NOISE AND VIBRATION IMPACT ANALYSIS

STEWART ALMOND WAREHOUSE PROJECT

SAN BERNARDINO COUNTY, CALIFORNIA

LSA

November 2022

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SAN BERNARDINO COUNTY, CALIFORNIA

Submitted to:

Lord Constructors, Inc.
1920 West 11th Street
Upland, California 91786

Prepared by:

LSA
20 Executive Park, Suite 200
Irvine, California 92614
(949) 553-0666

Project No. LCI2204

LSA

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LIST OF ABBREVIATIONS AND ACRONYMS

CalGreen	California Green Building Standards Code
County	County of San Bernardino
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTA Manual	FTA *Transit Noise and Vibration Impact Assessment Manual*
HVAC	heating, ventilation, and air conditioning
in/sec	inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
Noise Element	County of San Bernardino General Plan Noise Element
ONT	Ontario International Airport
PPV	peak particle velocity
project	Stewart Almond Warehouse
RMS	root-mean-square
sf	square foot/feet
SPL	sound power level
VdB	vibration velocity decibels

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the Stewart Almond Warehouse project (project) in San Bernardino County, California. This report is intended to satisfy the County of San Bernardino's (County) requirement for a project-specific noise impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

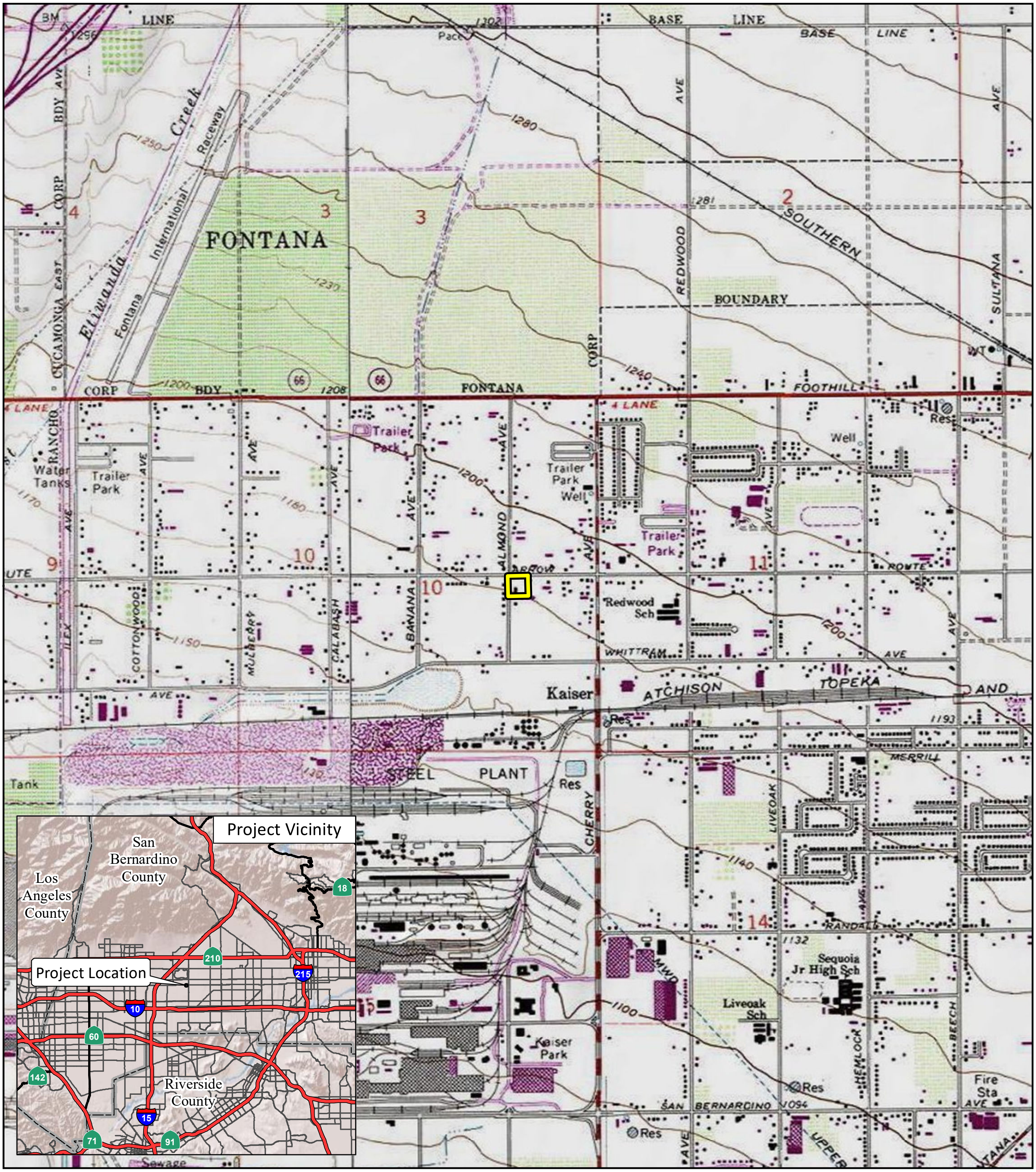
PROJECT LOCATION AND DESCRIPTION

The proposed project site is at 8531 Almond Avenue in Fontana, San Bernardino County, California (Assessor's Parcel Number 230-131-010). The project site is currently developed with a 1,500-square-foot (sf) residential structure and has a land use designation of Medium Density Residential (MDR). The proposed project is seeking a General Plan Amendment that would change the current land use designation from MDR to Community Industrial (IC). See Figure 1, Project Location and Vicinity, and Figure 2 for the Conceptual Site Plan, below.

The project proposes to demolish the existing 1,500 sf residential structure and concrete driveway to develop a 41,000 sf, two-story warehouse building. The first floor would comprise 2,000 sf of office space, 18,500 sf of open assembly area, and 18,500 sf of warehouse space. The second floor would consist of 2,000 sf of office space directly above the first-floor office. The proposed project would include a surface parking lot with a total of 53 parking stalls, including 3 Americans with Disabilities Act-compliant stalls and 3 electric vehicle stalls. In addition, approximately 15,000 sf of drought-tolerant landscaping would be installed in the project area. In addition, the proposed project would implement the following sustainability features: solar-ready roof, tinted windows for energy-efficient heating, ventilation, and air conditioning (HVAC), motion sensors on all lighting with auto shut off, skylights throughout assembly/warehouse, blue box controls per California's Green Building Standards Code (CalGreen) Requirement, low-flow toilets and sinks, and drought tolerant landscape.

Typical operational characteristics include employees and patrons traveling to and from the site and delivery of products to the site, truck loading and unloading, and truck maintenance operations. The project is assumed to operate 24 hours a day, 7 days a week; however, this may shift, depending on the tenant, as the hours of operation are unknown. The proposed project would generate approximately 70 average daily trips, including 48 passenger vehicle trips, 5 two-axle truck trips, 4 three-axle truck trips, and 13 four-axle truck trips.

Construction would begin on May 1, 2023 and would end in October 15, 2023. Construction would include site preparation, grading, building construction, paving, and architectural activities. Construction activities would involve the use of standard earthmoving equipment such as scrapers, graders, water trucks, dozers, cranes, boom trucks, forklifts, rubber-tired loaders, rubber-tired backhoes, and other small- to medium-sized construction equipment, as needed. This analysis also assumes the use of Tier 2 construction equipment. The project site would be assumed to be balanced, and no import or export of soil is required.



LEGEND

Project Location

FIGURE 1

0 1000 2000
FEET

SOURCE: USGS 7.5' Quad - Guasti (1981); Fontana (1980), CA

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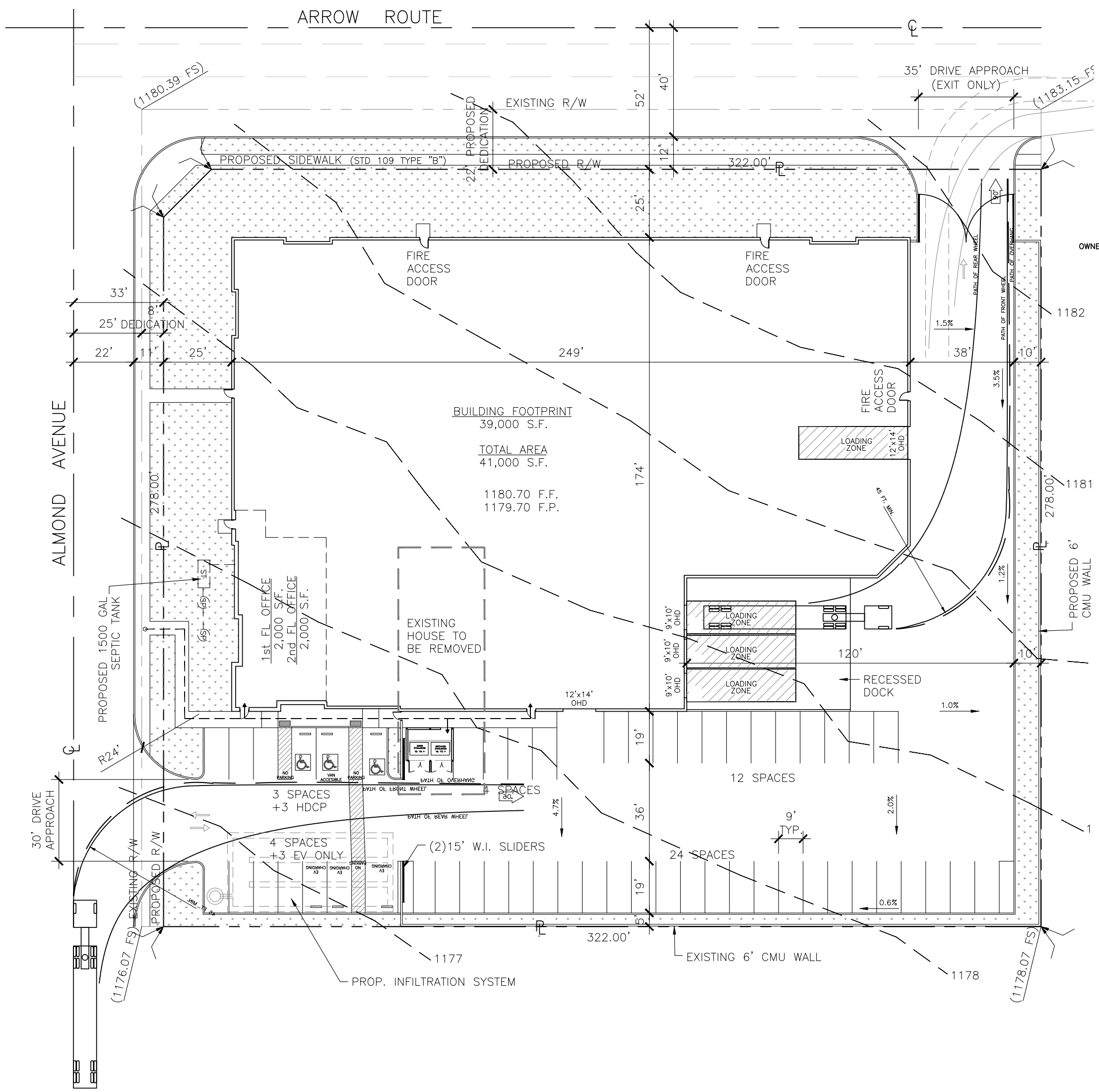
Stewart Almond Warehouse

Project Location and Vicinity

FIGURE 2



OWNER/APPLICANT: STEWART DEVELOPMENT, LLC.
1920 W. ELEVENTH STREET
UPLAND, CA 91786
PHONE: 909-946-6729
FAX: 909-946-3626

CONTACT: LORD CONSTRUCTORS, INC.
1920 W. ELEVENTH STREET
UPLAND, CA 91786
PHONE: 909-946-6729
FAX: 909-946-3626

APN: 0230-131-01

SUMMARY/ LOT COVERAGE (APPROXIMATES)

LAND AREA NET	(2.05 AC)	89,361 S.F.
LAND AREA GROSS	(2.50 AC)	108,900 S.F.
BUILDING FOOTPRINT		39,000 S.F.
F.A.R.		46%
AC PAVING		35,516 S.F. 40%
LANDSCAPE AREA – ONSITE		15,000 S.F. 17%
EXISTING ZONING		RM
PROPOSED ZONING		IC
EXISTING GENERAL PLAN		MDR
PROPOSED GENERAL PLAN		LIGHT INDUSTRIAL

PARKING REQUIREMENTS (APPROXIMATES)

BUILDING AREA:

OFFICE 1st FLOOR	2,000 S.F.
OFFICE 2nd FLOOR	2,000 S.F.
FACTORY INDUSTRIAL/WAREHOUSE	37,000 S.F.
TOTAL	41,000 S.F.

PARKING REQUIRED:

OFFICE 1st FLOOR (2000/250)	8 SPACES
OFFICE 2nd FLOOR (2000/250)	8 SPACES
WAREHOUSE (37000/1000)	37 SPACES
TOTAL	53 SPACES

NOTE:
1. NO PROTECTED OR ENDANGERED TREES EXIST ON SITE
2. NO SIGNAGE PROPOSED
3. NO HILLY TERRAIN OR DRAINAGE PROBLEMS EXIST.
4. NO IMPORT OR EXPORT PROPOSED. (BALANCED LOTS)
5. NO STRUCTURES WITHIN 20' OF PROPERTY LINE
6. SITE LIGHTING SHALL BE WALL PACKS LOCATED ON THE BUILDING
7. ALL STREET IMPROVEMENTS SHALL BE DONE AT THE SAME TIME. THERE WILL BE NO PHASING OF STREET IMPROVEMENTS.
8. THE SIDEWALK SHALL BE STD. 109 TYPE "B" WITH A PARKWAY

WQMP NOTES:
1. MAXIMIZED ROOF DRAINAGE TO LANDSCAPE
2. DOWNSPOUTS DISCHARGE ONTO PAVED SURFACE AND ROUTED TO UNDERGROUND INFILTRATION SYSTEM
3. ULTIMATELY ALL ON SITE WATER IS COLLECTED AND TREATED IN UNDERGROUND INFILTRATION SYSTEM

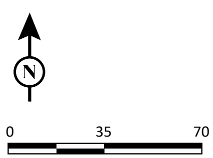
SEPTIC NOTES:
1. THE REQUIRED DEPTH OF THE SEEPAGE PIT(S) SHALL BE MEASURED BELOW THE SEWER PIPING INLET.

TRASH ENCLOSURE NOTES:
1. THE WALLS OF THE TRASH ENCLOSURES SHALL BE A MINIMUM 24" AWAY FROM THE EXTERIOR DOORS.
2. ACCESSIBLE PATH OF TRAVEL SHALL NOT BE OBSTRUCTED BY TRASH ENCLSOURES OR PARKED VEHICLES.

SCOPE OF WORK:
NEW CONSTRUCTION OF A 41,000 S.F. TOTAL (INCLUDING SECOND FLOOR) CONCRETE TILT-UP INDUSTRIAL WAREHOUSE WITH A 2,000 S.F. 1ST FLOOR OFFICE AND A 2,000 S.F. 2ND FLOOR OFFICE. SITE WORK SHALL INCLUDE GRADING, LANDSCAPE, PARKING, TRASH ENCLOSURE, SITE WALL, EXT. A POLICY PLAN AMENDMENT FROM MDR TO IL AND A CHANGE OF ZONE FROM RM TO IC.

LEGAL DESCRIPTION:
LOT 168, FONTANA ARROW TRACT NO. 2102, AS NUMBERED AND DELINEATED ON THE MAP ENTITLED FONTANA ARROW ROUTE TRACT 2102, RECORDED IN BOOK 31 OF MAPS AT PAGES 11 TO 13, BOTH INCLUSIVE, IN THE OFFICE OF THE COUNTY RECORDER OF SAID SAN BERNARDINO, TOGETHER WITH 1&1/2 SHARES OF CAPITAL STOCK OF FONTANA UNION WATER COMPANY, A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF CALIFORNIA.

LSA



SOURCE: Van Dam Engineering

Stewart Almond Warehouse

Conceptual Site Plan

I:\LCI2204\G\Site_Plan.ai (11/28/2022)

EXISTING LAND USES IN THE PROJECT AREA

The project site is surrounded primarily by commercial and residential uses. The areas adjacent to the project site include the following uses:

- **North:** Existing office and residential uses
- **East:** Existing vacant lot and commercial uses
- **South:** Existing warehouse building
- **West:** Existing residential uses opposite Almond Avenue

The nearest sensitive receptors are:

- **West:** Single-family residential uses opposite Almond Avenue, approximately 100 feet away from the project site boundary

- **Northwest:** Single-family residential uses at 8473 Almond Avenue, approximately 120 feet away from the project site boundary

NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

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

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

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

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

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

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

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

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

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

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

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

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

Table B: Common Sound Levels and Their Noise Sources

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

Source: Compiled by LSA (2022).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 feet (FTA 2018). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as

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

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

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the County's Noise Element of the General Plan (Noise Element) and the County of San Bernardino Municipal Code.

County of San Bernardino

Noise Element of the General Plan

The Noise Element provides the County's goals and policies related to noise, including the land use compatibility guidelines for community exterior noise environments. The County has identified the following goals and policies in the Noise Element.

Goal N 1: The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.

Policy N 1.1: Designate areas within San Bernardino County as "noise impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Chapter 83.01 of the Development Code (Refer to Table C).

Policy N 1.5: Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-truck traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.

Policy N 1.6: Enforce the hourly noise-level performance standards for stationary and other locally regulated sources, such as industrial, recreational, and construction activities as well as mechanical and electrical equipment.

Goal N 2: The County will strive to preserve and maintain the quiet environment of mountain, desert, and other rural areas.

Policy N 2.1: The County will require appropriate and feasible on-site noise attenuating measures that may include noise walls, enclosure of noise-generating equipment, site planning to locate noise sources away from sensitive receptors, and other comparable features.

County of San Bernardino Municipal Code

Operational Noise Standards. The County's noise control guidelines for determining and mitigating non-transportation or stationary noise source impacts from operations in adjacent properties are found in Section 83.01.080. The performance standards found in Section 83.01.080 set the limits for stationary noise sources, as summarized in Table C.

Table C: Noise Standards for Stationary Noise Sources

Affected Land Uses (Receiving Noise)	Daytime (7:00 a.m. to 10:00 p.m.) L_{eq}	Nighttime (10:00 p.m. to 7:00 a.m.) L_{eq}
Residential	55 dBA	45 dBA
Professional Services	55 dBA	55 dBA
Other Commercial	60 dBA	60 dBA
Industrial	70 dBA	70 dBA

Source: County of San Bernardino (2021).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Construction Noise Standards. The County has set restrictions to control noise impacts associated with the construction of the proposed project. According to Section 83.01.080 (g)(3), temporary construction, maintenance, repair, or demolition activities are exempt from the regulations of section 83.01.080, provided that construction is limited to the hours between 7 a.m. and 7 p.m., except on Sundays or federal holidays, when construction is prohibited.

State of California Green Building Standards Code

CALGreen contains mandatory measures for non-residential building construction in Section 5.507 on Environmental Comfort. These noise standards are applied to new construction in California for controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when non-residential structures are developed in areas where the exterior noise levels exceed 65 dBA CNEL, such as within a noise contour of an airport, freeway, railroad, and other noise source. If the development falls within an airport or freeway 65 dBA CNEL noise contour, buildings shall be constructed to provide an interior noise level environment attributable to exterior sources that does not exceed an hourly equivalent level of 50 dBA L_{eq} in occupied areas during any hour of operation.

Federal Transit Administration

Although the County does not have daytime construction noise level limits for activities within the specified hours of Section 18-63(b)(7), to determine potential California Environmental Quality Act noise impacts, construction noise was assessed using criteria from the Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) (FTA Manual). Table D shows the FTA's Detailed Analysis Construction Noise Criteria based on the composite noise levels per construction phase.

Table D: Detailed Assessment Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)	Nighttime 1-hour L_{eq} (dBA)
Residential	80	70
Commercial	85	85
Industrial	90	90

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

APPLICABLE VIBRATION STANDARDS

Federal Transit Administration

Vibration standards included in the FTA Manual are used in this analysis for ground-borne vibration impacts on human annoyance. The criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. Table E provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table E: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Vibration that is distinctly felt. Appropriate for workshops and similar areas not as sensitive to vibration.
Office	84	Vibration that can be felt. Appropriate for offices and similar areas not as sensitive to vibration.
Residential Day	78	Vibration that is barely felt. Adequate for computer equipment and low-power optical microscopes (up to 20×).
Residential Night and Operating Rooms	72	Vibration is not felt, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100×) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] As measured in 1/3-Octave bands of frequency over the frequency range 8 to 80 Hertz.
FTA = Federal Transit Administration
L_V = velocity in decibels
VdB = vibration velocity decibels
Max = maximum

Table F lists the potential vibration building damage criteria associated with construction activities, as suggested in the FTA Manual. FTA guidelines show that a vibration level of up to 0.5 in/sec in PPV is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage. For non-engineered timber and masonry buildings, the construction building vibration damage criterion is 0.2 in/sec in PPV.

Table F: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
Reinforced concrete, steel, or timber (no plaster)	0.50
Engineered concrete and masonry (no plaster)	0.30
Non-engineered timber and masonry buildings	0.20
Buildings extremely susceptible to vibration damage	0.12

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
FTA = Federal Transit Administration
PPV = peak particle velocity
in/sec = inch/inches per second

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are traffic on Arrow Route and Almond Avenue, and infrequent parking lot activity to the south.

AMBIENT NOISE MEASUREMENTS

Long-Term Noise Measurements

To assess existing noise levels, LSA conducted three long-term noise measurements in the vicinity of the project site. The long-term (24-hour) noise level measurements were conducted on October 24 through October 25, 2022, using three Larson Davis Spark 706RC Dosimeters. Table G provides a summary of the measured hourly noise levels and calculated CNEL levels from the noise level measurements. As shown in Table G, the calculated CNEL levels range from 61.2 dBA CNEL to 76.6 dBA CNEL. Hourly noise levels at the nearest sensitive residential uses are as low as 54.2 dBA L_{eq} during daytime hours and 55.0 dBA L_{eq} during nighttime hours. Noise measurement sheets are provided in Appendix A. Figure 3 shows the long-term and short-term monitoring locations.

Table G: Long-Term 24-Hour Ambient Noise Monitoring Results

Location		Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Daily Noise Levels (dBA CNEL)
LT-1	Northeast corner of the project site, 40 feet south of Arrow Route centerline	67.3 – 74.3	69.8 – 71.9	64.5 – 73.2	76.6
LT-2	Near southwest corner of the project site, 30 feet from Almond Avenue centerline	59.1 – 63.8	54.2 – 57.8	55.0 – 63.0	65.9
LT-3	Southeast corner of the project site, south of an existing retaining wall.	49.4 – 59.9	48.8 – 50.5	50.0 – 59.1	61.2

Source: Compiled by LSA (2022).
Note: Noise measurements were conducted from October 24 to October 25, 2022, starting at 2:00 p.m.
[1] Daytime Noise Levels = noise levels during the hours from 7:00 a.m. to 7:00 p.m.
[2] Evening Noise Levels = noise levels during the hours from 7:00 p.m. to 10:00 p.m.
[3] Nighttime Noise Levels = noise levels during the hours from 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level
CNEL = Community Noise Equivalent Level

EXISTING AIRCRAFT NOISE

Aircraft flyovers may be audible on the project site due to aircraft activity in the vicinity. The nearest airport to the project site is Ontario International Airport (ONT), a commercial airport 6.7 miles to the southwest. The project site is outside the ONT Airport Influence Area, according to Policy Map 2-1 and the 60-65 dBA CNEL airport noise impact zone consistent with Policy Map 2-3 of the *Ontario International Airport Land Use Compatibility Plan* (Ontario Airport Planning 2018*)*. Because the project site is outside the 60–65 dBA CNEL noise contour, no further analysis associated with aircraft noise impacts is necessary.

LSA

LEGEND

Project Site

LT-1 Long-term Noise Monitoring Location

0 125 250

FEET

SOURCE: Google Earth 2021

FIGURE 3

Stewart Almond Warehouse

Noise Monitoring Locations

I:\LCI2204\G\Noise_Locs.ai (11/21/2022)

PROJECT IMPACTS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 feet would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on Arrow Route. Because construction-related vehicle trips would not approach existing daily traffic volumes, traffic noise would not increase by 3 dBA CNEL. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction, which includes demolition of the existing structures and other site improvements, site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table H lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor, taken from the Federal Highway Administration (FHWA) *Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table H is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: $L_{eq}(equip)$ = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 feet.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table H: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Feet[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

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

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table H, and the construction equipment list provided, LSA calculated the composite noise level of each construction phase. The project construction composite noise levels at a distance of 50 feet would range from 74 dBA L_{eq} to 88 dBA L_{eq}, with the highest noise levels during the demolition phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA while halving the distance would increase noise levels by 6 dBA.

Table I shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table I: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 feet[1]	Distance (feet)	Composite Noise Level (dBA L_{eq})
Industrial (South)	88	250	74
Residence (West)		250	74
Residence (Northwest)		320	71
Commercial (East)		650	65

Source: Compiled by LSA (2022).

[1] The composite construction noise level represents the demolition phase, which is expected to result in the greatest noise level compared to other phases.

dBA L_{eq} = average A-weighted hourly noise level

While construction noise will vary, it is expected that composite noise levels during construction at the nearest off-site residence and industrial uses to the west and south, respectively, would reach 74 dBA L_{eq} during daytime hours. These predicted noise levels would only occur when all construction equipment is operating simultaneously; and therefore are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would cease once project construction is completed.

As stated above, noise impacts associated with construction activities are regulated by the County's noise ordinance. The proposed project would comply with the construction hours specified in the County's Noise Ordinance, which states that construction activities are allowed between the hours of 7:00 a.m. and 7:00 p.m., except on Sundays and federal holidays.

As it relates to off-site uses, construction-related noise impacts would remain below the 80 dBA L_{eq} and 90 dBA L_{eq} 1-hour construction noise level criteria for daytime construction noise level criteria as established by the FTA for residential and industrial land uses, respectively, and therefore would be considered less than significant.

Best construction practices presented at the end of this analysis shall be implemented to minimize noise impacts to surrounding receptors.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in VdB and assesses the potential for building damages using vibration levels in PPV (in/sec). This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while vibration level in PPV is best for characterizing potential for damage.

Table J shows the PPV and VdB values at 25 feet from the construction vibration source. As shown in Table J, bulldozers and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 feet, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table J: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

[1] RMS vibration velocity in decibels (VdB) is 1 µin/sec.

[2] Equipment shown in **bold** is expected to be used on site.

µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below, and Tables K and L below provide a summary of off-site construction vibration levels.

$$L_v dB(D) = L_v dB(25\ ft) - 30 \text{ Log } (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

As shown in Table E above, the threshold at which vibration levels would result in annoyance would be 90 VdB for workshop or industrial-type uses and 78 VdB for daytime residential uses. As shown in Table F, the FTA guidelines indicate that for a non-engineered timber and masonry building, the construction vibration damage criterion is 0.2 in/sec in PPV.

Table K: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (VdB) at 25 ft[1]	Distance (ft)[2]	Vibration Level (VdB)
Industrial (South)	87	250	57
Residence (West)		250	57
Residence (Northwest)		320	54
Commercial (East)		650	45

Source: Compiled by LSA (2022).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The reference distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.

ft = foot/feet

VdB = vibration velocity decibels

Table L: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Industrial (South)	0.089	90	0.013
Residence (West)		100	0.011
Residence (Northwest)		120	0.008
Commercial (East)		500	0.001

Source: Compiled by LSA (2022).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The reference distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.

ft = foot/feet

PPV = peak particle velocity

Based on the information provided in Table K, vibration levels are expected to approach 57 VdB at the closest industrial uses to the south and residential uses to the west and would not exceed the annoyance thresholds.

Based on the information provided in Table L, vibration levels are expected to approach 0.013 PPV in/sec at the nearest surrounding structures and would be below the 0.2 PPV in/sec damage threshold. Other building structures surrounding the project site are farther away and would experience further reduced vibration. Therefore, no construction vibration impacts would occur. No vibration reduction measures are required.

Because construction activities are regulated by the County's Municipal Code, which states that construction activities are allowed between the hours of 7:00 a.m. and 7:00 p.m., except on Sundays and federal holidays, vibration impacts would not occur during the more sensitive nighttime hours.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

As a result of the implementation of the proposed project, off-site traffic volumes on surrounding roadways have the potential to increase. The proposed project's trips generated were obtained from the project *Trip Generation Analysis* (LSA 2022). The proposed project would generate a net of 107 daily passenger car equivalent (PCE) trips. Based on data provided in Chapter IV of the *County of San Bernardino 2007 General Plan Program Final Environmental Impact Report and Appendices*, existing traffic volumes on Arrow Route range from 14,000 to 21,000 (County of San Bernardino 2007b). The following equation was used to determine the potential impacts of the project:

Change in CNEL = $10\ log_{10}\left[V_{e+p}/V_{existing}\right]$

where: $V_{existing}$ = existing daily volumes
V_{e+p} = existing daily volumes plus project
Change in CNEL = increase in noise level due to the project

Using a conservative assumption of an existing average daily traffic of 14,000 vehicles, the results of the calculations show that an increase of approximately 0.03 dBA CNEL is expected along the streets adjacent to the project site. A noise level increase of less than 1 dBA would not be perceptible to the human ear; therefore, the traffic noise increase in the vicinity of the project site resulting from the proposed project would be less than significant. No mitigation is required.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Vibration levels generated from project-related traffic on the adjacent roadways would be less than significant, and no mitigation measures are required.

LONG-TERM OFF-SITE STATIONARY NOISE IMPACTS

Adjacent off-site land uses would be potentially exposed to stationary-source noise impacts from the proposed on-site HVAC equipment, truck deliveries, and loading and unloading activities. The potential noise impacts to off-site sensitive land uses from the proposed HVAC equipment and truck delivery activities are discussed below. To provide a conservative analysis, it is assumed that operations would take place equally during all hours of the day and that all three loading docks would be active at all times. Additionally, it is assumed that within any given hour, three heavy trucks would maneuver to back into one of the proposed loading docks. To determine the future noise impacts from project operations to the noise sensitive uses, a 3-D noise model, SoundPLAN, was used to incorporate the site topography and the shielding from the proposed building on-site. A graphic representation of the operational noise impacts is presented in Appendix C.

Heating, Ventilation, and Air Conditioning Equipment

The project would have various rooftop mechanical equipment, including HVAC units, on the proposed building. To be conservative, it is assumed the project could have six rooftop HVAC units and operate 24 hours per day. The HVAC equipment could operate 24 hours per day and would generate sound power levels (SPL) of up to 87 dBA SPL or 72 dBA L_{eq} at 5 feet, based on manufacturer data (Trane).

Truck Deliveries and Truck Loading and Unloading Activities

Noise levels generated by delivery trucks would be similar to noise readings from truck loading and unloading activities, which generate a noise level of 75 dBA L_{eq} at 20 feet based on measurements taken by LSA (*Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center* [LSA 2016]). Shorter term noise levels that occurred during the docking process taken by LSA were measured to be 76.3 dBA L_8 at 20 feet. Delivery trucks would arrive at the project site and maneuver their trailers so that the trailers would be parked within the loading docks. During this process, noise levels are associated with the truck engine noise, air brakes, and back-up alarms while the truck is backing into the dock. These noise levels would occur for a shorter period of time (less than 5 minutes). After a truck enters the loading dock, the doors would be closed, and the remainder of the truck loading activities would be enclosed and therefore much less perceptible. To present a conservative assessment, it is assumed that truck arrivals and departure activities could occur at all 3 docks for a period of less than 5 minutes each and unloading activities could occur at all three docks simultaneously for a period of more than 30 minutes in a given hour.

Cumulative Operations Noise Assessment

Tables M and N below show the combined hourly noise levels generated by HVAC equipment and truck delivery activities at the closest off-site land uses.

Table M: Daytime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Daytime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residential (14275 Arrow Route and 8558 Almond Avenue)	West	54.2	52.5	No
Residential (14288 Arrow Route)	Northwest	67.3	41.1	No

Source: Compiled by LSA (2022).

[1] A potential operational noise impact would occur if (1) the quietest daytime ambient hour is less than 55 dBA L_{eq} and project noise impacts are greater than 55 dBA L_{eq}, OR (2) the quietest daytime ambient hour is greater than 55 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest daytime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

Table N: Nighttime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Nighttime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residential (14666 Ceres Ave)	West	55.0	52.5	No
Residential (14685 Merrill Ave)	Northwest	64.5	41.1	No

Source: Compiled by LSA (2022).

[1] A potential operational noise impact would occur if (1) the quietest nighttime ambient hour is less than 45 dBA L_{eq} and project noise impacts are greater than 45 dBA L_{eq}, OR (2) the quietest nighttime ambient hour is greater than 45 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest nighttime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

As shown in Appendix C, noise levels generated by the proposed project would not exceed the 70 dBA L_{eq} at the neighboring industrial uses during both daytime and nighttime hours. The project-related noise level impacts would range from 41.1 dBA L_{eq} to 52.5 dBA L_{eq} at the surrounding sensitive receptors.

The results in Table M below show that project-generated noise levels will remain below the residential use daytime noise standard of 55 dBA L_{eq} and will also be below existing daytime ambient noise levels. The results in Table N below show that project noise levels have the potential to exceed the residential nighttime noise standard of 45 dBA L_{eq}; however, ambient noise levels already exceed the applicable standard. therefore, because project noise levels would not generate a noise level increase of 3 dBA or more, the impact would be less than significant, and no noise reduction measures are required.

BEST CONSTRUCTION PRACTICES

In addition to compliance with the County's Municipal Code allowed hours of construction of 7:00 a.m. and 7:00 p.m., except on Sundays and federal holidays, the following best construction practices would further minimize construction noise impacts:

- The project construction contractor shall equip all construction equipment, fixed or mobile, with properly operating and maintained noise mufflers consistent with manufacturer's standards.
- The project construction contractor shall locate staging areas away from off-site sensitive uses during the later phases of project development.
- The project construction contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site whenever feasible.

REFERENCES

County of San Bernardino. 2007a. *General Plan Noise Element*. April.

_____. 2007b. *County of San Bernardino 2006 General Plan Program Final Environmental Impact Report and Appendices.* February.

_____. 2021. Municipal Code. December 14. Website: https://codelibrary.amlegal.com/codes/sanbernardino/latest/sanberncty_ca/0-0-0-146479 (accessed November 2022).

Federal Highway Administration (FHWA). 2006. *Roadway Construction Noise Model User's Guide.* January. Washington, D.C. Website: www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf (accessed November 2022).

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. Office of Planning and Environment. Report No. 0123. September.

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

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

_____. 2022. *Trip Generation Analysis.*

Ontario Airport Planning. 2018. *Ontario International Airport Land Use Compatibility Plan.* July.

State of California. 2020. *2019 California Green Building Standards Code.*

Trane. *Fan Performance - Product Specifications RT-PRC023AU-EN.*

United States Environmental Protection Agency (EPA). 1978. *Protective Noise Levels, Condensed Version of EPA Levels Document*, EPA 550/9-79-100. November.

APPENDIX A

NOISE MONITORING DATA

Noise Measurement Survey – 24 HR

Project Number: LCI2204
Project Name: Stewart Almond

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:908)

Site Number: LT-1 Date: 10/24/22

Time: From 2:00 p.m. To 2:00 p.m.

Site Location: Northeast corner of the project site on Arrow Route near a powerline pole.

Primary Noise Sources: Traffic noise on Arrow Route.

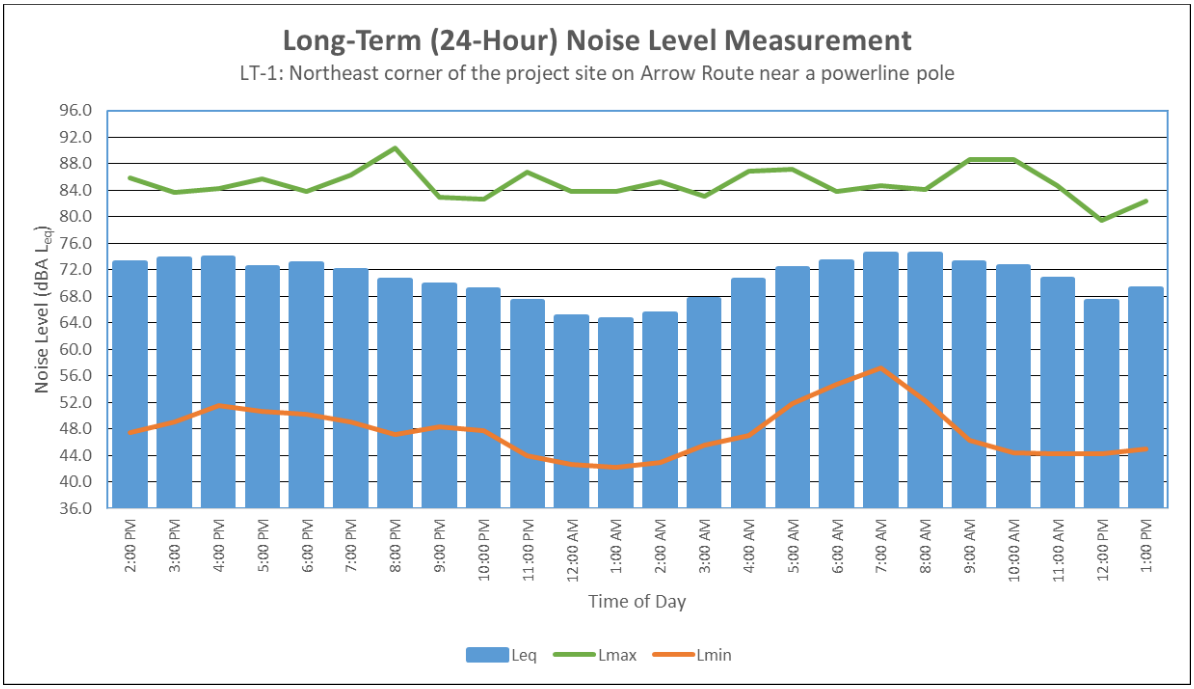
Comments:

Photo:

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

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2:00 PM	10/24/22	73.1	85.9	47.5
3:00 PM	10/24/22	73.7	83.7	49.0
4:00 PM	10/24/22	73.8	84.3	51.5
5:00 PM	10/24/22	72.4	85.7	50.6
6:00 PM	10/24/22	72.8	83.8	50.2
7:00 PM	10/24/22	71.9	86.2	49.0
8:00 PM	10/24/22	70.5	90.4	47.2
9:00 PM	10/24/22	69.8	82.9	48.3
10:00 PM	10/24/22	68.9	82.6	47.8
11:00 PM	10/24/22	67.2	86.7	44.0
12:00 AM	10/25/22	64.9	83.8	42.6
1:00 AM	10/25/22	64.5	83.8	42.2
2:00 AM	10/25/22	65.3	85.3	43.0
3:00 AM	10/25/22	67.5	83.0	45.5
4:00 AM	10/25/22	70.4	86.8	47.0
5:00 AM	10/25/22	72.1	87.1	51.8
6:00 AM	10/25/22	73.2	83.8	54.7
7:00 AM	10/25/22	74.3	84.7	57.2
8:00 AM	10/25/22	74.3	84.1	52.2
9:00 AM	10/25/22	73.0	88.6	46.3
10:00 AM	10/25/22	72.5	88.6	44.4
11:00 AM	10/25/22	70.5	84.6	44.3
12:00 PM	10/25/22	67.3	79.4	44.3
1:00 PM	10/25/22	69.1	82.4	44.9

Source: Compiled by LSA Associates, Inc. (2022).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: LCI2204
Project Name: Stewart Almond

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:907)

Site Number: LT-2 Date: 10/24/22

Time: From 2:00 p.m. To 2:00 p.m.

Site Location: Southwest corner of the project site on Almond Avenue near a powerline pole.

Primary Noise Sources: Traffic noise on Almond Avenue.

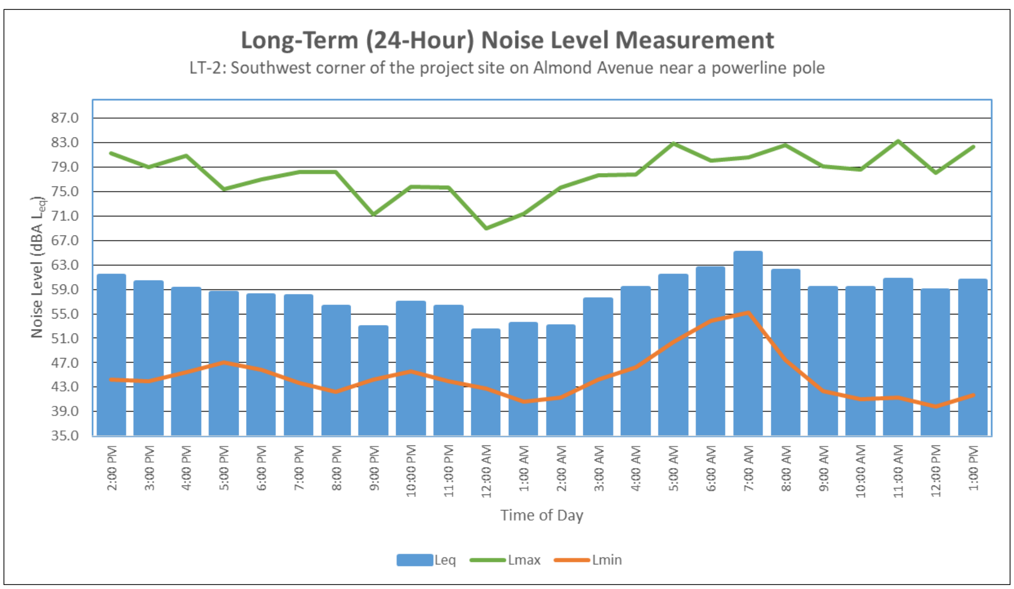
Comments:

Photo:

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

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2:00 PM	10/24/22	61.1	81.2	44.2
3:00 PM	10/24/22	60.2	78.9	44.0
4:00 PM	10/24/22	59.1	80.8	45.5
5:00 PM	10/24/22	58.5	75.3	47.0
6:00 PM	10/24/22	58.1	77.0	45.8
7:00 PM	10/24/22	57.8	78.2	43.7
8:00 PM	10/24/22	56.1	78.2	42.3
9:00 PM	10/24/22	52.9	71.2	44.2
10:00 PM	10/24/22	56.8	75.7	45.6
11:00 PM	10/24/22	56.1	75.6	44.0
12:00 AM	10/25/22	52.2	69.0	42.8
1:00 AM	10/25/22	53.4	71.4	40.7
2:00 AM	10/25/22	52.9	75.6	41.3
3:00 AM	10/25/22	57.3	77.6	44.2
4:00 AM	10/25/22	59.2	77.8	46.3
5:00 AM	10/25/22	61.2	82.8	50.4
6:00 AM	10/25/22	62.4	80.0	53.8
7:00 AM	10/25/22	64.9	80.5	55.2
8:00 AM	10/25/22	61.9	82.5	47.4
9:00 AM	10/25/22	59.2	79.1	42.4
10:00 AM	10/25/22	59.2	78.6	41.0
11:00 AM	10/25/22	60.5	83.2	41.3
12:00 PM	10/25/22	58.9	78.0	39.9
1:00 PM	10/25/22	60.5	82.3	41.7

Source: Compiled by LSA Associates, Inc. (2022).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: LCI2204
Project Name: Stewart Almond

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:119)

Site Number: LT-3 Date: 10/24/22

Time: From 2:00 p.m. To 2:00 p.m.

Site Location: Southeast corner of the project site opposite of a retaining wall near a tree.

Primary Noise Sources: Parking lot activity noise such as vehicles passing by, doors Opening and closing.

Comments: Monitor was placed at an operating warehouse facility. 5 foot and 8 inch Retaining wall surrounds warehouse facility to the south. Monitor was placed above retaining Wall height.

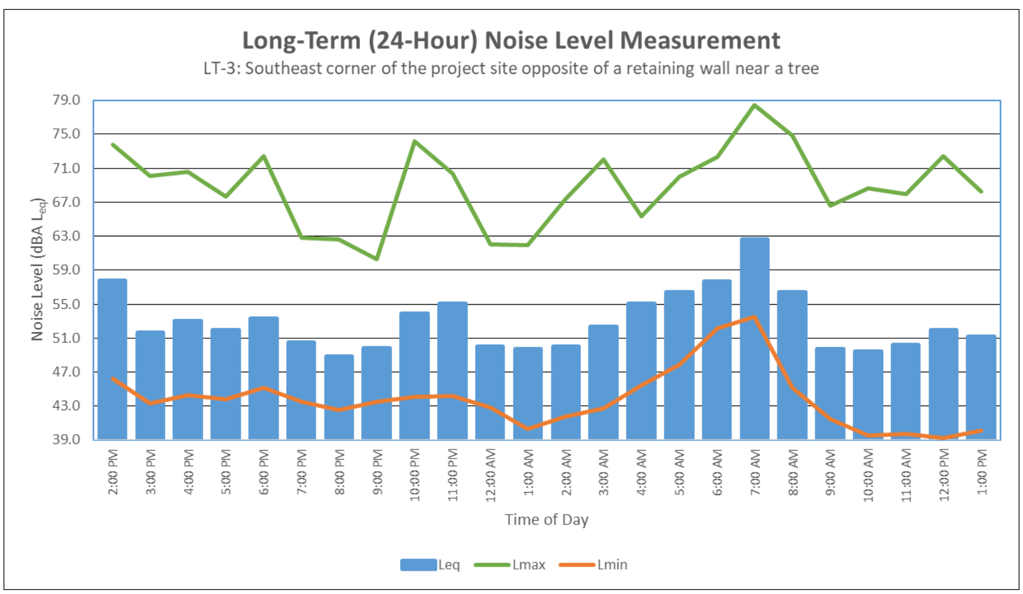
Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-3

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2:00 PM	10/24/22	61.1	81.2	44.2
3:00 PM	10/24/22	60.2	78.9	44.0
4:00 PM	10/24/22	59.1	80.8	45.5
5:00 PM	10/24/22	58.5	75.3	47.0
6:00 PM	10/24/22	58.1	77.0	45.8
7:00 PM	10/24/22	57.8	78.2	43.7
8:00 PM	10/24/22	56.1	78.2	42.3
9:00 PM	10/24/22	52.9	71.2	44.2
10:00 PM	10/24/22	56.8	75.7	45.6
11:00 PM	10/24/22	56.1	75.6	44.0
12:00 AM	10/25/22	52.2	69.0	42.8
1:00 AM	10/25/22	53.4	71.4	40.7
2:00 AM	10/25/22	52.9	75.6	41.3
3:00 AM	10/25/22	57.3	77.6	44.2
4:00 AM	10/25/22	59.2	77.8	46.3
5:00 AM	10/25/22	61.2	82.8	50.4
6:00 AM	10/25/22	62.4	80.0	53.8
7:00 AM	10/25/22	64.9	80.5	55.2
8:00 AM	10/25/22	61.9	82.5	47.4
9:00 AM	10/25/22	59.2	79.1	42.4
10:00 AM	10/25/22	59.2	78.6	41.0
11:00 AM	10/25/22	60.5	83.2	41.3
12:00 PM	10/25/22	58.9	78.0	39.9
1:00 PM	10/25/22	60.5	82.3	41.7

Source: Compiled by LSA Associates, Inc. (2022).

dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



APPENDIX B

CONSTRUCTION NOISE LEVEL CALCULATIONS

Construction Calculations

Phase: Demolition

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Concrete Saw	1	90	20	50	0.5	90	83
Tractor	3	84	40	50	0.5	84	85
Dozer	1	82	40	50	0.5	82	78
					Combined at 50 feet	**91**	**88**
					Combined at Receptor 250 feet	**78**	**74**
					Combined at Receptor 320 feet	**75**	**71**
					Combined at Receptor 650 feet	**69**	**65**

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	1	84	40	50	0.5	84	80
					Combined at 50 feet	**89**	**85**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	2	84	40	50	0.5	84	83
					Combined at 50 feet	**89**	**86**

Phase:Building Construstion

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	1	75	20	50	0.5	75	68
Generator	1	81	50	50	0.5	81	78
Tractor	1	84	40	50	0.5	84	80
Welder / Torch	3	74	40	50	0.5	74	75
					Combined at 50 feet	**87**	**83**

Phase:Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Drum Mixer	1	80	50	50	0.5	80	77
Paver	1	77	50	50	0.5	77	74
All Other Equipment > 5 HP	1	85	50	50	0.5	85	82
Roller	1	80	20	50	0.5	80	73
Tractor	1	84	40	50	0.5	84	80
					Combined at 50 feet	**89**	**85**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

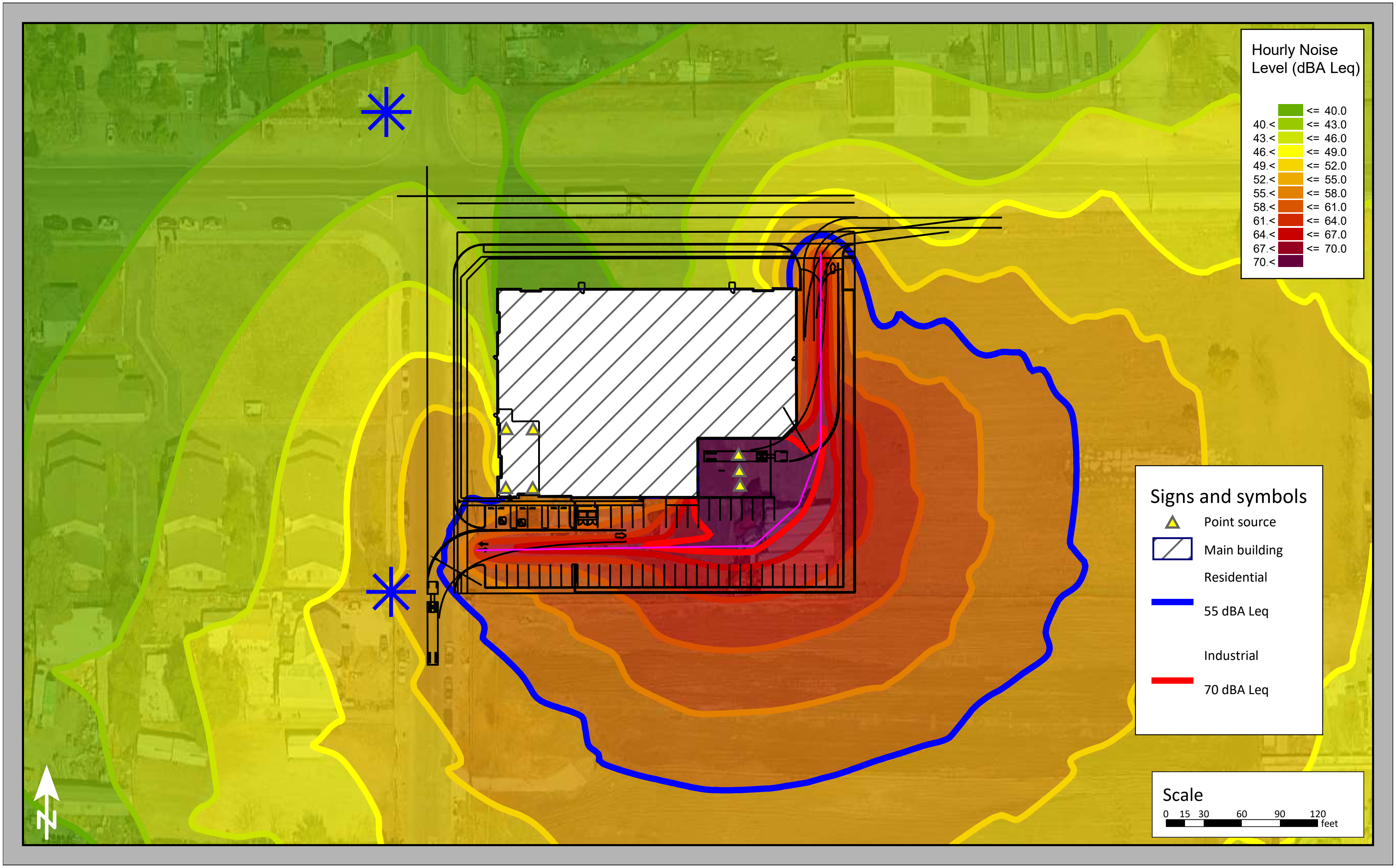
APPENDIX C

SOUNDPLAN NOISE MODEL PRINTOUTS

Stewart Almond

Project No. LCI2204

Project Operational Noise Levels



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