

TTM 83740

Noise Impact Study

City of Lancaster, CA

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

This noise assessment was prepared to evaluate the potential noise impacts for the project study area and to recommend noise mitigation measures, if necessary, to minimize the potential noise impacts. The assessment was conducted and compared to the noise standards set forth by the Federal, State, and Local agencies. Consistent with the City's Noise Guidelines, the project must demonstrate compliance to the applicable noise criterion as outlined within the City's Noise Element and Municipal Code.

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 on 20th St W south of W Avenue H (APN: 3114-012-069) in the City of Lancaster, CA, as shown in Exhibit A. The project site lot is designated as mixed use. Land uses surrounding the site include commercial to the north, residential to the south and east, and open space to the west. The nearest airport is General William J. Fox Airfield and is located 3 miles northwest of the project site. The site does not fall within the airport's 55 dBA CNEL noise contour.

1.3 Proposed Project Description

The project proposes to develop a 11.381-acre residential development consisting of 47 residential lots. The site plan is illustrated in Exhibit B.

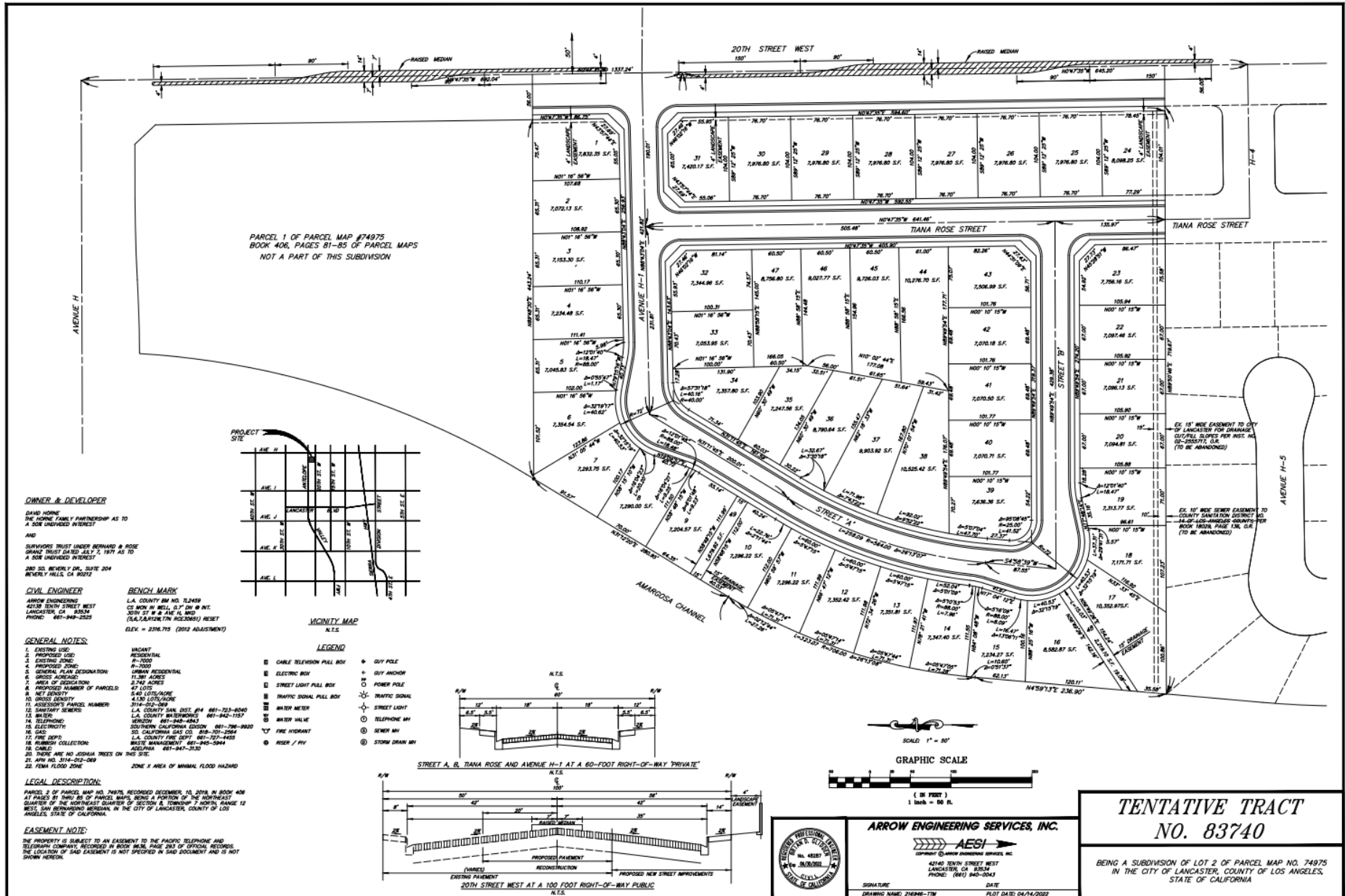
This study assesses the operational noise and traffic noise to and from the project site and compares the results to the applicable City noise standards. In addition, the study reviews noise generated by construction activities.

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

Exhibit A Location Map



Exhibit B Site Plan



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 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.

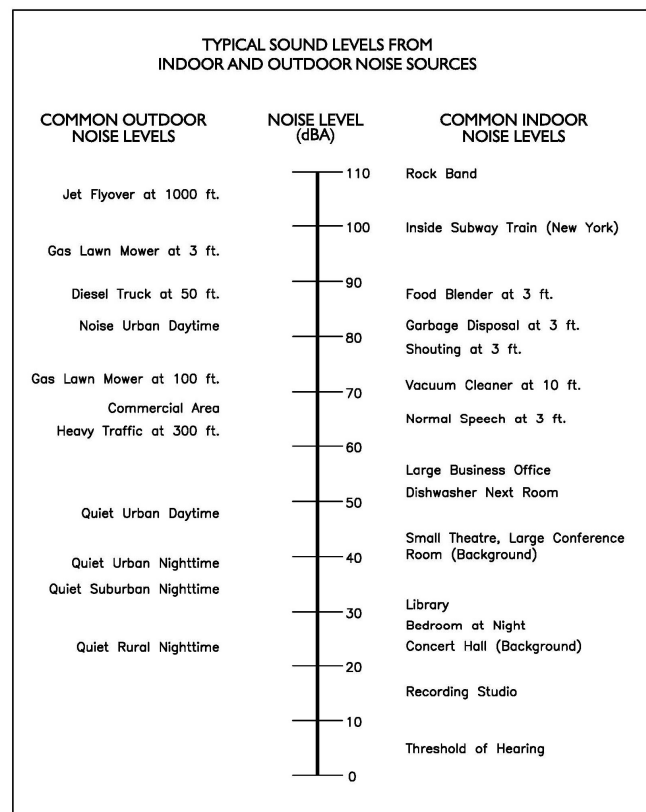
2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *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.

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 (0.0000000001) 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.

Exhibit C: Typical A-Weighted Noise Levels



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 of 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 decibel (dBA). Typically, the human ear can barely perceive the 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, 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: Any 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 depends 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 or more 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 Lancaster 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 Lancaster Noise Regulations

City of Lancaster General Plan Noise Element:

The City outlines their noise objectives, policies, and actions within the General Plan Noise Element. The following outlines the relevant actions to the proposed project:

Objective 4.3:

Promote noise compatible land use relationships by implementing the noise standards identified in Table 3-1 (*Table 1 of this report*) to be utilized for design purposes in new development, and establishing a program to attenuate existing noise problems.

Table 1: Noise Compatible Land Use Objectives

Land Use	Maximum Exterior CNEL	Maximum Interior CNEL
Rural, Single Family, Multiple Family Residential	65 dBA	45 dBA
Schools: Classrooms Playground	65 dBA 70 dBA	45 dBA --
Libraries	--	50 dBA
Hospitals/Convalescent Facilities: Living Areas Sleeping Areas	-- --	50 dBA 40 dBA
Commercial and Industrial Office Areas	70 dBA --	-- 50 dBA

Policy 4.3.1:

Ensure that noise-sensitive land uses and noise generators are located and designed in such a manner that City noise objectives will be achieved.

Specific Actions:

4.3.1(a): Where new development is proposed for areas within which the exterior or interior noise levels outlined in Table III-1 of Objective 4.3 are likely to be exceeded by existing or planned land uses, require a detailed noise attenuation study to be prepared by a qualified acoustical engineer, in order to determine appropriate mitigation and ways to incorporate such mitigation into project design.

4.3.1(d): When proposed projects include uses that could be potentially significant noise generators, require noise analyses to be prepared by an acoustical expert, including specific recommendations for mitigation when: 1) the project is located in close proximity to noise sensitive land uses or land which is planned for noise sensitive land uses, or 2) the proposed noise source could violate the noise provisions of the General Plan or Municipal Code.

4.3.1(e): For purposes of consistency, require that noise reports incorporate the following methodology:

- Assume three (3) dBA attenuation with doubling of distance for the natural attenuation of noise emanating from roadways (with the exception of freeways where a 4.5 dBA attenuation with doubling of distance may be utilized).
- Use the daily design capacity of roadways as outlined in the City of Lancaster Transportation Master Plan and the posted speed limit to quantify the design noise levels adjacent to master planned transportation routes for mitigation purposes.

4.3.1(h): Ensure that new commercial and industrial activities (including the placement of mechanical equipment) are designed so that activities comply with the maximum noise level standards at the property line of adjacent uses, thereby minimizing impacts on adjacent uses (see Table 1).

Policy 4.3.2:

Wherever feasible, manage the generation of single event noise levels (SENL) from motor vehicles, trains, aircraft, commercial, industrial, construction, and other activities such that SENL levels are no greater than 15 dBA above the noise objectives included in the Plan for Public Health and Safety.

Specific Actions:

4.3.2(d): As a condition of approval, limit non-emergency construction activities to daylight hours between sunrise and 8:00 pm.

Policy 4.3.3:

Ensure that the provision of noise attenuation does not create significant negative visual impacts.

Specific Actions:

4.3.3(a): In reviewing noise impacts, utilize site and architectural design features to mitigate impacts on sensitive land uses in conjunction with the provision of noise barriers. Design techniques to be considered in mitigating potential noise impacts include:

SITE DESIGN

- The use of building setbacks, landscaping and walls and dedication of noise easements to increase the distance between the noise source and receiver.
- The location of uses and orientation of buildings which are compatible with higher noise levels adjacent to noise generators or in clusters to shield more noise sensitive areas and uses.
- The placement of noise tolerant land uses, such as parking areas, between the noise source and receiver.

- The placement of noise tolerant structures such as garages or carports to shield noise-sensitive areas
- Clustering of office, commercial, or multiple family residential structures to reduce interior open space noise levels.

ARCHITECTURAL DESIGN

- The use of dense building materials.
- Tight fitting doors, ceilings, and floors.
- The use of noise reducing windows and the placement of entry doors on the side of the building facing away from the major roadway.
- Avoid balconies and patio areas facing major transportation routes.

4.3.3(b):

Whenever feasible, require the use of noise barriers (walls, berms, or a combination thereof) to reduce significant noise impacts.

- Noise barriers must be massive enough to prevent significant noise transmission and high enough to shield the receiver from the noise source.
- The barrier must be carefully constructed so that there are no cracks or openings.
- The barrier must interrupt the line-of-sight between the noise source and the noise receiver.
- The effects of flanking should be minimized by bending the barrier back from the noise source at the end of the barrier. (Flanking is a term used to describe the manner by which the performance of a noise barrier is compromised by noise passing around the end of the barrier).
- Require landscaping treatment to be provided in conjunction with noise barriers to provide visual relief and to reduce aesthetic impacts.

City of Lancaster Municipal Code

8.24.030 - Loud, unnecessary and unusual noises prohibited.

Notwithstanding any other provision of this chapter, and in addition thereto, no person shall make, cause or suffer, or permit to be made upon any premises owned, occupied or controlled by him/her any unnecessary noises or sounds which are physically annoying to persons of ordinary sensitiveness which

are so harsh or so prolonged or unnatural or unusual in their use, time, or place as to occasion physical discomfort to the inhabitants of any neighborhood. All animals shall be so maintained.

8.24.040 - Loud, unnecessary and unusual noises prohibited-Construction and building.

Except as otherwise provided in this chapter, a person at any time on Sunday or any day between the hours of eight p.m. and seven a.m. shall not perform any construction or repair work of any kind upon any building or structure or perform any earth excavating, filling or moving where any of the foregoing entails the use of any air compressor, jack hammer, power-driven drill, riveting machine, excavator, diesel-powered truck, tractor or other earth-moving equipment, hard hammers on steel or iron or any other machine tool, device or equipment which makes loud noises within five hundred (500) feet of an occupied dwelling, apartment, hotel, mobile home or other place of residence.

Applicability to project

The CNEL noise standards in Table 1 will be applied to the project. Construction activities must not occur at any time on Sunday or any day between the hours of eight p.m. and seven a.m.

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 to the County's and Caltrans (TeNS) technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 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 were calibrated (Larson Davis CAL 200) 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 Location

The noise monitoring location was selected to obtain a baseline of the existing noise environment. One (1) short-term 1-hour noise measurement was conducted at the Project site, and long-term data was extrapolated based on traffic patterns. Appendix A includes photos, the field sheet, and measured noise data. Exhibit D illustrates the location of the measurement.

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). Roadway volumes and percentages were retrieved from the City's traffic counts and Caltrans. The referenced traffic data was applied to the model and is in Appendix A. 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 outer most 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 through-out a 24-hour period

Table 2 indicates the roadway parameters and vehicle distribution utilized for this study.

Table 2: Roadway Parameters and Vehicle Distribution

Roadway	Segment	Existing ADT ¹	Existing + Project ADT ²	Speed (MPH)	Site Conditions
SR-14	West of site	41,000	41,470	65	Hard
20th St W	East of site	7,650	8,120	50	Hard
SR-14 Vehicle Distribution and Mix³					
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	96.2
Medium Trucks		84.8	4.9	10.3	1.5
Heavy Trucks		86.5	2.7	10.8	2.3
20th St. Vehicle Distribution and Mix					
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	97.4
Medium Trucks		84.8	4.9	10.3	1.8
Heavy Trucks		86.5	2.7	10.8	0.74
Notes:					
¹ City of Lancaster ADTs, 2014, Caltrans Census 2021					
² Project ADT from ITE Trip Generation Manual					
³ Caltrans Truck Counts, 2021					

To determine the project's noise impact to the surrounding land uses, MD generated noise using the City's traffic counts and Caltrans counts and assuming 470 daily trips for the project. 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 Interior Noise Modeling

The interior noise level is the difference between the projected exterior noise level at the structure's facade and the noise reduction provided by the structure itself. Typical building construction will provide a conservative 12 dBA noise level reduction with a "windows open" condition and a very conservative 20 dBA noise level reduction with "windows closed". MD estimated the interior noise level by subtracting the building shell design from the predicted exterior noise level.

For a "windows closed" condition, the project will require mechanical fresh air ventilation (e.g., air conditioning) to the habitable dwelling units.

5.5 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 B.

Exhibit E

Measurement Locations

= Short-Term
Monitoring Location



6.0 Existing Noise Environment

One (1) 1-hour noise measurement was conducted at the project site to document the existing noise environment. The measurement includes the 1-hour Leq, Lmin, Lmax, and other statistical data (e.g. L2, L8). 24-hour noise data was extrapolated from the 1-hour noise measurement using typical southern California roadway patterns. The results of the noise measurement are presented in Table 3, with the measured hour highlighted in yellow. The noise measurement field sheet is provided in Appendix A.

6.1 Short-Term Noise Measurement Results

The results of the short-term noise data are presented in Table 3.

Table 3: Short-Term Noise Measurement Data¹

Location	Start Time	Stop Time	Leq	Lmax	Lmin	L(2)	L(8)	L(25)	L(50)	L(90)	Estimated CNEL ²
NM1	9:06 AM	10:06 AM	54.2	69.9	38.9	61.9	58.8	54.5	49.4	43.8	57.8
Notes:											
¹ Short-term noise monitoring locations are illustrated in Exhibit E.											
² CNEL estimated based off typical traffic patterns.											

Noise data indicates the ambient noise level was 54 dBA Leq at the surrounding uses. The exterior ambient noise level is estimated to be 58 dBA CNEL. Additional field notes are provided in Appendix A.

Using this measurement data and the FHWA traffic noise model, the maximum CNEL level projected at the west property line is 63 dBA CNEL. The maximum CNEL level projected at the east property line is 66 dBA CNEL. The project must ensure that the project interior meets the 45 dBA CNEL requirement.

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 from 20th St. and 100 feet from SR-14. 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 commercial buildings 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 4.
- Existing + Project Condition: This scenario refers to the existing plus project traffic noise condition and is demonstrated in Table 4.

Table 4: 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
SR-14	West of site	74.6	202	436	939	2022
20th St W	East of site	66.9	31	67	144	311

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
SR-14	West of site	74.6	204	439	946	2037
20th St W	East of site	67.2	32	70	150	323

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

SR-14	West of site	74.6	74.6	0.0	No
20th St W	East of site	66.9	67.2	0.3	No
Notes: ¹ Exterior noise levels calculated at 5 feet above ground level. ² Noise levels calculated from centerline of subject roadway.					

Table 4 provides the Existing and Existing + Project noise conditions and shows the change in noise level because of the proposed project. As shown in Table 4, there will be a neglectable increase in traffic noise at 50 feet from the centerline of 20th St. and 100 ft from the centerline of SR-14.

7.2 Future On-Site Exterior Noise Levels

The Project is outside of the 55 CNEL noise contours of General William J Fox Airfield.

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. Table 5 indicates the first and second-floor interior noise levels for the project site.

Table 5: Future Interior Noise Levels (dBA CNEL)

Location	Roadway Noise Source	Exterior Facade Study Location	Noise Level at Building Facade ¹	Interior Noise Reduction Required to Meet Interior Noise Standard of 45 dBA CNEL	Interior Noise Level w/ Typical Residential Windows		STC Rating for Windows Facing Subject Roadway ⁴
					Window Open ²	Windows Closed ³	
1st Row Units Along Western Property Line	SR-14	1 st Floor	63	18	51	43	25
		2 nd Floor	63	18	51	43	25
1st Row Units Along Eastern Property Line	20th St W	1 st Floor	66	22	54	45	26
		2 nd Floor	66	21	54	45	26
Notes: 1. Noise level from Section 7.1 and from worksheets Appendix A. 2. A minimum of 12 dBA noise reduction is assumed with a "windows open" condition. 3. A minimum of 20 dBA noise reduction is assumed with a "windows closed" condition. 4. Indicates the required STC rating to meet the interior noise standard.							

As shown in Table 5, the interior noise level will be 51 dBA CNEL with the windows open and 43 dBA CNEL with the windows closed at the 1st row units facing SR-14 (STC >25), and 54 dBA CNEL with the windows open and 45 dBA CNEL at the 1st row units facing 20th St W (STC >26).

To meet the City’s interior 45 dBA CNEL standard a “windows closed” condition is required. The windows and sliding glass doors directly facing 20th Street W will require a minimum STC rating of 26 for the 1st and 2nd floors. 1st row units directly facing SR-14 require a minimum STC rating of 25 for the windows

and sliding glass doors. 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.

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 6.

Table 6: Typical Construction Noise Levels¹

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 8:00 p.m., excluding Sundays, according to the City's Municipal Code Section 8.24.040. 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 measures 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 7. A likely worst-case construction noise scenario assumes equipment operating at 190 feet from the nearest sensitive receptor (center of the site to the closest homes to the south).

Table 7: Construction Noise Levels at the Southern Property Line

Phase	dBA Lmax	dBA Leq
Site Prep	92.0	65.2
Grading	93.0	65.9
Build	92.0	63.7
Paving	88.0	59.0
Arch Coating	86.0	51.5
Notes: Const Equip from CalEEMod		

To ensure that construction activities do not disrupt the adjacent land uses, the noise reduction measures in Section 7.3 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 vibratory roller. A vibratory roller has a vibration impact of 0.089 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage.

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

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

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 8 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 8: 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 9 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 9: Vibration Source Levels for Construction Equipment¹

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 25 feet, a vibratory roller would yield a worst-case 0.210 PPV (in/sec) which may be perceptible but sustainably below any risk of damage (0.5 in/sec PPV is the threshold of residential structures). The impact is less than significant, and no mitigation is required.

8.3 Construction Noise Reduction Measures

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 measures should be taken:

1. Construction shall occur during the hours of 7AM to 8PM.
2. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.
3. The contractor should locate equipment staging areas as far as possible, away from the sensitive receptors.
4. Idling equipment should be turned off when not in use.
5. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 References

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

City of Lancaster: General Plan.

City of El Monte: Municipal Code Section 8.24 – Noise Regulations.

Caltrans Noise Technical Manual. 2013

Konan Vibration Criteria

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

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

Institute of Transportation Engineers, ITE Trip Generation Manual 11th Edition.

Appendix A:
Photographs and Field Measurement Data

1-Hour Noise Measurement Datasheet

Project Name: TTM 83740 Noise
Project: #/Name: 1169-2023-001
Site Address/Location: 20th St W and W Avenue H
Date: 08/01/2023
Field Tech/Engineer: Dennis Jordan / Rachel Edelman

Site Observations:
85°, partial clearing, no winds, traffic light to moderate

Sound Meter: XL2, NTI **SN:** A2A-05967-E0
Settings: A-weighted, slow, 1-sec, 1-hour interval
Site Id: ST-1



1-Hour Noise Measurement Datasheet - Cont.

Project Name: TTM 83740 Noise
Site Address/Location: 20th St W and W Avenue H
Site Id: ST-1

Figure 1: ST-1

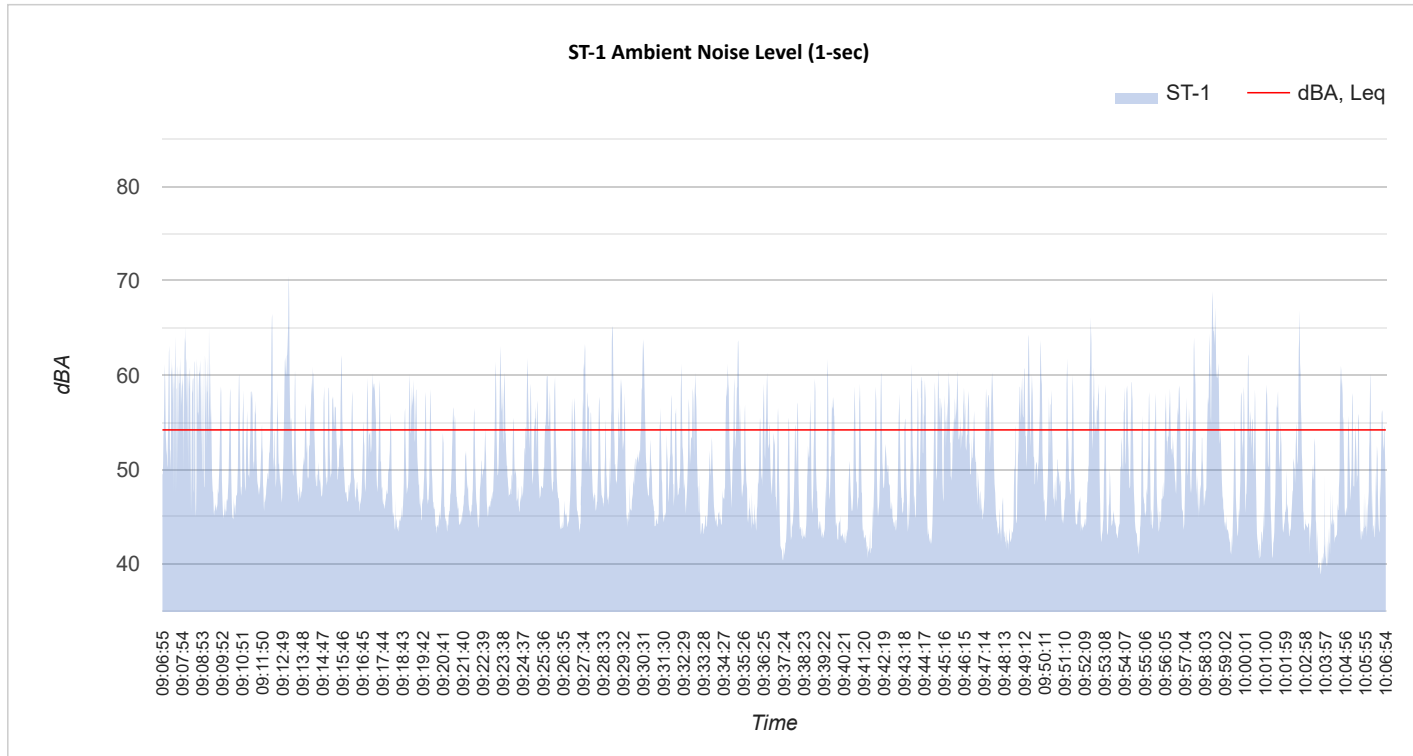


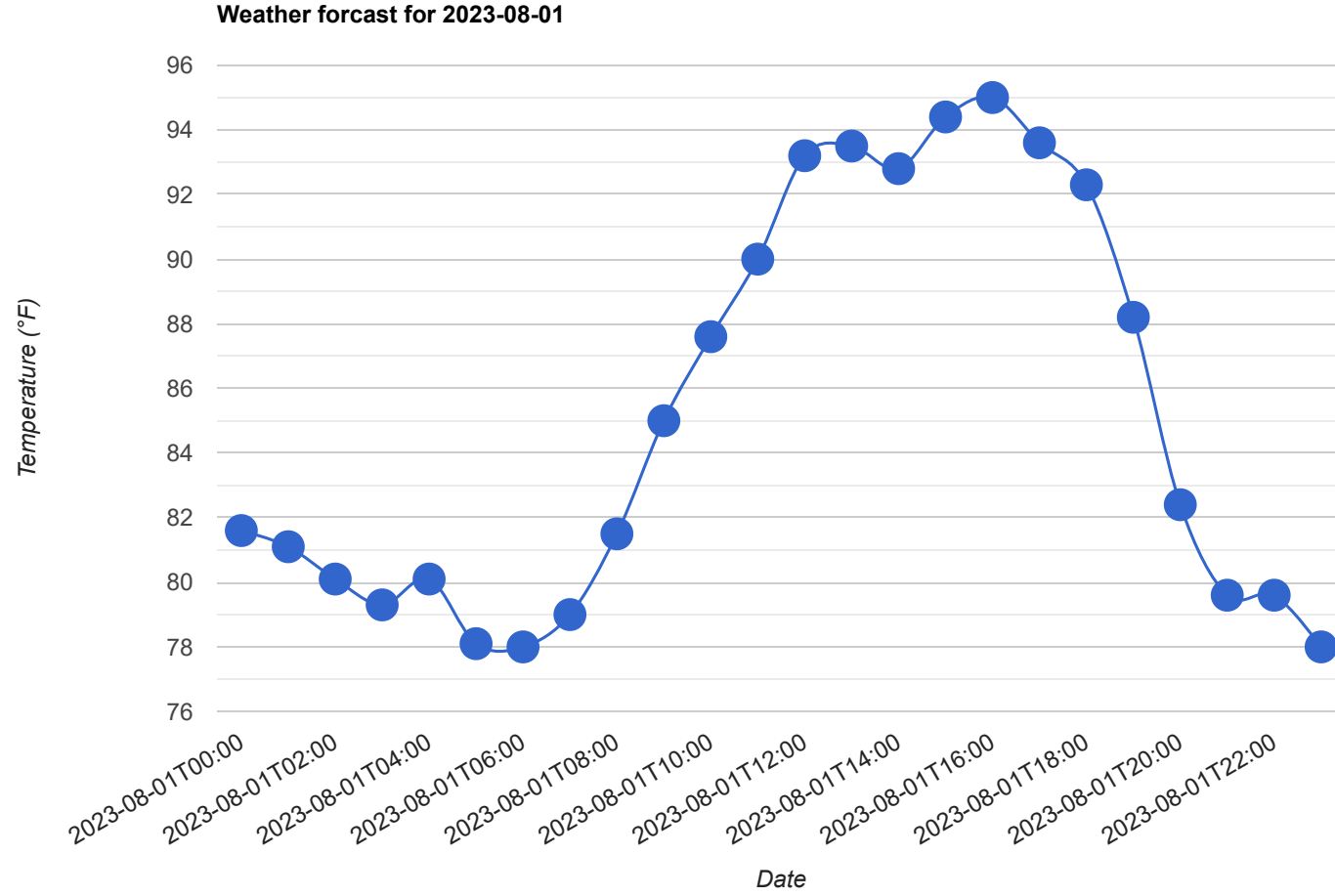
Table 1: Baseline Noise Measurement Summary

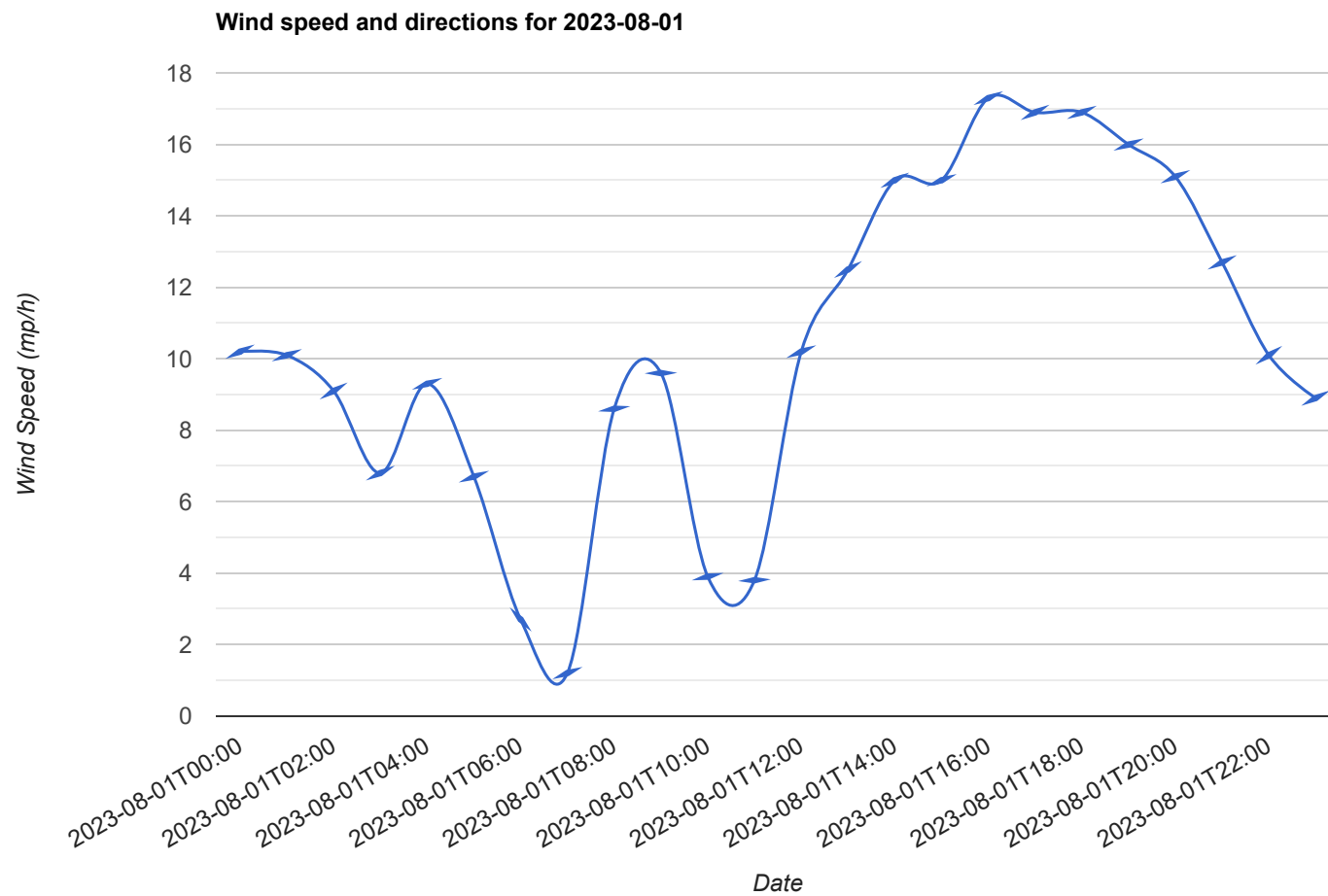
Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
ST-1	9:06 AM	10:06 AM	54.2	69.9	38.9	61.9	58.8	54.5	49.4	43.8

1-Hour Noise Measurement Datasheet - Cont.

Project Name:	TTM 83740 Noise	Site Topo:	Single story housing	Noise Source(s) w/ Distance:
Site Address/Location:	20th St W and W Avenue H	Meteorological Cond.:	85°, partial clearing, no winds	Road Noise / 150 ft from 20th St
Site Id:	ST-1	Ground Type:	Dirt and Vegetation	







Appendix B:
Traffic Noise Modeling Output

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: TTM 83740
ROADWAY: SR-14 E+P
LOCATION: Project West Façade 1st Floor

JOB #: 1169-2023-01
DATE: #####
ENGINEER C Pincock

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 41,470
SPEED = 65
PK HR % = 10
NEAR LANE/FAR LANE DI: 130
ROAD ELEVATION = 0.0
GRADE = 1.0 %
PK HR VOL = 4,147

RECEIVER INPUT DATA

RECEIVER DISTANCE = 435
DIST C/L TO WALL = 80
RECEIVER HEIGHT = 5.0
WALL DISTANCE FROM RECEIVER = 355
PAD ELEVATION = 0.0
ROADWAY VIEW: LF ANGLE= -90
RT ANGLE= 90
DF ANGLE= 180

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL 0.0
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	0.9619
MEDIUM TRUCKS	0.848	0.049	0.103	0.0148
HEAVY TRUCKS	0.865	0.027	0.108	0.0233

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	430.13	--
MEDIUM TRUCKS	4.0	430.12	--
HEAVY TRUCKS	8.0	430.13	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	62.8	60.9	59.1	53.1	61.7	62.3
MEDIUM TRUCKS	50.8	49.3	43.0	41.4	49.9	50.1
HEAVY TRUCKS	56.3	54.9	45.8	47.1	55.4	55.6
NOISE LEVELS (dBA)	63.9	62.1	59.4	54.3	62.8	63.3

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	62.8	60.9	59.1	53.1	61.7	62.3
MEDIUM TRUCKS	50.8	49.3	43.0	41.4	49.9	50.1
HEAVY TRUCKS	56.3	54.9	45.8	47.1	55.4	55.6
NOISE LEVELS (dBA)	63.9	62.1	59.4	54.3	62.8	63.3

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	157	338	727	1567
LDN	145	312	673	1450

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: [TTM 83740](#)
ROADWAY: [SR-14 E+P](#)
LOCATION: [Project West Façade 2nd Floor](#)

JOB #: [1169-2023-01](#)
DATE: #####
ENGINEER [C Pincock](#)

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = [41,470](#)
SPEED = [65](#)
PK HR % = [10](#)
NEAR LANE/FAR LANE DI: [130](#)
ROAD ELEVATION = [0.0](#)
GRADE = [1.0](#) %
PK HR VOL = [4,147](#)

RECEIVER INPUT DATA

RECEIVER DISTANCE = [435](#)
DIST C/L TO WALL = [80](#)
RECEIVER HEIGHT = [15.0](#)
WALL DISTANCE FROM RECEIVER = [355](#)
PAD ELEVATION = [0.0](#)
ROADWAY VIEW: LF ANGLE= [-90](#)
RT ANGLE= [90](#)
DF ANGLE= [180](#)

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL [0.0](#)
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	0.9619
MEDIUM TRUCKS	0.848	0.049	0.103	0.0148
HEAVY TRUCKS	0.865	0.027	0.108	0.0233

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	430.31	--
MEDIUM TRUCKS	4.0	430.26	--
HEAVY TRUCKS	8.0	430.17	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	62.8	60.9	59.1	53.1	61.7	62.3
MEDIUM TRUCKS	50.8	49.3	43.0	41.4	49.9	50.1
HEAVY TRUCKS	56.3	54.9	45.8	47.1	55.4	55.6
NOISE LEVELS (dBA)	63.9	62.1	59.4	54.3	62.8	63.3

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	62.8	60.9	59.1	53.1	61.7	62.3
MEDIUM TRUCKS	50.8	49.3	43.0	41.4	49.9	50.1
HEAVY TRUCKS	56.3	54.9	45.8	47.1	55.4	55.6
NOISE LEVELS (dBA)	63.9	62.1	59.4	54.3	62.8	63.3

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	157	337	727	1566
LDN	145	312	673	1450

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: [TTM 83740](#)
ROADWAY: [20th St W E+P](#)
LOCATION: [Project East Façade 1st Floor](#)

JOB #: [1169-2023-01](#)
DATE: #####
ENGINEER: [C Pincock](#)

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = [8,120](#)
SPEED = [50](#)
PK HR % = [10](#)
NEAR LANE/FAR LANE DI: [30](#)
ROAD ELEVATION = [0.0](#)
GRADE = [1.0](#) %
PK HR VOL = [812](#)

RECEIVER INPUT DATA

RECEIVER DISTANCE = [56](#)
DIST C/L TO WALL = [20](#)
RECEIVER HEIGHT = [5.0](#)
WALL DISTANCE FROM RECEIVER [36](#)
PAD ELEVATION = [0.0](#)
ROADWAY VIEW: LF ANGLE= [-90](#)
RT ANGLE= [90](#)
DF ANGLE= [180](#)

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL [0.0](#)
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 TRUCKS	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	54.04	--
MEDIUM TRUCKS	4.0	53.96	--
HEAVY TRUCKS	8.0	54.04	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	66.0	64.1	62.3	56.3	64.9	65.5
MEDIUM TRUCKS	56.4	54.9	48.6	47.0	55.5	55.7
HEAVY TRUCKS	56.7	55.3	46.2	47.5	55.9	56.0
NOISE LEVELS (dBA)	66.9	65.1	62.6	57.3	65.8	66.4

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	66.0	64.1	62.3	56.3	64.9	65.5
MEDIUM TRUCKS	56.4	54.9	48.6	47.0	55.5	55.7
HEAVY TRUCKS	56.7	55.3	46.2	47.5	55.9	56.0
NOISE LEVELS (dBA)	66.9	65.1	62.6	57.3	65.8	66.4

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	32	69	149	320
LDN	30	64	137	295

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: TTM 83740
ROADWAY: 20th St W E+P
LOCATION: Project East Façade 1st Floor

JOB #: 1169-2023-01
DATE: #####
ENGINEER C Pincock

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 8,120
SPEED = 50
PK HR % = 10
NEAR LANE/FAR LANE DI: 30
ROAD ELEVATION = 0.0
GRADE = 1.0 %
PK HR VOL = 812

RECEIVER INPUT DATA

RECEIVER DISTANCE = 56
DIST C/L TO WALL = 20
RECEIVER HEIGHT = 15.0
WALL DISTANCE FROM RECEIVER = 36
PAD ELEVATION = 0.0
ROADWAY VIEW: LF ANGLE= -90
RT ANGLE= 90
DF ANGLE= 180

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL 0.0
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 TRUCKS	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	55.50	--
MEDIUM TRUCKS	4.0	55.06	--
HEAVY TRUCKS	8.0	54.41	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	65.8	63.9	62.2	56.1	64.7	65.3
MEDIUM TRUCKS	56.3	54.8	48.4	46.9	55.4	55.6
HEAVY TRUCKS	56.7	55.2	46.2	47.5	55.8	55.9
NOISE LEVELS (dBA)	66.7	64.9	62.4	57.1	65.7	66.2

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	65.8	63.9	62.2	56.1	64.7	65.3
MEDIUM TRUCKS	56.3	54.8	48.4	46.9	55.4	55.6
HEAVY TRUCKS	56.7	55.2	46.2	47.5	55.8	55.9
NOISE LEVELS (dBA)	66.7	64.9	62.4	57.1	65.7	66.2

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	31	67	145	312
LDN	29	62	134	288

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: TTM 83740
 ROADWAY: SR-14 Existing
 LOCATION: Project West Façade 1st Floor

JOB #: 1169-2023-01
 DATE: #####
 ENGINEER C Pincock

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 41,000
 SPEED = 65
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 130
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 4,100

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 0
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 100
 PAD ELEVATION = 0.0
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL 0.0
 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	0.9619
MEDIUM TRUCKS	0.848	0.049	0.103	0.0148
HEAVY TRUCKS	0.865	0.027	0.108	0.0233

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	76.05	--
MEDIUM TRUCKS	4.0	76.00	--
HEAVY TRUCKS	8.0	76.05	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	74.0	72.1	70.4	64.3	72.9	73.5
MEDIUM TRUCKS	62.1	60.6	54.2	52.7	61.1	61.4
HEAVY TRUCKS	67.5	66.1	57.1	58.3	66.7	66.8
NOISE LEVELS (dBA)	75.1	73.3	70.7	65.5	74.1	74.6

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	74.0	72.1	70.4	64.3	72.9	73.5
MEDIUM TRUCKS	62.1	60.6	54.2	52.7	61.1	61.4
HEAVY TRUCKS	67.5	66.1	57.1	58.3	66.7	66.8
NOISE LEVELS (dBA)	75.1	73.3	70.7	65.5	74.1	74.6

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	202	436	939	2022
LDN	187	403	869	1871

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: TTM 83740
 ROADWAY: SR-14 Existing Plus Project
 LOCATION: Project West Façade 1st Floor

JOB #: 1169-2023-01
 DATE: #####
 ENGINEER C Pincock

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 41,470
 SPEED = 65
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 130
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 4,147

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 0
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 100
 PAD ELEVATION = 0.0
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL 0.0
 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	0.9619
MEDIUM TRUCKS	0.848	0.049	0.103	0.0148
HEAVY TRUCKS	0.865	0.027	0.108	0.0233

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	76.05	--
MEDIUM TRUCKS	4.0	76.00	--
HEAVY TRUCKS	8.0	76.05	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	74.1	72.2	70.4	64.4	73.0	73.6
MEDIUM TRUCKS	62.1	60.6	54.3	52.7	61.2	61.4
HEAVY TRUCKS	67.6	66.2	57.1	58.4	66.7	66.9
NOISE LEVELS (dBA)	75.2	73.4	70.7	65.6	74.1	74.6

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	74.1	72.2	70.4	64.4	73.0	73.6
MEDIUM TRUCKS	62.1	60.6	54.3	52.7	61.2	61.4
HEAVY TRUCKS	67.6	66.2	57.1	58.4	66.7	66.9
NOISE LEVELS (dBA)	75.2	73.4	70.7	65.6	74.1	74.6

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	204	439	946	2037
LDN	189	406	875	1886

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: [TTM 83740](#)
ROADWAY: [20th St W Existing](#)
LOCATION: [Project East Façade 1st Floor](#)

JOB #: [1169-2023-01](#)
DATE: #####
ENGINEER [C Pincock](#)

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 7,650
SPEED = 50
PK HR % = 10
NEAR LANE/FAR LANE DI: 30
ROAD ELEVATION = 0.0
GRADE = 1.0 %
PK HR VOL = 765

RECEIVER INPUT DATA

RECEIVER DISTANCE = 50
DIST C/L TO WALL = 20
RECEIVER HEIGHT = 5.0
WALL DISTANCE FROM RECEIVER = 30
PAD ELEVATION = 0.0
ROADWAY VIEW: LF ANGLE= -90
RT ANGLE= 90
DF ANGLE= 180

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL 0.0
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 TRUCKS	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	47.79	--
MEDIUM TRUCKS	4.0	47.71	--
HEAVY TRUCKS	8.0	47.79	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	66.5	64.6	62.9	56.8	65.4	66.0
MEDIUM TRUCKS	57.0	55.5	49.1	47.6	56.0	56.3
HEAVY TRUCKS	57.2	55.8	46.8	48.0	56.4	56.5
NOISE LEVELS (dBA)	67.4	65.6	63.2	57.8	66.4	66.9

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	66.5	64.6	62.9	56.8	65.4	66.0
MEDIUM TRUCKS	57.0	55.5	49.1	47.6	56.0	56.3
HEAVY TRUCKS	57.2	55.8	46.8	48.0	56.4	56.5
NOISE LEVELS (dBA)	67.4	65.6	63.2	57.8	66.4	66.9

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	31	67	144	311
LDN	29	62	133	286

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: **TTM 83740**
 ROADWAY: **20th St W Existing Plus Project**
 LOCATION: **Project East Faade 1st Floor**

JOB #: **1169-2023-01**
 DATE: **#####**
 ENGINEER **C Pincock**

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = **8,120**
 SPEED = **50**
 PK HR % = **10**
 NEAR LANE/FAR LANE DI: **30**
 ROAD ELEVATION = **0.0**
 GRADE = **1.0** %
 PK HR VOL = **812**

RECEIVER INPUT DATA

RECEIVER DISTANCE = **50**
 DIST C/L TO WALL = **20**
 RECEIVER HEIGHT = **5.0**
 WALL DISTANCE FROM RECEIVER = **30**
 PAD ELEVATION = **0.0**
 ROADWAY VIEW: LF ANGLE= **-90**
 RT ANGLE= **90**
 DF ANGLE= **180**

SITE CONDITIONS

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

WALL INFORMATION

HTH WALL **0.0**
 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 TRUCKS	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	47.79	--
MEDIUM TRUCKS	4.0	47.71	--
HEAVY TRUCKS	8.0	47.79	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	66.8	64.9	63.1	57.1	65.7	66.3
MEDIUM TRUCKS	57.2	55.7	49.4	47.8	56.3	56.5
HEAVY TRUCKS	57.5	56.1	47.0	48.3	56.7	56.8
NOISE LEVELS (dBA)	67.7	65.9	63.4	58.1	66.6	67.2

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	66.8	64.9	63.1	57.1	65.7	66.3
MEDIUM TRUCKS	57.2	55.7	49.4	47.8	56.3	56.5
HEAVY TRUCKS	57.5	56.1	47.0	48.3	56.7	56.8
NOISE LEVELS (dBA)	67.7	65.9	63.4	58.1	66.6	67.2

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	32	70	150	323
LDN	30	64	138	298

Appendix C:
Construction Noise Modeling Output

Receptor - Residences to the South

Construction Phase Equipment Item	# of Items	Item Lmax at 50 feet, dBA ¹	Edge of Site to Receptor, feet	Center of Site to Receptor, feet	Item Usage Percent ¹	Ground Factor ²	Usage Factor	Receptor Item Lmax, dBA	Recptor. Item Leq, dBA
SITE PREP									
Tractor	4	84	25	350	40	0.66	0.40	92.0	57.5
Dozer	3	82	25	350	40	0.66	0.40	90.0	55.5
							Log Sum	92.0	65.2
GRADE									
Excavator	2	81	25	350	40	0.66	0.40	89.0	54.5
Grader	1	85	25	350	40	0.66	0.40	93.0	58.5
Dozer	1	82	25	350	40	0.66	0.40	90.0	55.5
Scraper	2	84	25	350	40	0.66	0.40	92.0	57.5
Tractor	2	84	25	350	40	0.66	0.40	92.0	57.5
								93.0	65.9
BUILD									
Crane	1	81	25	350	16	0.66	0.16	89.0	50.6
Man lift	3	75	25	350	20	0.66	0.20	83.0	45.5
Generator	1	81	25	350	50	0.66	0.50	89.0	55.5
Tractor	3	84	25	350	40	0.66	0.40	92.0	57.5
Welder/Torch	1	74	25	350	40	0.66	0.40	82.0	47.5
								92.0	63.7
PAVE									
Paver	2	77	25	350	50	0.66	0.50	85.0	51.5
Roller	2	80	25	350	20	0.66	0.20	88.0	50.5
Paver	2	77	25	350	50	0.66	0.50	85.0	51.5
								88.0	59.0
ARCH COAT									
Compressor (air)	1	78	25	350	40	0.66	0.40	86.0	51.5
								86.0	51.5

¹FHWA Construction Noise Handbook: Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

VIBRATION LEVEL IMPACT

Project: TTM 83740 Date: 8/11/23
Source: Roller
Scenario: Unmitigated
Location: Adjacent residences
Address: 20th St W, Lancaster, CA
PPV = $PPV_{ref}(25/D)^n$ (in/sec)

DATA INPUT

Equipment = 1 Vibratory Roller INPUT SECTION IN BLUE
Type
PPVref = 0.21 Reference PPV (in/sec) at 25 ft.
D = 25.00 Distance from Equipment to Receiver (ft)
n = 1.10 Vibration attenuation rate through the ground

Note: Based on reference equations from Vibration Guidance Manual, California Department of Transportation, 2006, pgs 38-43.

DATA OUT RESULTS

PPV = 0.210 IN/SEC OUTPUT IN RED