HELIX Environmental Planning

Rose Glen Specific Plan Residential Project

Acoustical Analysis Report

November 2021 | 03669.00003.001

Prepared for:

Century Communities
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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
ALUCP	Airport Land Use Compatibility Plan
ANSI	American National Standards Institute
CAD	Computer Aided Design
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Upland
CNEL	Community Noise Equivalent Level
CY	cubic yard
dB	decibel
dBA	A-weighted decibels
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
kHz	kilohertz
L_{DN}	Day-Night level
L_{EQ}	equivalent sound level
L_{MAX}	maximum noise level
mPa	micro-Pascals
mph	miles per hour
NSLU	noise-sensitive land use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SPL	sound pressure level
STC	Sound Transmission Class
S_{WL}	sound power level
TFIC	Transportation Forecast Information Center
TNM	Traffic Noise Model
USDOT	U.S. Department of Transportation

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EXECUTIVE SUMMARY

This report presents an assessment of potential noise impacts associated with the proposed Rose Glen Specific Plan Residential Project (project). The 4.9-acre project site is located at 1400 East Arrow Highway in the city of Upland. The project involves removal of existing warehouses to construct 64 two-story single-family residential units. An existing 10-foot block wall separating the project site from an adjacent residential neighborhood to the east would remain. The project would require demolition of existing structures.

The project's heating, ventilation, and air conditioning (HVAC) systems are not anticipated to exceed allowable City Municipal Code limits.

The project would add traffic to nearby roadways, but transportation noise impacts to off-site land uses would be less than significant.

Anticipated construction activities would generate temporary elevated noise levels for nearby residences to the west and south. Noise levels from general construction may exceed the existing baseline ambient noise conditions by over 10 dBA. Mitigation measure NOI-1 would reduce noise impacts to less than significant levels. Construction would not generate substantial vibration.

Future residential units and exterior use areas would be exposed to noise from vehicular traffic along East Arrow Highway and from operations at the neighboring Cherokee Wood Products site. Noise levels at the proposed residences would not exceed the applicable 65 Community Noise Equivalent Level (CNEL) limit set forth in the City of Upland's (City's) General Plan Safety Element. Through incorporation of mitigation measure NOI-2, which relates to exterior wall and window construction, interior noise levels would not exceed the applicable 45 CNEL limit for residential uses.

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1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report analyzes potential noise and vibration impacts associated with the proposed Rose Glen Specific Plan Residential Project (project). The analysis includes a description of existing conditions in the project vicinity, an assessment of potential impacts associated with project implementation, and land use compliance for new residential uses. Analysis within this report addresses the relevant issues listed in Appendix G of the California Environmental Quality Act (CEQA) Guidelines.

1.2 PROJECT DESCRIPTION

The project site is located at 1400 East Arrow Highway in the city of Upland in the southwest region of San Bernardino County. The parcel is approximately 4.9 acres in size and is currently operating as a lumber yard. The Assessor's Parcel Number (APN) is 1046-481-14-0000. See Figure 1, *Project Location*, and Figure 2, *Project Vicinity (Aerial Photograph).*

The project involves removal of existing warehouses to construct 64 residential units (see Figure 3, *Site Plan*). The project's residences would consist of two-story single-family detached homes with a maximum height of 40 feet. The project would also include approximately 30,000 square feet of open space, 20,600 square feet of private exterior use areas, and 9,400 square feet of common areas. The project would also provide parking through private two-car garages and dedicated guest parking spaces throughout the site. A 6-foot block wall would be constructed along the project's western boundary. An existing 10-foot block wall separating the project site from an adjacent residential neighborhood to the east would remain, as would an existing six-foot wall along the project's southern edge. The project would be accessed from East Arrow Highway via a gated entrance to the north. A secondary emergency access would be located along 14th Avenue. A network of internal private drives would provide access to individual residences.

The project would require demolition of existing structures, totaling 5,000 square feet. A total of 213,444 square feet of asphalt would be demolished and removed from the site. Construction would require the import of 2,727 cubic yards of soil.

To accommodate the residences, the project would require a General Plan land use amendment and a zone change from the current Light Industrial/Business Park designation and Light Industrial Zoning to Specific Plan and RM-20 Residential, MF 20 dwelling units (du) per acre.

1.3 NOISE AND SOUND LEVEL DESCRIPTORS AND TERMINOLOGY

1.3.1 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 noise 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.

1.3.2 Terminology

1.3.2.1 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.

1.3.2.2 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.

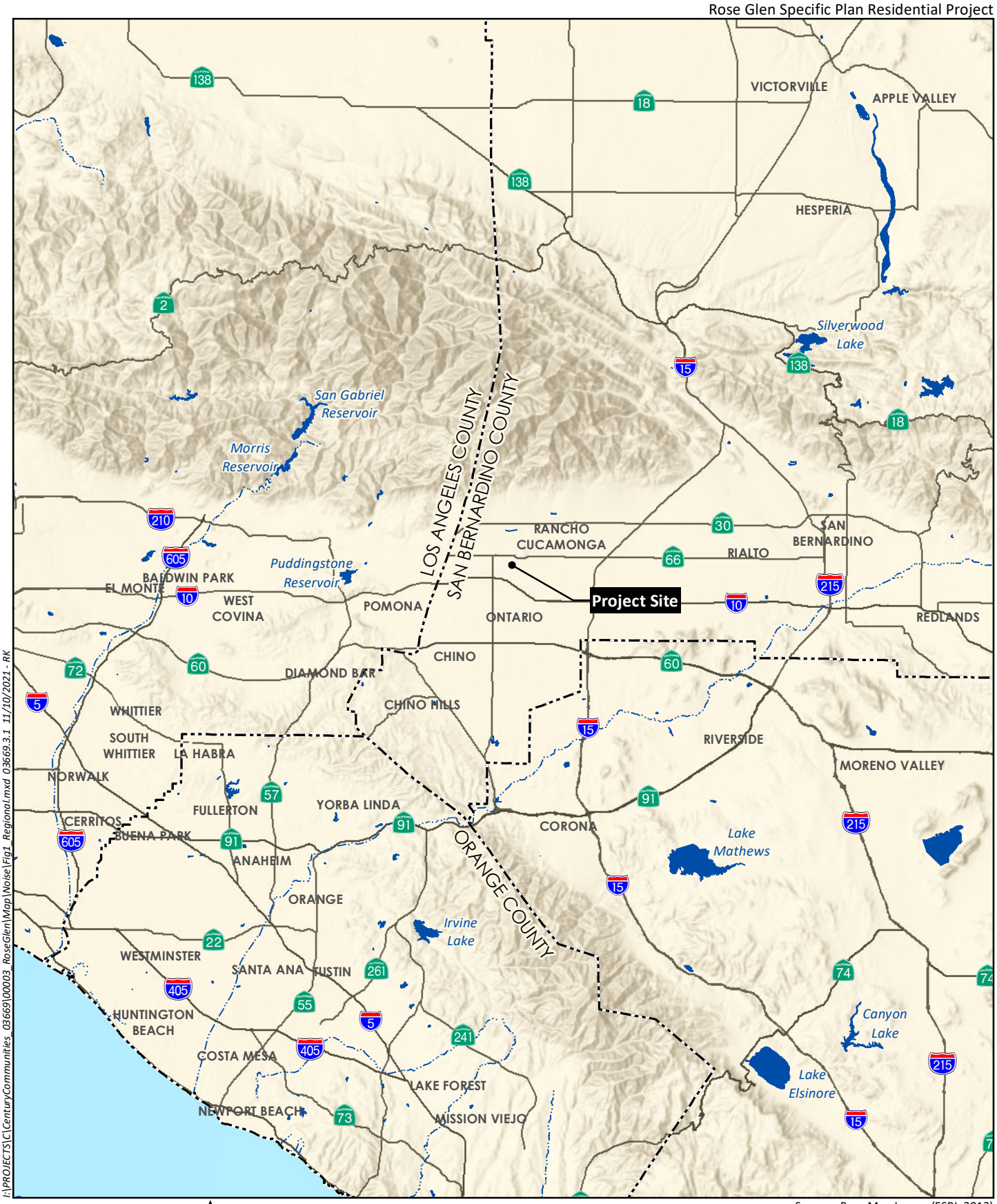
Sound Pressure Levels and Decibels

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.

1.3.2.3 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



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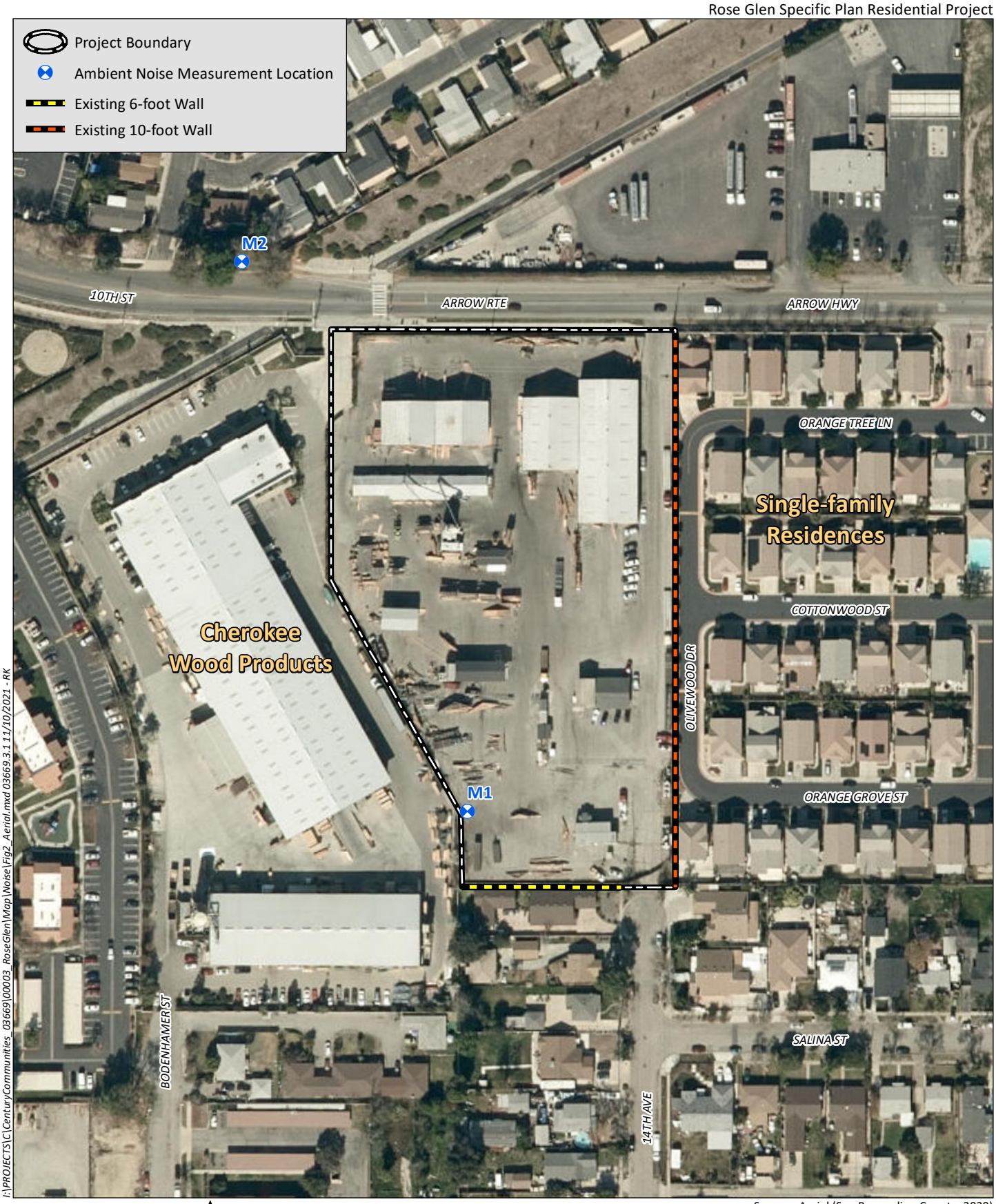
Regional Location

Figure 1



Source: Aerial (San Bernardino County, 2020)

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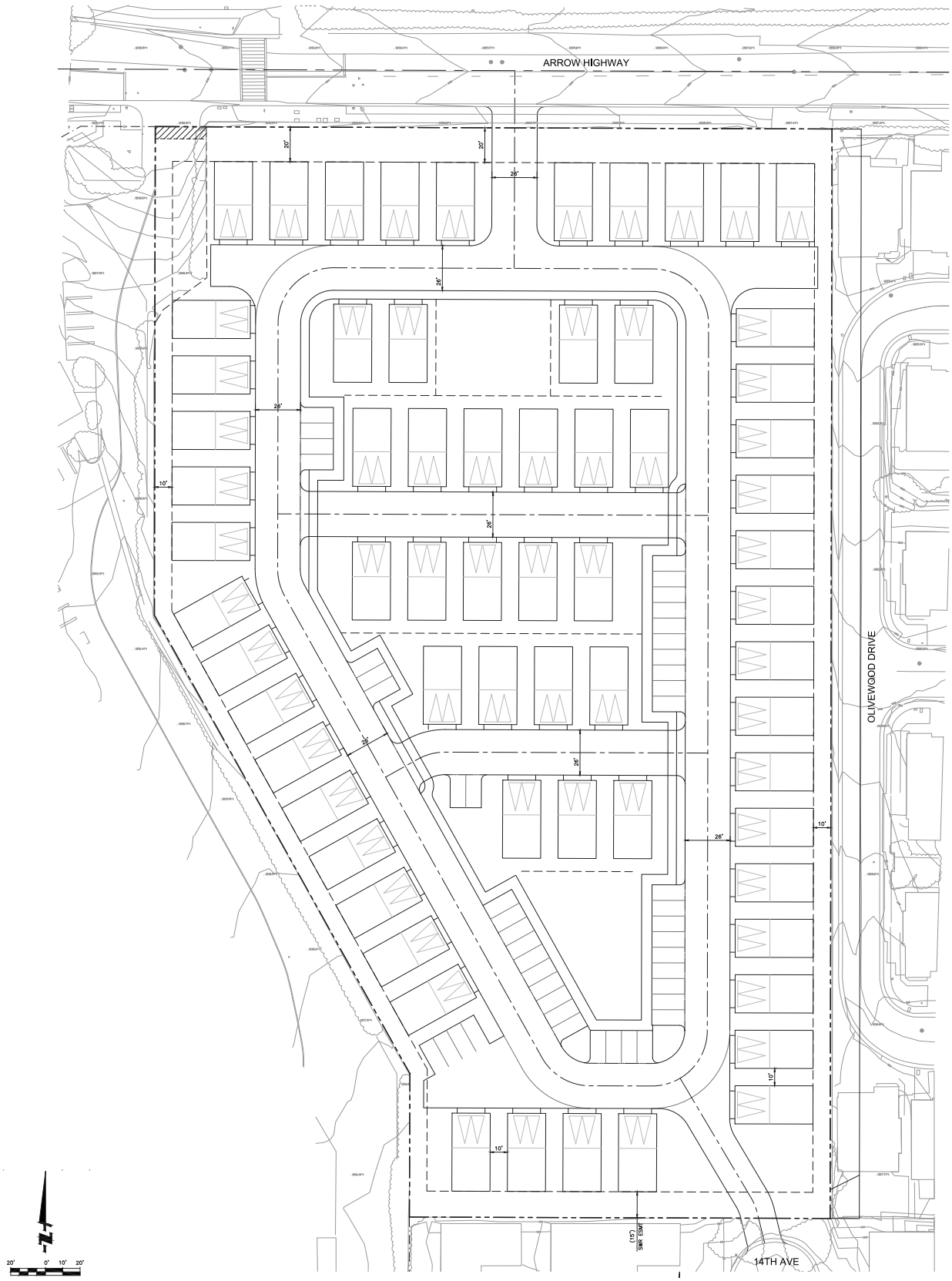
Project Vicinity (Aerial Photograph)

Figure 2



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Source: X Engineering & Consulting 2021

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Site Plan

Figure 3

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.

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.

1.4 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. NSLUs in the project vicinity include single-family residences to the west and south and a church to the southeast of the project site.

1.5 REGULATORY FRAMEWORK

1.5.1 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.

1.5.2 City of Upland General Plan, Safety Element

The Safety Element of the City's General Plan includes a table of noise compatibility standards to assess the suitability of different categories of planned land uses based on exterior noise level exposure (Table SAF-1 from the City General Plan; City 2015). For the project's land use (single-family residential), the Safety Element specifies the highest level of noise exposure regarded as normally acceptable is 65 CNEL. Refer to Table 1, *Exterior Noise Compatibility Standards*, for each land use type and noise exposure limits.

Table 1
EXTERIOR NOISE COMPATIBILITY STANDARDS

Land Use Type	Highest Level of Noise Exposure that is Regarded as Normally Acceptable (L_{DN} or CNEL)
Residential – Low Density Single Family, Duplex, Mobile Homes	60
Residential – Multi-Family	65
Mixed-Use	70
Transient Lodging – Hotels, Motels	65
Schools, Libraries, Churches Hospitals, Nursing Homes	70
Auditoriums, Concert Halls, Amphitheaters	Mitigation based on site-specific study
Sports Arena, Outdoor Spectator Sports	Mitigation based on site-specific study
Playgrounds, Neighborhood Parks	70
Golf Courses, Riding Stables, Water Recreation, Cemeteries	75
Office Buildings – Commercial, Office/Professional	70
Industrial, Manufacturing, Utilities, Agriculture	75

Source: City 2015
L_{DN}=Day-Night Level; CNEL=Community Noise Equivalent Level; dBA=A-weighted decibel

1.5.3 City of Upland Municipal Code, Chapter 9.40, Unnecessary Noise

Chapter 9.40 of the City Municipal Code pertain to City noise requirements and enforcement of violations. Table 2, *Applicable Residential Noise Limits,* lists the applicable noise limits as measured at the exterior of any residential property. Noise levels shall not exceed the base ambient noise level for the periods specified.

Table 2
APPLICABLE RESIDENTIAL NOISE LIMITS

Noise Level Exceeded	Maximum Duration Period
Base ambient noise level	30 minutes in any hour
5 dBA above Base ambient noise level	15 minutes in any hour
10 dBA above Base ambient noise level	5 minutes in any hour
15 dBA above Base ambient noise level	1 minute in any hour
20 dBA above Base ambient noise level	Not permitted

Source: City Municipal Code Chapter 9.40.070

Base ambient noise levels for residential uses are defined as 45 dBA during nighttime hours of 10:00 p.m. to 7:00 a.m. and 55 dBA between 7:00 a.m. and 10:00 p.m. Actual measurements exceeding these at the times and within the zones corresponding shall be employed as the base ambient noise level. Otherwise, no ambient noise shall be deemed to be less than the specified levels.

The project's neighboring parcels to the east and south are residential, therefore noise levels during daytime hours shall not exceed 55 dBA and nighttime noise levels shall not exceed 45 dBA.

Chapter 9.40.100 of the Municipal Code states that it is unlawful for any person to engage in or permit the erection (including excavation), demolition, alteration, or repair of any building other than between the hours of 7:00 a.m. and 6:00 p.m. on weekdays.

Chapter 9.40.100 also states that it is unlawful for any person to operate, cause to operate or permit the operation of any machinery, equipment, device, pump, fan, compressor, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient noise base level by 5 dBA.

2.0 ENVIRONMENTAL SETTING

2.1 SURROUNDING LAND USES

Adjacent lands surrounding the project site include single-family residences to the east and south; the Cherokee Wood Products business to the west; and a truck storage yard to the north across East Arrow Highway. See Figure 2 for nearby land uses.

2.2 EXISTING NOISE ENVIRONMENT

The existing noise environment is defined by traffic noise from East Arrow Highway and the neighboring Cherokee Wood Products site. The project is subject to some distant aircraft noise, with the nearest airports being Ontario International Airport and Cable Airport, each located approximately 3 miles to the south and west, respectively.

2.2.1 Ambient Noise Survey

Two measurements were taken at and adjacent to the project site for the ambient noise survey. The first measurement was recorded adjacent to the Cherokee Wood Products site at the western boundary of the project site. This was a three-hour measurement to capture noise levels during the workday. A traffic measurement was conducted at the second measurement location, west of the project along East Arrow Highway. A traffic count was conducted to estimate the breakdown of heavy trucks (three or more axles), medium trucks (double tires/two axles), and automobiles along the roadway. The measured noise levels are shown in Table 3, *Noise Measurement Results.* Traffic counts for the timed measurement and the one-hour equivalent volume are shown in Table 4, *Recorded Traffic Volume and Vehicle Mix.* The site visit sheets are included in Appendix A, *Site Survey Measurement Sheets.* Measurement locations are shown on Figure 2.

Table 3
NOISE MEASUREMENT RESULTS

Measurement 1 – Ambient	
Date:	September 20, 2021
Conditions:	Temperature: 88°F. Wind Speed: 10 mph. 28% humidity. Sunny.
Time:	11:41 a.m. – 2:43 p.m.
Location:	Along the western boundary of the project site
Measured Noise Level:	58.8 dBA L_{EQ}
Notes:	Measurement placed away from existing operational noise from the project site, approximately 80 feet from the nearest warehouse building. Microphone directed toward operations at the Cherokee Wood Products site.
Measurement 2 – Ambient	
Date:	September 20, 2021
Conditions:	Temperature: 88°F. Wind Speed: 10 mph. 28% humidity. Sunny.
Time:	3:00 p.m. – 3:15 p.m.
Location:	25 feet from the centerline of East Arrow Highway, approximately 175 feet west of the project site's northwestern corner.
Measured Noise Level:	68.0 dBA L_{EQ}
Notes:	Noise primarily from traffic on East Arrow Highway, with some operational noise from Cherokee Wood Products site.

Table 4
RECORDED TRAFFIC VOLUME AND VEHICLE MIX

Measurement	Roadway	Traffic	Autos	MT[1]	HT[2]
1	East Arrow Highway	15-minute count	155	5	1
		One-hour equivalent	620	20	4
		Percent	96.7%	0.9%	2.3%

[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 LxT 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 the Traffic Noise Model (TNM) version 2.5. 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). TNM was developed from Computer Aided Design (CAD) plans provided by the project applicant. 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 L_{EQ} can be converted to CNEL using the following equation, where $L_{EQ}(h)pk$ is the peak hour L_{EQ}, P is the peak hour volume percentage of the average daily trips (ADT), d and e are divisions of the daytime fraction of ADT to account for daytime and evening hours, and N is the nighttime fraction of ADT:

$$CNEL = L_{EQ}(h)pk + 10log10\ 4.17/P + 10log10(d + 4.77e + 10N)$$

The model-calculated one-hour L_{EQ} noise output is therefore approximately equal to the CNEL (Caltrans 2013).

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

Construction would require the use of equipment throughout the site for the full term of construction. General project construction activities would include site clearing, demolition, grading, underground utility installation, physical building construction, paving, and application of architectural coatings. The most prominent noise-generating standard construction equipment anticipated to be used on the site includes excavators, front-end loaders, backhoes, graders, dozers, rollers, and pavers.

Demolition would be required for an existing on-site structure and pavements. Grading of the site would require 2,727 CY of import, which is anticipated to be imported via 170 haul truck trips over the course of 10 days, or 17 trips per day.

3.2.2 Operations

The proposed project's operational noise sources are anticipated to include heating, ventilation, and air conditioning (HVAC) systems and vehicular traffic. During operations, the project would also be exposed to vehicular traffic noise from East Arrow Highway located adjacent to the northern boundary of the project site.

3.2.3 Cherokee Wood Products Noise

Noise from the adjacent Cherokee Wood Products property to the east would also be audible at the project site. As described in Section 2.2., a three-hour measurement was conducted to approximate the noise levels generated by adjacent operations. Operational noise was measured at 58.8 dBA L_{EQ}, however this measurement may not have captured the highest noise levels from the neighboring property. As a conservative estimate, it is assumed that noise levels from the Cherokee Wood Products operations would generate 60 dBA during a given hour. Over the course of a workday (6:00 a.m. to 6:00 p.m.), this would translate to approximately 62.3 CNEL. No single noise source from the neighboring property is solely attributable to the measured noise level, so the 62.3 CNEL measurement at the property line is conservatively assumed at all adjacent property lines to the west.

3.2.3.1 Heating, Ventilation, and Air Conditioning Units

The analysis assumes that the buildings would use a typical to larger-sized residential condenser mounted on ground level pads. The unit used in this analysis is a Carrier 38HDR060 split system condenser (see Appendix B, *Carrier 38HDR060 Split System Condenser*). The manufacturer's noise data is provided below in Table 5, *Carrier HDR060 Condenser Noise*.

Table 5
CARRIER HDR060 CONDENSER NOISE

125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	8 KHz	Overall Noise Level in A-weighted Scale (dBA)[1]
63.0	61.5	64.0	66.5	66.0	64.5	55.5	72.0

[1] Sound Power Level (S_{WL})
* Noise Levels in Decibels (dB) Measured at Octave Frequencies
KHz = kilohertz

3.2.3.2 Vehicular Traffic

Traffic volume data along East Arrow Highway was provided from peak hour traffic counts taken as part of the Program Environmental Impact Report for the City's General Plan (City 2015), and the project's trip generation were provided by Kimley Horn (2021). Based on the traffic counts taken during the site visit, a traffic distribution of 96.7 percent automobiles, 1 percent medium trucks, and 2.3 percent heavy trucks was used in this analysis for non-project traffic along East Arrow Highway. The project's traffic distribution would utilize this roadway segment and is conservatively assessed for both directions away from the project's driveway. Table 6, *Existing Plus Project Traffic Volumes*, summarizes the peak hour trip data for East Arrow Highway.

Table 6
EXISTING PLUS PROJECT TRAFFIC VOLUMES

Roadway Segment	Peak Hour Existing	Peak Hour Existing + Project
East Arrow Highway		
East of project driveway	642	678
West of project driveway	642	678

Source: City 2015, Kimley Horn 2021
Peak hour uses p.m. hour data

3.3 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE

Based on Appendix G of the CEQA Guidelines, implementation of the project would result in a significant adverse impact if it would:

Threshold 1: *Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the City General Plan or noise ordinance.*

Per the City Noise Ordinance, impacts would be significant if the project would generate noise levels at a common property line with the adjacent single-family residential zone to the west that would exceed the following baseline ambient noise levels for residential uses: 55 dBA from 7:00 a.m. to 10:00 p.m. and 45 dBA from 10:00 p.m. to 7:00 a.m. The Municipal Code further prohibits noise generated by HVAC units to exceed the baseline ambient noise base level by 5 dBA, as measured at the property line.

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

The Municipal Code prohibits construction and building work between the hours of 6:00 p.m. and 7:00 a.m. on weekdays. For the purposes of this analysis, construction noise would be significant if it exceeds the baseline ambient noise level by 10 dBA. For residential areas, impacts would be significant if construction noise levels exceed 65 dBA (since the ordinance establishes baseline exterior noise levels at 55 dBA).

Threshold 2: *Generate excessive ground-borne vibration or ground-borne noise levels.*

Excessive ground-borne vibration would occur if construction-related ground-borne vibration exceeds the “strongly perceptible” vibration annoyance potential criterion for human receptors of 0.1 inch per second peak particle velocity (PPV) or the damage potential criterion to relatively old residential structures 0.5 inch per second PPV for continuous/frequent intermittent construction sources (such as impact pile drivers, vibratory pile drivers, and vibratory compaction equipment), as specific by Caltrans (2020).

Threshold 3: *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 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 in the City General Plan Safety Element for the associated land use.

Threshold 4: *General Plan Noise Element compliance for new uses.*

Future land uses would be compliant with the City General Plan Noise Element if the project's residential exterior use areas are exposed to noise levels equal to and below 65 CNEL and interior noise levels are equal to and below 45 CNEL.

4.0 IMPACTS

4.1 ISSUE 1: EXCESSIVE NOISE LEVELS

Would the project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the City General Plan or noise ordinance.

4.1.1 Operational On-site Noise Generation

The project would include HVAC units at ground-level locations adjacent to each proposed residence. Specific locations and planning data for the future HVAC units is not available at this stage of project design. This report assumes that HVAC units would be located on the sides of the proposed residences. Further, as mentioned in Section 3.2.2.1, modeling assumed that the HVAC unit would be a Carrier 38HDR060 split system condenser. A single unit typically generates a noise level of 56 dBA at a distance of 7 feet. Assuming HVAC units are located adjacent to the proposed residence, each unit is assumed to operate at distances of approximately 10 feet from the nearest residence to the east and 15 feet from the nearest residence to the south. At 10 feet, noise levels from a proposed HVAC unit would be 53 dBA. The City Municipal Code's requires that HVAC noise levels not exceed the ambient baseline noise level by 5 dBA. For residential uses, HVAC units are prohibited from exceeding 5 dBA above 45 dBA nighttime limits. Nighttime noise levels from an HVAC unit would therefore exceed the 50 dBA nighttime limits without attenuation.

The project does not propose noise barriers, however existing concrete masonry unit walls are part of the existing conditions along the eastern and southern edges of the project. An approximately 10-foot high wall is located adjacent to the project that would be located adjacent to proposed residences, as shown in Figure 2. A wall of approximately 6-feet in height is currently located along the project's southern boundary. The line-of-sight between the proposed HVAC units and nearby properties would therefore be broken by a solid barrier. These existing walls would reduce noise levels by the 3 dBA necessary to meet the City's Municipal Code requirements. Impacts from the project's operations would therefore be less than significant.

4.1.2 Operational Off-site Transportation Noise Generation

The project would generate vehicular traffic that would utilize East Arrow Highway and have the potential to result in increased noise levels at existing single-family residences nearby. TNM software

was used to calculate the noise contour distances for Existing and Existing Plus Project conditions along East Arrow Highway. As noted in the assumptions, Existing and Existing Plus Project traffic noise levels presented in this analysis are based on peak hour traffic volumes provided by Kimley Horn (2021). Refer to Table 6 for the forecasted peak hour data for existing and project-added traffic volumes.

The off-site roadway modeling represents a conservative analysis that does not consider topography or attenuation provided by existing structures. The results of this analysis for the CNEL at the nearest NSLUs to the roadway centerline of East Arrow Highway Street are shown below in Table 7, *Off-site Traffic Noise Levels.*

Table 7
OFF-SITE TRAFFIC NOISE LEVELS

Roadway Segment	Distance to Nearest NSLU	CNEL at Distance to Nearest NSLU Existing	CNEL at Distance to Nearest NSLU Existing Plus Project	CNEL at Distance to Nearest NSLU Change from Existing	Direct Impact[1]
East Arrow Highway					
East of Project Driveway	35	64.5	64.8	+0.3	No
West of Project Driveway	60	61.0	61.2	+0.2	No

[1] A direct impact to off-site uses would occur if existing noise levels exceed 65 CNEL at single family residences and the project more than doubles (increases by more than 3 CNEL) the existing noise level.

NSLU = noise sensitive land use; CNEL = Community Noise Equivalent Level

Impacts would be significant in areas where traffic noise at single-family residential uses exceeds the 65 CNEL maximum noise level specified in the City's General Plan Safety Element and implementation of the project results in a significant increase in noise levels, which is considered greater than a perceptible change of 3 CNEL over existing conditions. As shown in Table 7, noise levels would increase by 0.3 CNEL which would not be a perceptible increase in noise. In addition, noise levels are modeled below the 65 CNEL General Plan standard for both the Existing and Existing Plus Project scenarios. Therefore, impacts from project-generated traffic would be less than significant.

4.1.3 On-site Construction Noise Generation

Construction of the project would require site clearing, demolition of existing structures, grading, installation of underground utilities/infrastructure, construction of new buildings, paving, and architectural coating. The magnitude of the noise 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 to the east and south of the project site. Construction would take place at varying distances from residences, depending on the construction phase. Construction equipment locations would vary within a given day, with the approximate average distance from the project site to nearby residences being 200 feet. For the purposes of this report, construction noise is calculated at the 100-foot distance, or the approximate distance from the on-site buildings to be demolished to nearby residences. Table 8, *Construction Equipment Noise Levels*, provides the 100-foot distance noise levels for equipment anticipated to be used for general construction activities.

Table 8
CONSTRUCTION EQUIPMENT NOISE LEVELS

Unit	Percent Operating Time	L_{MAX} at 50 feet	dBA L_{EQ} at 50 feet
Backhoe	40	71.5	67.6
Compactor	20	77.2	70.2
Compressor	40	71.6	67.7
Concrete Mixer Truck	40	72.8	68.8
Concrete Pump Truck	20	75.4	68.4
Dozer	40	75.6	71.7
Dump Truck	50	70.4	66.5
Grader	40	79.0	75.0
Excavator	40	74.7	70.7
Front End Loader	40	73.1	69.1
Paver	50	71.2	68.2
Roller	20	74.0	67.0
Loader/Dump Truck	N/A	73.1	71.0

Source: RCNM
L_{MAX} = maximum noise level; dBA = A-weighted decibel; L_{EQ} = equivalent sound level

The City Municipal Code prohibits construction and building work between the hours of 6:00 p.m. and 7:00 a.m. on weekdays. Project construction would therefore only occur during daytime hours. The construction equipment shown in Table 8 would exceed the 55 dBA daytime baseline ambient noise level for residential land uses as defined in the City Municipal Code by over 10 dBA L_{EQ}. The modeling results do not include existing noise barriers, such as the approximately 10-foot and 6-foot concrete masonry unit walls located on the project's eastern and southern boundaries, respectively. These walls are solid with no gaps or perforations and would therefore serve to reduce noise levels from construction. However, construction equipment exhaust pipes may be located approximately 7 to 8 feet above ground, so the barriers may not adequately reduce noise levels. To reduce impacts on nearby residences from construction noise, implementation of mitigation measure NOI-1 would ensure that the potential impact is reduced to a less than significant level.

NOI-1 Construction Noise Management Plan. Noise levels from project-related construction activities shall not exceed 65 dBA, defined as 10 dBA above the daytime baseline ambient noise levels defined in the City Municipal Code (55 dBA for residential uses), as measured at the neighboring land use. A Construction Management Plan that describes the measures included on the construction plans to ensure compliance with the noise limit shall be prepared by the project applicant and submitted to the City of Upland for approval prior to issuance of the grading permit. The following measures may be included to reduce construction noise:

- Construction equipment to be properly outfitted and maintained with manufacturer-recommended noise-reduction devices.

- Diesel equipment to be operated with closed engine doors and equipped with factory-recommended mufflers.

- Mobile or fixed "package" equipment (e.g., arc-welders and air compressors) to be equipped with shrouds and noise control features that are readily available for that type of equipment.

- Electrically powered equipment to be used instead of pneumatic or internal combustion powered equipment, where feasible.

- Unnecessary idling of internal combustion engines (e.g., in excess of 5 minutes) to be prohibited.

- Material stockpiles and mobile equipment staging, parking, and maintenance areas to be located as far as practicable from noise sensitive receptors.

- The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.

- No project-related public address or music system shall be audible at any adjacent sensitive receptor.

- Temporary sound barriers or sound blankets may be installed between construction operations and adjacent noise-sensitive receptors. Due to equipment exhaust pipes being approximately 7 to 8 feet above ground, a sound wall at least 10 feet in height above grade as measured at the neighboring parcels, would be located along the southern property line between the project and neighboring residences to mitigate noise levels to within acceptable levels. If barriers are to be used, 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.

- The project applicant shall notify residences within 100 feet of the project's property line in writing within one week of any construction activity such as demolition, concrete sawing, asphalt removal, and/or heavy grading operations. The notification shall describe the activities anticipated, provide dates and hours, and provide contact information with a description of a complaint and response procedure.

- The on-site construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process for the affected resident shall be established prior to construction commencement to allow for resolution of noise problems that cannot be immediately solved by the site supervisor.

4.1.4 Construction Traffic Noise

As discussed in Section 3.2.1., it is anticipated that 170 round trips would be required for soil import over the course of 10 days during the grading phase of construction, which would equate to 17 round trips per day. Over the course of an eight-hour construction day, it is assumed 4 haul truck trips would occur per hour, including the round trips for each truck. This daily traffic level associated with soil export is anticipated to be the highest daily traffic level associated with project construction.

The existing traffic volume and the increased traffic volume from construction were input into TNM on East Arrow Highway. Receivers were modeled at 35 feet from the roadway centerline (the approximate distance to the nearest single family residential NSLUs), and construction haul trips were modeled as heavy trucks. As presented above in Table 7 of Section 4.1.3, the modeled existing traffic noise level along this segment of Phillips Street is 64.5 CNEL. The addition of the project's haul truck trips during the grading phase of construction would increase noise levels to 64.8 CNEL, which represents a 0.3 CNEL increase. This would not be a perceptible increase in noise levels, and noise levels would remain below the 65 CNEL maximum exterior noise limit guideline for residential uses set forth in the City's General Plan Noise Element. Further, this increase in noise from haul trucks would be temporary (estimated at 10 days) and would cease upon the completion of construction. Therefore, impacts from construction traffic noise would be less than significant.

4.2 ISSUE 2: EXCESSIVE VIBRATION

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

4.2.1 Construction Vibration

A possible source of vibration during general project construction activities would be a vibratory roller, which may be used for compaction of soil beneath building foundations and could be used within 50 feet of off-site residences. Most usage of a vibratory roller, however, would occur at distances greater than 50 feet from any single residence due to the mobile nature of its use across the project site. A vibratory roller would create approximately 0.210 inch per second PPV at a distance of 25 feet (Caltrans 2020). A 0.210 inch per second PPV vibration level would equal 0.098 inch per second PPV at a distance of 50 feet.[1] This would be lower than the structural damage impact to older structures of 0.5 inch per second PPV and the "strongly perceptible" impact for humans of 0.1 inch per second PPV. Additionally, off-site exposure to such ground-borne vibration would be temporary as it would be limited to the short-term construction period. Therefore, even though vibration may be perceptible at nearby residences, temporary impacts associated with the roller (and other potential equipment) would be less than significant.

4.2.2 Operational Vibration

As a residential development, the project would not generate excessive ground-borne vibration during operations; therefore, no impacts would occur.

4.3 ISSUE 3: AIRPORT NOISE EXPOSURE

Would the project expose people residing or working in the project area to excessive noise from a nearby public use airport or private airstrip?

4.3.1 Aircraft Noise

The project is subject to some distant aircraft noise. The nearest airports are Ontario International Airport, located approximately 3 miles to the south and Cable Airport, located approximately 3 miles to

[1] Equipment PPV = Reference PPV * $(25/D)^n$ (inches per second), where Reference PPV is PPV at 25 feet, D is distance from equipment to the receiver in feet, and n = 1.1 (the value related to the attenuation rate through the ground); formula from Caltrans 2013.

the west. According to the Ontario International Airport's Airport Land Use Compatibility Plan (ALUCP), the project site is not within the airport's 60 CNEL noise impact zone (Mead and Hunt 2011). Similarly, the project site is not located within a noise impact zone for Cable Airport (Mead and Hunt 2015). Therefore, at these distances, no effects related to airport noise would occur at the project site, and impacts would be less than significant.

4.4 ISSUE 4: GENERAL PLAN SAFETY ELEMENT COMPLIANCE

Future land uses would be compliant with the City General Plan Safety Element if the project's residential exterior use areas are exposed to noise levels below 65 CNEL and interior noise levels are below 45 CNEL.

4.4.1 Exposure to Excessive Noise

4.4.1.1 Exterior Noise Levels

Future on-site residential land uses would be exposed to noise from vehicular traffic along East Arrow Highway adjacent to the project site. The noise levels associated with vehicular traffic were modeled at the project site using TNM. Impacts related to exterior noise would be significant if future residential uses are exposed to noise levels in excess of the 65 CNEL limit set forth in the City General Plan Safety Element. Modeling of Existing + Project traffic along East Arrow Highway indicates that noise levels would exceed 65 CNEL for all receivers within 30 feet of the roadway. According to the site plan, the 65 CNEL contour would not extend into the project site, as measured from the roadway centerline. At this distance, noise levels from the roadway would not exceed the limits set forth in the City General Plan for residential uses, and the project's proposed land use would therefore be compatible with the site's noise conditions.

Noise levels generated by the neighboring Cherokee Wood Products were calculated to be approximately 62.3 CNEL at the project's western boundary, although noise-generating activities at the adjacent property may fluctuate depending on the activities being performed. With the included 6-foot noise barrier to be built as part of the project, it is anticipated that noise levels from the adjacent property would not exceed the 65 CNEL limits set for residential uses, and the project's proposed land use would therefore be compatible with the site's noise conditions.

4.4.1.2 Interior Noise Levels

Traditional architectural materials are conservatively estimated to attenuate noise levels by 15 CNEL; therefore, if exterior noise levels at building façades exceed 60 CNEL, interior noise levels may exceed the 45 CNEL limit set forth in the City General Plan Safety Element for residential uses. Noise levels from East Arrow Highway would exceed 60 CNEL within 65 feet from the roadway centerline. Additionally, noise levels from the Cherokee Wood Products site would generate noise levels of approximately 62.3 CNEL at the western property line. Therefore, façades exposed to these elevated noise levels would not be guaranteed to comply with the 45 CNEL limits.

As a final site plan and floor plans are not available at this point in project planning, the precise individual residences and habitable rooms that would be exposed to noise levels cannot be determined. Due to the attenuation of the proposed project's structures, it is assumed that only those habitable rooms with a direct line-of-sight to East Arrow Highway and the neighboring Cherokee Wood Products

building would be expected to exceed the interior noise limits. As a conservative estimate, this report concludes that all residential façades located within 50 feet of the project's northern and western property lines would require mitigation measure NOI-2 to ensure interior noise level compliance.

NOI-2 Noise-attenuating Building Materials. For the project's habitable areas (both living rooms and bedrooms) within 50 feet of East Arrow Highway and the Cherokee Wood Products site, the following measures shall be incorporated in the design of the project to reduce interior noise levels to 45 CNEL or less:

- Minimum exterior wall requirement of STC 46 with a construction of standard 3/8-inch exterior one coat stucco over 1.0-inch rigid R-4 insulation over 1/2-inch shearwall on 2x6 studs with 5/8-inch Type "X" Drywall.

- Minimum window requirement of STC 28 with a vinyl frame window construction of dual glazing window thickness 1/8-inch and 1/2-inch air gap.

- Appropriate means of air circulation and provision of fresh air intake shall be incorporated in the project to allow windows to remain closed for extended intervals of time so that acceptable levels of noise can be maintained on the interior.

- Buildings shall provide mechanical ventilation in accordance with the 2019 California Mechanical Code.

5.0 LIST OF PREPARERS

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Kara Palm, Project Manager

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6.0 REFERENCES

California Building Standards Commission. 2019. California Building Code, California Code of Regulations, Title 24, Part 2.

California Department of Transportation (Caltrans). 2020. Transportation and Construction Vibration Guidance Manual. April.

2013. Technical Noise Supplement to the Traffic Noise Protocol. September.

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Mead and Hunt 2015. Cable Airport Land Use Compatibility Plan. September 14.

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U.S. Department of Transportation (USDOT). 2008. Roadway Construction Noise Model.

Upland, City of (City). 2021. City of Upland Municipal Code, Section 9.40, Unnecessary Noise. October.

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Appendix A

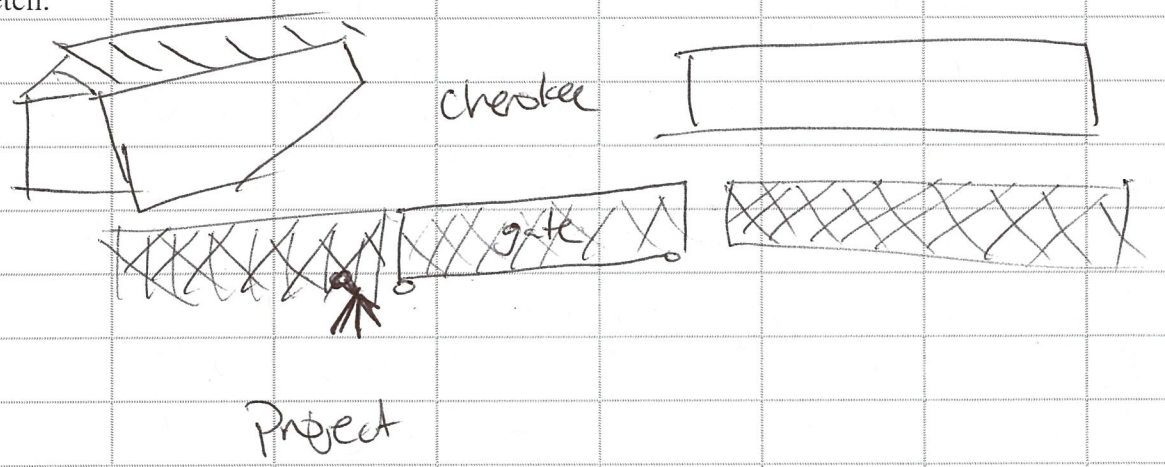
Site Survey Measurement Sheets

Site Survey

Job #		Project Name: Arrow 32	
Date: 9/20/2021	Site #: 1	Engineer: *Jason Runyan*	
Address: 1400 E. Arrow Hwy.			
Meter: LxT	Serial #: 1390	Calibrator: CA250	Serial #: 1741

Notes: 3-hour measurement. Microphone pointed toward Cherokee away from project site operational noise

Sketch:



Temp: 88 °F	Wind Spd: ~10 mph	Humidity: ~28 %
Start of Measurement: 1141 AM	End of Measurement: 243 PM	58.8 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)

Noise Measurement for Information Only

No Through Roadways

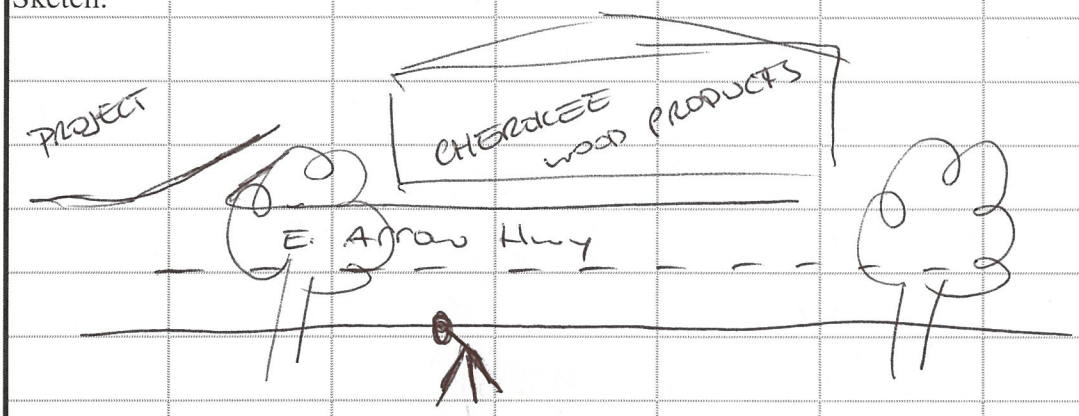
No Calibration Analysis Will Be Provided

Site Survey

Job #		Project Name: Arrow 32	
Date: 9/20/2021	Site #: 2	Engineer: *Jason Runyan*	
Address: 1390 E. Arrow Hwy			
Meter: LxT	Serial #: 1390	Calibrator: CA250	Serial #: 1741

Notes: Audible noise from project site operations. & traffic.

Sketch:



Temp: 88°F	Wind Spd: ~10 mph	Humidity: 28 %
Start of Measurement: 3:00 pm	End of Measurement: 3:15 pm	68.0 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
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(155)	(5)	(1)

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

Appendix B

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)