park	Exterior Use Area	59.7	N/A
R1	Southeast Corner	Residential Façade	64.3	N/A
R2	Victoria Street	Residential Façade	68.5	N/A
R3	Victoria Street	Residential Façade	68.8	N/A
R4	Victoria Street	Residential Façade	68.9	N/A
R5	Victoria Street	Residential Façade	66.1	N/A

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0 150 Feet

Aerial Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

HELIX Environmental Planning

Future Traffic Noise Contours, Receivers, and Proposed Barrier Location

Figure 5

Table 9 (cont.)
EXTERIOR NOISE LEVELS

Receiver	Location	Location Type	Noise Levels[1] (CNEL)	Noise Levels with 6-foot Barrier[1] (CNEL)
R6	Victoria Street	Residential Façade	64.1	N/A
R7	Victoria Street	Residential Façade	68.8	N/A
R8	Victoria Street	Residential Façade	68.9	N/A
R9	Victoria Street	Residential Façade	69.8	N/A
R10	Victoria Street	Residential Façade	63.6	N/A
R11	Victoria Street	Residential Façade	69.6	N/A
R12	Victoria Street	Residential Façade	70.1	N/A
R13	Victoria Street	Residential Façade	63.2	N/A
R14	Victoria Street and S Central Avenue	Residential Façade	70.9	N/A
R15	S Central Avenue and Victoria St	Residential Façade	70.3	N/A
R16	S Central Avenue	Residential Façade	67.2	N/A
R17	S Central Avenue	Residential Façade	66.5	N/A
R18	S Central Avenue	Residential Façade	69.9	N/A
R19	S Central Avenue	Residential Façade	67.0	N/A
R20	S Central Avenue	Residential Façade	70.0	N/A
R21	Northwest Corner	Residential Façade	66.8	N/A

[1] Includes planned residential structures

As seen in Table 9, noise levels within the Pool Use Area would exceed the General Plan 65 CNEL limits. Impacts to exterior use areas would therefore be significant without mitigation. Mitigation measure NOI-1 would reduce impacts to less than significant levels.

NOI-1 **On-Site Noise Barriers for Transportation Noise:** Noise levels at the proposed linear park exterior use area exposed to noise levels in excess of 65 CNEL shall be reduced to 65 CNEL. Noise reduction for on-site exterior use area noise impacts shall be accomplished through on-site noise barriers (walls).

The sound wall for this exterior use area exceeding 65 CNEL would be a 6-foot high wall between the two residential buildings flanking the southern portion of the Linear Park site adjacent Victoria Street.

The sound attenuation fence or wall must be solid. It can be constructed of masonry, wood, plastic, fiberglass, steel, or a combination of those materials, as long as there are no cracks or gaps, through or below the wall. Any seams or cracks must be filled or caulked. If wood is used, it can be tongue and groove and must be at least one-inch total thickness or have a density of at least 3½ pounds per square foot. Where architectural or aesthetic factors allow, glass or clear plastic ⅜ of an inch thick or thicker may be used on the upper portion, if it is desirable to preserve a view. Sheet metal of 18 gauge (minimum) may be used, if it meets the other criteria and is properly supported and stiffened so that it does not rattle or create noise itself from vibration or wind. Any door(s) or gate(s) must be designed with overlapping closures on the bottom and sides and meet the minimum specifications of the wall materials described above. The gate(s) may be of one-inch thick or better wood,

solid-sheet metal of at least 18-gauge metal, or an exterior-grade solid-core steel door with prefabricated doorjambs.

As shown in Table 9, with the sound walls installed, on-site noise levels would be below 65 CNEL at the Pool Use Area, and impacts would be less than significant.

4.1.1.2 Off-site Stationary and Operational Noise Exposure

The project is in an industrial area and has the potential to be affected by existing commercial and industrial off-site noise sources including the adjacent Verizon facility's air conditioners, air conditioning units mounted on rooftops of nearby commercial facilities, and off-site trucking activities.

The offsite air conditioning units generate a noise level of 70.6 dBA L_{EQ} immediately adjacent the Verizon air conditioning units, and 41.6 dBA L_{EQ} at the loudest location along Victoria Street from the other industrial buildings to the south of Victoria Street The offsite truck backup alarms would create potential noise levels of 38.7 dBA L_{EQ}.

The expected noise levels from these units would be approximately 55.6 dBA at the Linear Park and 40.3 dBA at the dog park. This equates to approximately 62.3 and 60 CNEL at the tot lot and pocket park, respectively. The continuous use of the Verizon air conditioning units would therefore not exceed the City's General Plan 65 CNEL limits for residential exterior use areas.

4.1.2 Consistency with Interior Noise Standards

As shown with the noise levels in Table 12, building façade noise levels may exceed 60 CNEL at the proposed residences facing both Central Avenue and South Victoria Street. Traditional architectural materials are normally able to reduce exterior-to-interior noise by up to 15 dBA. Therefore, interior noise levels may exceed the 45 CNEL interior noise standard, resulting in a potentially significant impact. To reduce noise impacts to residence interiors, implementation of mitigation measure NOI-2 below would ensure that the potential impacts are reduced to less than significant levels.

NOI-2 **Exterior-to-Interior Noise Level Limit:** Interior noise levels resulting from exterior noise sources for the proposed residences shall not exceed 45 CNEL. Once specific building plan information is available, additional exterior-to-interior noise analysis shall be conducted for the residences facing both Central Avenue and South Victoria Street where exterior noise levels are expected to exceed 60 CNEL to demonstrate that interior levels will not exceed 45 CNEL. The information in the analysis shall include wall heights and lengths, room volumes, window and door tables typical for a building plan, as well as information on any other openings in the building shell. With this specific building plan information, the analysis shall determine the predicted interior noise levels at the planned on-site buildings. If predicted noise levels are found to be in excess of 45 CNEL, the report shall identify architectural materials or techniques that could be included to reduce noise levels to 45 CNEL in habitable rooms. Standard measures such as glazing with Sound Transmission Class (STC) ratings from a STC 22 to STC 60, as well as walls with appropriate STC ratings (34 to 60), should be considered.

Appropriate means of air circulation and provision of fresh air shall be provided to allow windows to remain closed for extended intervals of time so that acceptable interior noise levels can be maintained. The mechanical ventilation system shall meet the criteria of the

International Building Code (Chapter 12, Section 1203.3 of the 2001 California Building Code).

4.1.3 Project-Generated Operational Noise

The project includes the outdoor installation of HVAC condenser units. As mentioned in the assumptions, modeling assumed that the air conditioning condenser would be a Carrier 38HDR060 split system. This unit typically generates a noise level of 56 dBA at a distance of 7 feet. Based on the site plan, the closest building to the property line would be the north commercial building. HVAC units could be placed on either the ground level or the building's rooftops. At ground level the HVAC units would not be located closer than about 35 feet from the nearest property line. At this distance, a single condenser would generate a noise level of 43 dBA. This does not exceed the City's allowable hourly nighttime limit of 45 dBA for residential properties. Impacts would be less than significant.

4.2 ISSUE 2: PERMANENT INCREASE IN AMBIENT NOISE LEVELS

Would the project cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Refer to Table 7 for the forecasted ADT data for existing and project-added traffic volumes.

TNM software was used to calculate the noise contour distances for Existing and Existing + Project conditions. The off-site roadway modeling represents a conservative analysis that does not take into account topography or attenuation provided by existing structures. The results of this analysis for the CNEL at 100 feet is approximately 71 CNEL, which exceeds the standard for multi-family residential uses (65 CNEL).

As noted in Section 4.1, a significant direct impact would occur if existing conditions approach or exceed City standards and the project more than doubles (increases by more than 3 CNEL) the existing noise level. The project would not increase any of the noise levels by more than 3 CNEL, as specified in Threshold 1. Therefore, exterior off-site direct transportation noise impacts would be less than significant.

4.3 ISSUE 3: TEMPORARY INCREASE IN AMBIENT NOISE

Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Construction of the project would involve grading, paving of the site, and erecting new buildings. The magnitude of the impact would depend on the type of construction activity, equipment, duration of each construction phase, distance between the noise source and receiver, and any intervening structures. Construction would generate elevated noise levels that may disrupt nearby residences. NSLUs include residences approximately 140 feet west of the project across Central Avenue and a daycare facility located in a commercial building approximately 30 feet north of the project site.

Construction equipment is mobile and would be moving across the site throughout the construction period. For modeling purposes, the general construction equipment was assumed to operate at a conservative distance of 75 feet from the project boundary. The noise levels for a dozer and a loader at

this distance would be 73.4 dBA L_{EQ} during a given hour, which would be under the short-term construction significance threshold of 80 dBA L_{EQ}. Long term (greater than 20 days) construction would be limited to occasional smaller and low noise equipment such as a mobile lift or skid steer with the potential noise impacts in excess of the long-term 70 dBA L_{EQ} limit.

Long-term construction noise levels at the nearby daycare facility shall be reduced to 70 dBA L_{EQ}. Noise reduction for the noise impacts to the daycare shall be accomplished through implementation of mitigation measure NOI-3.

NOI-3 **Temporary Sound Barriers.** Temporary sound barriers or sound blankets shall be installed between construction operations and adjacent noise-sensitive receptors. Due to equipment exhaust pipes being approximately 7-8 feet above ground, a sound wall at least 10 feet in height above grade, located along the northern property line between the project and neighboring daycare facility from Central Avenue east along the unnamed driveway between the site and daycare for approximately 180 feet. To reduce noise levels effectively, the sound barrier should be constructed of a material with a minimum weight of two pounds per square foot with no gaps or perforations and remain in place until the conclusion of demolition, grading, and construction activities.

4.4 ISSUE 4: VIBRATION

Would the project expose persons to or generation of excessive ground-borne vibration or ground borne noise levels?

A typical on-site source of vibration during project construction would be a vibratory roller (primarily used to achieve soil compaction as part of the foundation and paving construction). A vibratory roller would likely be used for compaction of fill. The vibratory roller would be used for compaction approximately 30 feet from the nearest commercial property line (with a daycare facility) and over 100 feet to the closest residential location. A vibratory roller creates approximately 0.210 in/sec PPV at a distance of 25 feet (Federal Transit Administration: Transit Noise and Vibration Assessment, May 2006), which would be reduced to about 0.172 at 30 feet. At a 1 Hz frequency, a vibratory roller would create a velocity of 0.03 in/sec, which is above the 0.01 in/sec standard. All frequencies above 1 Hz would not exceed the 0.01 in/sec standard. At 50 feet, a vibratory roller would create approximately 0.01 in/sec at 1 Hz frequency, and would meet the City standards for vibration.

With a vibratory roller operating 30 feet of the daycare facility, impacts would be perceptible and therefore potentially significant. Vibration reduction for the impacts to the daycare facility shall be accomplished through implementation of mitigation measure NOI-4.

NOI-4 **Vibration-generating Construction Equipment Limit.** The construction contractor shall not operate a vibratory roller, or equipment with the potential to result in an equivalent level of vibration that exceeds 0.01 in/sec over the frequency range of 1 to 100 Hz, or within 50 feet of the daycare facility north of the project site.

4.5 ISSUE 5: AIRPORT NOISE EXPOSURE

Would a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public use airport or private airstrip, expose people residing or working in the project area to excessive noise?

Compton/Woodley Airport is located approximately 1.5 miles north of the site. The airport runways are along an east west path and the site is almost due south of the center of the airport. The airport's noise contour map in the City of Compton General Plan (City of Compton 2014) is general and not based on noise modeling or computer analysis. The contour map (attached as Appendix B) provides the 65 CNEL contour. The 65 CNEL zone is approximately 4,500 feet north of the site and airport operations would therefore provide less than significant noise impacts at the project site.

5.0 LIST OF PREPARERS

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6.0 REFERENCES

California Building Standards Commission. 2013. California Building Code, California Code of Regulations, Title 24, Part 2.

California Department of Transportation (Caltrans). 2009. Technical Noise Supplement (TeNS). November.

City of Carson. 2004. City of Carson General Plan, Noise Element.

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Appendix A

Carrier 38HDR060 Split System Condenser

ELECTRICAL DATA

38HDR UNIT SIZE	V–PH–Hz	VOLTAGE RANGE*		COMPRESSOR		OUTDOOR FAN MOTOR			MIN CKT AMPS	FUSE/ HACR BKR AMPS
		Min	Max	RLA	LRA	FLA	NEC Hp	kW Out		
018	208/230–1–60	187	253	9.0	48.0	0.80	0.125	0.09	12.1	20
024	208/230–1–60	187	253	12.8	58.3	0.80	0.125	0.09	16.8	25
030	208/230–1–60	187	253	14.1	73.0	1.45	0.25	0.19	19.1	30
036	208/230–1–60	187	253	14.1	77.0	1.45	0.25	0.19	19.1	30
	208/230–3–60	187	253	9.0	71.0	1.45	0.25	0.19	12.7	20
	460–3–60	414	506	5.6	38.0	0.80	0.25	0.19	7.8	15
048	208/230–1–60	187	253	21.8	117.0	1.45	0.25	0.19	28.7	50
	208/230–3–60	187	253	13.7	83.1	1.45	0.25	0.19	18.6	30
	460–3–60	414	506	6.2	41.0	0.80	0.25	0.19	8.6	15
060	208/230–1–60	187	253	26.4	134.0	1.45	0.25	0.19	34.5	60
	208/230–3–60	187	253	16.0	110.0	1.45	0.25	0.19	21.5	35
	460–3–60	414	506	7.8	52.0	0.80	0.25	0.19	10.6	15

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

FLA – Full Load Amps
HACR – Heating, Air Conditininng, Refrigeration
LRA – Locked Rotor Amps
NEC – National Electrical Code
RLA – Rated Load Amps (compressor)

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

SOUND LEVEL

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

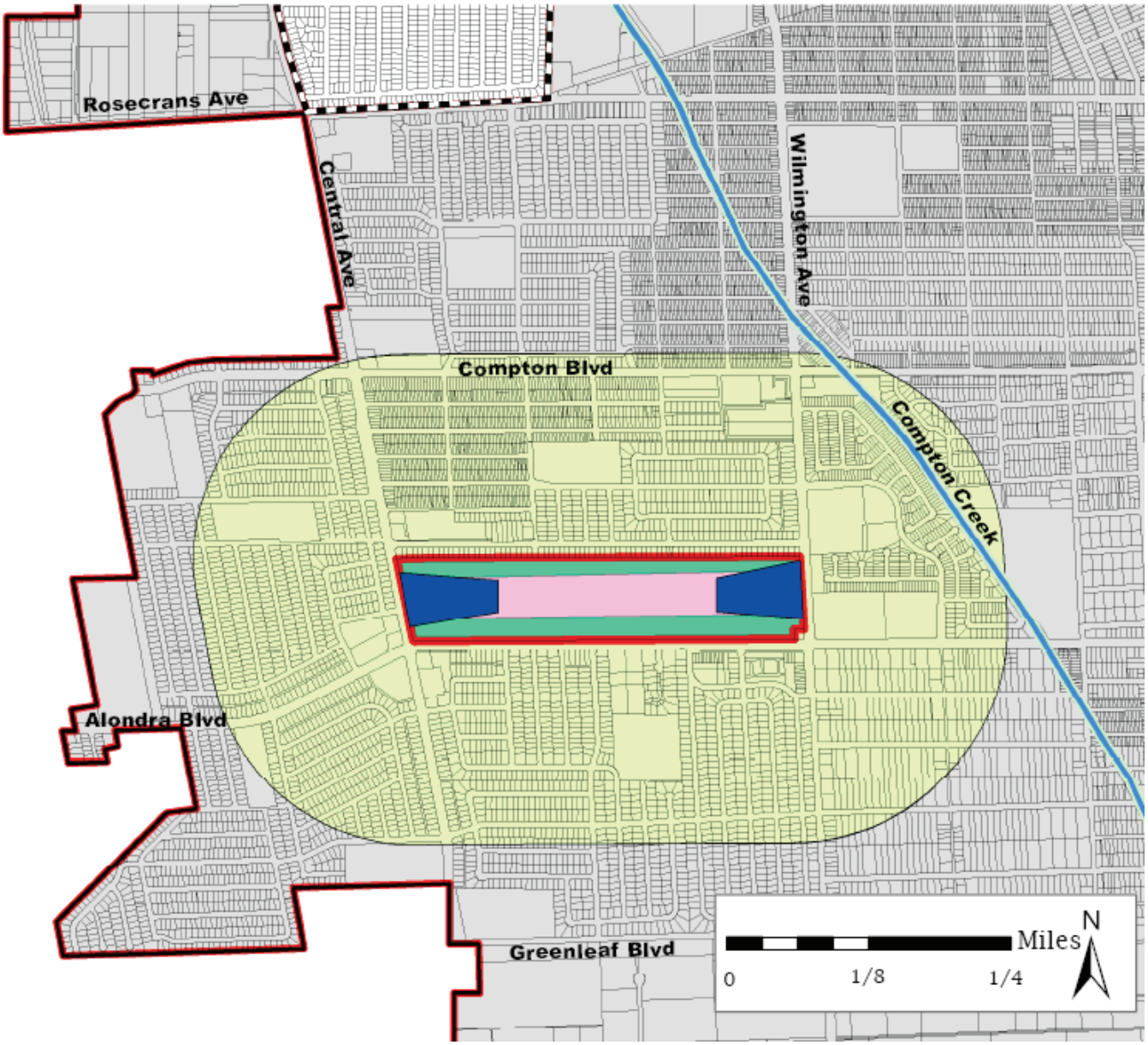
CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

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

Appendix B

Compton Airport Noise Contours

Exhibit 7-2
Compton Airport Noise Contours
Source: Los Angeles County Airport Land Use Commission



RUNWAY PROTECTION ZONE
AIRPORT PROPERTY
PLANNING BOUNDARY/AIRPORT INFLUENCE AREA
70 CNEL
65 CNEL
CITY BOUNDARY
PLANNING AREA
UNINCORPORATED COUNTY