Upland Multi-Family Residential Development

Noise Impact Study

City of Upland, CA

Prepared for:

Brian Taylor
Taylor & Clark
1968 S Coast Hwy #3043
Laguna Beach, CA 92651

Prepared by:

MD Acoustics, LLC
Joel Demir, INCE-USA
Claire Pincock, INCE-USA
1197 Los Angeles Ave, Ste C-256
Simi Valley, CA 93065

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MD ACOUSTICS
Sound Solutions for Planning and Design

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF EXHIBITS

LIST OF TABLES

1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

The assessment was conducted and compared to the noise standards set forth by Federal, State, and Local agencies. Consistent with the City's Noise Guidelines, the project must demonstrate compliance with the applicable noise criterion as outlined within the City's Noise Element and Municipal Code. This noise assessment intends to demonstrate the project's compliance with applicable noise regulations and lack of significant noise impacts.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- A description of the local noise guidelines and standards
- An analysis of traffic noise impacts to and from the project site
- An analysis of construction noise impacts

1.2 Site Location and Study Area

The project site is located north of West Arrow Highway between North San Antonio Avenue and North Mountain Avenue in the City of Upland, CA (APNs: 1007-181-01, 1007-181-02, 1007-181-03, 1007-181-04, 1046-321-43), as shown in Exhibit A. Land uses surrounding the site include residential to the north, residential and public to the east, residential and public to the south, and residential to the west. N San Antonio Avenue is to the east, W Arrow Hwy is to the south, and N Mountain Avenue is to the east. There is a railroad south of Arrow Hwy.

1.3 Proposed Project Description

The project proposes to develop a 19-building housing complex with 132 units and 352 parking spaces on an approximately 6.1-acre site. There will be 23 units consisting of 3 bedrooms and 2.5 bathrooms (1,386 to 1,400 SF), 60 units consisting of 3 bedrooms, 3 bathrooms (1,475 SF), and 49 units consisting of 4 bedrooms and 4 bathrooms (1,593 SF), resulting in a total of 198,565 square feet. There will be 264 garage parking spaces, 66 open parking spaces, and 22 open guest parking spaces. The recreational facilities on site will include one playground structure with a turf area and an outdoor barbecue with an eating area. The site plan used for this project is shown in Exhibit B.

This study assesses the traffic noise to and from the project site and compares the results to the applicable City noise standards. In addition, the study reviews noise generated by construction activities.

Construction activities within the Project area will consist of demolition, site preparation, grading, building, paving, and architectural coating.

Exhibit A

Location Map

Exhibit B

Site Plan

SITE INFORMATION
City: Upland
County: San Bernardino County
Zoning:

SP/RM-40 DEVELOPMENT STANDARDS (TBD)
As the RM-40 Zone has not been established, the proposed project will likely proceed under a Specific Plan from whichthe RM-40 zoning standards will be established.
Density: 20-40 du/ac
Max Building Height: 40'
Front Setback 20'
Side Setback: 5'
Rear Setback: 15'
Multi-Family Bldg Sep: 15'
Private Outdoor Living Space: 100sf/unit (min 8' dim)
Common Outdoor Living Space: 250 sf/unit (25' clear on any side)
Recreation Facilities:
101-150 units: 1 major & 2 minor facilities
Proposed Major Recreation Facilities:
Clubhouse with pergola and two pickle ball courts
Proposed Minor Recreation Facilities:
One larger park with shade structure, tables, chairs, BBQ, playground structure and turf area for playing. Another separate area with shade structure, tables, chairs and a BBQ.
Parking Required per City Code:
1 bd: 1 sp/unit (covered)
2bd: 2 sp/unit (covered)
3bd+: 2.5 sp/unit (2 covered)
Guest parking 100+ units: 1 per 6 units

SITE SUMMARY
Site Area: ±6.1 ac

Units:
8 units - Plan 1 (1386sf - 3bd/2.5ba, sxs)
8 units - Plan 2 (1390sf - 3bd/2.5ba, sxs)
60 units - Plan 3 (1475sf - 3bd/3ba, tandem)
49 units - Plan 4 (1593ef - 4bd/4ba, sxs)
7 units - Plan 5 (1400sf - 3bd/2.5ba, sxs)
132 units - Total

Density: ±21.6 du/ac

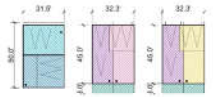
Parking Required: 2.67 sp/unit

Parking Provided:
264 spaces - Garages
88 spaces - Open
352 spaces - Total (±2.67 sp/unit)

Open Space Required: 250sf/unit (min 25' dim?)

Usable Open Space Provided*: ±21,000sf (±160sf/unit) **min 25' dim*

Additional Open Space Provided*: ±14,000sf (±105sf/unit) **no min size or dimension*



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WARMINGTON ARROW HIGHWAY
UPLAND, CA

CONCEPTUAL SITE PLAN OPTION 6
JANUARY 24, 2025

2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used within the report.

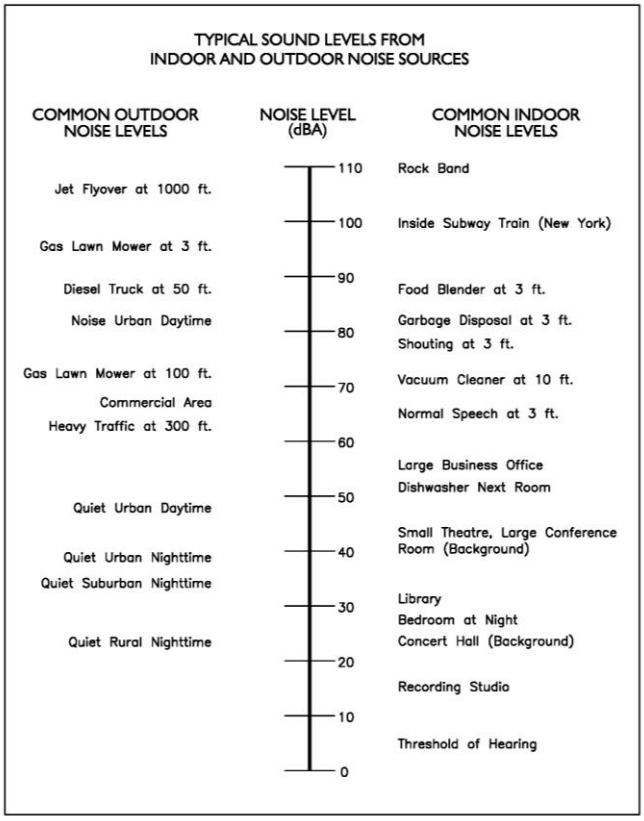
2.1 Sound, Noise, and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding), and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

Exhibit C: Typical A-Weighted Noise Levels



2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (µPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels, abbreviated dB. Exhibit C illustrates reference sound levels for different noise sources.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two sounds or equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase. If two sounds differ by approximately 10 dB, the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz (A-weighted scale), and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report, as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibels (dBA). Typically, the human ear can barely perceive a change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g., doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, while others are random. Some noise levels are constant while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels.

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level: The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly L50, L90 and L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area: Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

2.7 Traffic Noise Prediction

Noise levels associated with traffic depend on a variety of factors: (1) volume of traffic, (2) speed of traffic, (3) auto, medium truck (2 axle), and heavy truck percentage (3 axle and greater), and sound propagation. The greater the volume of traffic, higher speeds and truck percentages equate to a louder volume in noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3 dB; reasons for this are discussed in the sections above.

2.8 Sound Propagation

As sound propagates from a source, it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt, or landscaping attenuate noise at a rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 7.5 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet from a noise source. Wind, temperature, air humidity, and turbulence can further impact how far sound can travel.

3.0 Ground-Borne Vibration Fundamentals

3.1 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV – Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS – Known as root mean squared (RMS) can be used to denote vibration amplitude

VdB – A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be

effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 Regulatory Setting

The proposed project is located in the City of Upland and noise regulations are addressed through the efforts of various federal, state and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) originally was tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers.

The federal government advocates that local jurisdiction use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the “Land Use Compatibility for Community Noise Environments Matrix.” The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan.

4.3 City of Upland Noise Regulations

The City of Upland outlines its noise regulations and standards within the Safety Element from the General Plan and the Noise Ordinance from the Municipal Code.

City of Upland General Plan

The City has outlined goals and policies to reduce potential noise impacts, which are presented below:

Goals and Policies

Policies and goals from the noise section of the Safety Element that would mitigate potential impacts on noise include the following.

Goal SAF-1 Upland is protected from interior and exterior noise levels that cause harm to safety, health, and well-being.

Policy SAF-1.1 Exterior Noise Standards. Require noise mitigation for all development where the projected exterior noise levels exceed those shown in Table SAF-1 (Exhibit D in this report), to the extent feasible.

Exhibit D: Land Use Compatibility Guidelines

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

Source: Governor's Office of Planning and Research, State of California General Plan Guidelines 2003, 2003, pages 244-254.

Policy SAF-1.2 Exterior Incremental Noise Standards. Require noise mitigation for all development that increases existing noise levels by more than the allowable increment shown in Table SAF-4 (Table 1 in this report), to the extent feasible.

Table 1: Exterior Incremental Noise Impact Standards for Noise-Sensitive Uses (dBA)

Residences and Buildings Where People Normally Sleep		Institutional Land Uses with Primarily Daytime and Evening Uses	
Existing L_{dn}	Allowable Noise Increment	Existing Peak Hour L_{dn}	Allowable Noise Increment
45	8	45	12
50	5	50	9
55	3	55	6
60	2	60	5
65	1	65	3
70	1	70	3
75	0	75	1
80	0	80	0

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, 2006.

Policy SAF-1.3 Interior Noise Standards. Require new development to include noise mitigation to assure acceptable interior noise levels appropriate to the land use type: 45 dBA Ldn for residential, transient lodgings, hospitals, nursing homes, and other uses where people normally sleep; and 45 dBA Ldn (peak hour) for office buildings and similar uses.

Policy SAF-1.4 Location of Noise-Sensitive Land Uses. Prevent noise-sensitive land uses (schools, medical centers and hospitals, senior centers, and residences) from locating in areas with noise levels that exceed those considered normally acceptable for each land use unless measures can be implemented to reduce noise to acceptable levels.

Policy SAF-1.5 Noise Impact Study. Require a noise impact study to evaluate impacts of projects that may exceed 65 Ldn as part of the design review process.

Policy SAF-1.6 Acoustical Study. Require an acoustical study for all new residential developments that lie within the 65 Ldn noise contour on the Future Noise Contour Map, to ensure indoor levels will not exceed City standards. In addition, the City shall continue to enforce the California Building Code for indoor noise levels.

Policy SAF-1.7 Noise Reduction in Site Design. Require measures that attenuate exterior and/or interior noise levels to acceptable levels to be incorporated into all development projects where

current and/or future outdoor noise levels may be unacceptable. Require noise reduction features, the focus of which shall be on site design techniques, so long as they do not conflict with the goals of the Community Character Element. Techniques include:

A. Designing landscaped building setbacks to serve as a buffer between the noise source and receptor.

B. Placing noise-tolerant land uses such as parking lots, maintenance facilities, and utility areas between the noise source and receptor.

C. Orienting buildings to shield noise-sensitive outdoor spaces from a noise source.

D. Locating bedrooms or balconies on the sides of buildings facing away from noise sources.

E. Utilizing noise barriers, such as landscaped berms, to reduce adverse noise levels in noise-sensitive outdoor activity areas, avoiding sound walls wherever possible.

Policy SAF-1.9 Alternative to Sound Walls. Encourage the use of design strategies and other noise reduction methods along transportation corridors in lieu of sound walls to mitigate noise impacts and enhance aesthetics.

Policy SAF-1.11 Construction Noise. Require construction projects to adhere to the City's construction hours and incorporate measures to minimize impacts.

Policy SAF-1.12 Operational Noise. Require mixed-use, commercial, and industrial projects to mitigate operational noise impacts to adjoining sensitive uses to meet operational noise thresholds.

City of Upland Municipal Code

The City's noise ordinance is found in Chapter 9.40 – Unnecessary Noise.

Section 9.40.040 – Base ambient noise level.

All ambient noise measurements shall commence at the base ambient noise levels in decibels within the respective times and zones as follows:

Table 2: Base Ambient Noise Level

ZONE USE	SOUND LEVEL LIMIT (dBA)	
	DAYTIME (7 a.m. - 10 p.m.)	NIGHTTIME (10 p.m. - 7 a.m.)
Residential	55	45
Industrial and Commercial	75	75
Uses not specified	65	65

Actual decibel measurements exceeding the above levels at the times and within the zones corresponding thereto shall be employed as the base ambient noise level referred to in this chapter. Otherwise, no ambient noise shall be deemed to be less than the above specified levels.

9.40.050 Exterior noise level measurement.

Exterior noise levels shall be measured at any point relative to the closest point of the source of the noise at the property line on the affected property. Measurements will not be made during extraordinary times, such as during the movement of a nearby train or airplane.

9.40.070 Maximum residential noise levels.

Exterior noise shall be measured on the exterior of any residential property, and no noise level shall exceed the following for the duration periods specified:

Table 3: Maximum Residential Noise Levels

NOISE LEVEL EXCEEDED	MAXIMUM DURATION PERIOD
Base ambient noise level (BANL)	30 minutes in any hour
5 dBA above BANL	15 minutes in any hour
10 dBA above BANL	5 minutes in any hour
15 dBA above BANL	1 minute in any hour
20 dBA above BANL	Not permitted

9.40.080 Maximum nonresidential noise levels.

Measured on the exterior of nonresidential properties, no noise level shall exceed the respective base ambient noise levels for nonresidential land uses as determined by development standards established by the regulating agency.

9.40.100 Noises prohibited – Unnecessary noise standard.

The following acts are declared to be loud, disturbing and unnecessary noises in violation of this chapter, but such enumeration shall not be deemed to be exclusive, namely:

> E. Machinery, Equipment, Fans and Air Conditioning. 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 five dB(A).
>
> M. Construction or Repairing of Buildings. 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, except in case of urgent necessity in the interest of public health and safety, and then only with a permit from the building inspector, which permit may be granted for a period not to exceed three days or less while the emergency continues, and which permit may be renewed for periods of three days or less while the emergency continues. If the building inspector should determine that the public health and safety

will not be impaired by the erection, demolition, alteration or repair of any building or the excavation of streets and highways within the hours of 6:00 p.m. and 7:00 a.m., and if he or she shall further determine that loss or inconvenience would result to any party in interest, he or she may grant permission for such work to be done within the hours of 6:00 p.m. and 7:00 a.m., upon application being made at the time the permit for the work is awarded or during the progress of the work.

P. Blowers. It is unlawful for any person to operate any noise-creating blower or power fan or any internal combustion engine, the operation of which causes noise due to the explosion of operating gases or fluids, unless the noise from such blower or fan is muffled and such engine is equipped with a muffler device sufficient to deaden such noise.

4.4 CEQA Guidelines

According to CEQA guidelines, the project would have a potential impact if it resulted in:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Generation of excessive groundborne vibration or groundborne noise levels?

c) 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 airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

5.0 Study Method and Procedure

The following section describes the noise modeling procedures and assumptions used for this assessment.

5.1 Noise Measurement Procedure and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance with City and Caltrans (TeNS) technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-2014 identified in Chapter 19.68.020.AA). The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed 5 feet above the ground for all measurements
- Sound level meters (Piccolo II) were calibrated before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on “A” and slow response
- Results of the long-term noise measurements were recorded on field data sheets
- During any short-term noise measurements, any noise contaminations such as barking dogs, local traffic, lawn mowers, or aircraft fly-overs were noted
- Temperature and sky conditions were observed and documented

5.2 Noise Measurement Locations

Noise monitoring locations were selected based on the nearest sensitive receptors relative to the proposed noise sources impacting the area. Two (2) long-term 24-hour noise measurements were conducted at or near the project site and are illustrated in Exhibit E. Appendix A includes photos, the field sheet, and measured noise data.

5.3 FHWA Traffic Noise Prediction Model

Traffic noise from vehicular traffic was projected using the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) standards. The FHWA model arrives at the predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Existing roadway volumes were taken from the City of Upland Engineering & Traffic Survey from 2015, and the project trip generation was prepared by TJW Engineering (TJW Engineering, Arrow Highway Single Family Attached Housing Trip Generation and VMT Screening, April 9, 2025). The referenced traffic data was applied to the model and is in Appendix B. The following outlines the key adjustments made to the REMEL for the roadway inputs:

- Roadway classification – (e.g., freeway, major arterial, arterial, secondary, collector, etc.),
- Roadway Active Width – (distance between the center of the outermost travel lanes on each side of the roadway)
- Average Daily Traffic Volumes (ADT), Travel Speeds, Percentages of automobiles, medium trucks and heavy trucks
- Roadway grade and angle of view
- Site Conditions (e.g., soft vs. hard)
- Percentage of total ADT which flows each hour throughout a 24-hour period

Table 4 indicates the roadway parameters and vehicle distribution utilized for this study.

Table 4: Roadway Parameters and Vehicle Distribution

Roadway	Segment	Existing ADT[1]	Existing + Project ADT[2]	Speed (MPH)	Site Conditions
W Arrow Hwy	South of site	11,923	12,873	40	Hard
N San Antonio Ave	East of site	13,762	14,712	35	Hard
N Mountain Ave	West of site	31,535	32,485	40	Hard
Road Vehicle Distribution and Mix[3]					
Motor-Vehicle Type		**Daytime % (7AM to 7 PM)**	**Evening % (7 PM to 10 PM)**	**Night % (10 PM to 7 AM)**	**Total % of Traffic Flow**
Automobiles		77.5	12.9	9.6	97.5
Medium Trucks		84.8	4.9	10.3	1.8
Heavy Trucks		86.5	2.7	10.8	0.7

Notes:
[1] City of Upland Engineering & Traffic Survey, 2015
[2] Project Trip Generation from TJW Engineering
[3] Typical Southern California Vehicle Distribution

To determine the project's noise impact to the surrounding land uses, MD generated noise contours for projected traffic conditions. Noise contours are used to provide a characterization of sound levels experienced at a set distance from the centerline of a subject roadway. They are intended to represent a worst-case scenario and do not take into account structures, sound walls, topography, and/or other sound attenuating features which may further reduce the actual noise level. Noise contours are developed for comparative purposes and are used to demonstrate potential increases/decreases along subject roadways because of a project.

5.4 FHWA Roadway Construction Noise Model

The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RNCM), together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, % usage factor, and baseline parameters for the project site.

The project was analyzed based on the different construction phases. The construction noise calculation output worksheet is in Appendix C. The following assumptions relevant to short-term construction noise impacts were used:

- It is estimated that construction will occur over a 14-month time period.

Exhibit D

Measurement Locations

= Long-Term Monitoring Locations

6.0 Existing Noise Environment

Two (2) 24-hour noise measurements were conducted at the project site to document the existing noise environment. The measurements include hourly Leq, Lmin, Lmax, and other statistical data (e.g. L2, L8). The results of the noise measurement are presented in Table 5A and 5B. The noise measurement field sheet is provided in Appendix A.

6.1 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Tables 5A and 5B.

Table 5: Long-Term Noise Measurement Data[1]

Date	Hour	1-Hour dB(A)							
		Leq	Lmax	Lmin	L2	L8	L25	L50	L90
4/10/2025	12:00 PM	46.6	68.1	38.9	53.6	48.4	46.7	44.9	42.3
4/10/2025	1:00 PM	46.2	60.8	38.8	51.4	48.7	47.0	45.2	42.6
4/10/2025	2:00 PM	48.6	63.9	40.8	53.9	52.1	48.9	47.6	44.8
4/10/2025	3:00 PM	47.8	63.7	42.0	53.3	50.3	48.0	46.6	45.0
4/10/2025	4:00 PM	50.1	70.8	42.2	56.8	51.9	49.7	48.4	46.0
4/10/2025	5:00 PM	50.1	67.3	44.6	56.0	52.0	50.5	49.2	47.3
4/10/2025	6:00 PM	50.5	71.0	43.5	54.6	51.9	50.0	48.1	46.3
4/10/2025	7:00 PM	50.4	69.7	43.0	55.3	53.0	49.4	48.3	46.6
4/10/2025	8:00 PM	50.1	71.7	43.0	57.5	52.9	48.4	47.2	45.8
4/10/2025	9:00 PM	46.6	63.9	41.3	51.7	48.7	46.5	45.5	43.9
4/10/2025	10:00 PM	47.9	65.9	44.0	51.7	49.3	47.6	47.0	46.0
4/10/2025	11:00 PM	46.7	59.3	41.9	50.3	48.7	47.7	46.1	44.2
4/10/2025	12:00 AM	46.8	68.9	40.0	49.3	47.3	46.1	45.1	43.8
4/11/2025	1:00 AM	44.7	56.1	39.5	47.4	46.3	45.4	44.5	43.1
4/11/2025	2:00 AM	43.9	53.8	38.1	46.6	45.5	44.4	43.6	42.4
4/11/2025	3:00 AM	43.8	52.1	39.4	45.9	45.2	44.2	43.6	42.4
4/11/2025	4:00 AM	45.0	53.8	39.2	48.1	47.1	46.3	44.5	42.2
4/11/2025	5:00 AM	47.9	67.9	43.1	51.8	49.0	47.7	47.0	45.5
4/11/2025	6:00 AM	51.2	69.3	46.4	57.4	55.0	50.4	49.5	48.1
4/11/2025	7:00 AM	57.4	70.3	48.4	63.9	62.4	57.3	54.1	51.1
4/11/2025	8:00 AM	53.2	72.4	42.5	59.2	56.1	52.3	51.2	48.2
4/11/2025	9:00 AM	49.5	71.3	38.7	57.0	51.8	48.0	45.8	43.8
4/11/2025	10:00 AM	47.5	65.5	37.3	53.8	49.9	47.2	44.9	42.6
4/11/2025	11:00 AM	48.1	74.2	38.5	54.5	50.4	48.1	44.8	42.4
CNEL		56.8							

Table 6: Long-Term Noise Measurement Data[1]

Date	Hour	1-Hour dB(A)							
		Leq	Lmax	Lmin	L2	L8	L25	L50	L90
4/10/2025	11:00 AM	46.3	60.8	38.9	51.5	48.1	46.9	44.8	42.6
4/10/2025	12:00 PM	45.3	60.0	39.5	49.6	48.1	46.3	44.0	42.0
4/10/2025	1:00 PM	48.5	68.0	41.8	53.5	51.0	49.0	47.0	45.3
4/10/2025	2:00 PM	50.0	62.4	42.8	53.2	52.0	50.8	49.7	46.6
4/10/2025	3:00 PM	52.5	75.1	43.2	58.5	55.1	52.6	50.7	48.0
4/10/2025	4:00 PM	51.2	69.0	45.7	57.1	53.0	51.1	50.2	48.4
4/10/2025	5:00 PM	51.3	69.9	44.6	58.3	53.9	50.7	49.0	47.1
4/10/2025	6:00 PM	51.9	69.3	43.7	58.1	55.4	51.3	48.9	46.6
4/10/2025	7:00 PM	49.4	71.8	43.9	57.4	49.9	48.8	47.5	46.1
4/10/2025	8:00 PM	46.6	65.9	41.9	52.7	48.5	46.7	45.7	43.9
4/10/2025	9:00 PM	47.8	65.4	44.0	52.6	49.3	47.5	47.1	45.8
4/10/2025	10:00 PM	46.8	58.9	41.2	49.9	49.1	48.2	45.5	43.8
4/10/2025	11:00 PM	46.9	68.6	40.9	49.5	48.2	46.6	45.7	44.0
4/11/2025	12:00 AM	44.3	58.3	40.6	47.1	45.6	44.8	43.9	43.0
4/11/2025	1:00 AM	44.3	54.6	39.4	46.4	45.8	44.9	44.1	42.7
4/11/2025	2:00 AM	45.1	52.1	40.4	47.5	47.1	45.5	44.9	43.0
4/11/2025	3:00 AM	46.2	52.0	40.7	49.4	48.6	47.3	45.1	43.6
4/11/2025	4:00 AM	48.8	68.9	44.3	52.1	49.8	49.0	48.0	46.3
4/11/2025	5:00 AM	51.9	70.4	48.1	56.9	53.3	51.7	51.2	50.0
4/11/2025	6:00 AM	55.4	72.8	48.7	59.9	57.9	56.5	54.4	52.1
4/11/2025	7:00 AM	54.3	75.4	41.9	61.2	58.1	53.6	51.5	47.2
4/11/2025	8:00 AM	50.1	69.5	38.4	58.3	54.0	48.3	46.4	43.7
4/11/2025	9:00 AM	47.0	64.7	36.5	53.6	50.4	46.6	44.5	41.9
4/11/2025	10:00 AM	49.9	74.6	37.6	60.1	53.1	47.7	44.5	41.7
CNEL		56.3							

Noise data indicates the ambient noise level ranged from 44 to 57 dBA Leq at the project site. The exterior ambient noise level was between 56 and 57 CNEL dBA and falls within the normally acceptable level of 65 dBA CNEL from the Noise Compatibility Matrix. Additional field notes and photographs are provided in Appendix A.

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts to the project and compares the results to the City's Noise Standards. The analysis details the estimated exterior noise levels associated with traffic from adjacent roadway sources.

7.1 Future Off-site Exterior Noise Impact

The exterior noise level off-site of the project will be impacted by transportation-related sources and other stationary sources. The following outlines the impacts associated with exterior noise levels.

7.1.1 Future Off-site Traffic Noise Impact

The potential off-site noise impacts caused by the increase in vehicular traffic as a result of the project were calculated at a distance of 50 feet. The distance to the 55, 60, 65, and 70 dBA CNEL noise contours are also provided for reference. The noise level at 50 feet is representative of approximate distances to existing multi-family homes close to the subject roadway impacted by the project. The noise contours were calculated for the following scenarios and conditions:

- Existing Condition: This scenario refers to the existing traffic noise condition and is demonstrated in Table 7.
- Existing + Project Condition: This scenario refers to the existing plus project traffic noise condition and is demonstrated in Table 7.

<Table 7, next page>

Table 7: Existing/Existing + Project Scenario – Noise Levels Along Roadways (dBA CNEL)

Existing Exterior Noise Levels

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Arrow Hwy	South of site	67.9	30.6	96.9	306.3	968.7
N San Antonio	East of site	67.1	25.5	80.7	255.2	807.1
N Mountain Ave	West of site	73.0	99.4	314.4	994.3	3144.1

Existing + Project Exterior Noise Levels

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Arrow Hwy	West of site	68.2	33.1	104.6	330.8	1045.9
N San Antonio	North of site	67.4	27.3	86.3	272.8	862.8
N Mountain Ave	West of site	73.1	102.4	323.9	1024.2	3238.8

Change in Noise Levels as a Result of Projects

Roadway[1]	Segment	CNEL at 50 Feet dBA[2]			
		Existing Without Project	Existing With Project	Change in Noise Level	Potential Significant Impact
Arrow Hwy	West of site	67.9	68.2	0.3	No
N San Antonio	North of site	67.1	67.4	0.3	No
N Mountain Ave	West of site	73.0	73.1	0.1	No

Notes:
[1] Exterior noise levels calculated at 5 feet above ground level.
[2] Noise levels calculated from centerline of subject roadway.

Table 7 provides the Existing and Existing + Project noise conditions and shows the change in noise level because of the proposed project. As shown in Table 7, there will be a small increase in traffic noise of 0.3 dBA at 50 feet from the centerlines of Arrow Hwy and N San Antonio According, and a small increase in traffic noise of 0.1 dBA at 50 feet from the centerline of N Mountain Avenue. According to the Federal Highway Administration (see section 2.5), a change in noise level of 0-1 dB is considered imperceptible. Therefore, the anticipated changes in traffic noise levels due to the project are considered imperceptible. The project is in compliance with policy SAF-1.2 which has an allowable increase of 1 dB for existing noise levels of 65 dBA to 75 dBA.

7.1.2 Future Stationary Noise Impact

On-site operational noise is due to HVAC units. HVAC equipment is located in the side yards of the units (5 to 8 HVAC units per building). Equipment will be at least 23 feet away from the CMU wall that lines the residential property line to the east, and at least 34 feet from the property line at the south. The maximum

sound power level from a single unit is 78 dBA. At 23 feet away, the sound pressure level is estimated to be 42 dBA on the residential side of the wall, and at 34 feet away, the sound pressure is estimated to be 39 dBA on the residential side of the wall. For the worst case scenario of 12 HVAC units operating simultaneously near the south western property line, the sound level is 46 dBA on the residential side of the wall.

Operational noise complies with Section 9.40.100 of the Upland Municipal Code which states, "…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 five dB(A)." The noise due to the HVAC units operating simultaneously will not exceed the night-time base ambient noise level of 45 + 5 dBA. The impact is, therefore, less than significant.

7.2 Future On-site Exterior Noise Levels

The exterior noise level at the project site will be impacted by transportation-related sources. The following outlines the impacts associated with exterior noise levels. There are no airports located within 2 miles of the project site. The primary transportation-related noise source is Arrow Hwy.

7.2.1 Noise Impacts to On-Site Receptors Due to Traffic

Traffic is the main source of noise impacting the project site. Traffic noise was evaluated and compared to the County's guidelines. The first-row patio areas closest to Arrow Hwy are at least 2 ft above the roadway elevation and are shielded by 5 ft. tall walls. The noise level at the first-row patio areas will be approximately 64 dBA CNEL. The outdoor common areas closest to Arrow Hwy will be shielded from roadway noise, and the noise level will be approximately 57 dBA CNEL based on the long-term noise measurements. The 2nd floor balcony common areas are at least 345 ft from Arrow Hwy and will be 59 dBA CNEL based on the long-term noise measurements and traffic noise calculations.

7.3 Interior Noise Levels

The future interior noise level was calculated for the sensitive receptor locations using a typical "windows open" and "windows closed" condition. A "windows open" condition assumes 12 dBA of noise attenuation from the exterior noise level. A "windows closed" condition assumes a minimum of 20 dBA of noise attenuation from the exterior noise level. Table 6 indicates the interior noise levels for the project site.

<Table 8, next page>

Table 8: Future Interior Noise Levels (dBA CNEL)

Location	Roadway Noise Source	Noise Level at Building Facade[1]	Interior Noise Reduction Required to Meet Interior Noise Standard of 45 dBA CNEL	STC Rating for Windows Facing Subject Roadway[2]	Interior Noise Level w/ Residential Windows	
					Window Open[3]	Windows Closed[4]
South Units Facing Arrow Hwy	Arrow Hwy	68	23	29	56	45
South Units 2nd Floor Balconies Facing Arrow Hwy	Arrow Hwy	59	14	26	47	39

Notes:
1. Noise level from Section 7.2 and from worksheets Appendix B.
2. Indicates the required STC rating to meet the interior noise standard.
3. A minimum of 12 dBA noise reduction is assumed with a "windows open" condition.
4. A minimum of 20 dBA noise reduction is assumed with a "windows closed" condition.

As shown in Table 8, the interior noise level will be up to 56 dBA CNEL with the windows open and 45 dBA CNEL with the windows closed at units with a direct line of sight to Arrow Hwy. The exterior noise level at the 2nd floor balcony common areas with direct line of sight to Arrow Hwy will be up to 59 dBA CNEL. To meet the City's interior 45 dBA CNEL standard, a "windows closed" condition is required. A "windows closed" condition simply means that in order to achieve a 45 dBA CNEL interior noise level, the windows must be closed and does not mean the windows must be fixed. The project will incorporate the following Project Design Feature:

1. The windows and sliding glass doors for units adjacent to and with a direct line of sight of Arrow Hwy will have an STC rating of 29 or more.

8.0 Construction Noise Impact

The degree of construction noise may vary for different areas of the project site and also vary depending on the construction activities. Noise levels associated with the construction will vary with the different phases of construction. The construction noise and vibration level projections are provided in the sections below.

8.1 Construction Noise

The Environmental Protection Agency (EPA) has compiled data regarding the noise generated characteristics of typical construction activities. The data is presented in Table 9.

Table 9: Typical Construction Noise Levels[1]

Equipment Powered by Internal Combustion Engines

Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86

Impact Equipment

Type	Noise Levels (dBA) at 50 Feet
Saws	71 - 82
Vibrators	68 - 82

Notes:
[1] Referenced Noise Levels from the Environmental Protection Agency (EPA)

Construction is anticipated to occur during the permissible hours from 7:00 a.m. to 6:00 p.m. on weekdays, according to the City's Municipal Code Section 9.40.100. Construction noise is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the City's Municipal Code. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing within the project vicinity. Furthermore,

noise reduction policies are provided to further reduce construction noise. The construction noise impact is considered less than significant; however, construction noise level projections are provided.

Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Noise levels are in Table 10. A likely worst-case construction noise scenario assumes equipment operating an average of 250 feet from the nearest sensitive receptors, the residential properties on the north and west property lines.

Table 10: Construction Noise Levels at the Northwest Property Line

Phase	dBA Lmax	dBA Leq
Demo	100.6	68.6
Site Prep	94.6	69.1
Grade	95.6	68.7
Build	95.6	68.9
Paving	100.6	68.3
Arch Coating	88.6	55.4
Notes: Const Equip from CalEEMod		

To ensure that construction activities do not disrupt the adjacent land uses, the noise reduction policies in Section 8.3 should be taken.

8.2 Construction Vibration

Construction activities can produce vibration that may be felt by adjacent land uses. The construction of the proposed project would not require the use of equipment such as pile drivers, which are known to generate substantial construction vibration levels. The primary vibration source during construction may be from a bulldozer. A vibratory roller has a vibration impact of 0.21 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage for surrounding structures.

The fundamental equation used to calculate vibration propagation through average soil conditions and distance is as follows:

$$PPV_{equipment} = PPV_{ref} (100/D_{rec})^{n}$$

Where: PPV_{ref} = reference PPV at 100ft.
D_{rec} = distance from equipment to receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

The thresholds from the Caltrans Transportation and Construction Induced Vibration Guidance Manual in Table 11 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 11: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, Transportation and Construction Vibration Guidance Manual, Caltrans, Sept. 2013.
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 12 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 12: Vibration Source Levels for Construction Equipment[1]

Equipment	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

At a distance of 20 feet, a vibratory roller would yield a worst-case 0.268 PPV (in/sec), which will be perceptible but sustainably below any risk of damage (0.3 in/sec PPV is the threshold of old residential structures). The impact is less than significant if the noise reduction policies in Section 8.3 are taken.

8.3 Construction Noise and Vibration Reduction Policies

Construction operations must follow the City's Noise Ordinance, which states that construction, repair or excavation work performed must occur within the permissible hours. To further ensure that construction activities do not disrupt the adjacent land uses, the following policies should be taken:

1. Construction shall occur during the hours of 7AM to 6PM on weekdays.

2. All construction equipment shall be equipped with appropriate mufflers.

3. The contractor shall locate equipment staging areas as far away as possible from the sensitive receptors.

4. Vibratory rollers shall not operate within 20' of existing buildings. All other heavy equipment shall not operate within 10' of existing buildings.

5. Idling equipment shall be turned off when not in use.

6. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 CEQA Analysis

The California Environmental Quality Act Guidelines establishes thresholds for noise impact analysis as presented below:

(a) Would the project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise Code, or applicable standards of other agencies?

Transportation Noise Impacts

Transportation noise impacts would be considered significant if the existing plus project levels are expected to increase by more than 3 dB. Compared to existing traffic noise levels, future traffic volumes are expected to increase by a maximum of 0.3 dBA CNEL at existing land uses. The impact is therefore less than significant.

Stationary Noise Sources

Stationary noise impacts would be considered significant if they result in exceedances of Chapter 9.40 of the Municipal Code. Implementation of the proposed project may result in stationary noise related to HVAC Systems and Transformers. According to Section 9.40.100 of the Municipal Code, it is unlawful for HVAC equipment to exceed the base ambient noise level by 5 dBA. The base ambient noise level of the surrounding residential properties is 45 dBA Leq during the hours of 10pm – 7am. HVAC equipment is anticipated to be 46 dBA Leq when operating simultaneously as a worst-case scenario and would not increase the base ambient noise level by more than 5 dB. The impact would therefore be less than significant.

Construction Noise and Vibration

Construction is anticipated to occur during the permissible hours from 7:00 a.m. to 6:00 p.m. on weekdays, according to the City's Municipal Code Section 9.40.100. Construction noise is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the City's Municipal Code. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing within the project vicinity. Furthermore, noise reduction policies are provided below to further reduce construction noise. The construction noise impact is considered less than significant.

1. Construction shall occur during the hours of 7AM to 6PM on weekdays.

2. All construction equipment shall be equipped with appropriate mufflers.

3. The contractor shall locate equipment staging areas as far away as possible from the sensitive receptors.

4. Vibratory rollers shall not operate within 20’ of existing buildings. All other heavy equipment shall not operate within 10’ of existing buildings.

5. Idling equipment shall be turned off when not in use.

6. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

b) Generate excessive ground-borne vibration or ground-borne noise levels?

Construction vibration would be significant if vibration exceeds levels which would result in structural damage to existing buildings. Construction activity is not anticipated to occur within 20 feet of neighboring buildings. At a distance of 20 feet a vibratory roller would yield a worst-case 0.268 PPV (in/sec), which will be perceptible, but is below the threshold of any risk of damage. Vibratory rollers shall not operate within 20’ of existing buildings. All other heavy equipment shall not operate within 10’ of existing buildings. The impact is therefore less than significant.

10.0 References

State of California General Plan Guidelines: 1998. Governor's Office of Planning and Research

City of Upland: General Plan EIR.

City of Upland: Safety Element.

Caltrans Noise Technical Manual. 2013

Konan Vibration Criteria

TJW Engineering, Inc.: Arrow Highway Trip Generation and VMT Screening, City of Upland – May 2023.

Federal Highway Administration. Noise Barrier Design Handbook. June 2017.

Federal Transit Administration. Transit Noise and Vibration Impact Assessment Manual. September 2018

Appendix A:

Photographs and Field Measurement Data

24-Hour Continuous Noise Measurement Datasheet - NM1, NM2

Project Name:	Arrow Noise
Project: #/Name:	1310-2025-001
Site Address/Location:	911 Arrow Highway
Date:	04/10/2025
Field Tech/Engineer:	Jason Schuyler / Rachel Edelman

Site Observations:

Temps are in the high 80's F during the day, and the skies are clear, with winds 1-10mph. The primary noise sources are traffic, children playing at the Upland Brethren School/ church, and some residential noise.

Sound Meter:	Piccolo-II, Soft dB	**SN:**	PO222040501
Settings:	A-weighted, slow, 1-min, 24-hour duration		
Site Id:	NM1, NM2		

STICS

MD ACOUSTICS

24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1, NM2

Project Name:	Arrow Noise	**Calibrator:**	Larson Davis Cal 200	
Site Address/Location:	911 Arrow Highway	**Cal Check: Pre-test:**	.05 **Post Test:**	.01
Site Id:	NM1, NM2			

Figure 1: NM1

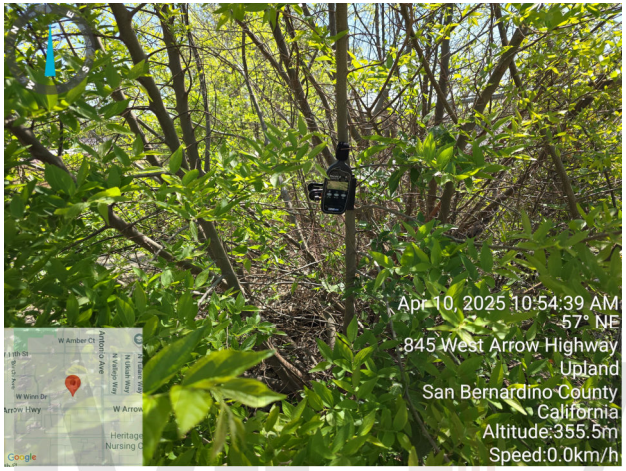
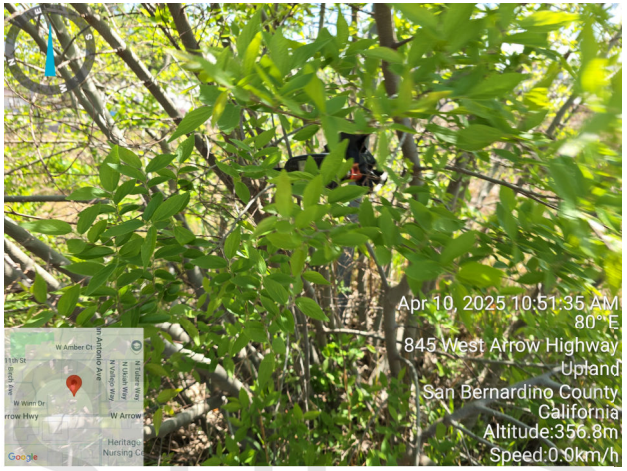


Figure 2: NM1

Figure 3: NM2



24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1

Project Name:	Arrow Noise	**Site Topo:**	Slight upslope and a **Day:** 1 of 2
Site Address/Location:	911 Arrow Highway	lane in bet	**Noise Source(s) w/ Distance:**
Site Id:	NM1	**Meteorological Cond.:**	72F Winds 0-10mph road noise and residential noise
		Ground Type:	Sandy soil and clay

Table 1: Baseline Noise Measurement Summary

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
4/10/2025	11:00 AM	12:00 PM	46.6	68.1	38.9	53.6	48.4	46.7	44.9	42.3
4/10/2025	12:00 PM	1:00 PM	46.2	60.8	38.8	51.4	48.7	47	45.2	42.6
4/10/2025	1:00 PM	2:00 PM	48.6	63.9	40.8	53.9	52.1	48.9	47.6	44.8
4/10/2025	2:00 PM	3:00 PM	47.8	63.7	42	53.3	50.3	48	46.6	45
4/10/2025	3:00 PM	4:00 PM	50.1	70.8	42.2	56.8	51.9	49.7	48.4	46
4/10/2025	4:00 PM	5:00 PM	50.1	67.3	44.6	56	52	50.5	49.2	47.3
4/10/2025	5:00 PM	6:00 PM	50.5	71	43.5	54.6	51.9	50	48.1	46.3
4/10/2025	6:00 PM	7:00 PM	50.4	69.7	43	55.3	53	49.4	48.3	46.6
4/10/2025	7:00 PM	8:00 PM	50.1	71.7	43	57.5	52.9	48.4	47.2	45.8
4/10/2025	8:00 PM	9:00 PM	46.6	63.9	41.3	51.7	48.7	46.5	45.5	43.9
4/10/2025	9:00 PM	10:00 PM	47.9	65.9	44	51.7	49.3	47.6	47	46
4/10/2025	10:00 PM	11:00 PM	46.7	59.3	41.9	50.3	48.7	47.7	46.1	44.2
4/10/2025	11:00 PM	12:00 AM	46.8	68.9	40	49.3	47.3	46.1	45.1	43.8
4/11/2025	12:00 AM	1:00 AM	44.7	56.1	39.5	47.4	46.3	45.4	44.5	43.1
4/11/2025	1:00 AM	2:00 AM	43.9	53.8	38.1	46.6	45.5	44.4	43.6	42.4
4/11/2025	2:00 AM	3:00 AM	43.8	52.1	39.4	45.9	45.2	44.2	43.6	42.4
4/11/2025	3:00 AM	4:00 AM	45	53.8	39.2	48.1	47.1	46.3	44.5	42.2
4/11/2025	4:00 AM	5:00 AM	47.9	67.9	43.1	51.8	49	47.7	47	45.5
4/11/2025	5:00 AM	6:00 AM	51.2	69.3	46.4	57.4	55	50.4	49.5	48.1
4/11/2025	6:00 AM	7:00 AM	57.4	70.3	48.4	63.9	62.4	57.3	54.1	51.1
4/11/2025	7:00 AM	8:00 AM	53.2	72.4	42.5	59.2	56.1	52.3	51.2	48.2
4/11/2025	8:00 AM	9:00 AM	49.5	71.3	38.7	57	51.8	48	45.8	43.8
4/11/2025	9:00 AM	10:00 AM	47.5	65.5	37.3	53.8	49.9	47.2	44.9	42.6
4/11/2025	10:00 AM	11:00 AM	48.1	74.2	38.5	54.5	50.4	48.1	44.8	42.4

	DNL	54.2

24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

Project Name:	Arrow Noise	**Site Topo:**	Open field, w paved	**Day:**	2 of 2
Site Address/Location:	911 Arrow Highway		areas	**Noise Source(s) w/ Distance:**	
Site Id:	NM2	**Meteorological Cond.:**	72F Winds 0-10mph	road noise and residential noise	
		Ground Type:	Sandy soil and clay		

Table 2: Baseline Noise Measurement Summary

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
4/10/2025	11:00 AM	12:00 PM	46.3	60.8	38.9	51.5	48.1	46.9	44.8	42.6
4/10/2025	12:00 PM	1:00 PM	45.3	60	39.5	49.6	48.1	46.3	44	42
4/10/2025	1:00 PM	2:00 PM	48.5	68	41.8	53.5	51	49	47	45.3
4/10/2025	2:00 PM	3:00 PM	50	62.4	42.8	53.2	52	50.8	49.7	46.6
4/10/2025	3:00 PM	4:00 PM	52.5	75.1	43.2	58.5	55.1	52.6	50.7	48
4/10/2025	4:00 PM	5:00 PM	51.2	69	45.7	57.1	53	51.1	50.2	48.4
4/10/2025	5:00 PM	6:00 PM	51.3	69.9	44.6	58.3	53.9	50.7	49	47.1
4/10/2025	6:00 PM	7:00 PM	51.9	69.3	43.7	58.1	55.4	51.3	48.9	46.6
4/10/2025	7:00 PM	8:00 PM	49.4	71.8	43.9	57.4	49.9	48.8	47.5	46.1
4/10/2025	8:00 PM	9:00 PM	46.6	65.9	41.9	52.7	48.5	46.7	45.7	43.9
4/10/2025	9:00 PM	10:00 PM	47.8	65.4	44	52.6	49.3	47.5	47.1	45.8
4/10/2025	10:00 PM	11:00 PM	46.8	58.9	41.2	49.9	49.1	48.2	45.5	43.8
4/10/2025	11:00 PM	12:00 AM	46.9	68.6	40.9	49.5	48.2	46.6	45.7	44
4/11/2025	12:00 AM	1:00 AM	44.3	58.3	40.6	47.1	45.6	44.8	43.9	43
4/11/2025	1:00 AM	2:00 AM	44.3	54.6	39.4	46.4	45.8	44.9	44.1	42.7
4/11/2025	2:00 AM	3:00 AM	45.1	52.1	40.4	47.5	47.1	45.5	44.9	43
4/11/2025	3:00 AM	4:00 AM	46.2	52	40.7	49.4	48.6	47.3	45.1	43.6
4/11/2025	4:00 AM	5:00 AM	48.8	68.9	44.3	52.1	49.8	49	48	46.3
4/11/2025	5:00 AM	6:00 AM	51.9	70.4	48.1	56.9	53.3	51.7	51.2	50
4/11/2025	6:00 AM	7:00 AM	55.4	72.8	48.7	59.9	57.9	56.5	54.4	52.1
4/11/2025	7:00 AM	8:00 AM	54.3	75.4	41.9	61.2	58.1	53.6	51.5	47.2
4/11/2025	8:00 AM	9:00 AM	50.1	69.5	38.4	58.3	54	48.3	46.4	43.7
4/11/2025	9:00 AM	10:00 AM	47	64.7	36.5	53.6	50.4	46.6	44.5	41.9
4/11/2025	10:00 AM	11:00 AM	49.9	74.6	37.6	60.1	53.1	47.7	44.5	41.7

	DNL	54.7

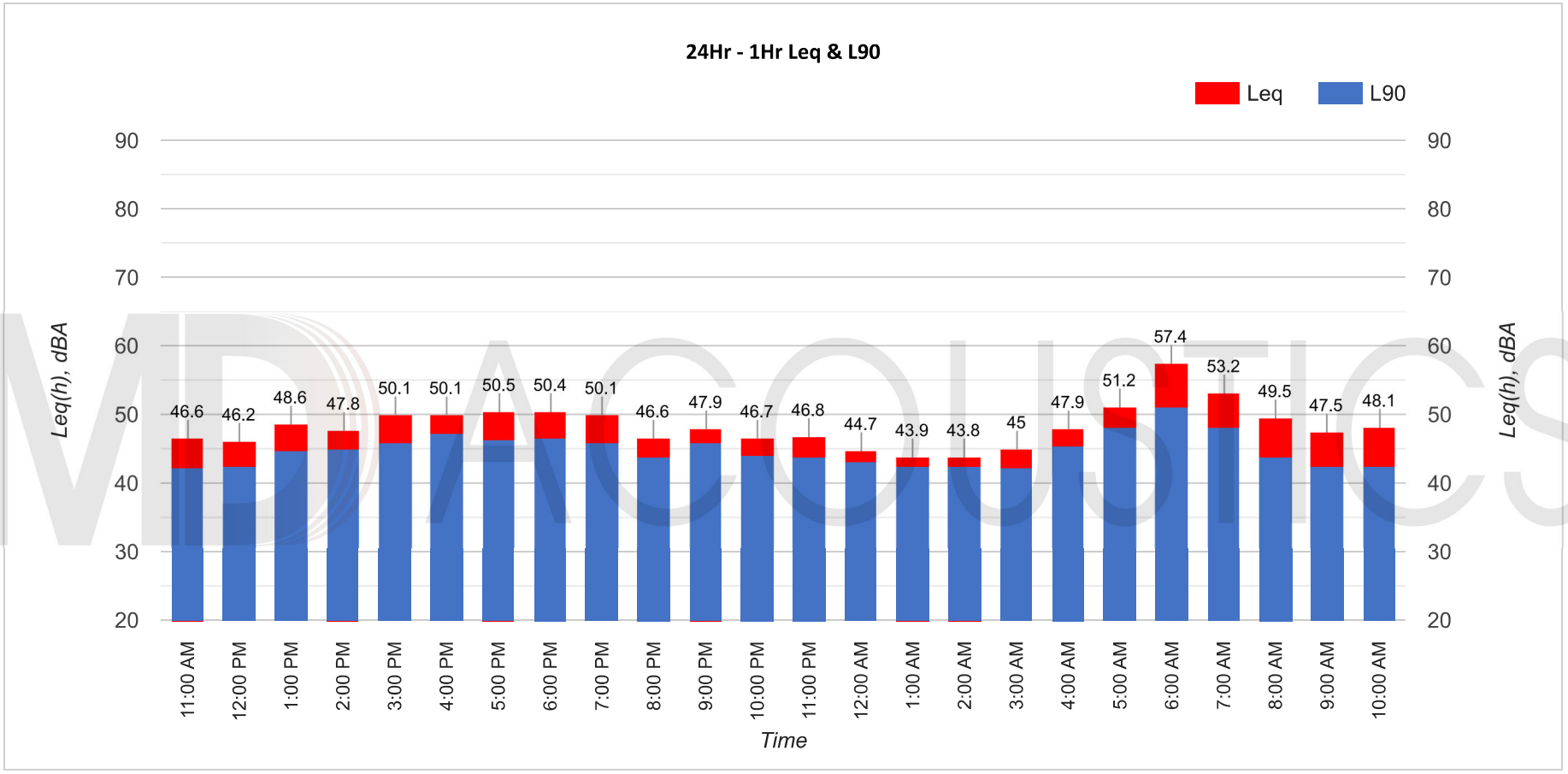
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1

Project Name:	Arrow Noise	**Site Topo:**	Slight upslope and a
Site Address/Location:	911 Arrow Highway		lane in bet
Site Id:	NM1	**Meteorological Cond.:**	72F Winds 0-10mph
		Ground Type:	Sandy soil and clay

Day: 1 of 2

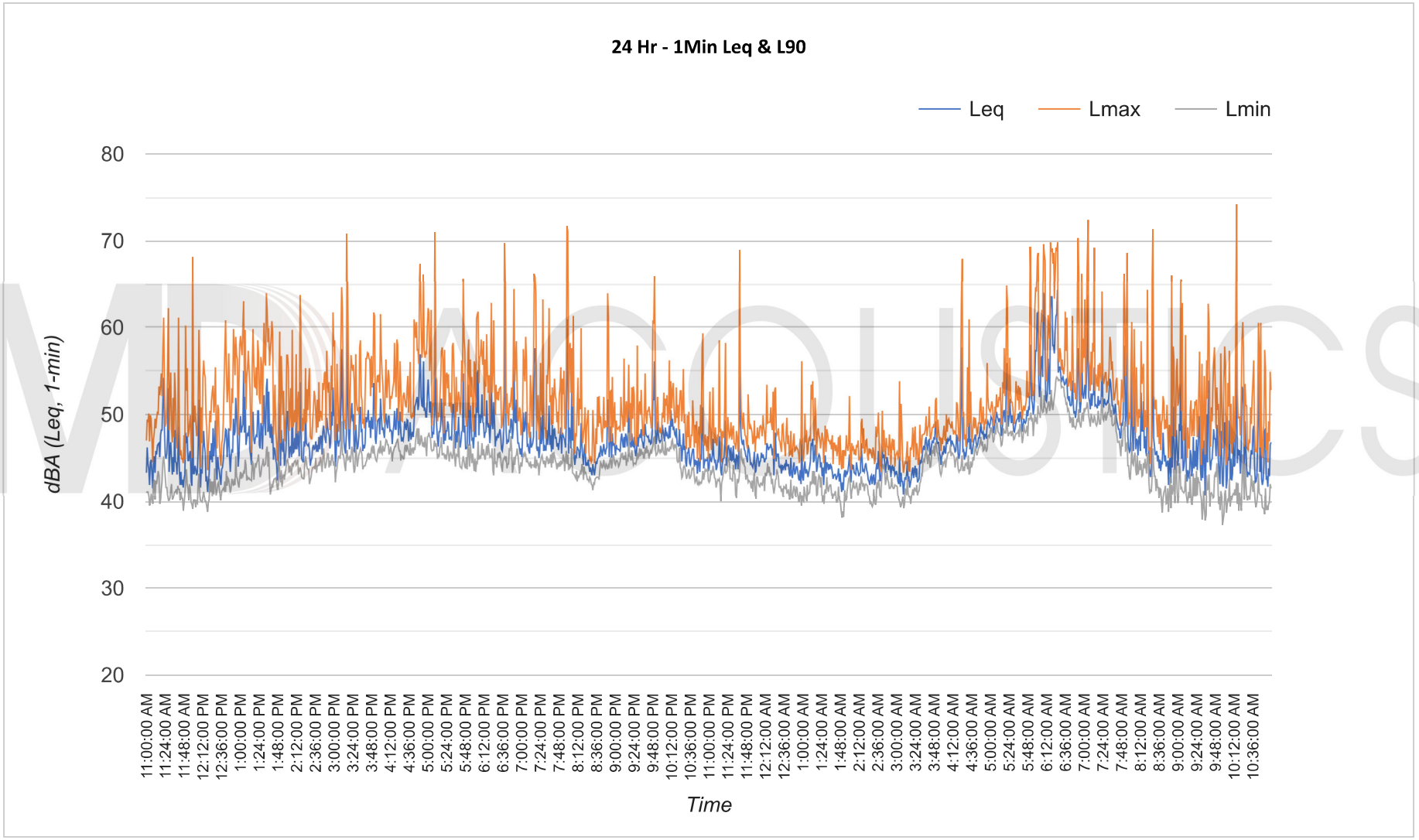
Noise Source(s) w/ Distance:

road noise and residential noise



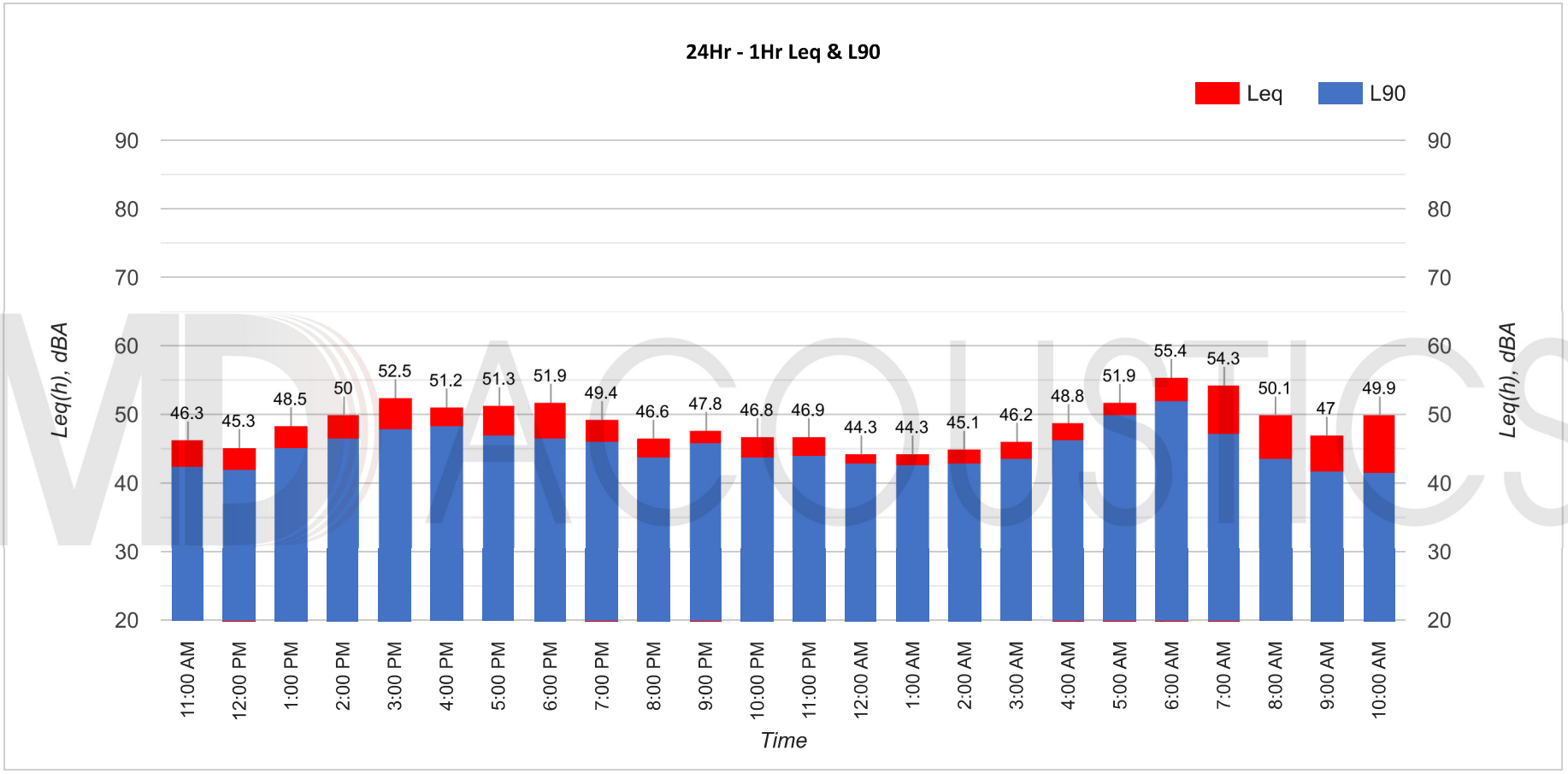
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1

Project Name:	Arrow Noise	**Site Topo:**	Slight upslope and a **Day:** 1 of 2
Site Address/Location:	911 Arrow Highway		lane in bet **Noise Source(s) w/ Distance:**
Site Id:	NM1	**Meteorological Cond.:**	72F Winds 0-10mph road noise and residential noise
		Ground Type:	Sandy soil and clay



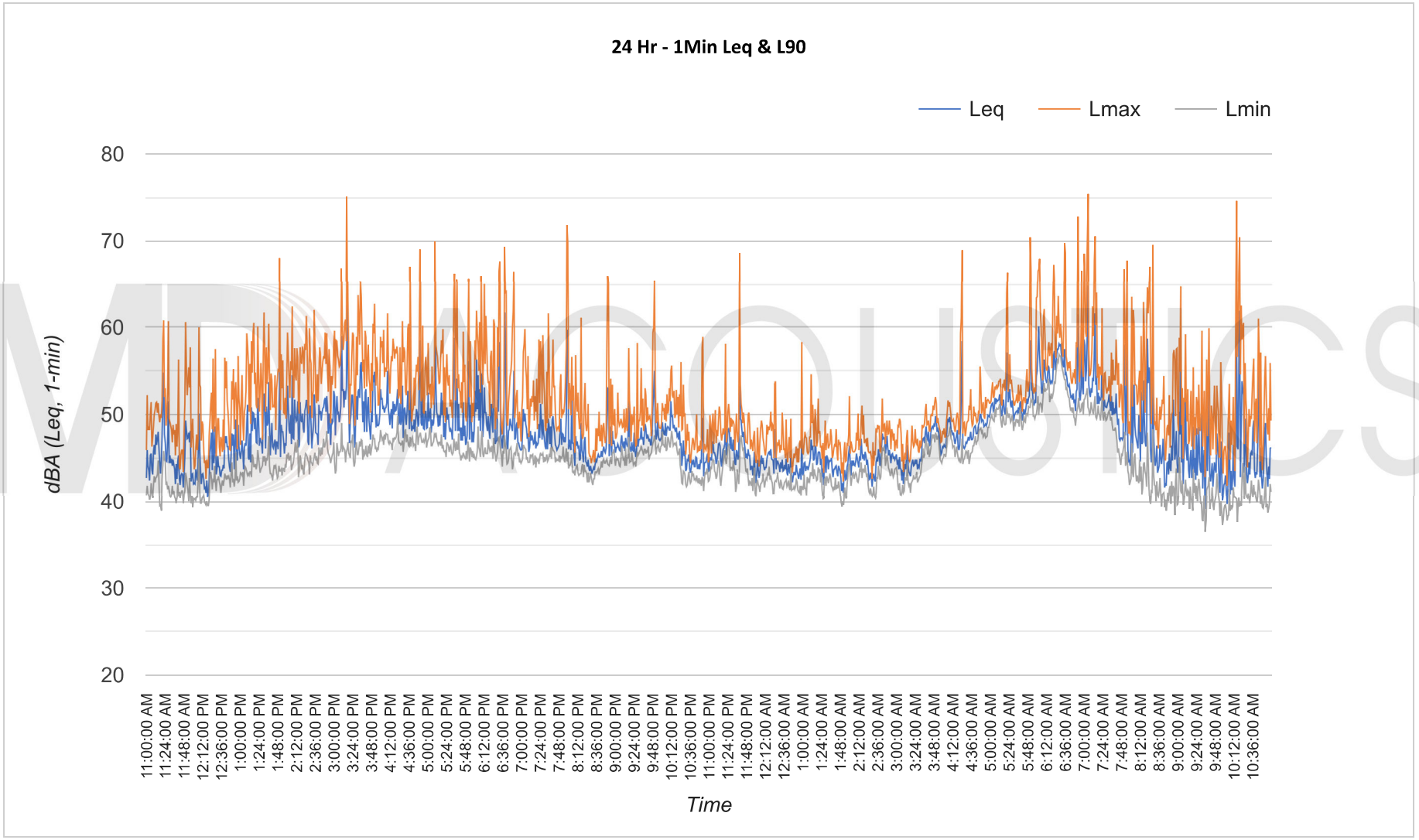
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

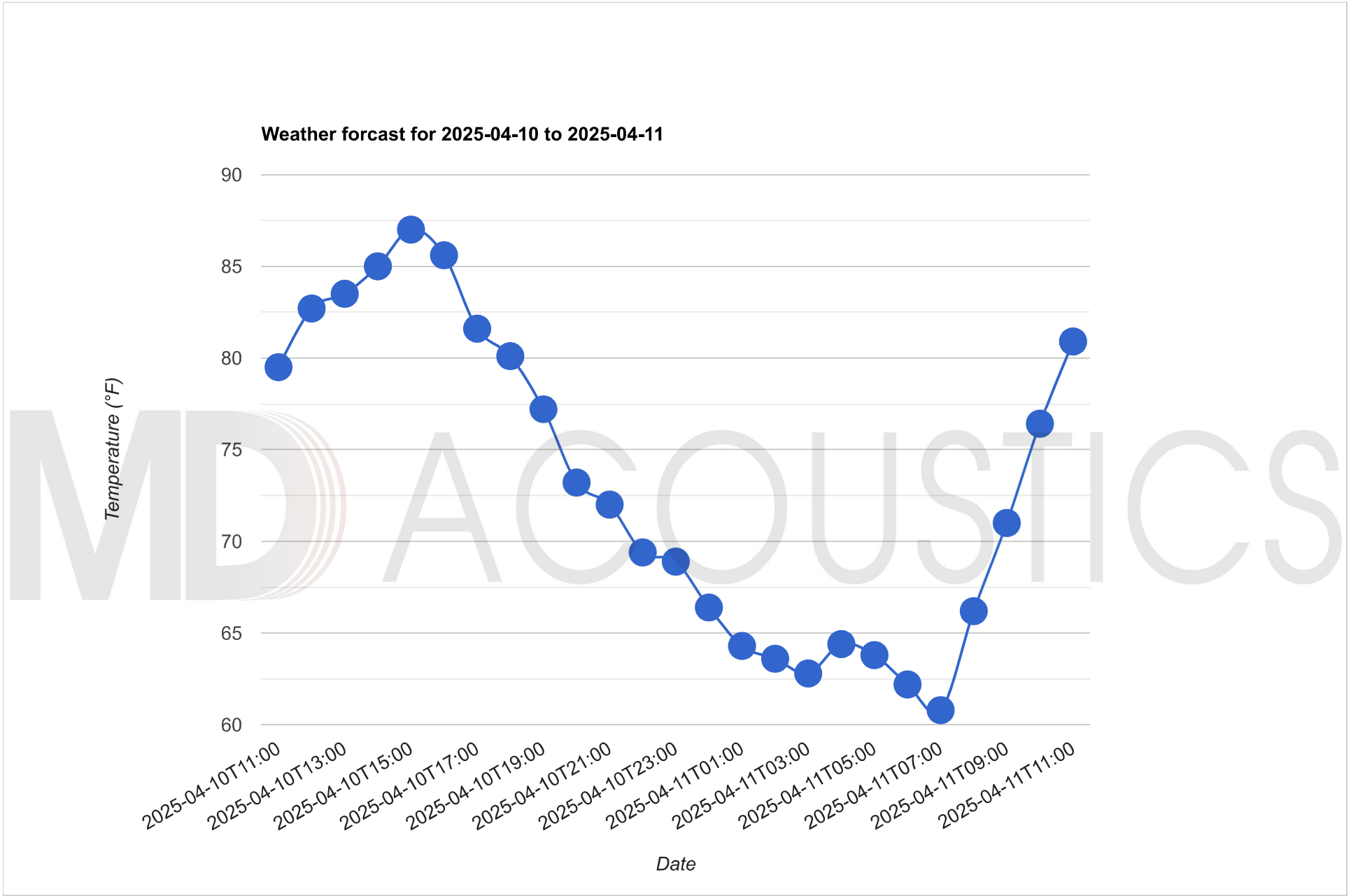
Project Name:	Arrow Noise	**Site Topo:**	Open field, w paved areas
Site Address/Location:	911 Arrow Highway	**Day:**	1 of 2
Site Id:	NM2	**Meteorological Cond.:**	72F Winds 0-10mph
		Noise Source(s) w/ Distance:	road noise and residential noise
		Ground Type:	Sandy soil and clay

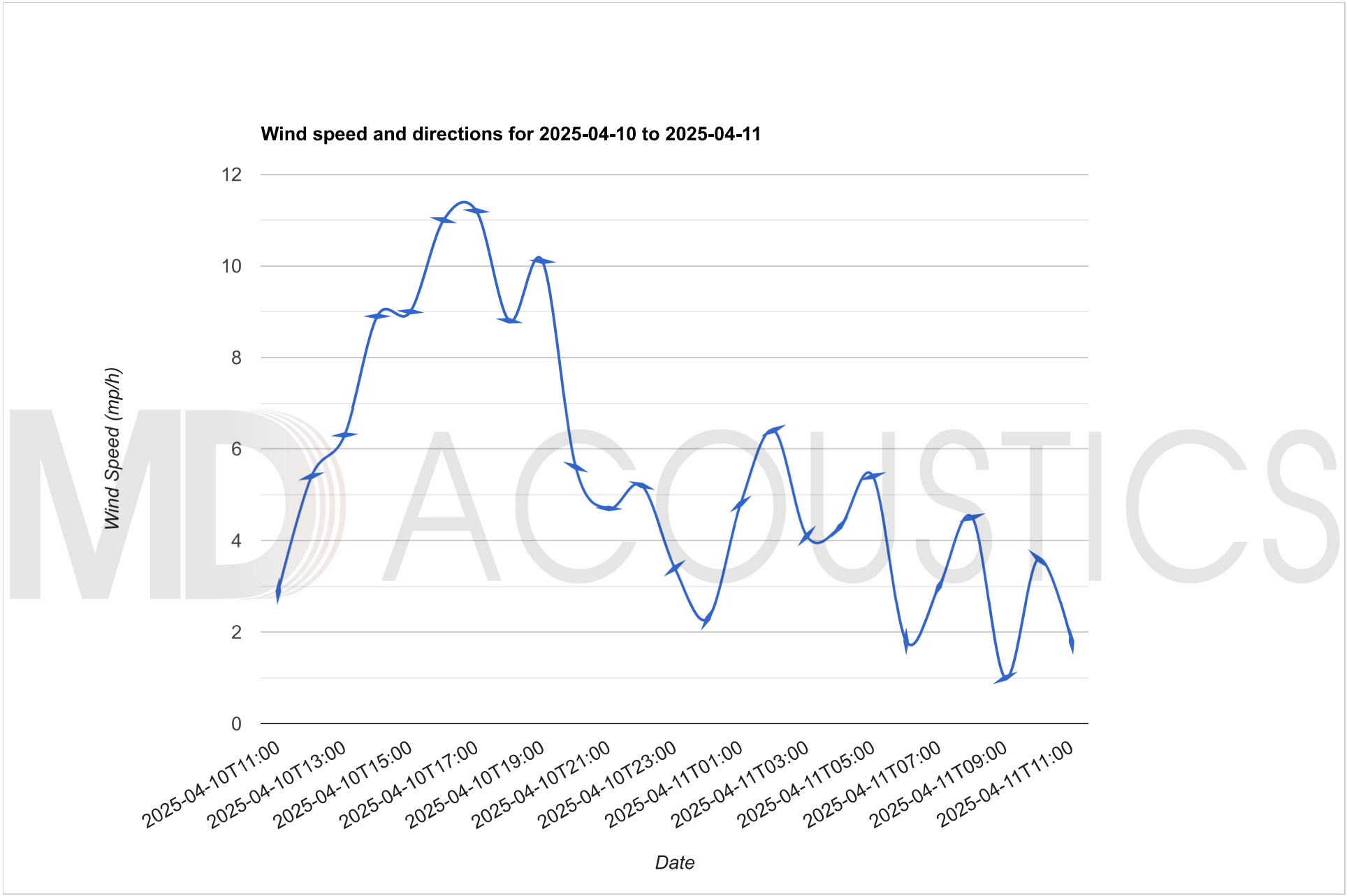


24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

Project Name:	Arrow Noise	**Site Topo:**	Open field, w paved	**Day:** 1 of 2	
Site Address/Location:	911 Arrow Highway		areas	**Noise Source(s) w/ Distance:**	
Site Id:	NM2	**Meteorological Cond.:**	72F Winds 0-10mph	road noise and residential noise	
		Ground Type:	Sandy soil and clay		







Source: Global Forecast System (GFS) weather forcast model

Appendix B:

Traffic Noise Modeling Output

Automobiles: TYPICAL - ROADWAY

Project: 1310-2025-001 Arrow Noise

Noise Input Data

Roadway Conditions

ADT: 11923

Speed (mph): 40

Peak Hour%: 10

Near Lane/Far Lane: 48

Road Elevation: 0

Grade (%): 1.6

Receiver Input Data

Receiver Distance (ft): 345

Distance C/L to Wall (ft): 0

Receiver Height: 15

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	58.2	56.3	54.6	48.5	57.1	57.7
Medium Truck	49.9	48.4	42.1	40.5	49	49.2
Heavy Truck	50.8	49.4	43	41.4	49.9	50.2
Noise Levels	59.5	57.7	55.1	49.8	58.4	58.9

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	43.2	41.3	39.6	33.5	42.1	42.7
Medium Truck	32.7	31.2	24.9	23.3	31.8	32
Heavy Truck	31.7	30.3	23.9	22.3	30.8	31.1
Noise Levels	43.9	42.1	39.5	34.3	42.8	43.4

Noise Contour (ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	27	85	270	853
Ldn	24	76	240	758

Automobiles: TYPICAL - ROADWAY

Project: 1310-2025-001 Arrow Noise

Noise Input Data

Roadway Conditions

ADT: 12873

Speed (mph): 40

Peak Hour%: 10

Near Lane/Far Lane: 48

Road Elevation: 0

Grade (%): 1.6

Receiver Input Data

Receiver Distance (ft): 345

Distance C/L to Wall (ft): 0

Receiver Height: 15

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	58.6	56.7	54.9	48.8	57.5	58.1
Medium Truck	50.3	48.8	42.4	40.9	49.3	49.6
Heavy Truck	51.2	49.8	43.3	41.8	50.3	50.5
Noise Levels	59.8	58	55.4	50.2	58.8	59.3

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	43.6	41.7	39.9	33.8	42.5	43.1
Medium Truck	33.1	31.6	25.2	23.7	32.1	32.4
Heavy Truck	32.1	30.7	24.2	22.7	31.2	31.4
Noise Levels	44.2	42.4	39.8	34.6	43.2	43.7

Noise Contour (ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	29	92	291	921
Ldn	26	82	259	819

Automobiles: TYPICAL - ROADWAY

Noise Input Data

Roadway Conditions

ADT: 11923

Speed (mph): 40

Peak Hour%: 10

Near Lane/Far Lane: 48

Road Elevation: 0

Grade (%): 1.6

Receiver Input Data

Reciever Distance: 50

Distance C/L to Wall (ft): 0

Receiver Height: 5

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Ambient: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	67.2	65.3	63.5	57.5	66.1	66.7
Medium Truck	58.9	57.4	51	49.5	57.9	58.2
Heavy Truck	59.8	58.4	51.9	50.4	58.9	59.1
Noise Levels	68.4	66.6	64	58.8	67.4	67.9

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	52.3	50.4	48.6	42.6	51.2	51.8
Medium Truck	41.7	40.2	33.8	32.3	40.7	41
Heavy Truck	40.7	39.3	32.8	31.3	39.8	40
Noise Levels	52.9	51.1	48.5	43.3	51.9	52.4

Noise Contour (Ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	30.6	96.9	306.3	968.7
Ldn	27.2	86.1	272.2	860.8

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: Upland Arrow
ROADWAY: Arrow Hwy
LOCATION: 1ST Floor Outdoor Area

JOB #: 1310-2025-001
DATE: 13-May-26
ENGINEER J. Demir

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	11,923	
SPEED =	40	
PK HR % =	10	
NEAR LANE/FAR LANE DI	48	
ROAD ELEVATION =	0.0	
GRADE =	1.6	%
PK HR VOL =	1,192	

RECEIVER INPUT DATA

RECEIVER DISTANCE =	50	
DIST C/L TO WALL =	47	
RECEIVER HEIGHT =	5.0	
WALL DISTANCE FROM RECEIVER	3	
PAD ELEVATION =	2.0	
ROADWAY VIEW: LF ANGLE=	-90	
RT ANGLE=	90	
DF ANGLE=	180	

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL	5.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCK	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	43.72	- -
MEDIUM TRUCKS	4.0	43.52	- -
HEAVY TRUCKS	8.0	43.87	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	67.2	65.3	63.5	57.5	66.1	66.7
MEDIUM TRUCKS	58.9	57.4	51.1	49.5	58.0	58.2
HEAVY TRUCKS	59.8	58.4	49.3	50.6	58.9	59.1
NOISE LEVELS (dBA)	68.4	66.7	63.9	58.8	67.4	67.9

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	62.1	60.2	58.4	52.4	61.0	61.6
MEDIUM TRUCKS	54.0	52.5	46.1	44.6	53.0	53.3
HEAVY TRUCKS	59.8	58.4	49.3	50.6	58.9	59.1
NOISE LEVELS (dBA)	64.5	62.7	60.0	54.9	63.4	63.9

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	31	97	308	973
LDN	27	87	274	867

Automobiles: TYPICAL - ROADWAY

Noise Input Data

Roadway Conditions

ADT: 31535

Speed (mph): 40

Peak Hour%: 10

Near Lane/Far Lane: 70

Road Elevation: 0

Grade (%): 3.3

Receiver Input Data

Reciever Distance: 50

Distance C/L to Wall (ft): 0

Receiver Height: 5

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Ambient: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	72.3	70.4	68.6	62.6	71.2	71.8
Medium Truck	64	62.5	56.1	54.6	63.1	63.3
Heavy Truck	66	63.5	57	55.5	64	64.2
Noise Levels	73.7	71.7	69.1	63.9	72.5	73

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	57.4	55.5	53.7	47.7	56.3	56.9
Medium Truck	46.8	45.3	38.9	37.4	45.9	46.1
Heavy Truck	46.9	44.4	37.9	36.4	44.9	45.1
Noise Levels	58.2	56.3	53.6	48.4	57	57.5

Noise Contour (Ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	99.4	314.4	994.3	3144.1
Ldn	88.4	279.4	883.5	2793.9

Automobiles: TYPICAL - ROADWAY

Noise Input Data

Roadway Conditions

ADT: 32485

Speed (mph): 40

Peak Hour%: 10

Near Lane/Far Lane: 70

Road Elevation: 0

Grade (%): 3.3

Receiver Input Data

Reciever Distance: 50

Distance C/L to Wall (ft): 0

Receiver Height: 5

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Ambient: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	72.4	70.5	68.7	62.7	71.3	71.9
Medium Truck	64.1	62.6	56.3	54.7	63.2	63.4
Heavy Truck	66.1	63.6	57.2	55.6	64.1	64.3
Noise Levels	73.8	71.9	69.3	64	72.6	73.1

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	57.5	55.6	53.8	47.8	56.4	57
Medium Truck	46.9	45.4	39.1	37.5	46	46.2
Heavy Truck	47	44.5	38.1	36.5	45	45.2
Noise Levels	58.3	56.4	53.8	48.5	57.1	57.6

Noise Contour (Ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	102.4	323.9	1024.2	3238.8
Ldn	91	287.8	910.1	2878

Automobiles: TYPICAL - ROADWAY

Noise Input Data

Roadway Conditions

ADT: 13762

Speed (mph): 35

Peak Hour%: 10

Near Lane/Far Lane: 48

Road Elevation: 0

Grade (%): 3.5

Receiver Input Data

Reciever Distance: 50

Distance C/L to Wall (ft): 0

Receiver Height: 5

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Ambient: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	66.1	64.2	62.5	56.4	65	65.6
Medium Truck	58.6	57.1	50.7	49.2	57.7	57.9
Heavy Truck	61	58.4	52	50.5	59	59.2
Noise Levels	67.8	65.9	63.1	58	66.6	67.1

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	51.2	49.3	47.6	41.5	50.1	50.7
Medium Truck	41.4	39.9	33.5	32	40.5	40.7
Heavy Truck	41.9	39.3	32.9	31.4	39.9	40.1
Noise Levels	52.2	50.3	47.5	42.4	51	51.5

Noise Contour (Ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	25.5	80.7	255.2	807.1
Ldn	22.8	72	227.7	719.9

Automobiles: TYPICAL - ROADWAY

Noise Input Data

Roadway Conditions

ADT: 14712

Speed (mph): 35

Peak Hour%: 10

Near Lane/Far Lane: 48

Road Elevation: 0

Grade (%): 3.5

Receiver Input Data

Reciever Distance: 50

Distance C/L to Wall (ft): 0

Receiver Height: 5

Pad Elevation: 0

Left Angle View (-90 - 0°): -90

Right Angle View (0 - 90°): 90

Site Conditions

Automobiles: Hard Site

Medium Trucks: Hard Site

Heavy Trucks: Hard Site

Wall Information

Wall Height: 0

Ambient: 0

Barrier: Wall

Noise Output Data

Noise impacts (Without Topo or Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	66.4	64.5	62.8	56.7	65.3	65.9
Medium Truck	58.9	57.4	51	49.5	58	58.2
Heavy Truck	61.3	58.7	52.3	50.7	59.2	59.5
Noise Levels	68.1	66.2	63.4	58.3	66.9	67.4

Noise impacts (With Topo and Barrier Shielding)

	Pk Hr Leq	Day Leq	Even Leq	Night Leq	Ldn	Cnel
Automobile	51.5	49.6	47.9	41.8	50.4	51
Medium Truck	41.7	40.2	33.8	32.3	40.8	41
Heavy Truck	42.2	39.6	33.2	31.6	40.1	40.4
Noise Levels	52.5	50.5	47.8	42.7	51.3	51.8

Noise Contour (Ft)

	70 DBA	65 DBA	60 DBA	55 DBA
Cnel	27.3	86.3	272.8	862.8
Ldn	24.3	77	243.4	769.6

Appendix C:

Construction Noise Modeling Output

Distance from edge of site to Receptor:		Distance from center of site to Receptor:		Ground factor:	Site Size:		CalEEMod:
20	ft	250	ft	.66	6	acres	☑

DEMO

Number of equipment: 3

Construction phase Equipment Item	# of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Excavator	4	81	40	0.4	91.6	58.4
Dozer	2	82	40	0.4	92.6	59.4
Concrete Saw	1	90	20	0.2	100.6	64.4
				Log Sum:	100.6	68.6

SITE PREP

Number of equipment: 2

Construction phase Equipment Item	# of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Dozer	3	82	40	0.4	92.6	59.4
Tractor	4	84	40	0.4	94.6	61.4
				Log Sum:	94.6	69.1

GRADE

Number of equipment: 4

Construction phase Equipment Item	# of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Dozer	1	82	40	0.4	92.6	59.4
Tractor	3	84	40	0.4	94.6	61.4
Grader	1	85	40	0.4	95.6	62.4
Excavator	1	81	40	0.4	91.6	58.4
				Log Sum:	95.6	68.7

BUILD Number of equipment: 5

Construction phase Equipment Item	# of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Crane	1	81	16	0.2	91.6	55.4
Man Lift	3	75	20	0.2	85.6	49.4
Tractor	3	84	40	0.4	94.6	61.4
Welder/Torch	1	85	50	0.5	95.6	63.4
Generator	1	81	50	0.5	91.6	59.4
				Log Sum:	95.6	68.9

PAVE

Number of equipment: 3

Construction phase Equipment Item	*it* of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Paver	2	77	**50**	**0.5**	**87.6**	**55.4**
Pavement Scarifier	2	90	**20**	**0.2**	**100.6**	**64.4**
Roller	2	80	**20**	**0.2**	**90.6**	**54.4**
				Log Sum:	**100.6**	**68.3**

ARC COAT

Number of equipment: 1

Construction phase Equipment Item	# of items	Item Lmax at 50 feet, dBA	Item Use Percent	Usage Factor	Receptor Item Lmax	Receptor Item Leq
Air Compressor	1	78	40	0.4	88.6	55.4
				Log Sum:	88.6	55.4

Appendix D:

Equipment Reference Data

50PG03–14
Ultra High Efficiency Single Package Electric Cooling with Optional Electric Heat Commercial Rooftop Units with Puron® (R–410A) Refrigerant, Optional EnergyX™ (Energy Recovery Ventilator)
2 to 12.5 Nominal Tons

Carrier
turn to the experts

Not equipment being used, but a similar assumption

Product Data

CENTURION

DEALER DESIGN AWARDS
the NEWS | GOLD

BUILDINGS magazine
Editors' Choice
TOP 100 PRODUCTS
2005

Puron
the environmentally sound refrigerant

AHRI* CAPACITY RATINGS

50PG03-14

UNIT 50PG	NOMINAL CAPACITY (Tons)	NET COOLING CAPACITY (Btuh)	TOTAL POWER (kW)	SEER	EER†	SOUND RATING (dB)	IEER
03	2.0	24,000	2.1	14.1	11.5	75	—
04	3.0	35,800	3.1	14.1	11.7	73	—
05	4.0	47,500	4.0	15.0	12.2	72	—
06	5.0	58,500	4.9	14.8	12.2	78	—
07	6.0	69,000	5.8	—	12.2	78	13.0
08	7.5	88,000	7.0	—	12.7	80	13.5
09	8.5	102,000	8.4	—	12.4	80	13.4
12	10.0	119,000	9.9	—	12.2	80	13.0
14	12.5	150,000	13.2	—	11.5	83	11.6

LEGEND
EER – Energy Efficiency Ratio
SEER – Seasonal Energy Efficiency Ratio

*Air Conditioning, Heating and Refrigeration Institute.
† AHRI does not require EER ratings for units with capacity below 65,000 Btuh.

Assuming 1 5-ton unit per apartment unit

NOTES:
1. Tested in accordance with AHRI Standards 210–94 (sizes 03–12), 360–93 (size 14).
2. Ratings are net values, reflecting the effects of circulating fan heat.
3. Ratings are based on:
Cooling Standard: 80°F db, 67°F wb indoor entering–air temperature and 95°F db air entering outdoor unit.
IPLV Standard: 80°F db, 67°F wb indoor entering–air temperature and 80°F db outdoor entering–air temperature.
4. All 50PG units are in compliance with Energy Star® and ASHRAE 90.1 2010 Energy Standard for minimum SEER and EER requirements.
5. Units are rated in accordance with AHRI sound standards 270 or 370.
6. Per AHRI, Integrated Energy Efficiency Ratio (IEER) became effective beginning January 1, 2010. Integrated Part–Load Value (IPLV) was superseded by IEER on January 1, 2010. IEER is intended to be a measure of merit for the part load performance of the unit. Each building may have different part load performance due to local occupancy schedules, building construction, building location and ventilation requirements. For specific building energy analysis, an hour–by–hour analysis program should be used.

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