APPENDIX F
Noise and Vibration

Overview of Noise and Vibration

Noise Fundamentals

Noise may be described as unwanted sound and is usually objectionable because it is disturbing or annoying. Sound is defined as any pressure variation in air that the human ear can detect. In general, the objectionable nature of sound can be due to its pitch or its loudness. Pitch is related to the frequency of the vibrations by which sound is produced; in general, intermediate pitched signals sound louder to humans than sounds with a lower or higher pitch. Loudness is the amplitude or intensity of sound waves combined with the reception characteristics of the ear; the higher the amplitude, the louder the sound.

Technical acoustical terms commonly used in this section are defined in Table 1. Acoustics consists of a sound (i.e., noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and the obstructions or atmospheric (environmental) factors, which affect the propagation path to the receptor, determine the sound level and the characteristics of the noise perceived by the receptor.

Although the decibel (dB) scale is commonly used, the dB scale alone does not adequately characterize how humans perceive noise. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on human sensitivity to those frequencies. The common measure is the A-weighted sound level (dBA), which approximates the response of the average young ear to most ordinary sounds (Table 2). Peoples' judgments regarding the relative loudness or annoyance of a sound tend to correlate well with the A-scale sound levels of those sounds.

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3 dB increase, so that when two identical sources are each producing sound of the same loudness, their combined sound level at a given distance would be 3 dB higher than either source under the same conditions. For example, if one excavator produces a sound pressure level of 80 dBA, two excavators would not produce 160 dBA. Rather, they would combine to produce 83 dBA. The cumulative sound level of any number of sources, such as excavators, can be determined using decibel addition.

Table 1: Definitions of Acoustical Terms

Term	Definition
Sound	A vibratory disturbance created by a vibrating object, which when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism such as the human ear or a microphone.
Noise	Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micropascals, where 1 pascal is the pressure from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is more commonly expressed in decibels (see below). Sound pressure level is the quantity that is measured directly by a sound level meter.
Decibel (dB)	A unit describing the amplitude of sound equal to 20 times the logarithm to base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micropascals.
Frequency, Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is 20 Hertz (Hz) - 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A-weighting 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 frequency response of the human ear and correlates well with subjective reactions to noise.

Term	Definition
Equivalent Noise Level (L_{eq})	The average A-weighted noise level during the measurement period. The hourly L_{eq} used for this report is denoted as dBA L_{eq}[h].
Community Noise Equivalent Level (CNEL)	The average A-weighted noise level during a 24-hour day, which is obtained by adding 5 dB to sound levels in the evening from 7:00 PM to 10:00 PM and 10 dB to sound levels between 10:00 PM and 7:00 AM
Day/Night Noise Level (L_{dn})	The average A-weighted noise level during a 24-hour day, which is obtained by adding 10 dB to sound levels measured at night between 10:00 PM and 7:00 AM
Maximum Sound Level (Lmax)	The maximum A-weighted noise level measured during the measurement period.
Minimum Sound Level (Lmin)	The minimum A-weighted noise level measured during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content as well as the prevailing ambient noise level.

Environmental sounds are commonly described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This equivalent noise level descriptor is called Leq. A common averaging period is hourly, but Leq can describe any series of noise events of arbitrary duration. Sound level meters can accurately measure environmental noise levels to within approximately plus or minus 1 dBA.

Table 2: Typical Noise Levels in the Environment

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
	120 dBA	
Jet fly-over at 300 meters		Rock concert
	110 dBA	
Pile driver at 30 meters	100 dBA	
		Night club with live music
	90 dBA	
Large truck passes by at 15 meters		
	80 dBA	Noisy restaurant
		Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters
Commercial/Urban area daytime		Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	
Suburban daytime		Active office environment
	50 dBA	
Urban area nighttime		Quiet office environment
	40 dBA	
Suburban nighttime		
Quiet rural areas	30 dBA	Library
		Quiet bedroom at night
Wilderness area	20 dBA	
	10 dBA	Quiet recording studio

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
Threshold of human hearing	0 dBA	Threshold of human hearing

Human Responses to Noise

It is widely accepted that a change of 3 dBA in the normal environment is just noticeable to most people; an increase of 3 dBA is perceived as approximately a 25 percent increase in noise level; a change of 5 dBA is readily perceptible; and a change of 10 dBA is perceived as being twice as loud. Accordingly, a doubling of sound energy (e.g., doubling the volume of traffic on a highway), which would result in a 3 dB increase in sound would generally be barely detectable.

A number of studies have linked increases in noise with health effects, including hearing impairment, sleep disturbance, cardiovascular effects, psychophysiological effects, and potential impacts to fetal development.[1] Potential health effects appear to be caused by both short and long-term exposure to very loud noises and long-term exposure to lower levels of sound (chronic exposure). Acute exposure to sound levels greater than 120 dBA (equivalent to a rock concert, Table 3.5-2) can cause mechanical damage to the ear and hearing impairment.[2]

According to the World Health Organization and the USEPA, Leq = 70 dBA is a safe daily average noise level for the ear.[3][4] However, even this level may cause disturbance to sleep and concentration and be linked to chronic health impacts such as hypertension and heart disease.[5]

Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise is reduced with distance depends on the following important factors:

Geometric spreading from point sources. Sound from a single source (i.e., a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance (intensity drops to one-quarter of the previous level with each doubling of distance).

Geometric spreading from line sources. Some sound generators are not point sources. Highway noise, for example, is not a single stationary point source of sound. The movement of vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a "line" source) rather than from a point. This results in cylindrical spreading rather than the spherical spreading resulting from a point source. The change in sound level from a line source is 3 dBA per doubling of distance (intensity drops to one-half of the previous level with each doubling of distance).

Ground absorption. Usually the noise path between the source and the observer is very close to the ground. The excess noise attenuation from ground absorption occurs due to acoustic energy losses on sound wave reflection. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of

[1] Babisch, Wolfgang, Transportation Noise and Cardiovascular Risk, Federal Environmental Agency, Berlin, Germany. January 2006. https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/2997.pdf (last accessed April 2019).

[2] Babisch, 2006.

[3] Berglund, B., Lindvall, T., & Schwela, D. H. Guidelines for community noise. World Health Organization, Geneva, Switzerland. 1999.

[4] U.S. Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, Prepared by Office of Noise Abatement Control. March 1974. https://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.PDF (last accessed April 2019).

[5] Babisch, 2006.

less than 200 feet, prediction results based on this scheme are sufficiently accurate. For acoustically "hard" sites (i.e., sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receptor), no excess ground attenuation is assumed because the sound wave is reflected without energy losses. For acoustically absorptive or "soft" sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source. Although some ground attenuation is expected, it is often ignored in a noise analysis, to ensure a conservative analysis and considering that, in any event, it is very difficult to characterize accurately.

Atmospheric effects. Research by Caltrans and others has shown that atmospheric conditions can have a major effect on noise levels. Wind has been shown to be the single most important meteorological factor within approximately 500 feet, whereas vertical air temperature gradients are more important over longer distances. Other factors, such as air temperature, humidity, and turbulence, also have major effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur because of temperature inversion conditions (i.e., increasing temperature with elevation) which cause reflection of sound from the inversion layer back to the ground. As with ground absorption, atmospheric effects are often ignored, as here, in the interest of a conservative analysis.

Shielding by natural or human-made features. A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by this shielding depends on the size of the object, proximity to the noise source and receptor, surface weight, solidity, and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. As appropriate, walls are often constructed between a source and a receptor with the specific purpose of reducing noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dBA of noise reduction. A higher barrier may provide as much as 20 dBA of noise reduction. Lightly built barriers provide less attenuation.

Vibration Fundamentals

Groundborne vibration is an oscillatory motion of the soil with respect to the equilibrium position and can be quantified in terms of velocity or acceleration. It can be a serious concern for nearby neighbors of activities that cause buildings to shake and rumbling sounds to be heard, but it is unusual for vibration from sources such as buses and trucks on smooth roads to be perceptible, even in locations close to major roads. Most perceptible indoor vibration is caused by sources within buildings, such as the operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are heavy construction equipment and activities (such as blasting and pile driving), steel-wheeled trains, and heavy trucks on rough roads. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS.

Table 3 summarizes common sources of groundborne vibration velocity levels (measured in decibel units [VdB]) and average human response to vibration that may be anticipated when a person is at rest in quiet

surroundings (tolerance to vibration increases considerably during physical activity). The duration of the vibration event has an effect on human response, as does its frequency of occurrence: increases in both result in decreased tolerance. Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold (65 VdB) of perception for most humans.

Groundborne noise is a secondary phenomenon of groundborne vibration. When a building or structure vibrates, noise radiates into the interior of the building, producing rattling of windows, doors, stacked dishes, etc. Low-frequency vibration could produce groundborne noise perceived as a low rumble. Groundborne noise is quantified by the A-weighted sound level inside the building. The sound level accompanying vibration is generally 25 to 40 dBA lower than the vibration velocity level in VdB. Groundborne vibration levels of 65 VdB can result in groundborne noise levels up to 40 dBA, which can disturb sleep. Groundborne vibration levels of 85 VdB can result in groundborne noise levels up to 60 dBA, which can be annoying to daytime noise sensitive land uses such as schools.[6]

Table 3: Typical Levels of Ground-borne Vibration

Human or Structural Response	Vibration Velocity Level (VdB)	Typical Sources (50 feet from source)
Threshold for minor cosmetic damage to fragile buildings	100	Blasting, pile driving, vibratory compaction equipment
	95	Bulldozers, and other heavily tracked construction equipment
Difficulty with tasks such as reading a video or computer screen	90	Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events	76	Commuter rail, typical
Residential annoyance, frequent events	72	Bus or truck over bump or on rough roads
	70	Rapid transit, typical
Limit for vibration sensitive equipment	60	Bus or truck, typical
	50	Typical background vibration

Source: USDOT Federal Transit Administration, 2006.

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise (and groundborne vibration) levels than others. People in residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, natural areas, parks and outdoor recreation areas are generally more sensitive to noise than are people at commercial and industrial establishments. Consequently, the noise standards for sensitive land uses are more stringent than for those at less sensitive uses. Notably, schools, parks, and recreational land uses are not considered as sensitive to noise as residential uses and places where people sleep.

[6] Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06. May. Available online at: http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/revguidance.pdf (last accessed April 2019).

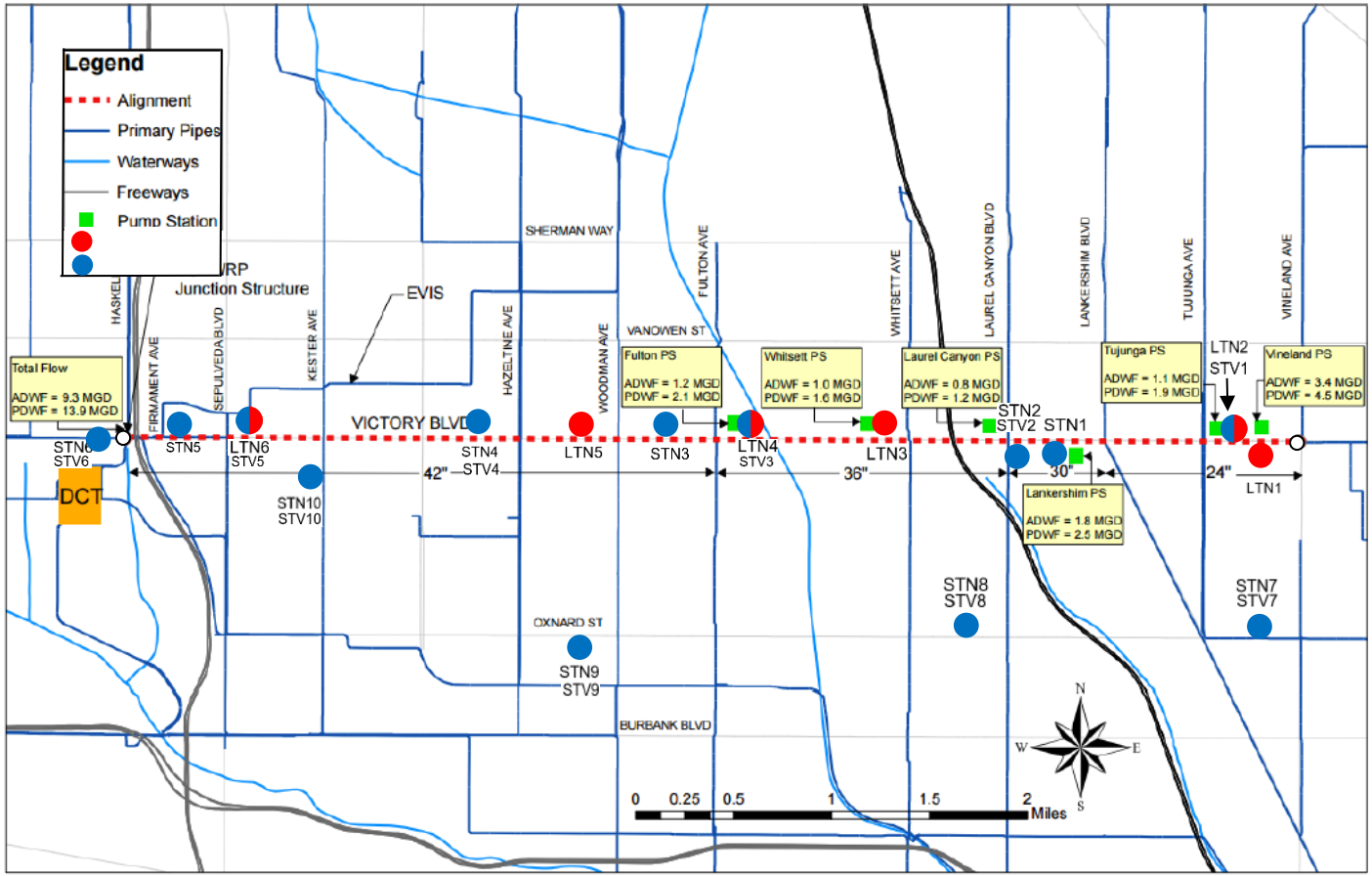
Noise and Vibration Documentation

Following are the documents associated with the Noise and Vibration analysis of the proposed East West Valley Interceptor Sewer Project Draft EIR:

- Noise and Vibration Measurement Locations
- Long-term Noise Measurement Data – Hourly Noise Levels
- Short-term Noise Monitoring Field Data Sheets
- Short-term Vibration Monitoring Field Data Sheets
- Construction Noise Analysis
- FHWA Traffic Noise Calculator spreadsheets
- Construction Vibration Analysis

East West Valley Interceptor Sewer EIR

Background



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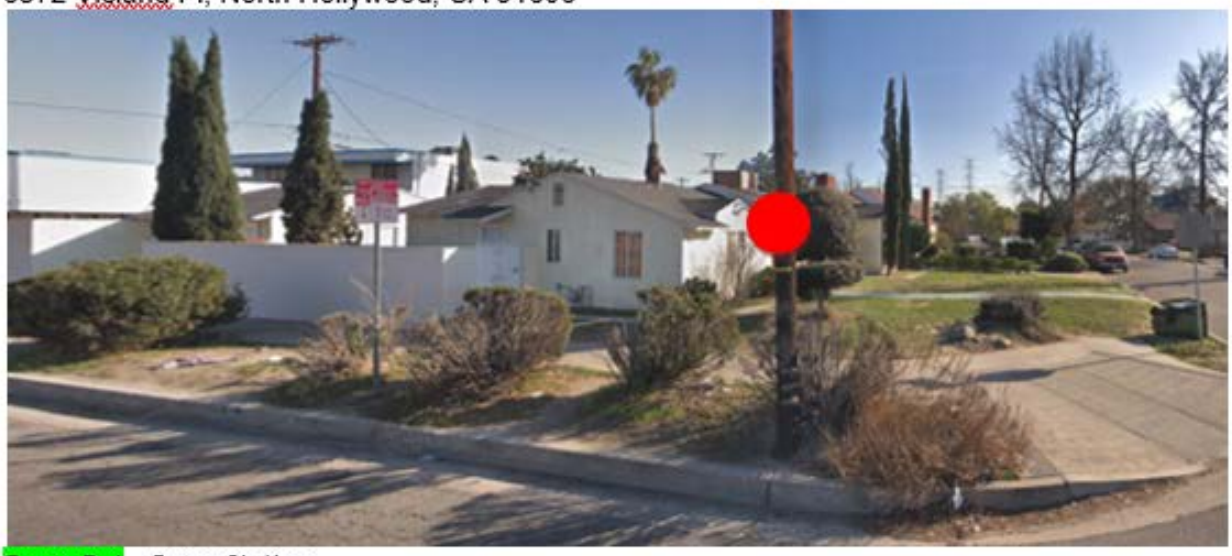

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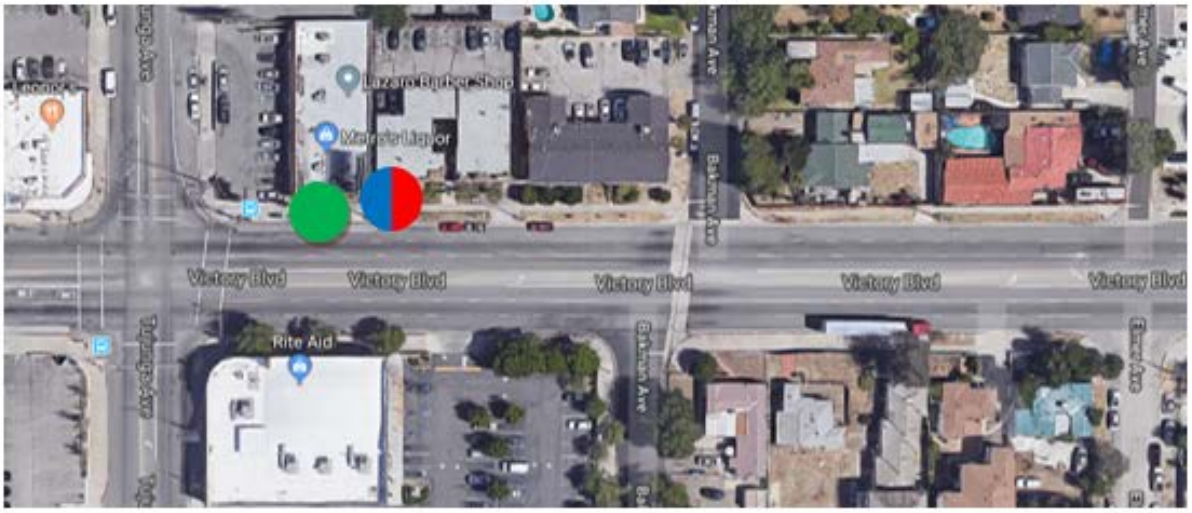

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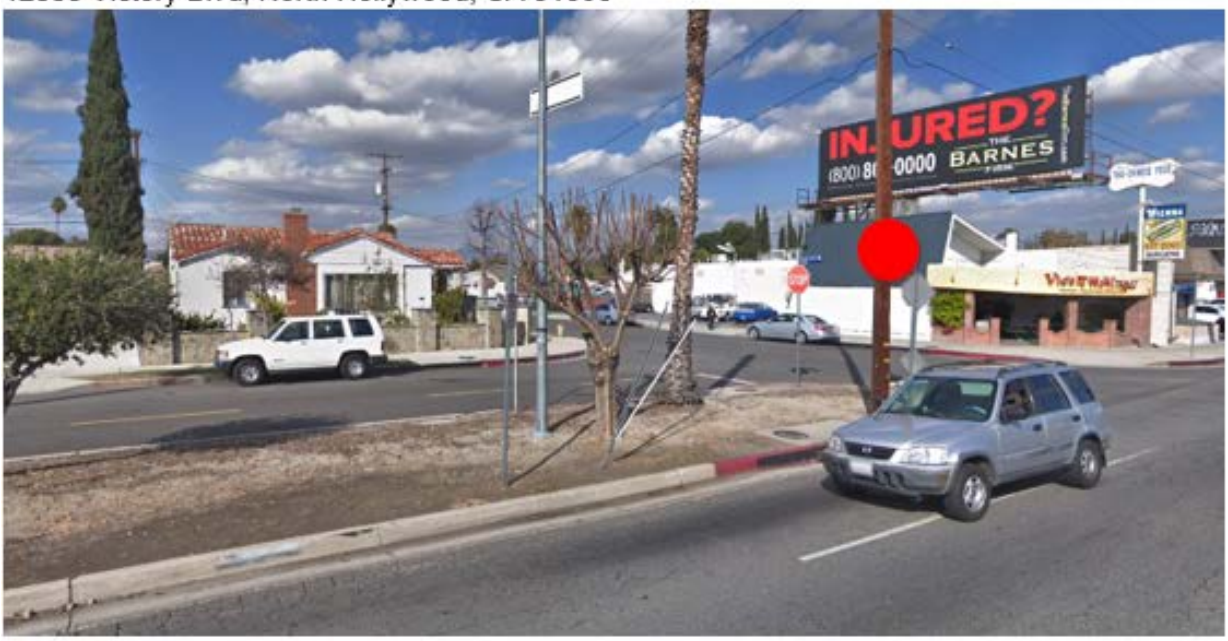

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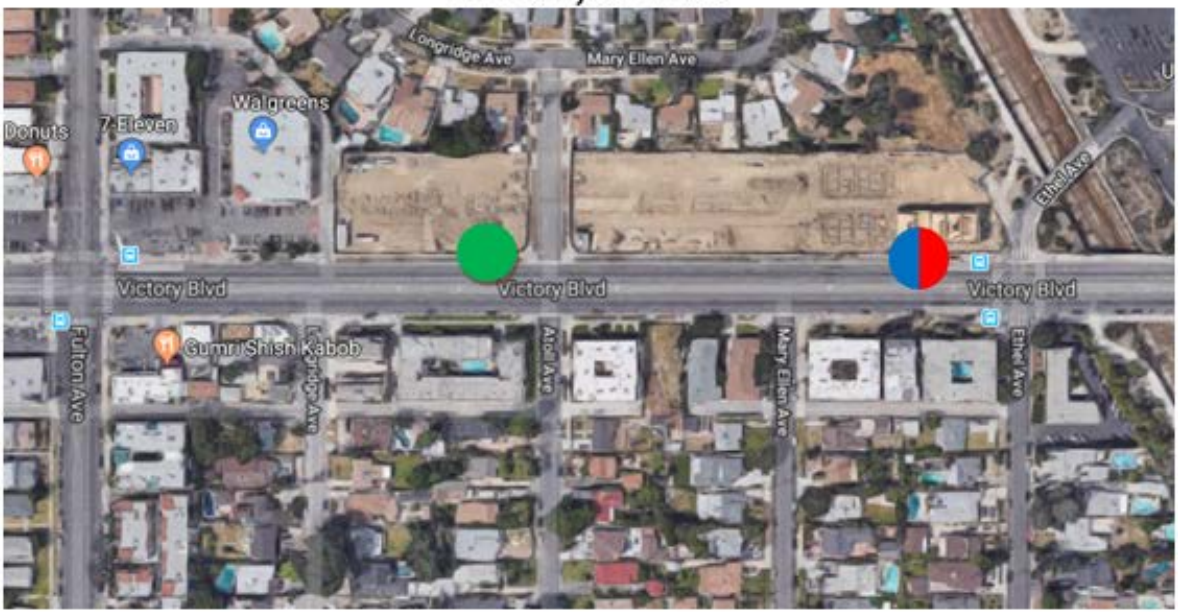

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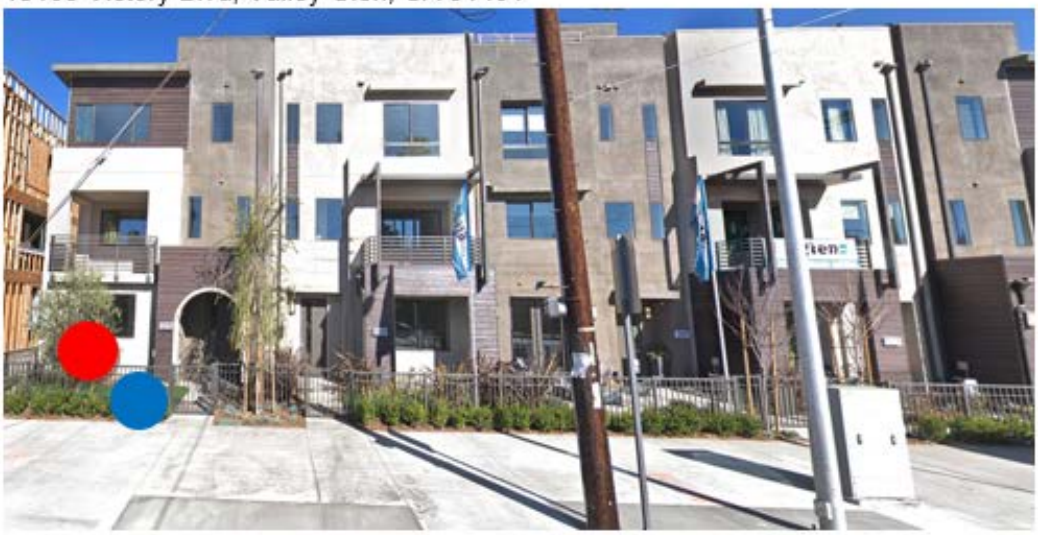

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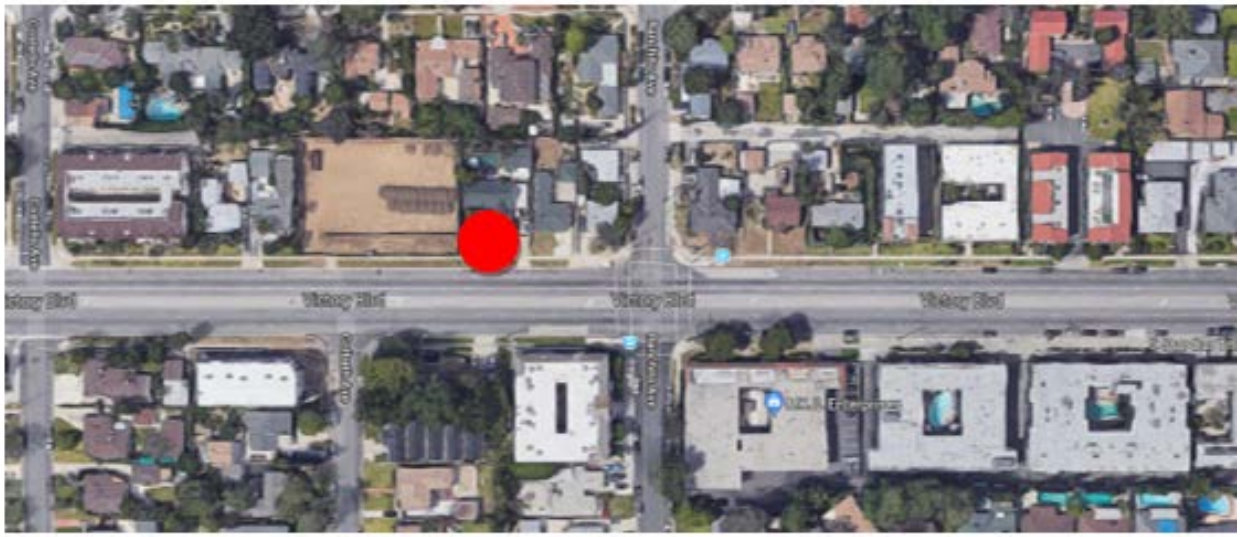

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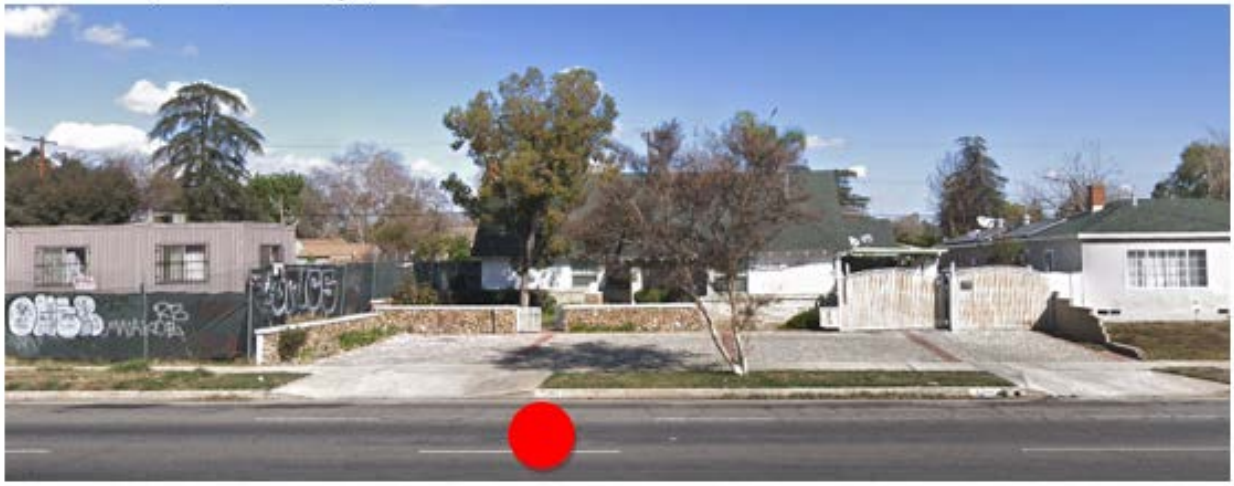

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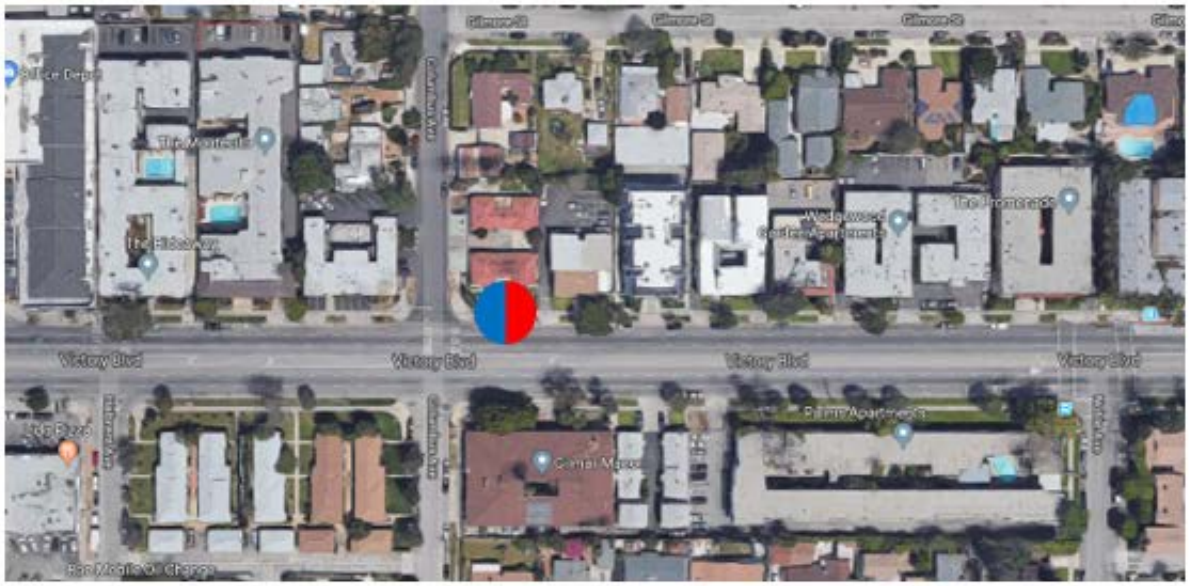

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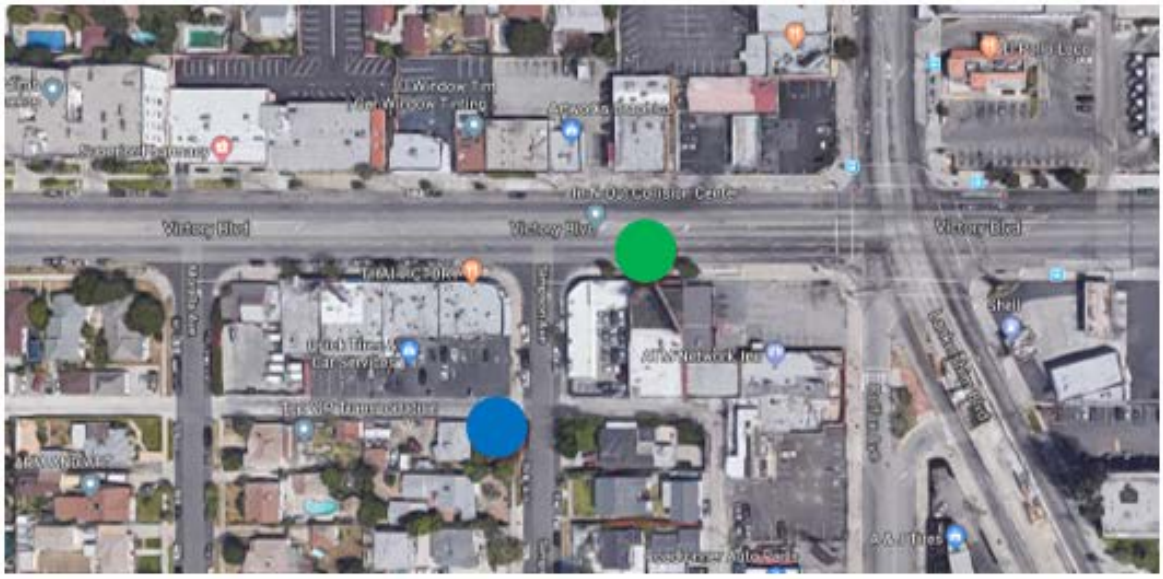

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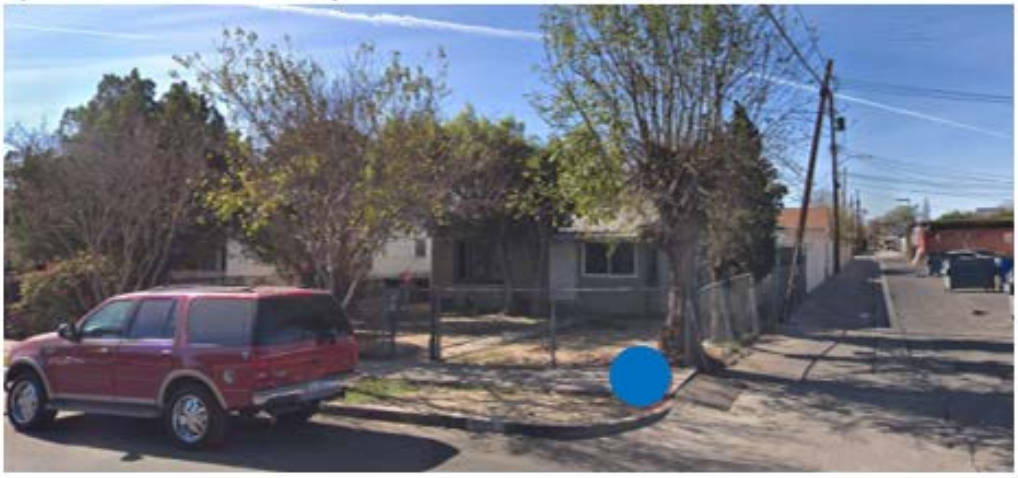

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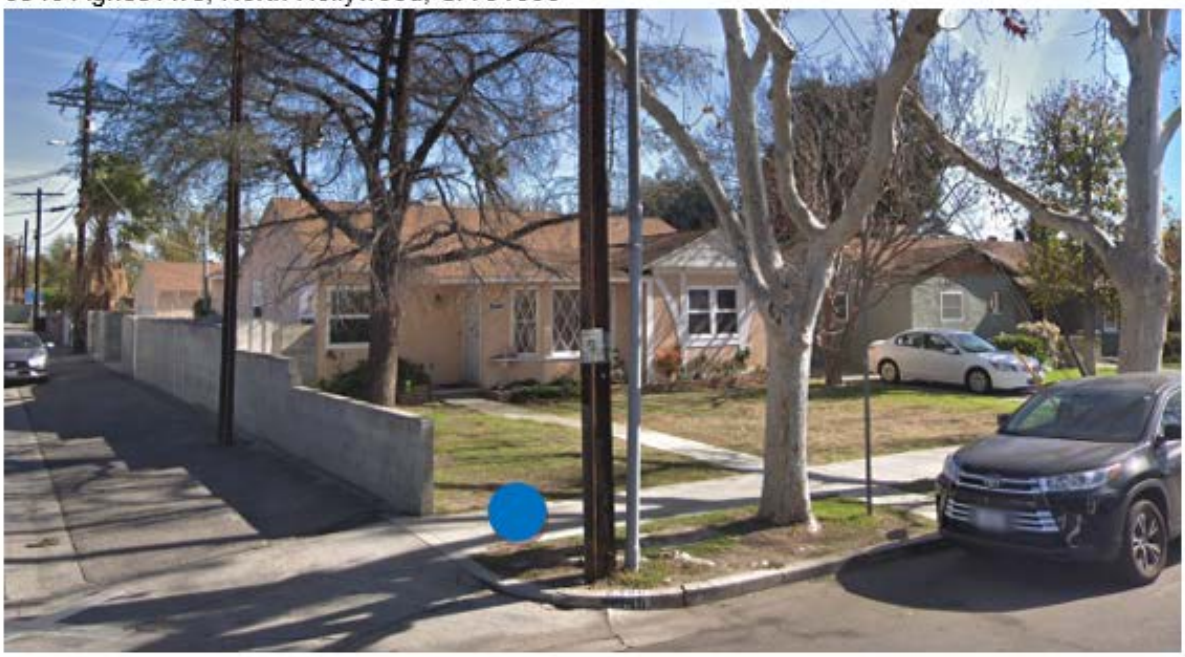

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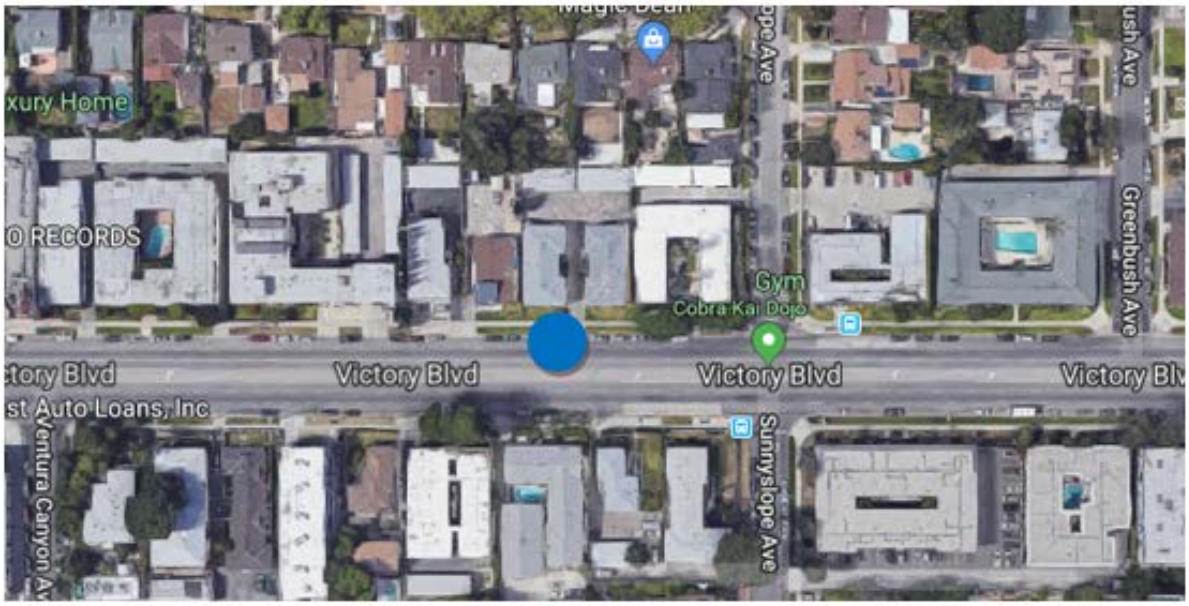

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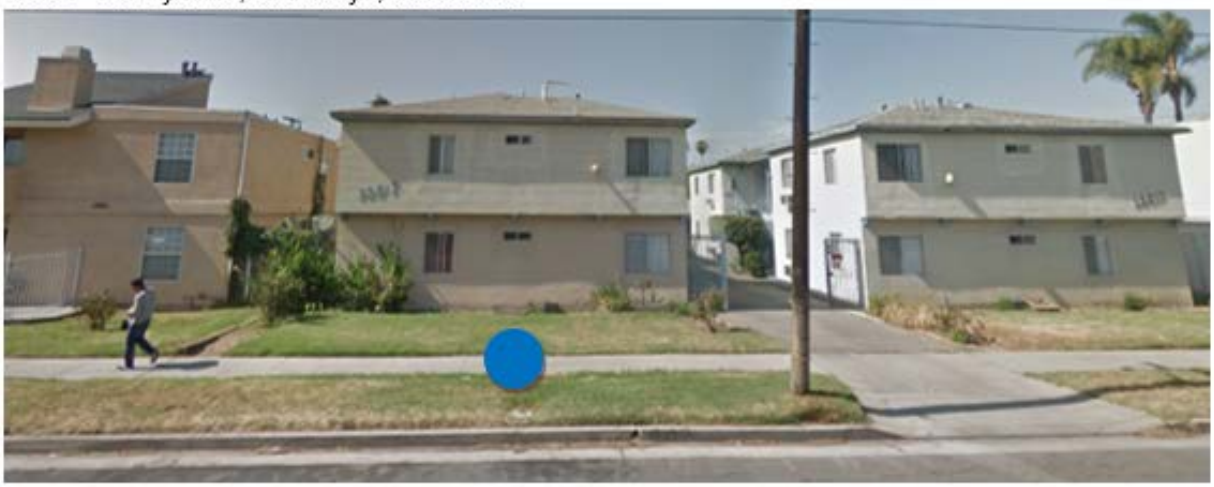

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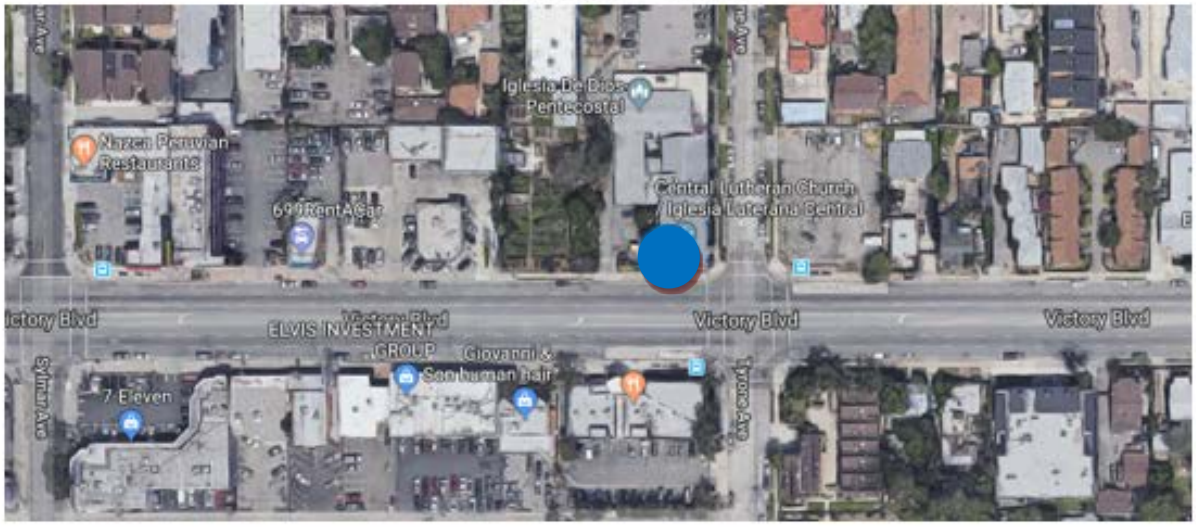

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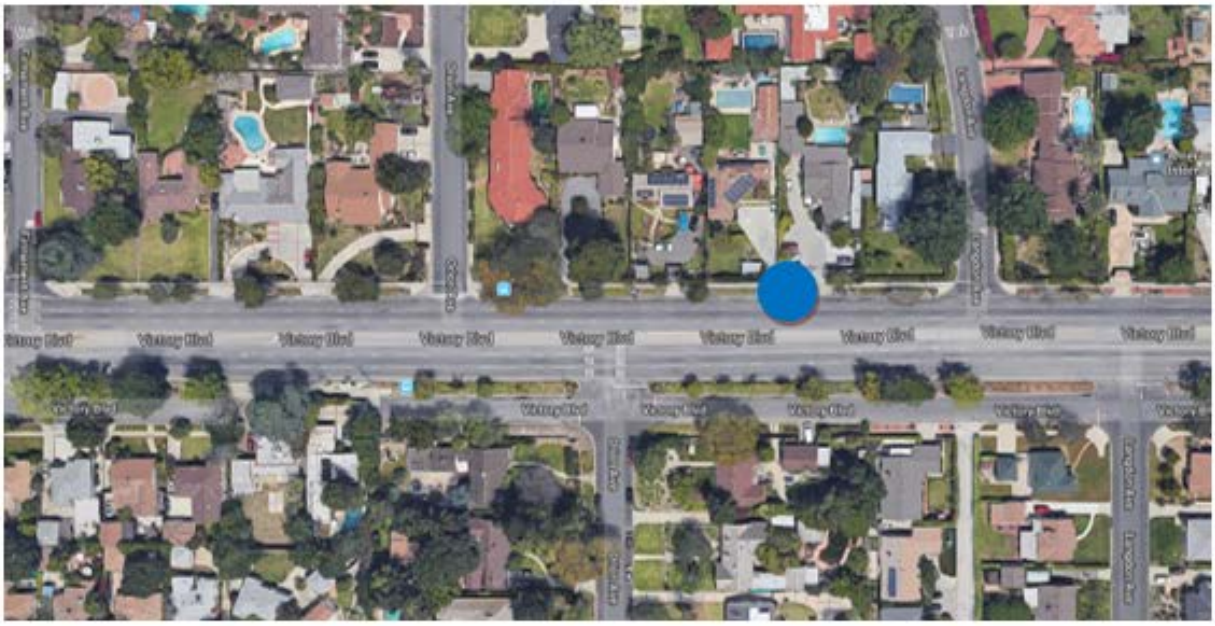

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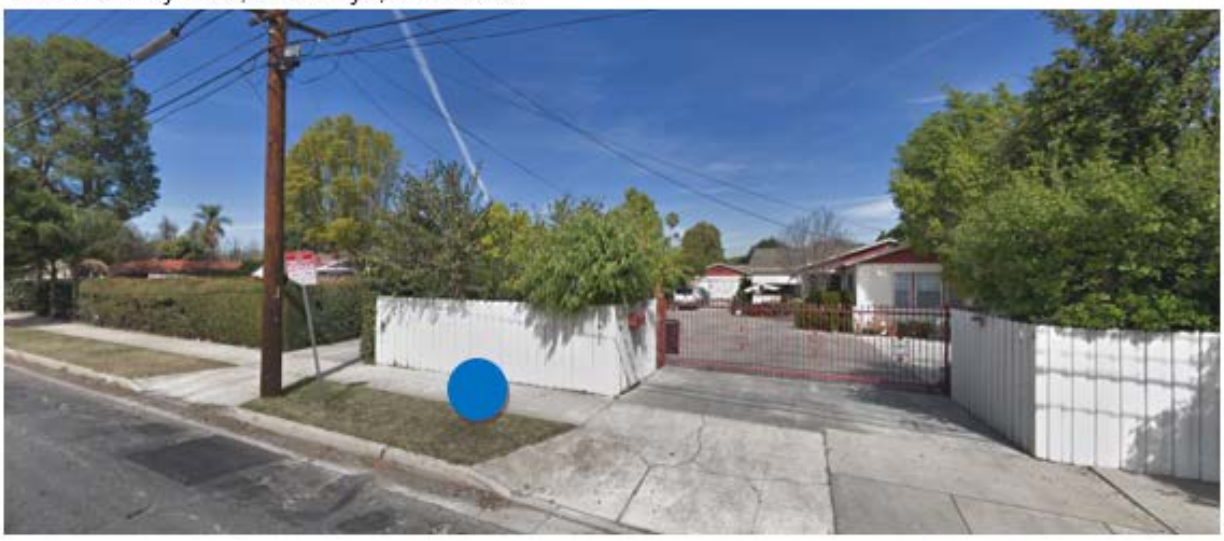

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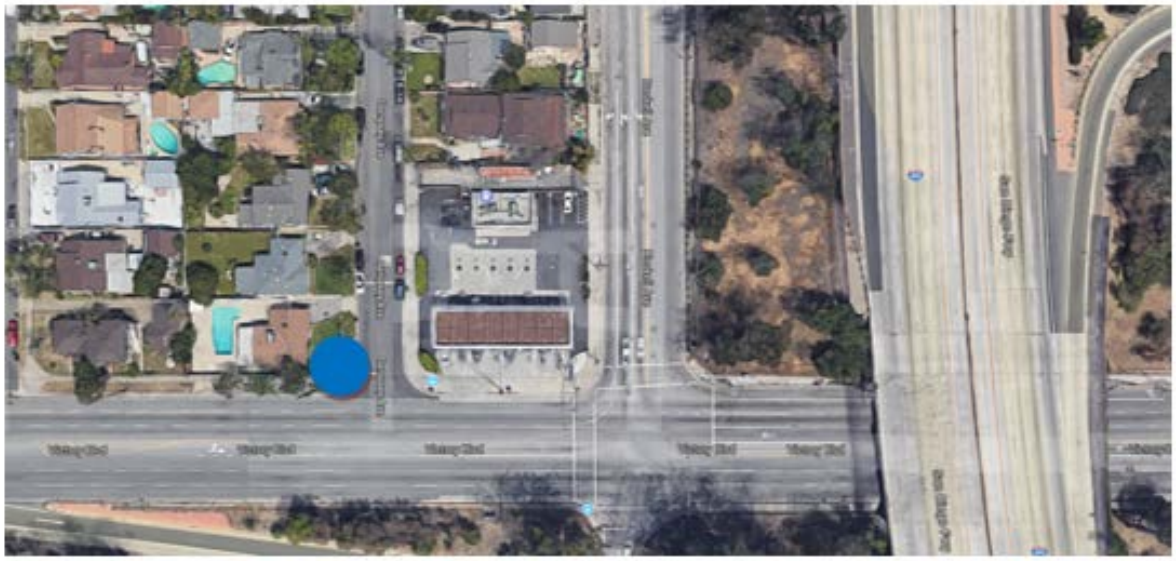

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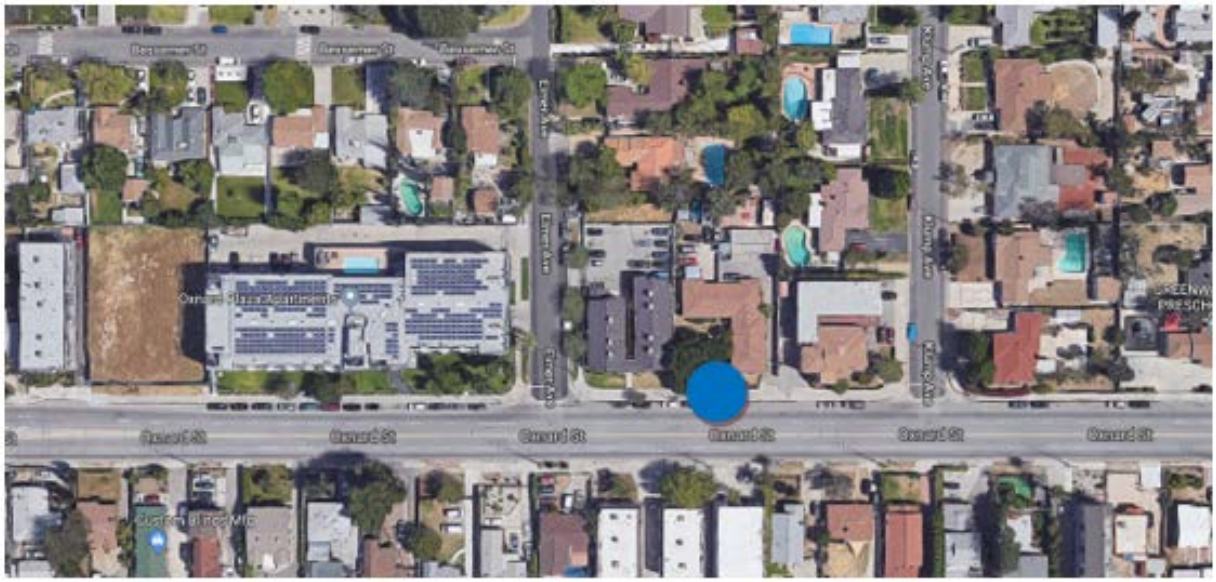

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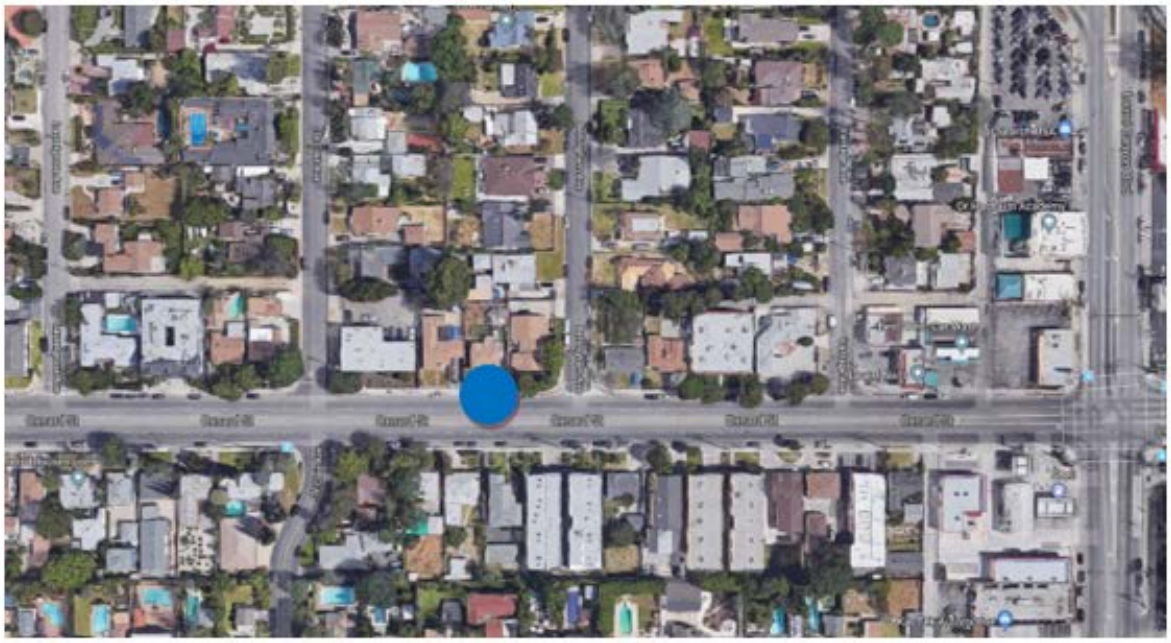

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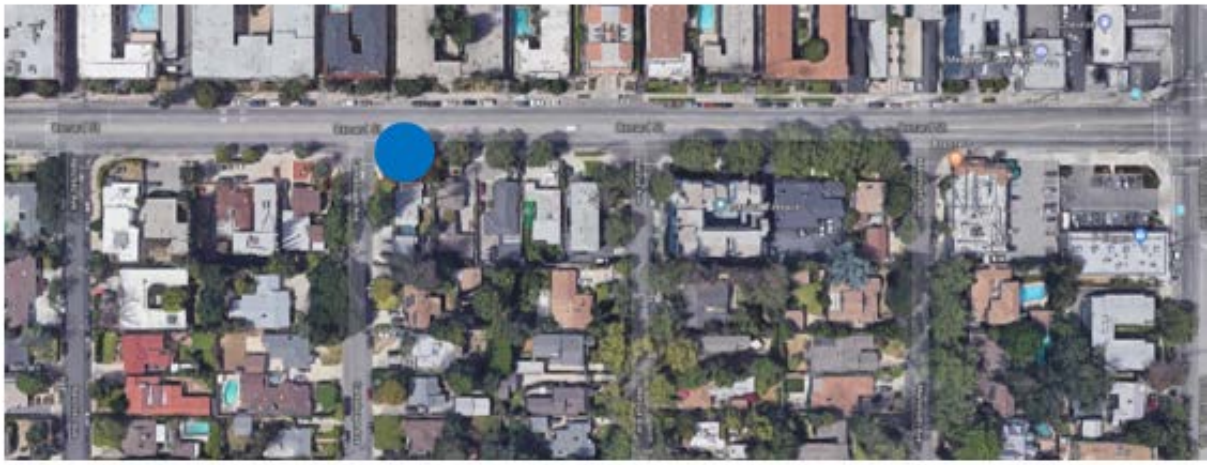

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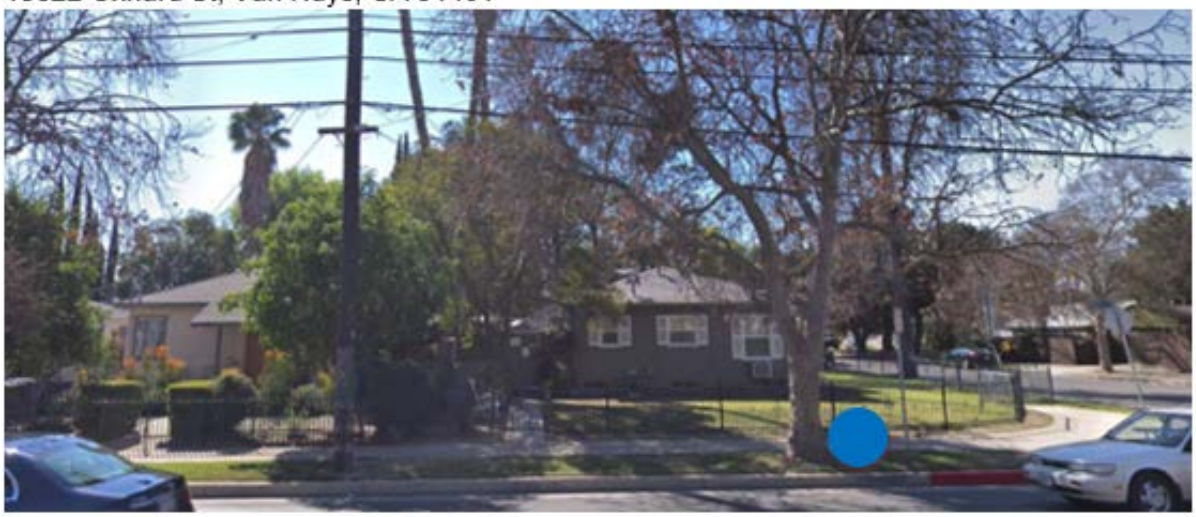

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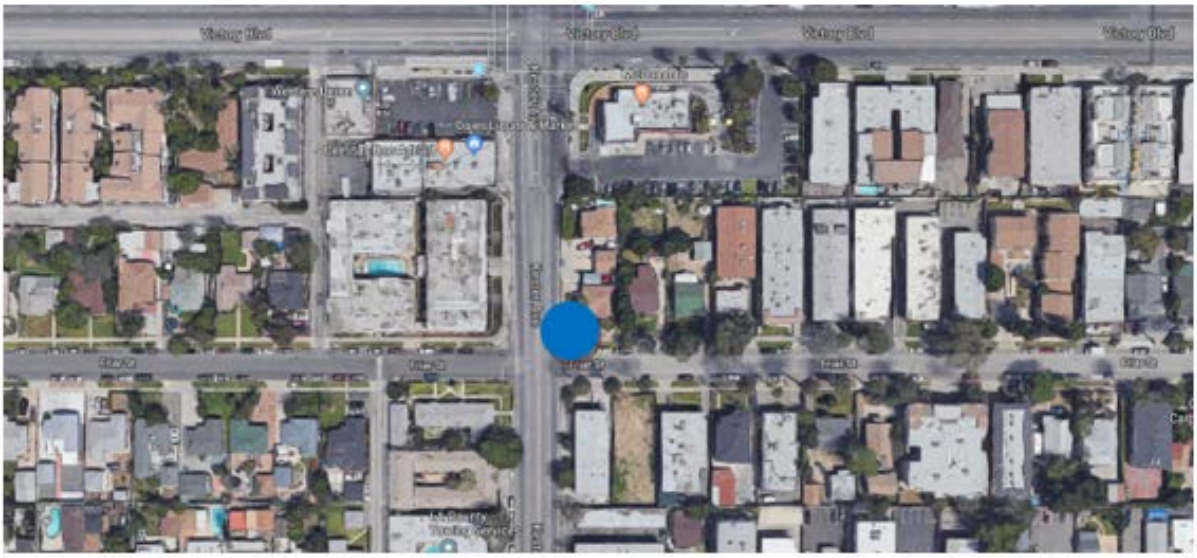

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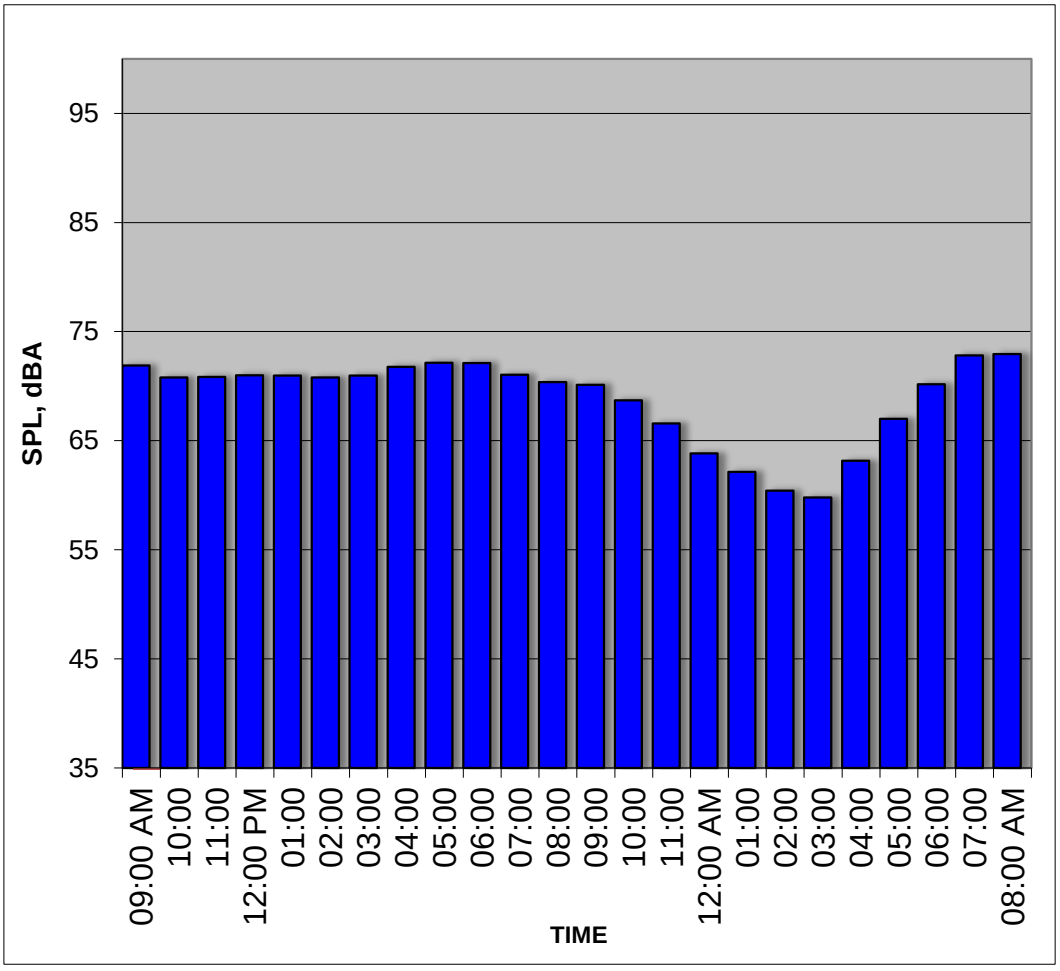
MEASUREMENT DATA - HOURLY NOISE LEVELS

Project: CDM Smith - LASAN EWVIS
Address: 6372 Vicland Place, North Hollywood, CA 91606
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/26/2019
Position: LTN1



TIME	HNL, dB(A)
09:00 - 10:00 AM	71.9
10:00 - 11:00 AM	70.8
11:00 - 12:00 PM	70.9
12:00 - 01:00 PM	71.0
01:00 - 02:00 PM	71.0
02:00 - 03:00 PM	70.8
03:00 - 04:00 PM	71.0
04:00 - 05:00 PM	71.8
05:00 - 06:00 PM	72.2
06:00 - 07:00 PM	72.1
07:00 - 08:00 PM	71.1
08:00 - 09:00 PM	70.4
09:00 - 10:00 PM	70.1
10:00 - 11:00 PM	68.7
11:00 - 12:00 AM	66.6
12:00 - 01:00 AM	63.8
01:00 - 02:00 AM	62.2
02:00 - 03:00 AM	60.4
03:00 - 04:00 AM	59.8
04:00 - 05:00 AM	63.2
05:00 - 06:00 AM	67.0
06:00 - 07:00 AM	70.2
07:00 - 08:00 AM	72.8
08:00 - 09:00 AM	73.0
CNEL:	74.2

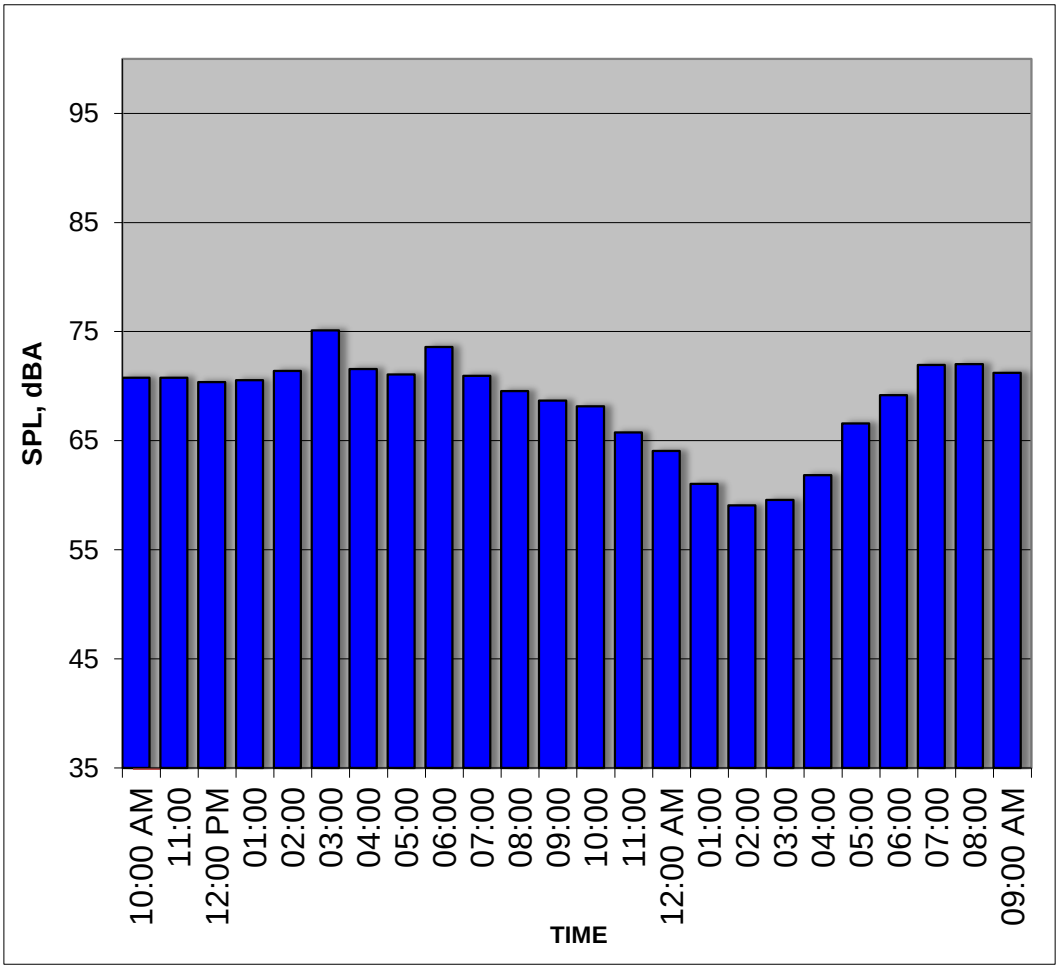
Notes:

Source: Acoustics Group, Inc.

MEASUREMENT DATA - HOURLY NOISE LEVELS

Project: CDM Smith - LASAN EWVIS
Address: 11341 Victory Blvd, North Hollywood, CA 91606
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/26/2019
Position: LTN2



TIME	HNL, dB(A)
10:00 - 11:00 AM	70.8
11:00 - 12:00 PM	70.8
12:00 - 01:00 PM	70.4
01:00 - 02:00 PM	70.5
02:00 - 03:00 PM	71.4
03:00 - 04:00 PM	75.1
04:00 - 05:00 PM	71.6
05:00 - 06:00 PM	71.1
06:00 - 07:00 PM	73.6
07:00 - 08:00 PM	71.0
08:00 - 09:00 PM	69.6
09:00 - 10:00 PM	68.7
10:00 - 11:00 PM	68.1
11:00 - 12:00 AM	65.8
12:00 - 01:00 AM	64.1
01:00 - 02:00 AM	61.0
02:00 - 03:00 AM	59.1
03:00 - 04:00 AM	59.6
04:00 - 05:00 AM	61.8
05:00 - 06:00 AM	66.6
06:00 - 07:00 AM	69.2
07:00 - 08:00 AM	71.9
08:00 - 09:00 AM	72.0
09:00 - 10:00 AM	71.2
CNEL:	73.8

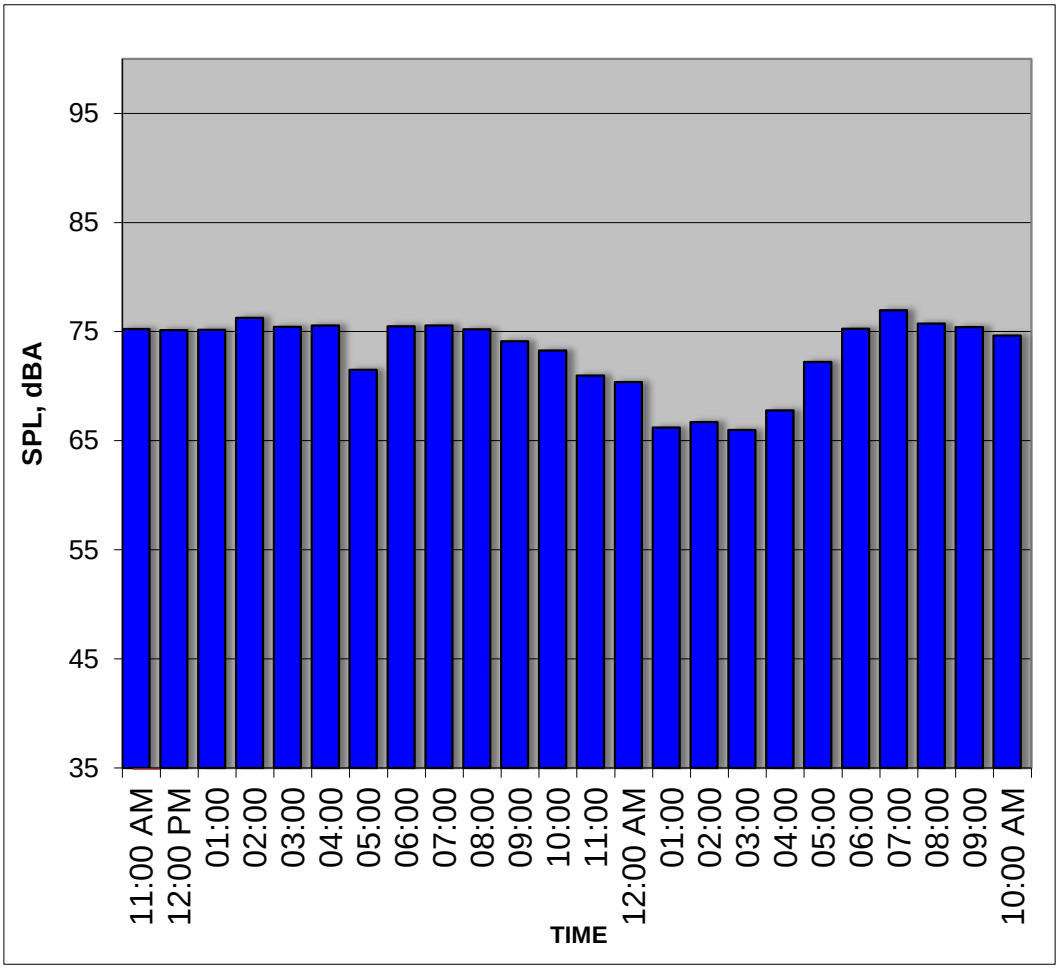
Notes:

Source: Acoustics Group, Inc.

MEASUREMENT DATA - HOURLY NOISE LEVELS

Project: CDM Smith - LASAN EWVIS
Address: 12535 Victory Blvd, North Hollywood, CA 91606
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/25/2019
Position: LTN3



TIME	HNL, dB(A)
11:00 - 12:00 PM	75.2
12:00 - 01:00 PM	75.1
01:00 - 02:00 PM	75.2
02:00 - 03:00 PM	76.3
03:00 - 04:00 PM	75.4
04:00 - 05:00 PM	75.6
05:00 - 06:00 PM	71.5
06:00 - 07:00 PM	75.5
07:00 - 08:00 PM	75.6
08:00 - 09:00 PM	75.2
09:00 - 10:00 PM	74.1
10:00 - 11:00 PM	73.3
11:00 - 12:00 AM	71.0
12:00 - 01:00 AM	70.4
01:00 - 02:00 AM	66.2
02:00 - 03:00 AM	66.7
03:00 - 04:00 AM	66.0
04:00 - 05:00 AM	67.8
05:00 - 06:00 AM	72.2
06:00 - 07:00 AM	75.3
07:00 - 08:00 AM	77.0
08:00 - 09:00 AM	75.7
09:00 - 10:00 AM	75.4
10:00 - 11:00 AM	74.6
CNEL:	*78.9*

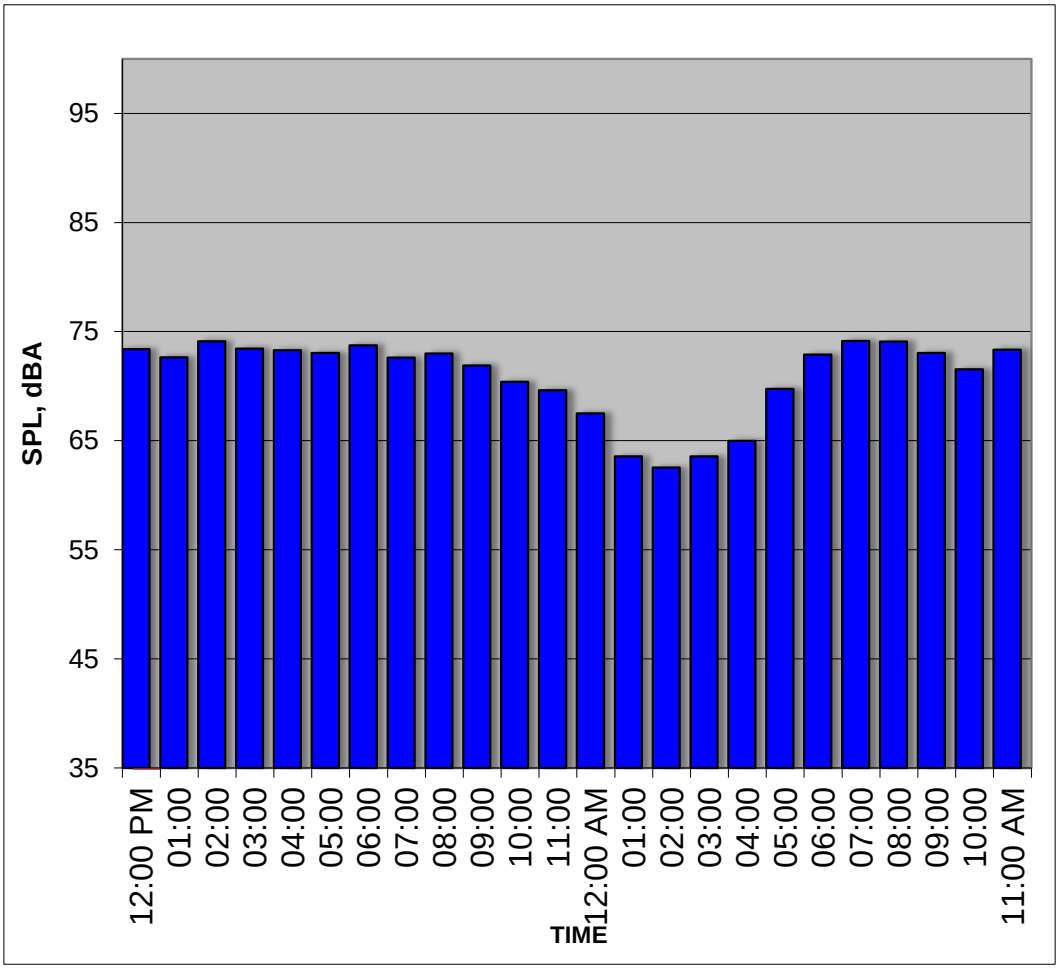
Notes:

Source: Acoustics Group, Inc.

MEASUREMENT DATA - HOURLY NOISE LEVELS

Project: CDM Smith - LASAN EWVIS
Address: 13109 Victory Blvd, North Hollywood, CA 91401
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/26/2019
Position: LTN4



TIME	HNL, dB(A)
12:00 - 01:00 PM	73.4
01:00 - 02:00 PM	72.6
02:00 - 03:00 PM	74.1
03:00 - 04:00 PM	73.4
04:00 - 05:00 PM	73.3
05:00 - 06:00 PM	73.0
06:00 - 07:00 PM	73.8
07:00 - 08:00 PM	72.6
08:00 - 09:00 PM	73.0
09:00 - 10:00 PM	71.9
10:00 - 11:00 PM	70.4
11:00 - 12:00 AM	69.6
12:00 - 01:00 AM	67.5
01:00 - 02:00 AM	63.6
02:00 - 03:00 AM	62.5
03:00 - 04:00 AM	63.6
04:00 - 05:00 AM	65.0
05:00 - 06:00 AM	69.7
06:00 - 07:00 AM	72.9
07:00 - 08:00 AM	74.1
08:00 - 09:00 AM	74.1
09:00 - 10:00 AM	73.0
10:00 - 11:00 AM	71.5
11:00 - 12:00 PM	73.3
CNEL:	76.5

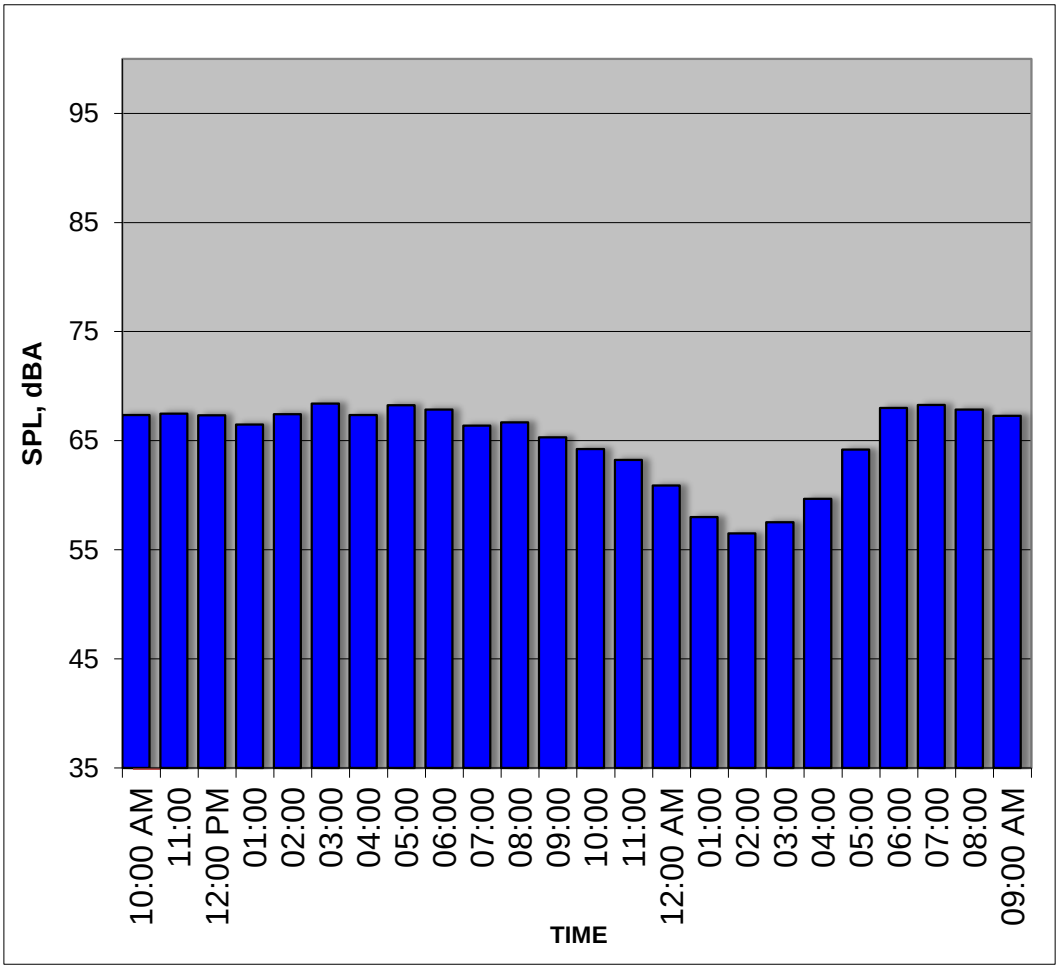
Notes:

Source: Acoustics Group, Inc.

MEASUREMENT DATA - HOURLY NOISE LEVELS

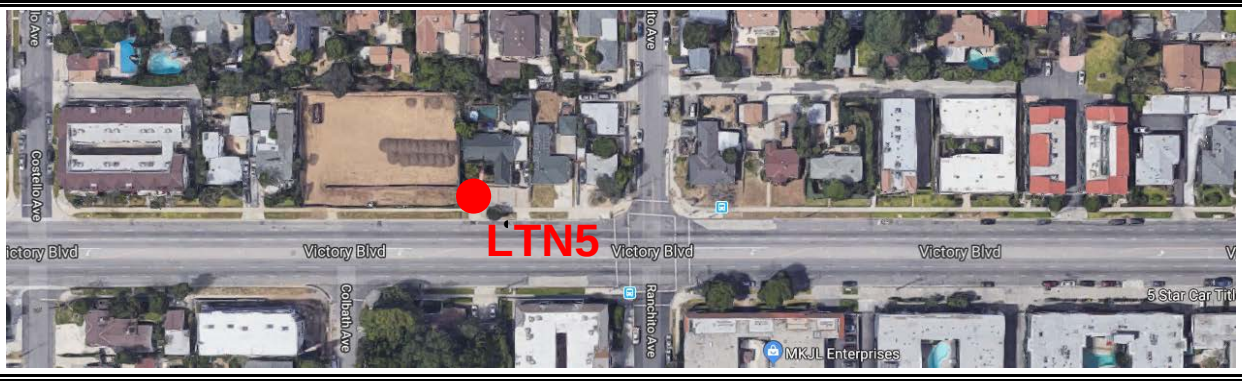
Project: CDM Smith - LASAN EWVIS
Address: 13903 Victory Blvd, Van Nuys, CA 91401
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/26/2019
Position: LTN5



TIME	HNL, dB(A)
10:00 - 11:00 AM	67.4
11:00 - 12:00 PM	67.5
12:00 - 01:00 PM	67.3
01:00 - 02:00 PM	66.5
02:00 - 03:00 PM	67.4
03:00 - 04:00 PM	68.4
04:00 - 05:00 PM	67.4
05:00 - 06:00 PM	68.3
06:00 - 07:00 PM	67.9
07:00 - 08:00 PM	66.4
08:00 - 09:00 PM	66.7
09:00 - 10:00 PM	65.3
10:00 - 11:00 PM	64.2
11:00 - 12:00 AM	63.2
12:00 - 01:00 AM	60.9
01:00 - 02:00 AM	58.0
02:00 - 03:00 AM	56.5
03:00 - 04:00 AM	57.5
04:00 - 05:00 AM	59.7
05:00 - 06:00 AM	64.2
06:00 - 07:00 AM	68.0
07:00 - 08:00 AM	68.3
08:00 - 09:00 AM	67.9
09:00 - 10:00 AM	67.3
CNEL:	*70.7*

Notes:

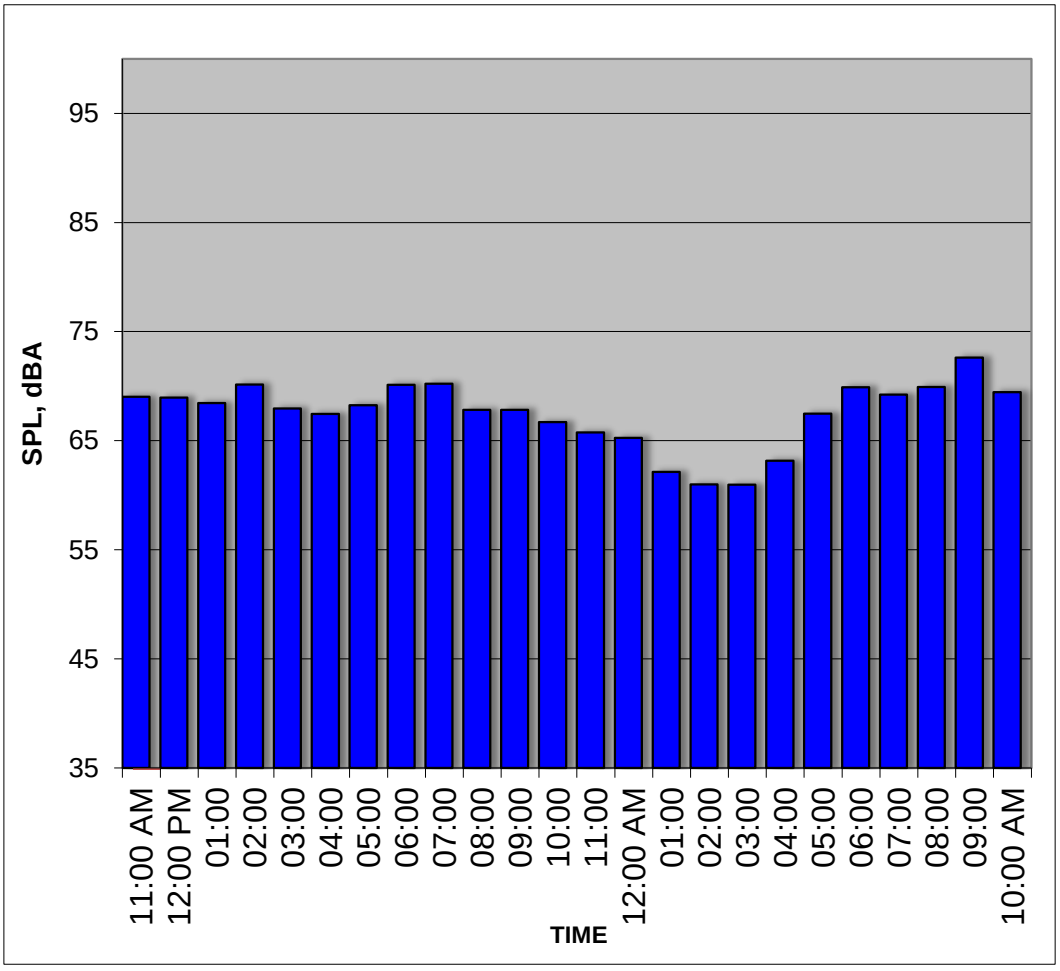


Source: Acoustics Group, Inc.

MEASUREMENT DATA - HOURLY NOISE LEVELS

Project: CDM Smith - LASAN EWVIS
Address: 15157 Victory Blvd, Van Nuys, CA 91411
Location:
Noise Sources: Traffic Noise

Date: 2/25/2019 - 2/26/2019
Position: LTN6



TIME	HNL, dB(A)
11:00 - 12:00 PM	69.0
12:00 - 01:00 PM	69.0
01:00 - 02:00 PM	68.5
02:00 - 03:00 PM	70.2
03:00 - 04:00 PM	67.9
04:00 - 05:00 PM	67.5
05:00 - 06:00 PM	68.3
06:00 - 07:00 PM	70.1
07:00 - 08:00 PM	70.2
08:00 - 09:00 PM	67.8
09:00 - 10:00 PM	67.8
10:00 - 11:00 PM	66.7
11:00 - 12:00 AM	65.8
12:00 - 01:00 AM	65.3
01:00 - 02:00 AM	62.1
02:00 - 03:00 AM	61.0
03:00 - 04:00 AM	61.0
04:00 - 05:00 AM	63.2
05:00 - 06:00 AM	67.5
06:00 - 07:00 AM	69.9
07:00 - 08:00 AM	69.2
08:00 - 09:00 AM	69.9
09:00 - 10:00 AM	72.6
10:00 - 11:00 AM	69.5
CNEL:	*73.3*

Notes:

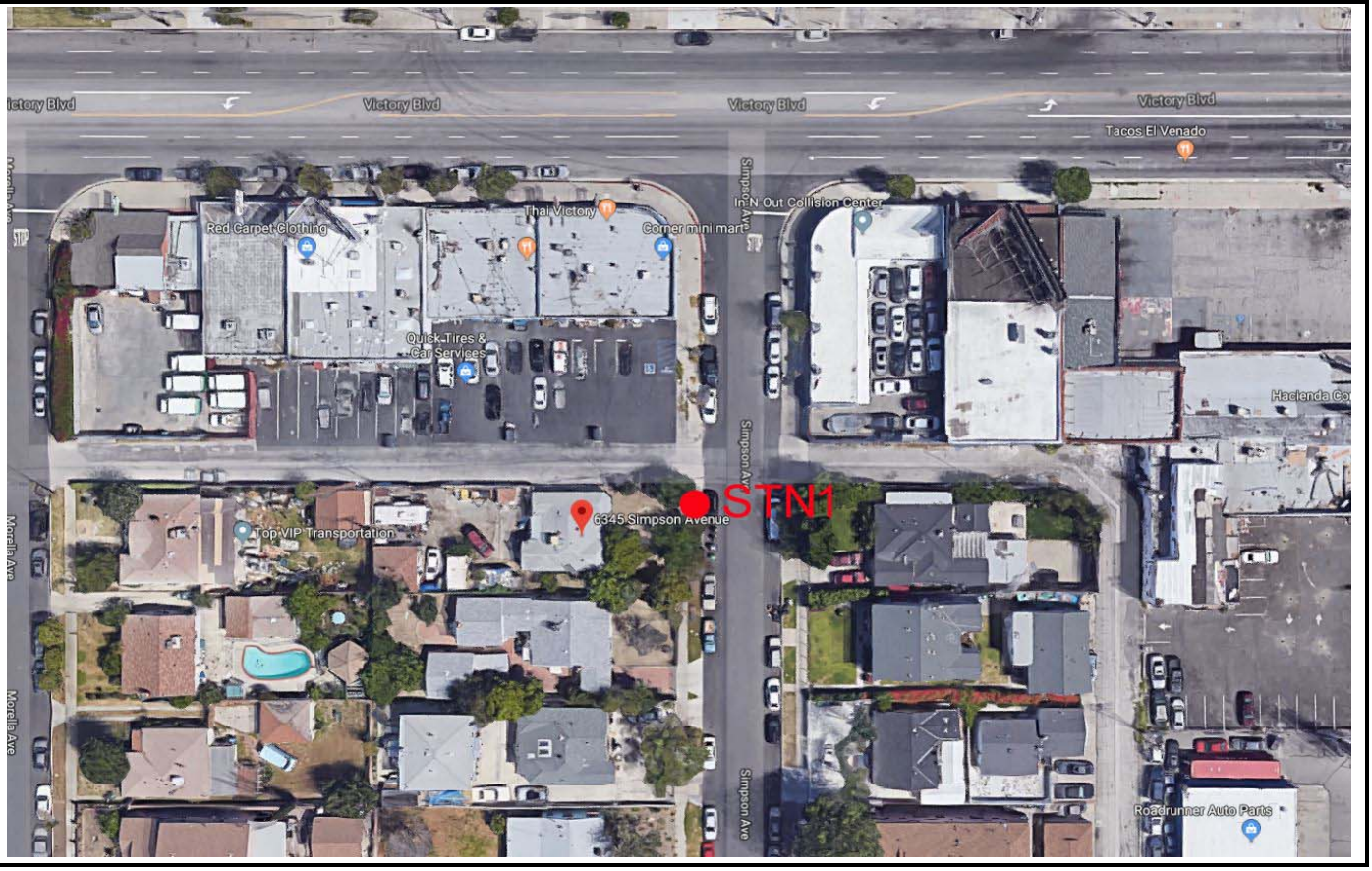
Source: Acoustics Group, Inc.

NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN1**		
	6345 Simpson Avenue, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3086903**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 9:06 AM	2/8/2019 9:26 AM	64.2	62.0	59.5	57.4	54.5	53.8	71.4	51.8	58.3	Vehicular Traffic, Mechanical Equipment, Wildlife
2/8/2019 12:15 PM	2/8/2019 12:46 PM	63.7	60.6	57.7	55.5	51.6	50.5	70.8	46.5	57.1	Vehicular Traffic, Aircraft, Mechical Equipment, Water Hose
2/8/2019 3:12 PM	2/8/2019 3:41 PM	64.7	60.9	58.4	56.9	54.6	53.9	74.9	51.7	58.2	Vehicular Traffic, Mechanical Equipment, Community Noise, Wind

Notes:

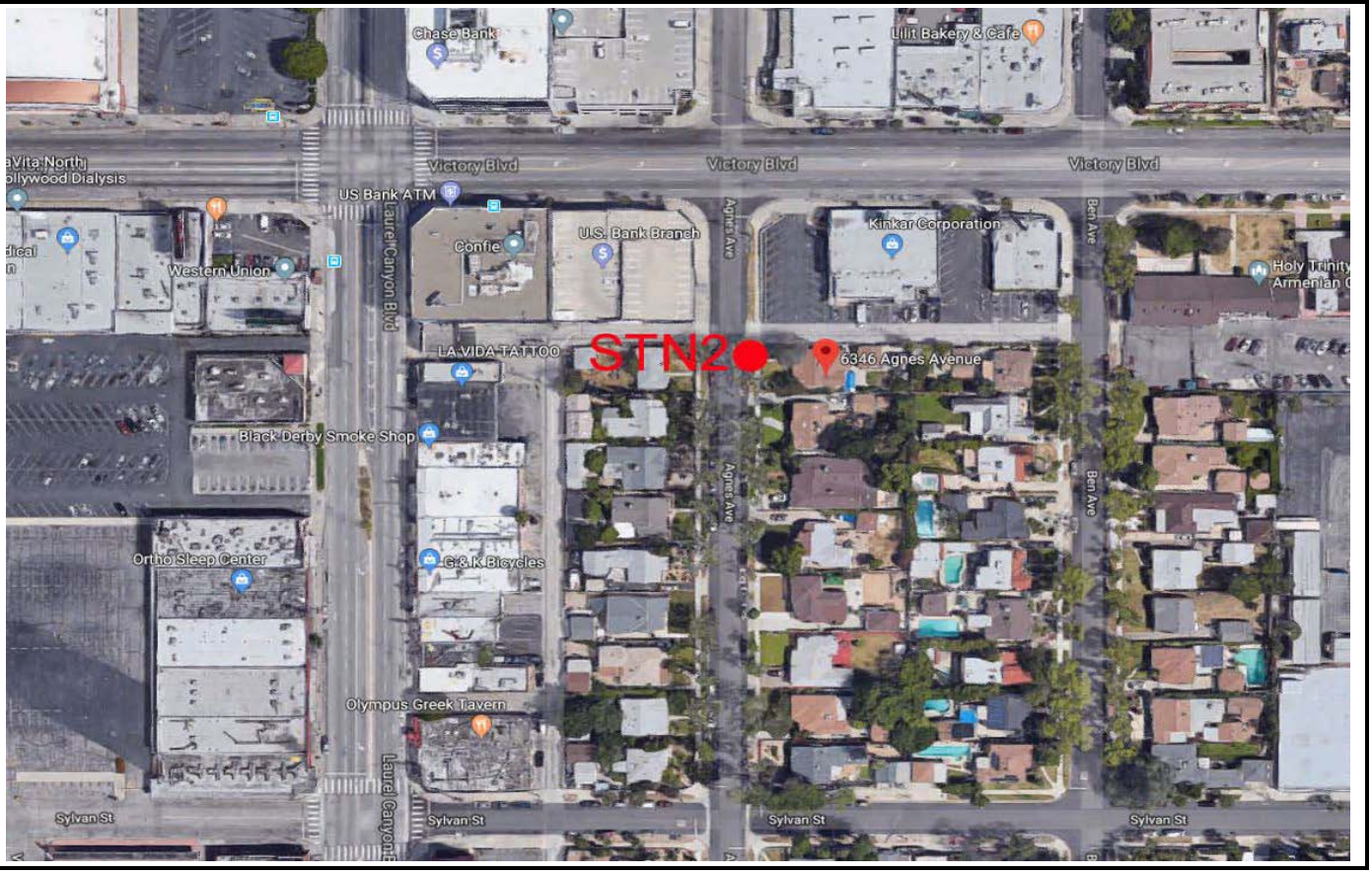


NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN2**		
	6346 Agnes Ave, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3100588**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 9:26 AM	2/8/2019 9:46 AM	66.5	64.5	62.3	60.3	55.5	53.9	71.2	49.1	61.2	Vehicular Traffic, Community Noise, Helicopter
2/8/2019 12:23 PM	2/8/2019 12:43 PM	66.3	63.1	60.7	59.0	55.8	54.3	75.5	51.0	60.3	Vehicular Traffic, Community Noise, Aircraft, Wildlife
2/8/2019 3:18 PM	2/8/2019 3:38 PM	68.2	65.5	63.0	61.4	59.2	57.8	73.7	55.7	62.5	Vehicular Traffic, Community Noise, Aircraft, Wildlife

Notes:

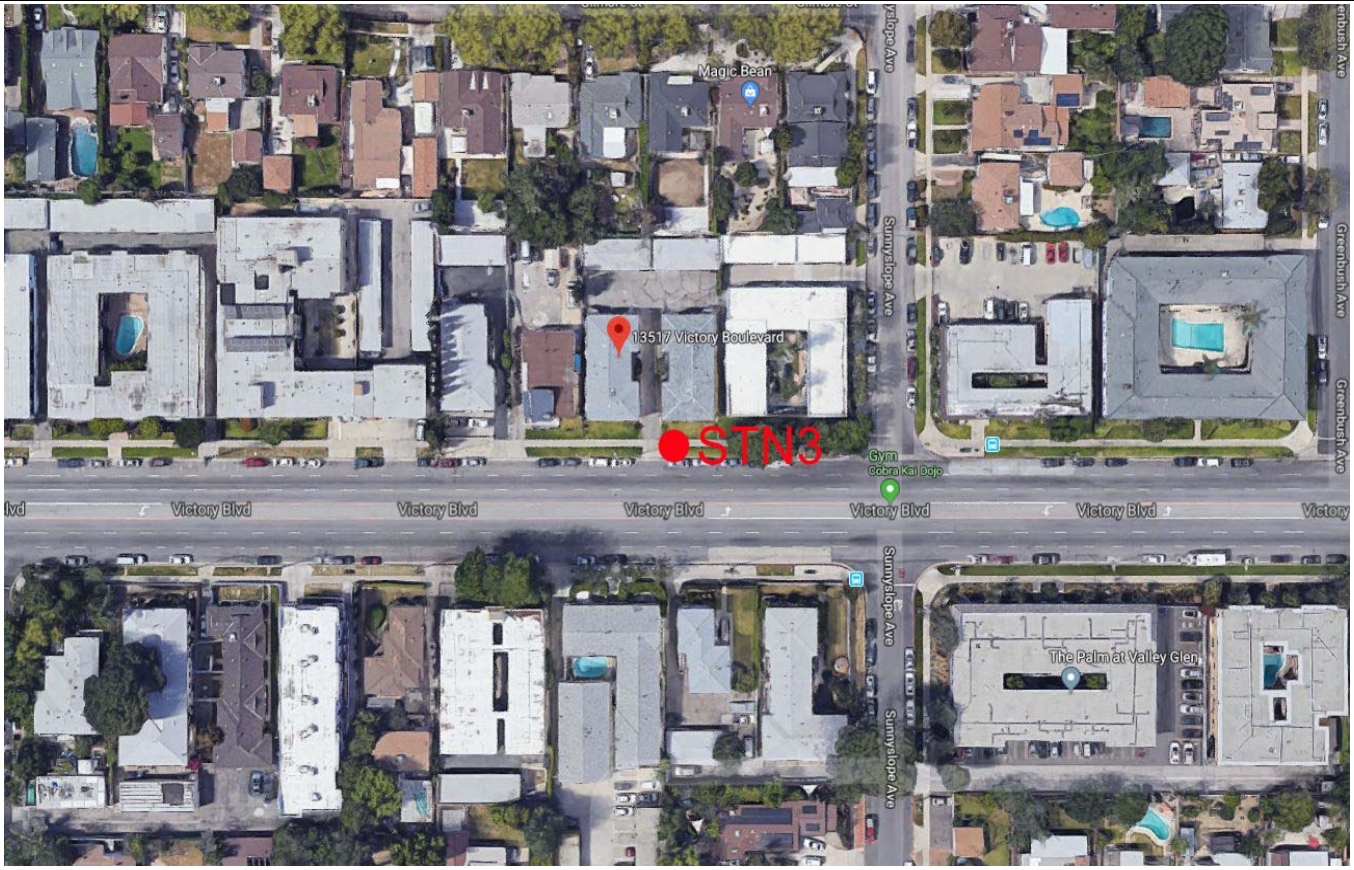


NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN3**		
	13517 Victory Blvd, Van Nuys, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3086903**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 10:01 AM	2/8/2019 10:36 AM	78.3	76.8	75.2	73.7	69.7	67.1	85.6	53.4	74.1	Vehicular Traffic, Community Noise
2/8/2019 1:05 PM	2/8/2019 1:39 PM	82.4	78.1	75.5	73.8	68.7	65.9	94.8	55.7	75.3	Vehicular Traffic, Siren, Community Noise
2/8/2019 3:57 PM	2/8/2019 4:30 PM	77.0	74.8	73.1	71.5	67.3	64.5	86.3	57.0	72.1	Vehicular Traffic, Bust Stop, Community Noise

Notes:

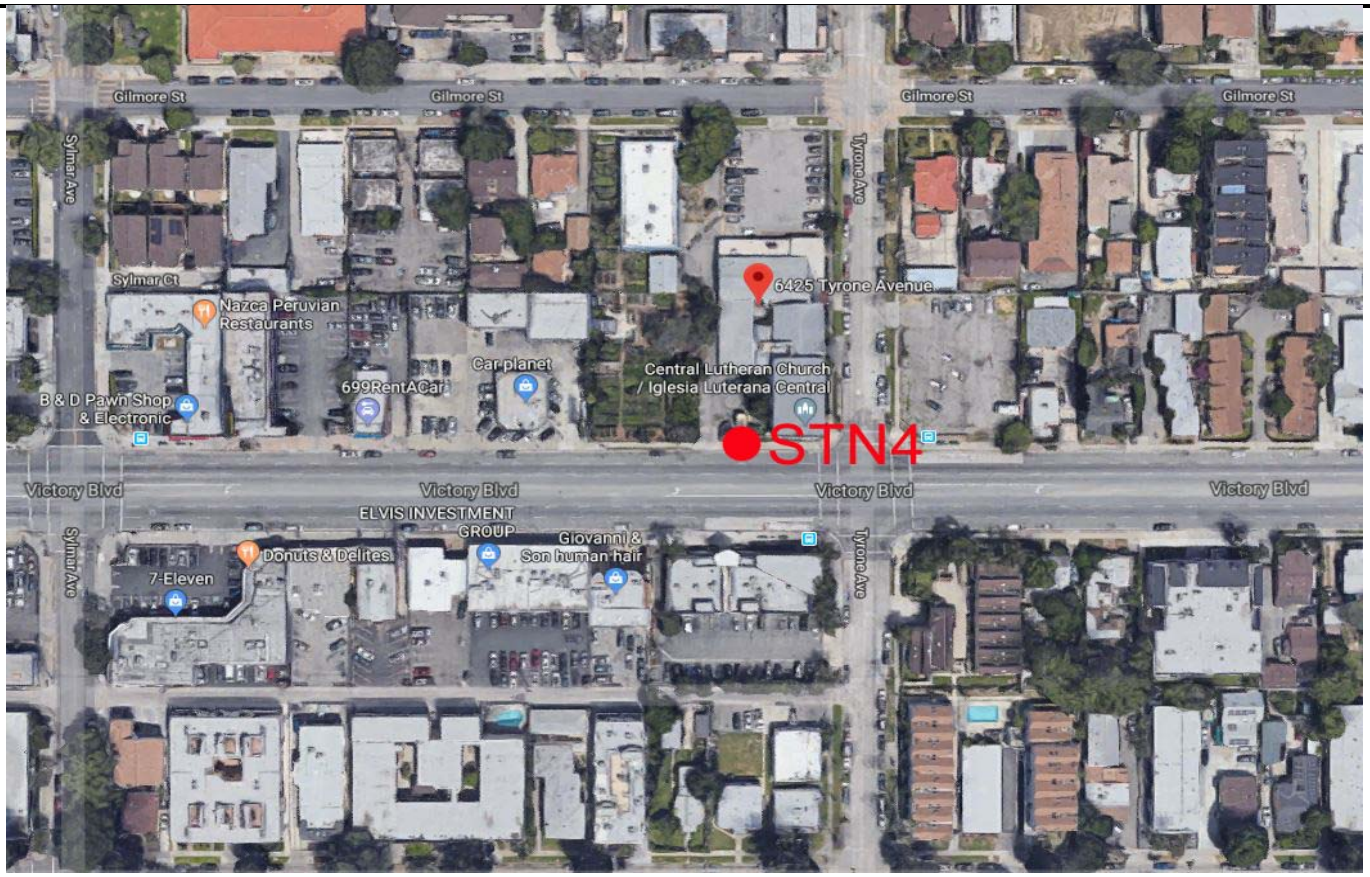


NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN4**		
	6425 Tyrone Ave, Van Nuys, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3100588**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 10:09 AM	2/8/2019 10:29 AM	82.1	77.7	75.2	72.7	66.1	63.9	93.3	56.2	74.5	Vehicular Traffic, Community Noise
2/8/2019 1:14 PM	2/8/2019 1:34 PM	80.3	76.9	74.8	72.6	64.9	62.3	88.9	56.1	73.6	Vehicular Traffic, Community Noise
2/8/2019 4:05 PM	2/8/2019 4:25 PM	80.3	77.1	75.0	73.0	67.3	65.8	88.7	56.8	74.0	Vehicular Traffic, Community Noise

Notes:



NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN5**		
	15411 Victory Blvd, Van Nuys, CA 91406		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3100588**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 11:07 AM	2/8/2019 11:30 AM	81.7	79.6	77.4	74.7	69.2	66.0	87.0	56.8	76.1	Vehicular Traffic, Community Noise
2/8/2019 2:05 PM	2/8/2019 2:25 PM	81.5	80.1	78.3	75.8	69.4	65.7	85.1	59.7	76.8	Vehicular Traffic, Community Noise, Helicopter, Aircraft
2/8/2019 5:04 PM	2/8/2019 5:24 PM	83.2	80.8	79.1	77.3	72.9	70.8	91.5	63.0	78.0	Vehicular Traffic, Community Noise, Weed Wacker

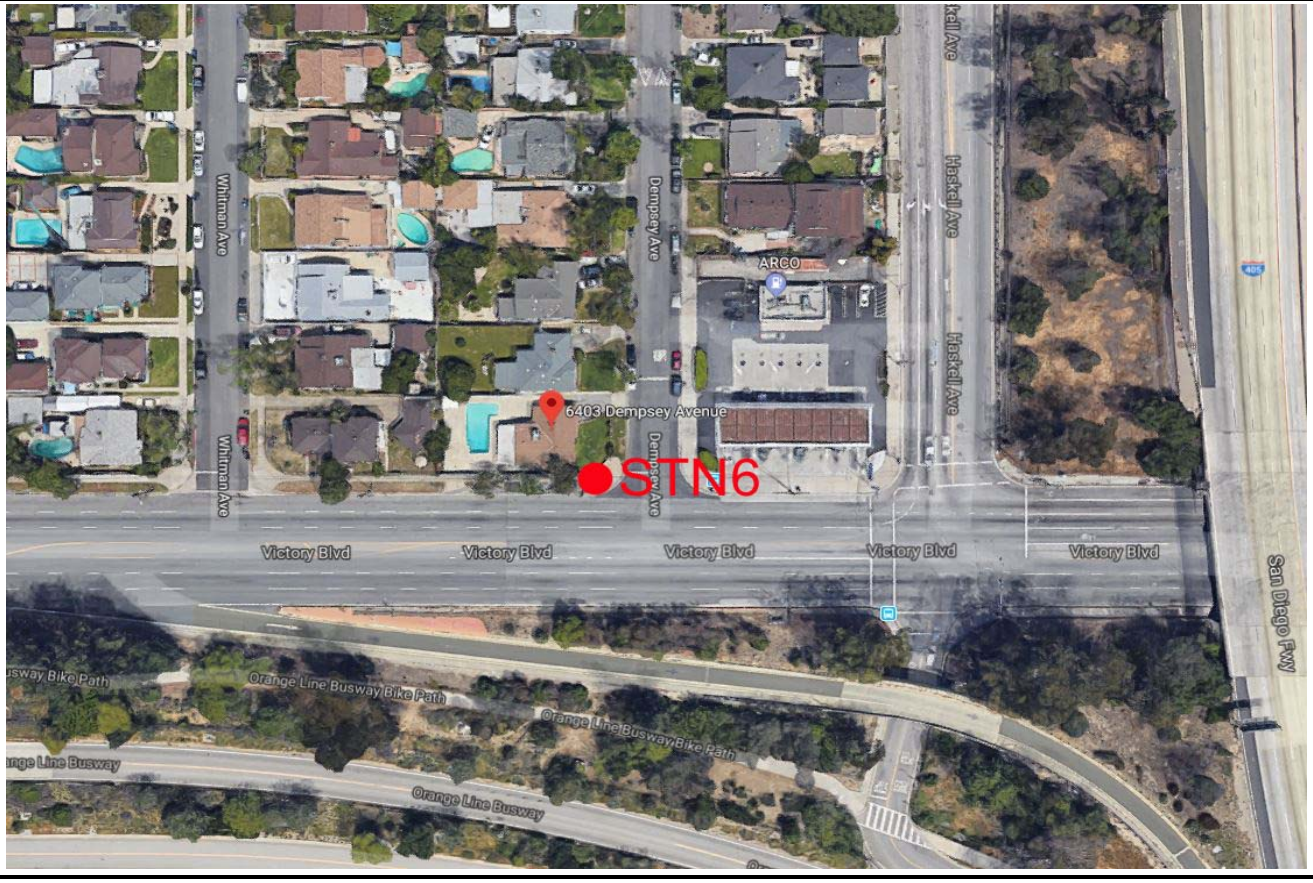
Notes:

NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STN6**		
	6403 Dempsey Ave, Van Nuys, CA 91406		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3086903**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/8/2019 10:54 AM	2/8/2019 11:24 AM	80.4	77.8	75.3	72.4	65.6	63.7	90.5	59.5	73.9	Vehicular Traffic, Community Noise, Commercial Plaza Noise
2/8/2019 1:57 PM	2/8/2019 2:30 PM	83.3	79.0	76.9	74.1	69.0	66.5	97.7	60.5	76.1	Vehicular Traffic, Community Noise
2/8/2019 4:47 PM	2/8/2019 5:25 PM	82.8	79.8	77.6	74.7	69.5	67.3	95.1	61.5	75.4	Vehicular Traffic, Community Noise, Aircraft

Notes:

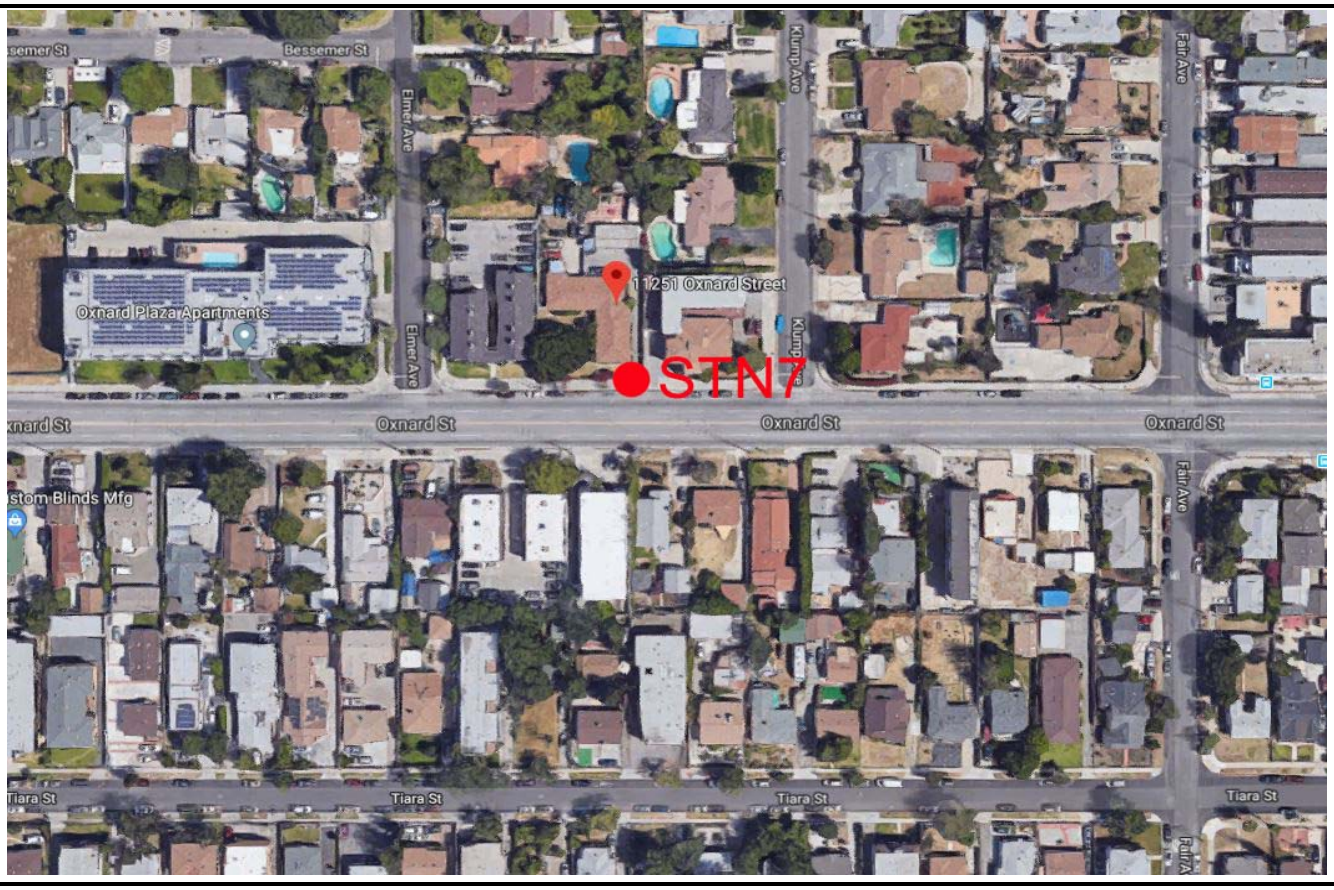


NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019**
Loc:	**STN7**		**2/12/2019**
	11251 Oxnard St, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3086903**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/11/2019 10:37 AM	2/11/2019 11:07 AM	76.9	75.0	72.2	67.9	58.1	55.0	81.4	42.1	70.5	Vehicular Traffic, Community Noise, Wildlife
2/11/2019 12:14 PM	2/11/2019 12:38 PM	76.1	73.8	71.0	67.0	57.6	55.0	82.9	43.9	69.4	Vehicular Traffic, Community Noise, Wildlife
2/12/2019 2:09 PM	2/12/2019 2:32 PM	76.9	75.2	72.6	69.3	59.9	57.6	81.1	49.4	71.1	Vehicular Traffic, Community Noise, Wildlife

Notes:



NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019**
Loc:	**STN8**		**2/12/2019**
	12217 Oxnard St, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3100588**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/11/2019 10:51 AM	2/11/2019 11:01 AM	80.1	77.5	74.8	72.7	66.9	64.8	86.9	56.0	74.1	Vehicular Traffic, Community Noise, Helicopter
2/11/2019 12:19 PM	2/11/2019 12:31 PM	82.4	77.5	73.5	71.1	66.0	63.3	92.2	55.4	73.8	Vehicular Traffic, Community Noise, Motorcycle, Wildlife
2/12/2019 2:15 PM	2/12/2019 2:26 PM	75.6	74.2	72.3	70.4	65.9	63.9	86.7	65.4	71.6	Vehicular Traffic, Community Noise

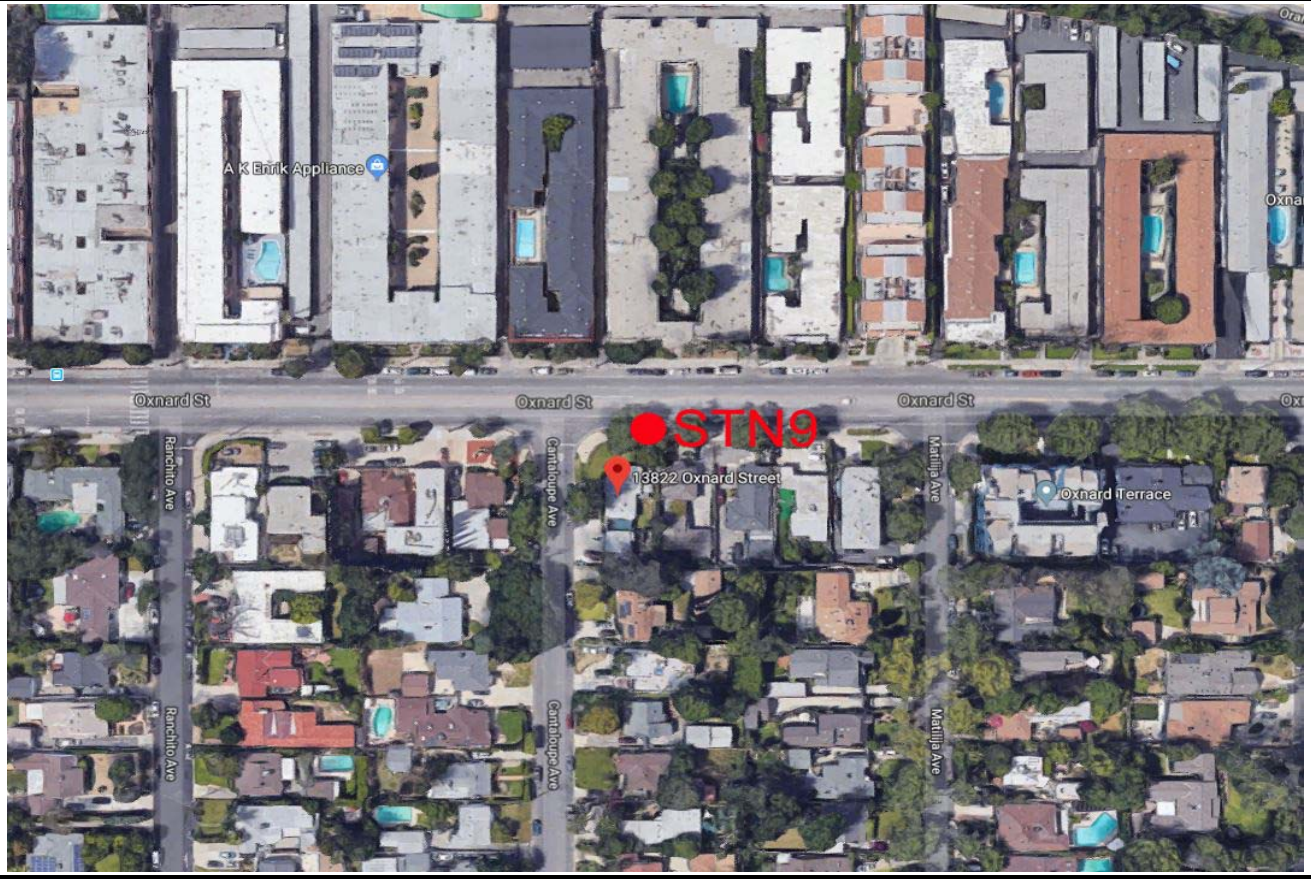
Notes:

NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019**
Loc:	**STN9**		**2/12/2019**
	13822 Oxnard St, Van Nuys, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3086903**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/11/2019 11:14 AM	2/11/2019 11:56 AM	79.5	77.7	75.4	72.6	64.2	61.5	83.8	47.3	73.9	Vehicular Traffic, Community Noise, Wildlife
2/11/2019 12:57 PM	2/11/2019 1:24 PM	79.7	77.4	74.9	72.1	66.0	64.0	86.0	51.6	73.6	Vehicular Traffic, Community Noise, Wildlife
2/12/2019 2:49 PM	2/12/2019 3:00 PM	80.7	78.8	76.1	73.7	66.9	62.8	88.2	52.5	75.0	Vehicular Traffic

Notes:

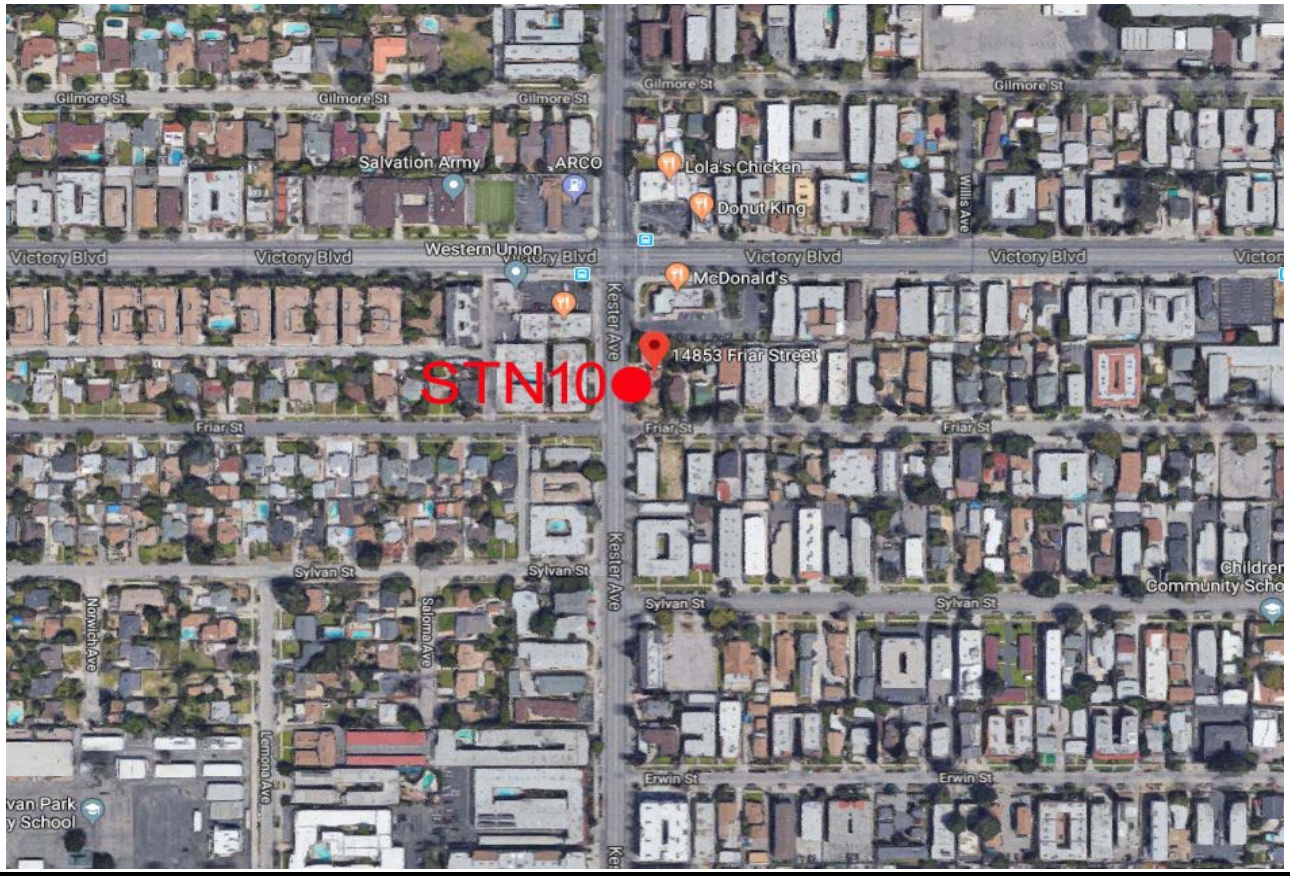


NOISE MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019**
Loc:	**STN10**		**2/12/2019**
	14853 Friar St, Van Nuys, CA 91411		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Bruel & Kjaer Type 4189**	**SN:**	**3100588**
P/A:		**SN:**	

Start	Stop	L2	L8	L25	L50	L90	L99	Lmax	Lmin	Leq	Notes
2/11/2019 11:35 AM	2/11/2019 11:46 AM	77.4	74.8	72.2	69.7	63.0	60.4	85.3	52.6	71.1	Vehicular Traffic, Community Noise
2/11/2019 1:07 PM	2/11/2019 1:17 PM	76.0	73.7	71.4	67.8	59.9	57.7	80.3	50.3	69.8	Vehicular Traffic, Community Noise
2/12/2019 3:11 PM	2/12/2019 3:22 PM	80.6	76.4	70.8	68.7	65.0	63.9	81.1	49.4	71.1	Vehicular Traffic, Community Noise, Construction, Siren

Notes:



VIBRATION MONITORING FIELD DATA SHEET

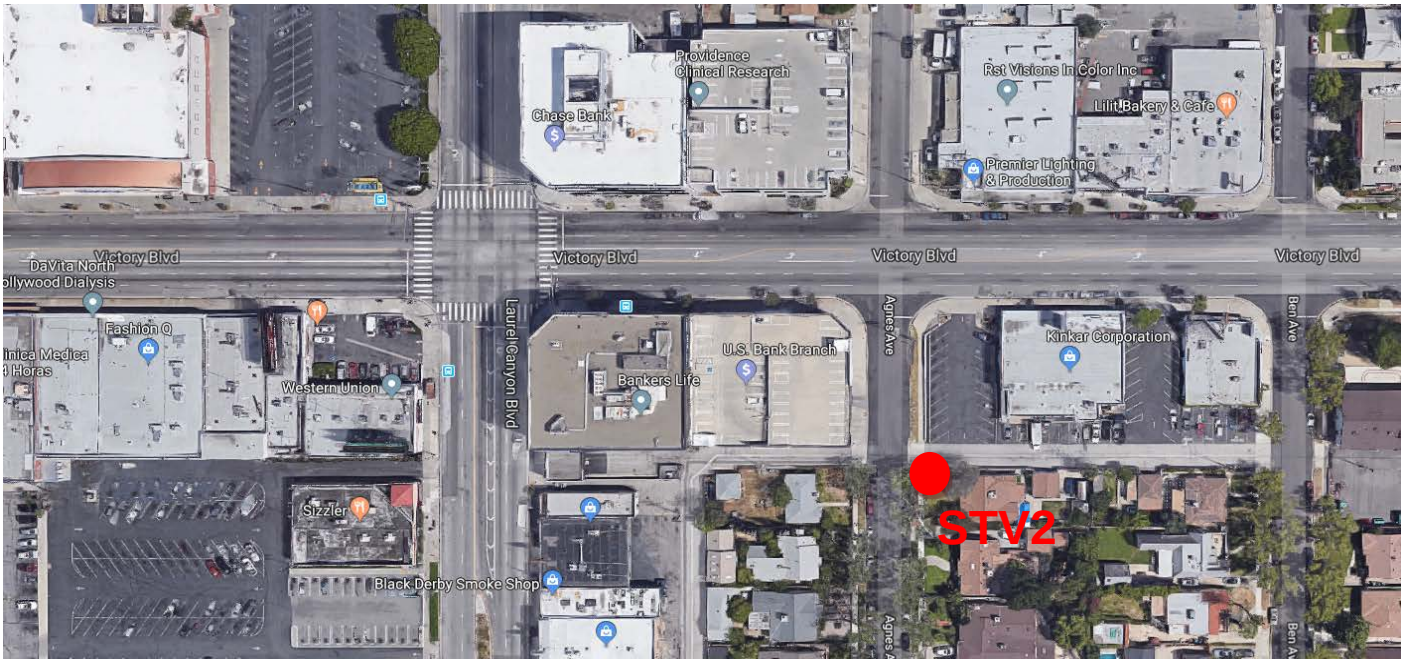
Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019, 2/12/2019**
Loc:	**STV1**		
	11341 Victory Blvd, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Dytran Model 3100D24**	**SN:**	**7155**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/11/2019 9:06 AM	2/11/2019 9:26 AM	0.029	0.007	81.86	89.25	77.10	Vehicular traffic
2/12/2019 12:43 PM	2/12/2019 12:53 PM	0.007	0.003	72.19	76.81	69.21	Vehicular traffic
2/12/2019 4:25 PM	2/12/2019 4:35 PM	0.011	0.005	76.32	80.52	73.44	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STV2**		
	6346 Agnes Ave, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Dytran Model 3100D24T**	**SN:**	**7136**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/8/2019 9:26 AM	2/8/2019 9:46 AM	0.011	0.003	74.39	80.91	70.77	Vehicular traffic, community activity
2/8/2019 12:23 PM	2/8/2019 12:43 PM	0.011	0.003	71.60	80.61	68.85	Vehicular traffic, community activity
2/8/2019 3:18 PM	2/8/2019 3:38 PM	0.013	0.003	71.88	82.06	69.15	Vehicular traffic, community activity



VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/12/2019, 2/25/2019**
Loc:	**STV3**		
	13109 Victory Blvd, Valley Glen, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Dytran Model 3100D24**	**SN:**	**7155**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/25/2019 10:25 AM	2/25/2019 10:35 AM	0.005	0.002	70.09	74.03	67.10	Vehicular traffic, community activity
2/12/2019 11:50 AM	2/12/2019 12:18 PM	0.009	0.003	72.05	78.64	69.29	Vehicular traffic, community activity
2/12/2019 4:01 PM	2/12/2019 4:10 PM	0.009	0.004	76.55	79.54	72.29	Vehicular traffic, bus stop, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STV4**		
	6425 Tyrone Ave, Van Nuys, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Dytran Model 3100D24T**	**SN:**	**7136**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/8/2019 10:09 AM	2/8/2019 10:29 AM	0.002	0.003	72.79	85.95	70.02	Vehicular traffic, community activity
2/8/2019 1:14 PM	2/8/2019 1:34 PM	0.017	0.002	70.64	84.53	67.85	Vehicular traffic, community activity
2/8/2019 4:05 PM	2/8/2019 4:25 PM	0.018	0.003	72.73	85.05	69.01	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/12/2019, 2/25/2019**
Loc:	**STV5**		
	15157 Victory Blvd, Van Nuys, CA 91411		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Dytran Model 3100D24T**	**SN:**	**7136**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/25/2019 10:56 AM	2/25/2019 11:02 AM	0.006	0.003	72.02	75.26	68.62	Vehicular traffic, community activity
2/12/2019 11:58 AM	2/12/2019 12:12 PM	0.014	0.004	79.60	83.20	71.36	Vehicular traffic, community activity
2/12/2019 3:34 PM	2/12/2019 3:45 PM	0.009	0.004	77.09	79.33	72.42	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/8/2019**
Loc:	**STV6**		
	6403 Dempsey Ave, Van Nuys, CA 91406		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Dytran Model 3100D24**	**SN:**	**7155**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/8/2019 10:54M	2/8/2019 11:24 AM	0.035	0.005	81.68	90.91	74.73	Vehicular traffic, community activity, commercial plaza activity
2/8/2019 1:57 PM	2/8/2019 2:30 PM	0.039	0.004	81.17	91.73	70.94	Vehicular traffic, community activity
2/8/2019 4:47 PM	2/8/2019 5:25 PM	0.033	0.004	83.22	90.29	71.58	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019, 2/12/2019**
Loc:	**STV7**		
	11251 Oxnard St, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Dytran Model 3100D24**	**SN:**	**7155**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/11/2019 10:37 AM	2/11/2019 11:07 AM	0.023	0.006	81.93	87.23	75.05	Vehicular traffic, community activity
2/11/2019 12:14 PM	2/11/2019 12:38 PM	0.024	0.007	81.88	87.59	76.55	Vehicular traffic, community activity
2/12/2019 2:09 PM	2/12/2019 2:32 PM	0.007	0.002	71.38	76.65	67.84	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

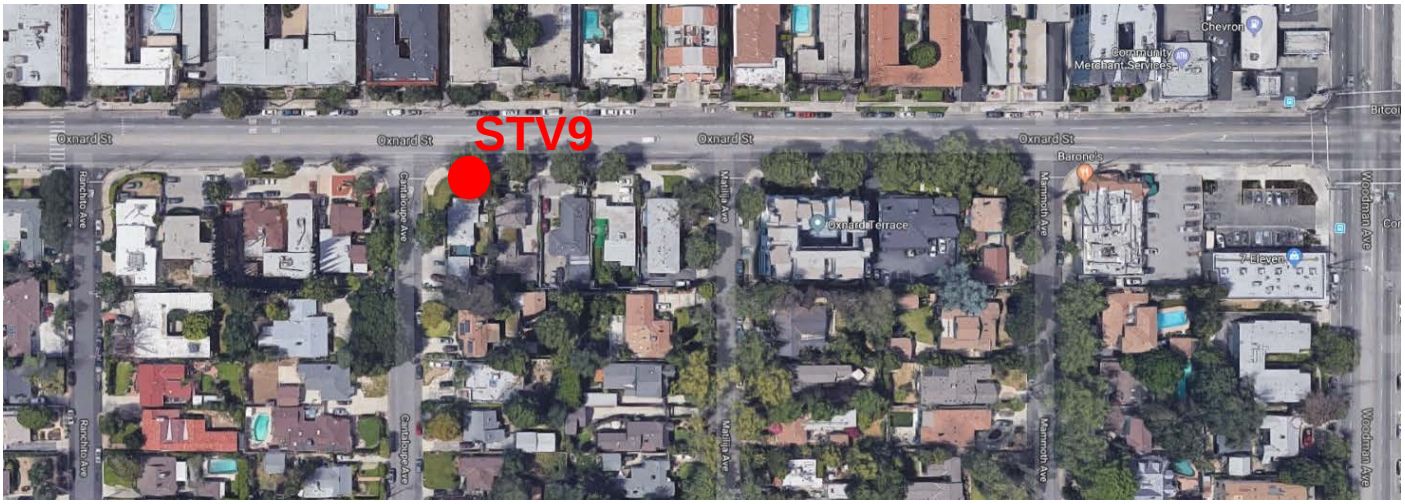
Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019, 2/12/2019**
Loc:	**STV8**		
	12217 Oxnard St, North Hollywood, CA 91606		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Dytran Model 3100D24T**	**SN:**	**7136**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/11/2019 10:51 AM	2/11/2019 11:01 AM	0.008	0.003	72.08	78.06	69.12	Vehicular traffic, community activity
2/11/2019 12:19 PM	2/11/2019 12:31 PM	0.008	0.003	72.97	78.21	69.53	Vehicular traffic, community activity, motorcycle
2/12/2019 2:15 PM	2/12/2019 2:26 PM	0.009	0.003	76.09	78.74	69.89	Vehicular traffic, community activity

VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019, 2/12/2019**
Loc:	**STV9**		
	13822 Oxnard St, Van Nuys, CA 91401		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3023678**
Mic:	**Dytran Model 3100D24T**	**SN:**	**7136**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/11/2019 11:14 AM	2/11/2019 11:56 AM	0.026	0.005	81.68	88.30	74.27	Vehicular traffic, community activity
2/11/2019 12:57 PM	2/11/2019 1:24 PM	0.025	0.006	82.20	88.00	75.1	Vehicular traffic, community activity
2/12/2019 2:49 PM	2/12/2019 3:00 PM	0.009	0.003	71.89	78.98	69.33	Vehicular traffic



VIBRATION MONITORING FIELD DATA SHEET

Project:	**CDM Smith - LASAN EWVIS**	**Date:**	**2/11/2019, 2/12/2019**
Loc:	**STV10**		
	14853 Friar St, Van Nuys, CA 91411		
SLM:	**Bruel & Kjaer Type 2270**	**SN:**	**3011341**
Mic:	**Dytran Model 3100D24**	**SN:**	**7155**
P/A:		**SN:**	

Start	Stop	PPV Max, in/sec	PPV Min, in/sec	RMS, VdB	RMS Max, VdB	RMS Min, VdB	Notes
2/11/2019 11:35 AM	2/11/2019 11:46 AM	0.007	0.003	73.10	76.39	70.17	Vehicular traffic, community activity
2/11/2019 1:07 PM	2/11/2019 1:17 PM	0.006	0.003	71.16	75.17	68.51	Vehicular traffic, community activity
2/12/2019 3:11 PM	2/12/2019 3:22 PM	0.009	0.003	76.21	78.59	70.82	Vehicular traffic, community activity

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	RCNM Lmax @ 50 ft	Energy	Energy*Usage	Leq for One Piece of Equipment @ 50 ft	Energy	Total Energy	Leq for Total Equipment Pieces @ 50 ft	Receptor to Source Distance, ft: LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	Nearest Residence: 1. SR-170 2. Tujunga 3. Kester 4. Sepulveri 5. 405 Fwy	Shielding Factor: LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6
1	**Force Main**																																			
1.1	**Excavation and Shoring**																																			
	Concrete Saw	Concrete Saw	60%	1	60 hp	89.6	9.12E+08	547206503.6	87.4	547206503.6	547206503.6	87.4	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Pavement Breaker	Jackhammer	60%	1	100 hp	88.9	7.76E+08	465748270	86.7	465748270.0	465748270.0	86.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Loader	Front End Loader	60%	2	150 hp	79.1	81283052	48769830.97	76.9	48769831.0	97539661.9	79.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	84.4	2.75E+08	165253722.2	82.2	165253722.2	330507444.4	85.2	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Service Crane	Crane	50%	2	250 hp	80.6	1.15E+08	57407681.07	77.6	57407681.1	114815362.1	80.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Excavator	Excavator	80%	1	162 hp	80.7	1.17E+08	93991804.4	79.7	93991804.4	93991804.4	79.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator- PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Compressor- PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	200 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Pumping Equipment (GW)	Pumps	50%	2	50 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	123026877.1	80.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Haul Trips -net export	Dump Truck	40%	0		76.5	44668359	17867343.69	72.5	17867343.7	160806093.2	82.1	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Haul Trips -- staging areas	Dump Truck	40%	11		76.5	44668359	17867343.69	72.5	17867343.7	196540780.5	82.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips - materials	Flat Bed Truck	40%	10		74.3	26915348	10766139.22	70.3	10766139.2	107661392.2	80.3	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Concrete or Gravel Truck	Concrete Mixer Truck	40%	4		78.8	75857758	30343103	74.8	30343103.0	121372412.0	80.8	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
1.2	**Bedding**																																			
	Loader	Front End Loader	40%	1	150 hp	79.1	81283052	32513220.65	75.1	32513220.6	32513220.6	75.1	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips (materials)	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
1.3	**Pipe Laying**																																			
	Service Crane	Crane	50%	1	250 hp	80.6	1.15E+08	57407681.07	77.6	57407681.1	57407681.1	77.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Loader	Front End Loader	30%	1	150 hp	79.1	81283052	24384915.48	73.9	24384915.5	24384915.5	73.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips (materials)	Flat Bed Truck	40%	2		74.3	26915348	10766139.22	70.3	10766139.2	21532278.4	73.3	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
1.4	**Testing**																																			
	Compressor	Compressor (air)	100%	1	50 hp	77.7	58884366	58884365.54	77.7	58884365.5	58884365.5	77.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Water Truck	Flat Bed Truck	40%	1	150 hp	74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Pumping Equipment	Pumps	80%	1	100 hp	80.9	1.23E+08	98421501.66	76.9	98421501.7	98421501.7	76.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips (misc)	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
1.5	**Restoration**																																			
	Loader	Front End Loader	50%	2	150 hp	79.1	81283052	40641525.81	76.1	40641525.8	81283051.6	79.1	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Soil Compacter	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Roller	Roller	80	1	90 hp	80	1E+08	80000000	79.0	80000000.0	80000000.0	79.0	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Asphalt Paver	Paver	40%	1	100 hp	77.2	52480746	20992298.41	73.2	20992298.4	20992298.4	73.2	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Haul Trips (staging)	Dump Truck	40%	11		76.5	44668359	17867343.69	72.5	17867343.7	196540780.5	82.9	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips (other)	Flat Bed Truck	40%	6		74.3	26915348	10766139.22	70.3	10766139.2	64596835.3	78.1	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
	Supply Trips (asphalt)	Flat Bed Truck	40%	3		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1	35	42	76	45	33	34	163	168	34	30	36	193								20	20				
2	**Pump Stations (Each)**																																			
2.1	**Excavation and Shoring**																																			
	Concrete Saw	Concrete Saw	20%	1	60 hp	89.6	9.12E+08	182402167.9	82.6	182402167.9	182402167.9	82.6	88	10	38	15			183	537												20	20				
	Pavement Breaker	Jackhammer	30%	1	100 hp	88.9	7.76E+08	232874135	83.7	232874135.0	232874135.0	83.7	88	10	38	15			183	537												20	20				
	Loader	Front End Loader	80%	1	150 hp	79.1	81283052	65026441.29	78.1	65026441.3	65026441.3	78.1	88	10	38	15			183	537												20	20				
	Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	84.4	2.75E+08	82626861.1	79.2	82626861.1	82626861.1	79.2	88	10	38	15			183	537												20	20				
	Service Crane	Crane	30%	1	250 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4	88	10	38	15			183	537												20	20				
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	81.4	1.38E+08	110430741.2	80.4	110430741.2	110430741.2	80.4	88	10	38	15			183	537												20	20				
	Excavator	Excavator	80%	1	162 hp	80.7	1.17E+08	70493853.3	78.5	70493853.3	70493853.3	78.5	88	10	38	15			183	537												20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537												20	20				
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7	88	10	38	15			183	537												20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	88	10	38	15			183	537												20	20				
	Pumping Equipment	Pumps	50%	1	50 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	61513438.5	77.9	88	10	38	15			183	537												20	20				
	Haul Trips (net export)	Dump Truck	40%	19.00		76.5	44668359	17867343.69	72.5	17867343.7	339479530.0	85.3	88	10	38	15			183	537												20	20				
	Supply Trips (materials)	Flat Bed Truck	40%	8.00		74.3	26915348	10766139.22	70.3	10766139.2	86129113.7	79.4	88	10	38	15			183	537												20	20				
	Gravel Trips	Dump Truck	40%	4.00		76.5	44668359	17867343.69	72.5	17867343.7	107204062.1	80.3	88	10	38	15			183	537												20	20				
	Formwork and Casting																																			
2.2	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	81.4	1.38E+08	82823055.88	79.2	82823055.9	82823055.9	79.2	88	10	38	15			183	537												20	20				
	Forklift	Man Lift	20%	1	90 hp	74.7	29512092	5902418.453	67.7	5902418.5	5902418.5	67.7	88	10	38	15			183	537												20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537												20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Supply Trips	Flat Bed Truck	40%	4		74.3	26915348	10766139.22	70.3	10766139.2	43064556.9	76.3	88	10	38	15			183	537												20	20				
	Concrete Trips	Concrete Mixer Truck	40%	11		78.8	75857758	30343103	74.8	30343103.0	333774133.0	85.2	88	10	38	15			183	537												20	20				
2.3	**Equipment Installation**																																			
	Service Crane	Crane	20%	1	250 hp	80.6	1.15E+08	22963072.43	73.6	22963072.4	22963072.4	73.6	88	10	38	15			183	537												20	20				
	Forklift	Man Lift	20%	1	90 hp	74.7	29512092	5902418.453	67.7	5902418.5	5902418.5	67.7	88	10	38	15			183	537												20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537												20	20				
	Supply Trips	Flat Bed Truck	40%	4		74.3	26915348	10766139.22	70.3	10766139.2	43064556.9	76.3	88	10	38	15			183	537												20	20				
2.4	**Restoration**																																			
	Service Crane	Crane	40%	1	250 hp	80.6	1.15E+08	45926144.86	76.6	45926144.9	45926144.9	76.6	88	10	38	15			183	537												20	20				
	Loader	Front End Loader	60%	1	150 hp	79.1	81283052	48769830.97	76.9	48769831.0	48769831.0	76.9	88	10	38	15			183	537												20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537												20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537												20	20				
	Soil Compactor	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2	88	10	38	15			183	537												20	20				
	Roller	Roller	20%	1	90 hp	80	1E+08	20000000	73.0	20000000.0	20000000.0	73.0	88	10	38	15			183	537												20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	88	10	38	15			183	537												20	20				
	Haul Trips (staging)	Dump Truck	40%	1		76.5	44668359	17867343.69	72.5	17867343.7	17867343.7	72.5	88	10	38	15			183	537												20	20				
	Haul Trips (shoring)	Dump Truck	40%	8		76.5	44668359	17867343.69	72.5	17867343.7	142938749.5	81.6	88	10	38	15			183	537												20	20				
	Concrete Trips	Concrete Mixer Truck	40%	2		78.8	75857758	30343103	74.8	30343103.0	60686206.0	77.8	88	10	38	15			183	537												20	20				

Construction Analysis with RCNM Methodology

Stage		Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Equipment Noise at Receptor Location, Leq											Nearest Residence	Total Construction Noise Leq at Receptor Location											Nearest Residence
							LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170 2. Tujunga 3. Kester 4. SepulvecS. 405 Fwy	LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170 2. Tujunga 3. Kester 4. SepulvecS. 405 Fwy
	1	**Force Main**																		99.3	97.7	92.6	97.1	99.8	97.6	66.0	63.7	99.6	100.7	99.1	84.5	
	1.1	**Excavation and Shoring**																		97.3	95.7	90.6	95.1	97.8	97.6	63.9	63.7	97.6	98.6	97.1	82.5	
		Concrete Saw	Concrete Saw	60%	1	60 hp	90.5	88.9	83.7	88.3	91.0	90.7	57.1	56.9	90.7	91.8	90.2	75.6														
		Pavement Breaker	Jackhammer	60%	1	100 hp	89.8	88.2	83.0	87.6	90.3	90.0	56.4	56.2	90.0	91.1	89.5	74.9														
		Loader	Front End Loader	60%	2	150 hp	83.0	81.4	76.3	80.8	83.5	83.2	49.6	49.4	83.2	84.3	82.7	68.2														
		Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	88.3	86.7	81.6	86.1	88.8	88.5	54.9	54.7	88.5	89.6	88.0	73.5														
		Service Crane	Crane	50%	2	250 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9														
		Excavator	Excavator	80%	1	162 hp	82.8	81.2	76.1	80.6	83.3	83.1	49.5	49.2	83.1	84.2	82.6	68.0														
		Generator- PwrTools	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Generator- Vent. Fans	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Compressor- PwrTools	Compressor (air)	80%	1	50 hp	79.8	78.2	73.1	77.6	80.3	80.1	46.5	46.2	80.1	81.2	79.6	65.0														
		Forklift	Man Lift	50%	1	90 hp	74.8	73.2	68.1	72.6	75.3	75.0	41.4	41.2	75.0	76.1	74.5	60.0														
		Sweeper	Vacuum Street Sweeper	20%	1	200 hp	77.7	76.1	71.0	75.5	78.2	78.0	44.3	44.1	78.0	79.0	77.5	62.9														
		Pumping Equipment (GW)	Pumps	50%	2	50 hp	84.0	82.4	77.3	81.8	84.5	84.2	50.6	50.4	84.2	85.3	83.8	69.2														
		Haul Trips -net export	Dump Truck	40%	9		85.2	83.6	78.4	83.0	85.7	85.4	51.8	51.5	85.4	86.5	84.9	70.3														
		Haul Trips – staging areas	Dump Truck	40%	11		86.0	84.4	79.3	83.8	86.5	86.3	52.7	52.4	86.3	87.4	85.8	71.2														
		Supply Trips - materials	Flat Bed Truck	40%	10		83.4	81.8	76.7	81.2	83.9	83.7	50.1	49.8	83.7	84.8	83.2	68.6														
		Concrete or Gravel Truck	Concrete Mixer Truck	40%	4		83.9	82.4	77.2	81.8	84.5	84.2	50.6	50.3	84.2	85.3	83.7	69.1														
	1.2	**Bedding**																		84.4	82.8	77.7	82.2	84.9	84.7	51.0	50.8	84.7	85.7	84.2	69.6	
		Loader	Front End Loader	40%	1	150 hp	78.2	76.6	71.5	76.0	78.7	78.5	44.9	44.6	78.5	79.6	78.0	63.4														
		Generator- Vent. Fans	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Supply Trips (materials)	Flat Bed Truck	40%	1		73.4	71.8	66.7	71.2	73.9	73.7	40.1	39.8	73.7	74.8	73.2	58.6														
	1.3	**Pipe Laying**																		88.3	86.8	81.6	86.2	88.8	88.6	55.0	54.7	88.6	89.7	88.1	73.5	
		Service Crane	Crane	50%	1	250 hp	80.7	79.1	74.0	78.5	81.2	80.9	47.3	47.1	80.9	82.0	80.4	65.9														
		Loader	Front End Loader	30%	1	150 hp	77.0	75.4	70.2	74.8	77.5	77.2	43.6	43.3	77.2	78.3	76.7	62.1														
		Generator w/PwrTools	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Generator- Vent. Fans	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	79.8	78.2	73.1	77.6	80.3	80.1	46.5	46.2	80.1	81.2	79.6	65.0														
		Supply Trips (materials)	Flat Bed Truck	40%	2		76.4	74.8	69.7	74.2	76.9	76.7	43.1	42.8	76.7	77.8	76.2	61.6														
	1.4	**Testing**																		85.6	84.0	78.9	83.4	86.1	85.9	52.3	52.0	85.9	87.0	85.4	70.8	
		Compressor	Compressor (air)	100%	1	50 hp	80.8	79.2	74.1	78.6	81.3	81.0	47.4	47.2	81.0	82.1	80.6	66.0														
		Water Truck	Flat Bed Truck	40%	1	150 hp	73.4	71.8	66.7	71.2	73.9	73.7	40.1	39.8	73.7	74.8	73.2	58.6														
		Pumping Equipment	Pumps	80%	1	100 hp	83.0	81.4	76.3	80.8	83.5	83.3	49.7	49.4	83.3	84.4	82.8	68.2														
		Supply Trips (misc)	Flat Bed Truck	40%	1		73.4	71.8	66.7	71.2	73.9	73.7	40.1	39.8	73.7	74.8	73.2	58.6														
	1.5	**Restoration**																		92.7	91.1	85.9	90.5	93.2	92.9	59.3	59.0	92.9	94.0	92.4	77.8	
		Loader	Front End Loader	50%	2	150 hp	82.2	80.6	75.5	80.0	82.7	82.4	48.8	48.6	82.4	83.5	82.0	67.4														
		Generator w/PwrTools	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Generator- Vent. Fans	Generator	80%	1	50 hp	82.7	81.1	76.0	80.5	83.2	83.0	49.4	49.1	83.0	84.1	82.5	67.9														
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	79.8	78.2	73.1	77.6	80.3	80.1	46.5	46.2	80.1	81.2	79.6	65.0														
		Soil Compacter	Compactor (ground)	80%	1	100 hp	85.3	83.7	78.6	83.1	85.8	85.6	52.0	51.7	85.6	86.7	85.1	70.5														
		Roller	Roller	80%	1	90 hp	82.1	80.5	75.4	79.9	82.6	82.4	48.8	48.5	82.4	83.5	81.9	67.3														
		Sweeper	Vacuum Street Sweeper	20%	1	150 hp	77.7	76.1	71.0	75.5	78.2	78.0	44.3	44.1	78.0	79.0	77.5	62.9														
		Asphalt Paver	Paver	40%	1	100 hp	76.3	74.7	69.6	74.1	76.8	76.6	43.0	42.7	76.6	77.7	76.1	61.5														
		Haul Trips (staging)	Dump Truck	40%	11		86.0	84.4	79.3	83.8	86.5	86.3	52.7	52.4	86.3	87.4	85.8	71.2														
		Supply Trips (other)	Flat Bed Truck	40%	6		81.2	79.6	74.5	79.0	81.7	81.5	47.8	47.6	81.5	82.5	81.0	66.4														
		Supply Trips (asphalt)	Flat Bed Truck	40%	3		78.2	76.6	71.5	76.0	78.7	78.4	44.8	44.6	78.4	79.5	77.9	63.4														
	2	**Pump Stations (Each)**																		90.3	109.2	97.6	105.7			63.9	54.6					
	2.1	**Excavation and Shoring**																		87.3	106.1	94.6	102.6			60.9	51.5					
		Concrete Saw	Concrete Saw	20%	1	60 hp	77.7	96.6	85.0	93.1			51.3	42.0																		
		Pavement Breaker	Jackhammer	30%	1	100 hp	78.8	97.7	86.1	94.1			52.4	43.1																		
		Loader	Front End Loader	80%	1	150 hp	73.2	92.1	80.5	88.6			46.9	37.5																		
		Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	74.3	93.2	81.6	89.6			47.9	38.6																		
		Service Crane	Crane	30%	1	250 hp	70.5	89.4	77.8	85.8			44.1	34.8																		
		Concrete Pump	Concrete Pump Truck	80%	1	100 hp	75.5	94.4	82.8	90.9			49.2	39.8																		
		Excavator	Excavator	60%	1	162 hp	73.6	92.5	80.9	88.9			47.2	37.9																		
		Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																		
		Forklift	Man Lift	50%	1	90 hp	66.8	85.7	74.1	82.1			40.4	31.1																		
		Sweeper	Vacuum Street Sweeper	20%	1	150 hp	69.7	88.6	77.0	85.1			43.3	34.0																		
		Pumping Equipment	Pumps	50%	1	50 hp	73.0	91.9	80.3	88.3			46.6	37.3																		
		Haul Trips (net export)	Dump Truck	40%	19.00		80.4	99.3	87.7	95.8			54.0	44.7																		
		Supply Trips (materials)	Flat Bed Truck	40%	8.00		74.4	93.3	81.7	89.8			48.1	38.7																		
		Gravel Trips	Dump Truck	40%	6.00		75.4	94.3	82.7	90.8			49.0	39.7																		
		Formwork and Casting																		82.9	101.8	90.2	98.3			56.5	47.2					
	2.2	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	74.3	93.2	81.6	89.6			47.9	38.6																		
		Forklift	Man Lift	20%	1	90 hp	62.8	81.7	70.1	78.2			36.4	27.1																		
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																		
		Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Supply Trips	Flat Bed Truck	40%	4		71.4	90.3	78.7	86.8			45.1	35.7																		
		Concrete Trips	Concrete Mixer Truck	40%	11		80.3	99.2	87.6	95.7			54.0	44.6																		
	2.3	**Equipment Installation**																		79.9	98.8	87.2	95.3			53.5	44.2					
		Service Crane	Crane	20%	1	250 hp	68.7	87.6	76.0	84.1			42.3	33.0																		
		Forklift	Man Lift	20%	1	90 hp	62.8	81.7	70.1	78.2			36.4	27.1																		
		Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																		
		Supply Trips	Flat Bed Truck	40%	4		71.4	90.3	78.7	86.8			45.1	35.7																		
	2.4	**Restoration**																		83.9	102.8	91.2	99.3			57.6	48.2					
		Service Crane	Crane	40%	1	250 hp	71.7	90.6	79.0	87.1			45.4	36.0																		
		Loader	Front End Loader	60%	1	150 hp	72.0	90.9	79.3	87.3			45.6	36.3																		
		Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																		
		Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																		
		Soil Compacter	Compactor (ground)	80%	1	100 hp	77.3	96.2	84.6	92.7			51.0	41.6																		
		Roller	Roller	20%	1	90 hp	68.1	87.0	75.4	83.5			41.7	32.4																		
		Sweeper	Vacuum Street Sweeper	20%	1	150 hp	69.7	88.6	77.0	85.1			43.3	34.0																		
		Haul Trips (staging)	Dump Truck	40%	1		67.6	86.5	74.9	83.0			41.3	31.9																		
		Haul Trips (shoring)	Dump Truck	40%	8		76.6	95.5	83.9	92.0			50.3	40.9																		
		Concrete Trips	Concrete Mixer Truck	40%	2		72.9	91.8	80.2	88.3			46.6	37.2																		

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	Nearest Residence 1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy	Overall Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy
1	**Force Main**																																						
1.1	**Excavation and Shoring**																						92.7	91.1	86.0	90.5	93.2	92.9	59.3	59.1	92.9	94.0	92.5	77.9					
	Concrete Saw	Concrete Saw	60%	1	60 hp	92.7	91.1	86.0	90.5	93.2	92.9	59.3	59.1	92.9	94.0	92.5	77.9																						
	Pavement Breaker	Jackhammer	60%	1	100 hp	92.0	90.4	85.3	89.8	92.5	92.2	58.6	58.4	92.2	93.3	91.8	77.2																						
	Loader	Front End Loader	60%	2	150 hp	82.2	80.6	75.5	80.0	82.7	82.4	48.8	48.6	82.4	83.5	82.0	67.4																						
	Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	87.5	85.9	80.8	85.3	88.0	87.7	54.1	53.9	87.7	88.8	87.3	72.7																						
	Service Crane	Crane	50%	2	250 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Excavator	Excavator	80%	1	162 hp	83.8	82.2	77.1	81.6	84.3	84.0	50.4	50.2	84.0	85.1	83.6	69.0																						
	Generator- PwrTools	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Generator- Vent. Fans	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Compressor- PwrTools	Compressor (air)	80%	1	50 hp	80.8	79.2	74.1	78.6	81.3	81.0	47.4	47.2	81.0	82.1	80.6	66.0																						
	Forklift	Man Lift	50%	1	90 hp	77.8	76.2	71.1	75.6	78.3	78.0	44.4	44.2	78.0	79.1	77.6	63.0																						
	Sweeper	Vacuum Street Sweeper	20%	1	200 hp	84.7	83.1	78.0	82.5	85.2	84.9	51.3	51.1	84.9	86.0	84.5	69.9																						
	Pumping Equipment (GW)	Pumps	50%	2	50 hp	84.0	82.4	77.3	81.8	84.5	84.2	50.6	50.4	84.2	85.3	83.8	69.2																						
	Haul Trips -net export	Dump Truck	40%	9		79.6	78.0	72.9	77.4	80.1	79.8	46.2	46.0	79.8	80.9	79.4	64.8																						
	Haul Trips – staging areas	Dump Truck	40%	11		79.6	78.0	72.9	77.4	80.1	79.8	46.2	46.0	79.8	80.9	79.4	64.8																						
	Supply Trips - materials	Flat Bed Truck	40%	10		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
	Concrete or Gravel Truck	Concrete Mixer Truck	40%	4		81.9	80.3	75.2	79.7	82.4	82.1	48.5	48.3	82.1	83.2	81.7	67.1																						
1.2	**Bedding**																						83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9					
	Loader	Front End Loader	40%	1	150 hp	82.2	80.6	75.5	80.0	82.7	82.4	48.8	48.6	82.4	83.5	82.0	67.4																						
	Generator- Vent. Fans	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Supply Trips (materials)	Flat Bed Truck	40%	1		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
1.3	**Pipe Laying**																						83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9					
	Service Crane	Crane	50%	1	250 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Loader	Front End Loader	30%	1	150 hp	82.2	80.6	75.5	80.0	82.7	82.4	48.8	48.6	82.4	83.5	82.0	67.4																						
	Generator w/PwrTools	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Generator- Vent. Fans	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	80.8	79.2	74.1	78.6	81.3	81.0	47.4	47.2	81.0	82.1	80.6	66.0																						
	Supply Trips (materials)	Flat Bed Truck	40%	2		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
1.4	**Testing**																						84.0	82.4	77.3	81.8	84.5	84.2	50.6	50.4	84.2	85.3	83.8	69.2					
	Compressor	Compressor (air)	100%	1	50 hp	80.8	79.2	74.1	78.6	81.3	81.0	47.4	47.2	81.0	82.1	80.6	66.0																						
	Water Truck	Flat Bed Truck	40%	1	150 hp	77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
	Pumping Equipment	Pumps	80%	1	100 hp	84.0	82.4	77.3	81.8	84.5	84.2	50.6	50.4	84.2	85.3	83.8	69.2																						
	Supply Trips (misc)	Flat Bed Truck	40%	1		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
1.5	**Restoration**																						86.3	84.7	79.6	84.1	86.8	86.5	52.9	52.7	86.5	87.6	86.1	71.5					
	Loader	Front End Loader	50%	2	150 hp	82.2	80.6	75.5	80.0	82.7	82.4	48.8	48.6	82.4	83.5	82.0	67.4																						
	Generator w/PwrTools	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Generator- Vent. Fans	Generator	80%	1	50 hp	83.7	82.1	77.0	81.5	84.2	83.9	50.3	50.1	83.9	85.0	83.5	68.9																						
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	80.8	79.2	74.1	78.6	81.3	81.0	47.4	47.2	81.0	82.1	80.6	66.0																						
	Soil Compacter	Compactor (ground)	80%	1	100 hp	86.3	84.7	79.6	84.1	86.8	86.5	52.9	52.7	86.5	87.6	86.1	71.5																						
	Roller	Roller	80%	1	90 hp	83.1	81.5	76.4	80.9	83.6	83.3	49.7	49.5	83.3	84.4	82.9	68.3																						
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	84.7	83.1	78.0	82.5	85.2	84.9	51.3	51.1	84.9	86.0	84.5	69.9																						
	Asphalt Paver	Paver	40%	1	100 hp	80.3	78.7	73.6	78.1	80.8	80.5	46.9	46.7	80.5	81.6	80.1	65.5																						
	Haul Trips (staging)	Dump Truck	40%	11		79.6	78.0	72.9	77.4	80.1	79.8	46.2	46.0	79.8	80.9	79.4	64.8																						
	Supply Trips (other)	Flat Bed Truck	40%	6		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
	Supply Trips (asphalt)	Flat Bed Truck	40%	3		77.4	75.8	70.7	75.2	77.9	77.6	44.0	43.8	77.6	78.7	77.2	62.6																						
2	**Pump Stations (Each)**																																						
2.1	**Excavation and Shoring**																						84.7	103.6	92.0	100.1			58.3	49.0									
	Concrete Saw	Concrete Saw	20%	1	60 hp	84.7	103.6	92.0	100.1			58.3	49.0																										
	Pavement Breaker	Jackhammer	30%	1	100 hp	84.0	102.9	91.3	99.4			57.6	48.3																										
	Loader	Front End Loader	80%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																										
	Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	79.5	98.4	86.8	94.9			53.1	43.8																										
	Service Crane	Crane	30%	1	250 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	76.5	95.4	83.8	91.9			50.1	40.8																										
	Excavator	Excavator	60%	1	162 hp	75.8	94.7	83.1	91.2			49.4	40.1																										
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																										
	Forklift	Man Lift	50%	1	90 hp	69.8	88.7	77.1	85.2			43.4	34.1																										
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	76.7	95.6	84.0	92.1			50.3	41.0																										
	Pumping Equipment	Pumps	50%	1	50 hp	76.0	94.9	83.3	91.4			49.6	40.3																										
	Haul Trips (net export)	Dump Truck	40%	19.00		71.6	90.5	78.9	87.0			45.2	35.9																										
	Supply Trips (materials)	Flat Bed Truck	40%	8.00		69.4	88.3	76.7	84.8			43.0	33.7																										
	Gravel Trips	Dump Truck	40%	6.00		71.6	90.5	78.9	87.0			45.2	35.9																										
	Formwork and Casting																						76.5	95.4	83.8	91.9			50.1	40.8									
2.2	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	76.5	95.4	83.8	91.9			50.1	40.8																										
	Forklift	Man Lift	20%	1	90 hp	69.8	88.7	77.1	85.2			43.4	34.1																										
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																										
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Supply Trips	Flat Bed Truck	40%	4		69.4	88.3	76.7	84.8			43.0	33.7																										
	Concrete Trips	Concrete Mixer Truck	40%	11		73.9	92.8	81.2	89.3			47.5	38.2																										
2.3	**Equipment Installation**																						75.7	94.6	83.0	91.1			49.3	40.0									
	Service Crane	Crane	20%	1	250 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Forklift	Man Lift	20%	1	90 hp	69.8	88.7	77.1	85.2			43.4	34.1																										
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																										
	Supply Trips	Flat Bed Truck	40%	4		69.4	88.3	76.7	84.8			43.0	33.7																										
2.4	**Restoration**																						78.3	97.2	85.6	93.7			51.9	42.6									
	Service Crane	Crane	40%	1	250 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Loader	Front End Loader	60%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																										
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																										
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																										
	Soil Compacter	Compactor (ground)	80%	1	100 hp	78.3	97.2	85.6	93.7			51.9	42.6																										
	Roller	Roller	20%	1	90 hp	75.1	94.0	82.4	90.5			48.7	39.4																										
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	76.7	95.6	84.0	92.1			50.3	41.0																										
	Haul Trips (staging)	Dump Truck	40%	1		71.6	90.5	78.9	87.0			45.2	35.9																										
	Haul Trips (shoring)	Dump Truck	40%	8		71.6	90.5	78.9	87.0			45.2	35.9																										
	Concrete Trips	Concrete Mixer Truck	40%	2		73.9	92.8	81.2	89.3			47.5	38.2																										

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	RCNM Lmax @ 50 ft	Energy	Energy*Usage	Leq for One Piece of Equipment @ 50 ft	Energy	Total Energy	Leq for Total Equipment Pieces @ 50 ft	Receptor to Source Distance, ft: LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	Nearest Residence: 1. SR-170 2. Tujunga 3. Kester 4. Sepulveri5. 405 Fwy	Shielding Factor: LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6
	Diversion Structures (Each)																																			
3.1	**Excavation and Shoring**																																			
	Concrete Saw	Concrete Saw	20%	1	60 hp	89.6	9.12E+08	182402167.9	82.6	182402167.9	182402167.9	82.6	335	130	350	390			390	290													20	20				
	Pavement Breaker	Jackhammer	30%	1	100 hp	88.9	7.76E+08	232874135	83.7	232874135.0	232874135.0	83.7	335	130	350	390			390	290													20	20				
	Loader	Front End Loader	80%	1	150 hp	79.1	81283052	65026441.29	78.1	65026441.3	65026441.3	78.1	335	130	350	390			390	290													20	20				
	Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	84.4	2.75E+08	82626861.1	79.2	82626861.1	82626861.1	79.2	335	130	350	390			390	290													20	20				
	Service Crane	Crane	30%	1	250 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4	335	130	350	390			390	290													20	20				
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	81.4	1.38E+08	110430741.2	80.4	110430741.2	110430741.2	80.4	335	130	350	390			390	290													20	20				
	Excavator	Excavator	60%	1	162 hp	80.7	1.17E+08	70493853.3	78.5	70493853.3	70493853.3	78.5	335	130	350	390			390	290													20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	335	130	350	390			390	290													20	20				
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7	335	130	350	390			390	290													20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	335	130	350	390			390	290													20	20				
	Pumping Equipment (tie ins)	Pumps	50%	1	50 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	61513438.5	77.9	335	130	350	390			390	290													20	20				
	Haul Trips -net export	Dump Truck	40%	1		76.5	44668359	17867343.69	72.5	17867343.7	53602031.1	77.3	335	130	350	390			390	290													20	20				
	Haul Trips -staging	Dump Truck	40%	1		76.5	44668359	17867343.69	72.5	17867343.7	125071405.8	81.0	335	130	350	390			390	290													20	20				
	Supply Trips -materials	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	53830696.1	77.3	335	130	350	390			390	290													20	20				
	Gravel Trips	Dump Truck	40%	1		76.5	44668359	17867343.69	72.5	17867343.7	35734687.4	75.5	335	130	350	390			390	290													20	20				
3.2	**Formwork and Casting**																																			
	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	81.4	1.38E+08	82823055.88	79.2	82823055.9	82823055.9	79.2	335	130	350	390			390	290													20	20				
	Forklift	Man Lift	20%	1	90 hp	74.7	29512092	5902418.453	67.7	5902418.5	5902418.5	67.7	335	130	350	390			390	290													20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	335	130	350	390			390	290													20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Supply Trips	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1	335	130	350	390			390	290													20	20				
	Concrete Trips	Concrete Mixer Truck	40%	1		78.8	75857758	30343103	74.8	30343103.0	30343103.0	74.8	335	130	350	390			390	290													20	20				
3.3	**Equipment Installation**																																			
	Service Crane	Crane	20%	1	250 hp	80.6	1.15E+08	22963072.43	73.6	22963072.4	22963072.4	73.6	335	130	350	390			390	290													20	20				
	Forklift	Man Lift	20%	1	90 hp	74.7	29512092	5902418.453	67.7	5902418.5	5902418.5	67.7	335	130	350	390			390	290													20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	335	130	350	390			390	290													20	20				
	Supply Trips	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1	335	130	350	390			390	290													20	20				
3.4	**Restoration**																																			
	Service Crane	Crane	40%	1	250 hp	80.6	1.15E+08	45926144.86	76.6	45926144.9	45926144.9	76.6	335	130	350	390			390	290													20	20				
	Loader	Front End Loader	60%	1	150 hp	79.1	81283052	48769830.97	76.9	48769831.0	48769831.0	76.9	335	130	350	390			390	290													20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	335	130	350	390			390	290													20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	335	130	350	390			390	290													20	20				
	Soil Compacter	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2	335	130	350	390			390	290													20	20				
	Roller	Roller	20%	1	90 hp	80	1E+08	20000000.0	73.0	20000000.0	20000000.0	73.0	335	130	350	390			390	290													20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	335	130	350	390			390	290													20	20				
	Haul Trips (staging)	Dump Truck	40%	7		76.5	44668359	17867343.69	72.5	17867343.7	125071405.8	81.0	335	130	350	390			390	290													20	20				
	Haul Trips (shoring)	Dump Truck	40%	3		76.5	44668359	17867343.69	72.5	17867343.7	53602031.1	77.3	335	130	350	390			390	290													20	20				
	Supply Trips (asphalt)	Flat Bed Truck	40%	7		74.3	26915348	10766139.22	70.3	10766139.2	21532278.4	73.3	335	130	350	390			390	290													20	20				
	Junction to EVS																																			
4.1	**Excavation and Shoring**																								193											
	Concrete Saw	Concrete Saw	20%	1	60 hp	89.6	9.12E+08	182402167.9	82.6	182402167.9	182402167.9	82.6													193							20	20				
	Pavement Breaker	Jackhammer	30%	1	100 hp	88.9	7.76E+08	232874135	83.7	232874135.0	232874135.0	83.7													193							20	20				
	Loader	Front End Loader	40%	2	150 hp	79.1	81283052	32513220.65	75.1	32513220.6	65026441.3	78.1													193							20	20				
	Drill Rig	Auger Drill Rig	30%	2	150 hp	84.4	2.75E+08	82626861.1	79.2	82626861.1	165253722.2	82.2													193							20	20				
	Large Crane	Crane	30%	1	350 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4													193							20	20				
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	81.4	1.38E+08	110430741.2	80.4	110430741.2	110430741.2	80.4													193							20	20				
	Excavator	Excavator	80%	1	162 hp	80.7	1.17E+08	93991804.4	79.7	93991804.4	93991804.4	79.7													193							20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Generator- Vent. Fans	Generator	80%	2	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	183704579.4	82.6													193							20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7													193							20	20				
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7													193							20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6													193							20	20				
	Pumping Equipment	Pumps	50%	2	75 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	123026877.1	80.9													193							20	20				
	Haul Trips – staging	Dump Truck	40%	14		76.5	44668359	17867343.69	72.5	17867343.7	250142811.6	84.0													193							20	20				
	Haul Trips - net export	Dump Truck	40%	4		76.5	44668359	17867343.69	72.5	17867343.7	71469374.7	78.5													193							20	20				
	Supply Trips - materials	Flat Bed Truck	40%	22		74.3	26915348	10766139.22	70.3	10766139.2	236855062.7	83.7													193							20	20				
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3		78.8	75857758	30343103	74.8	30343103.0	91029309.0	79.6													193							20	20				
4.2	**Formwork and Casting**																								193											
	Large Crane	Crane	30%	1	350 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4													193							20	20				
	Forklift	Man Lift	30%	1	90 hp	74.7	29512092	8853627.68	69.5	8853627.7	8853627.7	69.5													193							20	20				
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	81.4	1.38E+08	110430741.2	80.4	110430741.2	110430741.2	80.4													193							20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7													193							20	20				
	Supply Truck	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3													193							20	20				
4.3	**Equipment Installation**																								193											
	Large Crane	Crane	30%	1	350 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4													193							20	20				
	Forklift	Man Lift	40%	1	90 hp	74.7	29512092	11804836.91	70.7	11804836.9	11804836.9	70.7													193							20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7													193							20	20				
	Supply Truck	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3													193							20	20				
4.4	**Restoration**																								193											
	Large Crane	Crane	50%	1	350 hp	80.6	1.15E+08	57407681.07	77.6	57407681.1	57407681.1	77.6													193							20	20				
	Loader	Front End Loader	60%	1	150 hp	79.1	81283052	48769830.97	76.9	48769831.0	48769831.0	76.9													193							20	20				
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6													193							20	20				
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852288.7	91852289.7	79.6													193							20	20				
	Soil Compacter	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2													193							20	20				
	Roller	Roller	80%	1	90 hp	80	1E+08	80000000	79.0	80000000.0	80000000.0	79.0													193							20	20				
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6													193							20	20				
	Haul Trips (staging)	Dump Truck	40%	14		76.5	44668359	17867343.69	72.5	17867343.7	250142811.6	84.0													193							20	20				
	Haul Trips (shoring)	Dump Truck	40%	22		76.5	44668359	17867343.69	72.5	17867343.7	393081561.1	85.9													193							20	20				
	Supply Trips (base)	Flat Bed Truck	40%	4		74.3	26915348	10766139.22	70.3	10766139.2	43064556.9	76.3													193							20	20				
	Supply Trips (for concrete structure)	Flat Bed Truck	40%	11		74.3	26915348	10766139.22	70.3	10766139.2	118427531.4	80.7													193							20	20				
	Supply Trips (asphalt)	Flat Bed Truck	40%	4		74.3	26915348	10766139.22	70.3	10766139.2	43064556.9	76.3													193							20	20				

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Equipment Noise at Receptor Location, Leq											Nearest Residence	Total Construction Noise Leq at Receptor Location											Nearest Residence
						LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170 2. Tujunga 3. Kester 4. SepulvedeS. 405 Fwy	LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170 2. Tujunga 3. Kester 4. SepulvedeS. 405 Fwy
	Diversion Structures (Each)																												
3.1	**Excavation and Shoring**																		74.9	83.1	74.5	73.6			53.6	56.1				
	Concrete Saw	Concrete Saw	20%	1	60 hp	66.1	74.3	65.7	64.8			44.8	47.3																	
	Pavement Breaker	Jackhammer	30%	1	100 hp	67.1	75.4	66.8	65.8			45.8	48.4																	
	Loader	Front End Loader	80%	1	150 hp	61.6	69.8	61.2	60.3			40.3	42.9																	
	Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	62.6	70.9	62.3	61.3			41.3	43.9																	
	Service Crane	Crane	30%	1	250 hp	58.8	67.1	58.5	57.5			37.5	40.1																	
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	63.9	72.1	63.5	62.6			42.6	45.2																	
	Excavator	Excavator	60%	1	162 hp	62.0	70.2	61.6	60.6			40.6	43.2																	
	Generator w/PwrTools	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Generator- Vent. Fans	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	60.2	68.4	59.8	58.9			38.9	41.5																	
	Forklift	Man Lift	50%	1	90 hp	55.2	63.4	54.8	53.8			33.8	36.4																	
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	58.1	66.3	57.7	56.8			36.8	39.3																	
	Pumping Equipment (tie ins)	Pumps	50%	1	50 hp	61.4	69.6	61.0	60.0			40.0	42.6																	
	Haul Trips -net export	Dump Truck	40%	[3]		60.8	69.0	60.4	59.4			39.4	42.0																	
	Haul Trips -staging	Dump Truck	40%	[7]		64.5	72.7	64.1	63.1			43.1	45.7																	
	Supply Trips -materials	Flat Bed Truck	40%	[5]		60.8	69.0	60.4	59.5			39.5	42.0																	
	Gravel Trips	Dump Truck	40%	[2]		59.0	67.2	58.6	57.7			37.7	40.3																	
3.2	**Formwork and Casting**																		68.1	76.3	67.7	66.8			46.8	49.4				
	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	62.7	70.9	62.3	61.3			41.3	43.9																	
	Forklift	Man Lift	20%	1	90 hp	51.2	59.4	50.8	49.9			29.9	32.4																	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	60.2	68.4	59.8	58.9			38.9	41.5																	
	Generator- Vent. Fans	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Supply Trips	Flat Bed Truck	40%	[3]		58.6	66.8	58.2	57.2			37.2	39.8																	
	Concrete Trips	Concrete Mixer Truck	40%	1		58.3	66.5	57.9	57.0			37.0	39.6																	
3.3	**Equipment Installation**																		68.1	76.4	67.8	66.8			46.8	49.4				
	Service Crane	Crane	20%	1	250 hp	57.1	65.3	56.7	55.8			35.8	38.3																	
	Forklift	Man Lift	20%	1	90 hp	51.2	59.4	50.8	49.9			29.9	32.4																	
	Generator w/PwrTools	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Generator- Vent. Fans	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	60.2	68.4	59.8	58.9			38.9	41.5																	
	Supply Trips	Flat Bed Truck	40%	[3]		58.6	66.8	58.2	57.2			37.2	39.8																	
3.4	**Restoration**																		72.2	80.4	71.8	70.9			50.9	53.4				
	Service Crane	Crane	40%	1	250 hp	60.1	68.3	59.7	58.8			38.8	41.4																	
	Loader	Front End Loader	60%	1	150 hp	60.4	68.6	60.0	59.0			39.0	41.6																	
	Generator w/PwrTools	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Generator- Vent. Fans	Generator	80%	1	50 hp	63.1	71.3	62.7	61.8			41.8	44.4																	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	60.2	68.4	59.8	58.9			38.9	41.5																	
	Soil Compacter	Compactor (ground)	80%	1	100 hp	65.7	73.9	65.3	64.4			44.4	47.0																	
	Roller	Roller	20%	1	90 hp	56.5	64.7	56.1	55.2			35.2	37.7																	
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	58.1	66.3	57.7	56.8			36.8	39.3																	
	Haul Trips (staging)	Dump Truck	40%	7		64.5	72.7	64.1	63.1			43.1	45.7																	
	Haul Trips (shoring)	Dump Truck	40%	3		60.8	69.0	60.4	59.4			39.4	42.0																	
	Supply Trips (asphalt)	Flat Bed Truck	40%	[2]		56.8	65.0	56.4	55.5			35.5	38.1																	
	Junction to EVIS																												
4.1	**Excavation and Shoring**																												81.3
	Concrete Saw	Concrete Saw	20%	1	60 hp												70.9												
	Pavement Breaker	Jackhammer	30%	1	100 hp												71.9												
	Loader	Front End Loader	40%	2	150 hp												66.4												
	Drill Rig	Auger Drill Rig	30%	2	150 hp												70.4												
	Large Crane	Crane	30%	1	350 hp												63.6												
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp												68.7												
	Excavator	Excavator	80%	1	162 hp												68.0												
	Generator w/PwrTools	Generator	80%	1	50 hp												67.9												
	Generator- Vent. Fans	Generator	80%	2	50 hp												70.9												
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												65.0												
	Forklift	Man Lift	50%	1	90 hp												60.0												
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp												62.9												
	Pumping Equipment	Pumps	50%	2	75 hp												69.2												
	Haul Trips -- staging	Dump Truck	40%	14													72.3												
	Haul Trips - net export	Dump Truck	40%	4													66.8												
	Supply Trips - materials	Flat Bed Truck	40%	22													72.0												
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3													67.9												
4.2	**Formwork and Casting**																												77.8
	Large Crane	Crane	30%	1	350 hp												63.6												
	Forklift	Man Lift	30%	1	90 hp												57.7												
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp												68.7												
	Generator w/PwrTools	Generator	80%	1	50 hp												67.9												
	Generator- Vent. Fans	Generator	80%	1	50 hp												67.9												
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												65.0												
	Supply Truck	Flat Bed Truck	40%	[7]													63.4												
	Concrete Truck	Concrete Mixer Truck	40%	16													75.1												
4.3	**Equipment Installation**																												72.9
	Large Crane	Crane	30%	1	350 hp												63.6												
	Forklift	Man Lift	40%	1	90 hp												59.0												
	Generator w/PwrTools	Generator	80%	1	50 hp												67.9												
	Generator- Vent. Fans	Generator	80%	1	50 hp												67.9												
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												65.0												
	Supply Truck	Flat Bed Truck	40%	1													58.6												
4.4	**Restoration**																												79.8
	Large Crane	Crane	50%	1	350 hp												65.9												
	Loader	Front End Loader	60%	1	150 hp												65.1												
	Generator w/PwrTools	Generator	80%	1	50 hp												67.9												
	Generator- Vent. Fans	Generator	80%	1	50 hp												67.9												
	Soil Compacter	Compactor (ground)	80%	1	100 hp												70.5												
	Roller	Roller	80%	1	90 hp												67.3												
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp												62.9												
	Haul Trips (staging)	Dump Truck	40%	14													72.3												
	Haul Trips (shoring)	Dump Truck	40%	22													74.2												
	Supply Trips (base)	Flat Bed Truck	40%	4													64.6												
	Supply Trips (for concrete structure)	Flat Bed Truck	40%	11													69.0												
	Supply Trips (asphalt)	Flat Bed Truck	40%	[4]													64.6												

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	Nearest Residence 1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy	Overall Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy
3	**Diversion Structures (Each)**																																					
3.1	**Excavation and Shoring**																						73.1	81.3	72.7	71.8			51.8	54.3									
	Concrete Saw	Concrete Saw	20%	1	60 hp	73.1	81.3	72.7	71.8			51.8	54.3																									
	Pavement Breaker	Jackhammer	30%	1	100 hp	72.4	80.6	72.0	71.1			51.1	53.6																									
	Loader	Front End Loader	80%	1	150 hp	62.6	70.8	62.2	61.3			41.3	43.8																									
	Drill Rig/Auger	Auger Drill Rig	30%	1	150 hp	67.9	76.1	67.5	66.6			46.6	49.1																									
	Service Crane	Crane	30%	1	250 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp	64.9	73.1	64.5	63.6			43.6	46.1																									
	Excavator	Excavator	60%	1	162 hp	64.2	72.4	63.8	62.9			42.9	45.4																									
	Generator w/PwrTools	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	61.2	69.4	60.8	59.9			39.9	42.4																									
	Forklift	Man Lift	50%	1	90 hp	58.2	66.4	57.8	56.9			36.9	39.4																									
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	65.1	73.3	64.7	63.8			43.8	46.3																									
	Pumping Equipment (tie ins)	Pumps	50%	1	50 hp	64.4	72.6	64.0	63.1			43.1	45.6																									
	Haul Trips -net export	Dump Truck	40%	3		60.0	68.2	59.6	58.7			38.7	41.2																									
	Haul Trips -staging	Dump Truck	40%	7		60.0	68.2	59.6	58.7			38.7	41.2																									
	Supply Trips -materials	Flat Bed Truck	40%	5		57.8	66.0	57.4	56.5			36.5	39.0																									
	Gravel Trips	Dump Truck	40%	2		60.0	68.2	59.6	58.7			38.7	41.2																									
3.2	**Formwork and Casting**																						64.9	73.1	64.5	63.6			43.6	46.1									
	Concrete Pump	Concrete Pump Truck	60%	1	100 hp	64.9	73.1	64.5	63.6			43.6	46.1																									
	Forklift	Man Lift	20%	1	90 hp	58.2	66.4	57.8	56.9			36.9	39.4																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	61.2	69.4	60.8	59.9			39.9	42.4																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Supply Trips	Flat Bed Truck	40%	3		57.8	66.0	57.4	56.5			36.5	39.0																									
	Concrete Trips	Concrete Mixer Truck	40%	1		62.3	70.5	61.9	61.0			41.0	43.5																									
3.3	**Equipment Installation**																						64.1	72.3	63.7	62.8			42.8	45.3									
	Service Crane	Crane	20%	1	250 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Forklift	Man Lift	20%	1	90 hp	58.2	66.4	57.8	56.9			36.9	39.4																									
	Generator w/PwrTools	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Generator- Vent..Fans	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	61.2	69.4	60.8	59.9			39.9	42.4																									
	Supply Trips	Flat Bed Truck	40%	3		57.8	66.0	57.4	56.5			36.5	39.0																									
3.4	**Restoration**																						66.7	74.9	66.3	65.4			45.4	47.9									
	Service Crane	Crane	40%	1	250 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Loader	Front End Loader	60%	1	150 hp	62.6	70.8	62.2	61.3			41.3	43.8																									
	Generator w/PwrTools	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	64.1	72.3	63.7	62.8			42.8	45.3																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	61.2	69.4	60.8	59.9			39.9	42.4																									
	Soil Compacter	Compactor (ground)	80%	1	100 hp	66.7	74.9	66.3	65.4			45.4	47.9																									
	Roller	Roller	20%	1	90 hp	63.5	71.7	63.1	62.2			42.2	44.7																									
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	65.1	73.3	64.7	63.8			43.8	46.3																									
	Haul Trips (staging)	Dump Truck	40%	7		60.0	68.2	59.6	58.7			38.7	41.2																									
	Haul Trips (shoring)	Dump Truck	40%	3		60.0	68.2	59.6	58.7			38.7	41.2																									
	Supply Trips (asphalt)	Flat Bed Truck	40%	2		57.8	66.0	57.4	56.5			36.5	39.0																									
	Junction to EVIS																																					
4.1	**Excavation and Shoring**																																		77.9				
	Concrete Saw	Concrete Saw	20%	1	60 hp												77.9																		77.9				
	Pavement Breaker	Jackhammer	30%	1	100 hp												77.2																						
	Loader	Front End Loader	40%	2	150 hp												67.4																						
	Drill Rig	Auger Drill Rig	30%	2	150 hp												72.7																						
	Large Crane	Crane	30%	1	350 hp												68.9																						
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp												68.7																						
	Excavator	Excavator	80%	1	162 hp												69.0																						
	Generator w/PwrTools	Generator	80%	1	50 hp												68.9																						
	Generator- Vent. Fans	Generator	80%	2	50 hp												68.9																						
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												66.0																						
	Forklift	Man Lift	50%	1	90 hp												63.0																						
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp												69.9																						
	Pumping Equipment	Pumps	50%	2	75 hp												69.2																						
	Haul Trips – staging	Dump Truck	40%	14													64.8																						
	Haul Trips - net export	Dump Truck	40%	4													64.8																						
	Supply Trips - materials	Flat Bed Truck	40%	22													62.6																						
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3													67.1																						
4.2	**Formwork and Casting**																																		69.7				
	Large Crane	Crane	30%	1	350 hp												68.9																		69.7				
	Forklift	Man Lift	30%	1	90 hp												63.0																						
	Concrete Pump	Concrete Pump Truck	80%	1	100 hp												68.7																						
	Generator w/PwrTools	Generator	80%	1	50 hp												68.9																						
	Generator- Vent. Fans	Generator	80%	1	50 hp												68.9																						
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												66.0																						
	Supply Truck	Flat Bed Truck	40%	3													62.6																						
	Concrete Truck	Concrete Mixer Truck	40%	16													67.1																						
4.3	**Equipment Installation**																																		68.9				
	Large Crane	Crane	30%	1	350 hp												68.9																		68.9				
	Forklift	Man Lift	40%	1	90 hp												63.0																						
	Generator w/PwrTools	Generator	80%	1	50 hp												68.9																						
	Generator- Vent..Fans	Generator	80%	1	50 hp												68.9																						
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp												66.0																						
	Supply Truck	Flat Bed Truck	40%	1													62.6																						
4.4	**Restoration**																																		71.5				
	Large Crane	Crane	50%	1	350 hp												68.9																		71.5				
	Loader	Front End Loader	60%	1	150 hp												67.4																						
	Generator w/PwrTools	Generator	80%	1	50 hp												68.9																						
	Generator- Vent. Fans	Generator	80%	1	50 hp												68.9																						
	Soil Compacter	Compactor (ground)	80%	1	100 hp												71.5																						
	Roller	Roller	80%	1	90 hp												68.3																						
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp												69.9																						
	Haul Trips (staging)	Dump Truck	40%	14													64.8																						
	Haul Trips (shoring)	Dump Truck	40%	22													64.8																						
	Supply Trips (base)	Flat Bed Truck	40%	4													62.6																						
	Supply Trips (for concrete structure)	Flat Bed Truck	40%	11													62.6																						
	Supply Trips (asphalt)	Flat Bed Truck	40%	4													62.6																						

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	RCNM Lmax @ 50 ft	Energy	Energy*Usage	Leq for One Piece of Equipment @ 50 ft	Energy	Total Energy	Leq for Total Equipment Pieces @ 50 ft	Receptor to Source Distance, ft						Nearest Residence						Shielding Factor					
													LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvel	5. 405 Fwy	
	Connecting Sewers (Each)																													
5.1.1	**Excavation and Shoring**																													
	Concrete Saw	Concrete Saw	50%	1	60 hp	89.6	9.12E+08	456005419.7	86.6	456005419.7	456005419.7	86.6	88	10	38	15			183	537											
	Pavement Breaker	Jackhammer	50%	1	100 hp	88.9	7.76E+08	388123558.3	85.9	388123558.3	388123558.3	85.9	88	10	38	15			183	537											
	Loader	Front End Loader	50%	1	150 hp	79.1	81283052	40641525.81	76.1	40641525.8	40641525.8	76.1	88	10	38	15			183	537											
	Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	84.4	2.75E+08	165253722.2	82.2	165253722.2	330507444.4	85.2	88	10	38	15			183	537											
	Service Crane	Crane	40%	2	250 hp	80.6	1.15E+08	45926144.86	76.6	45926144.9	91852289.7	79.6	88	10	38	15			183	537											
	Excavator	Excavator	80%	1	162 hp	80.7	1.17E+08	93991804.4	79.7	93991804.4	93991804.4	79.7	88	10	38	15			183	537											
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537											
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7	88	10	38	15			183	537											
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	88	10	38	15			183	537											
	Pumping Equipment	Pumps	50%	2	50 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	123026877.1	80.9	88	10	38	15			183	537											
	Haul Truck -net export	Dump Truck	40%	4		76.5	44668359	17867343.69	72.5	17867343.7	71469374.7	78.5	88	10	38	15			183	537											
	Haul Truck --staging	Dump Truck	40%	15		76.5	44668359	17867343.69	72.5	17867343.7	268010155.3	84.3	88	10	38	15			183	537											
	Supply Truck (materials)	Flat Bed Truck	40%	10		74.3	26915348	10766139.22	70.3	10766139.2	107661392.2	80.3	88	10	38	15			183	537											
	Concrete or Gravel Truck	Concrete Mixer Truck	40%	1		78.8	75857758	30343103	74.8	30343103.0	30343103.0	74.8	88	10	38	15			183	537											
	Bedding																													
5.2.1	Loader	Front End Loader	50%	1	150 hp	79.1	81283052	40641525.81	76.1	40641525.8	40641525.8	76.1	88	10	38	15			183	537											
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Supply Trips	Flat Bed Truck	40%	3		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1	88	10	38	15			183	537											
	Pipe Laying																													
5.3.1	Service Crane	Crane	50%	1	250 hp	80.6	1.15E+08	57407681.07	77.6	57407681.1	57407681.1	77.6	88	10	38	15			183	537											
	Loader	Front End Loader	30%	1	150 hp	79.1	81283052	24384915.48	73.9	24384915.5	24384915.5	73.9	88	10	38	15			183	537											
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7	88	10	38	15			183	537											
	Supply Trips	Flat Bed Truck	40%	1		74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3	88	10	38	15			183	537											
	Restoration																													
5.4.1	Loader	Front End Loader	40%	1	150 hp	79.1	81283052	32513220.65	75.1	32513220.6	32513220.6	75.1	88	10	38	15			183	537											
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6	88	10	38	15			183	537											
	Soil Compacter	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2	88	10	38	15			183	537											
	Roller	Roller	80%	1	90 hp	80	1E+08	80000000	79.0	80000000.0	80000000.0	79.0	88	10	38	15			183	537											
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6	88	10	38	15			183	537											
	Asphalt Paver	Paver	50%	1	100 hp	77.2	52480746	26240373.01	74.2	26240373.0	26240373.0	74.2	88	10	38	15			183	537											
	Haul Truck (staging)	Dump Truck	40%	15		76.5	44668359	17867343.69	72.5	17867343.7	268010155.3	84.3	88	10	38	15			183	537											
	Haul Truck (shoring)	Dump Truck	40%	9		76.5	44668359	17867343.69	72.5	17867343.7	160806093.2	82.1	88	10	38	15			183	537											
	Supply Trips (asphalt)	Flat Bed Truck	40%	2		74.3	26915348	10766139.22	70.3	10766139.2	21532278.4	73.3	88	10	38	15			183	537											
	Concrete Trips	Concrete Mixer Truck	40%	1		78.8	75857758	30343103	74.8	30343103.0	30343103.0	74.8	88	10	38	15			183	537											
6	**Microtunneling (Each)**																													
6.1.1	**Excavation and Shoring**																													
	Concrete Saw	Concrete Saw	20%	1	60 hp	89.6	9.12E+08	182402167.9	82.6	182402167.9	182402167.9	82.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Pavement Breaker	Jackhammer	30%	1	100 hp	88.9	7.76E+08	232874135	83.7	232874135.0	232874135.0	83.7			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Loader	Front End Loader	80%	1	150 hp	79.1	81283052	65026441.29	78.1	65026441.3	65026441.3	78.1			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Drill Rig/Auger	Auger Drill Rig	60%	1	150 hp	84.4	2.75E+08	165253722.2	82.2	165253722.2	165253722.2	82.2			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Service Crane	Crane	30%	1	250 hp	80.6	1.15E+08	34444608.64	75.4	34444608.6	34444608.6	75.4			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Excavator	Excavator	60%	1	162 hp	80.7	1.17E+08	70493853.3	78.5	70493853.3	70493853.3	78.5			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Forklift	Man Lift	50%	1	90 hp	74.7	29512092	14756046.13	71.7	14756046.1	14756046.1	71.7			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	GW Pumping Equipment	Pumps	50%	2	75 hp	80.9	1.23E+08	61513438.54	77.9	61513438.5	123026877.1	80.9			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Haul Trips -staging	Dump Truck	40%	34		76.5	44668359	17867343.69	72.5	17867343.7	607489685.3	87.8			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Supply Trips - materials	Flat Bed Truck	40%	17		74.3	26915348	10766139.22	70.3	10766139.2	183024366.7	82.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3		78.8	75857758	30343103	74.8	30343103.0	91029309.0	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
6.2.1	**Pipe Installation**																													
	Large Crane	Crane	40%	1	350 hp	80.6	1.15E+08	45926144.86	76.6	45926144.9	45926144.9	76.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Loader	Front End Loader	40%	1	150 hp	79.1	81283052	32513220.65	75.1	32513220.6	32513220.6	75.1			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	77.7	58884366	47107492.43	76.7	47107492.4	47107492.4	76.7			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Tunnel Boring Machine	Horizontal Boring Hydr. Jack	80%	1	250 hp	82	1.58E+08	126791455.4	81.0	126791455.4	126791455.4	81.0			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Slurry Pumps	Concrete Pump Truck	80%	3	75 hp	81.4	1.38E+08	110430741.2	80.4	110430741.2	331292223.5	85.2			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Slurry Mixing/Separation	Slurry Plant	80%	1	75 hp	78	63095734	50476587.56	77.0	50476587.6	50476587.6	77.0			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Hydraulic Jack System	Horizontal Boring Hydr. Jack	40%	1	75 hp	82	1.58E+08	63395727.7	78.0	63395727.7	63395727.7	78.0			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Water Truck	Flat Bed Truck	40%	1	150 hp	74.3	26915348	10766139.22	70.3	10766139.2	10766139.2	70.3			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Haul Trips (daily) – soil	Dump Truck	40%	3		76.5	44668359	17867343.69	72.5	17867343.7	53602031.1	77.3			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Supply Trips	Flat Bed Truck	40%	'		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1			1040	60	1850	1200			1100	193			220	60	148	200	40	
6.3.1	**Restoration**																													
	Large Crane	Crane	40%	1	350 hp	80.6	1.15E+08	45926144.86	76.6	45926144.9	45926144.9	76.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Loader	Front End Loader	60%	1	150 hp	79.1	81283052	48769830.97	76.9	48769831.0	48769831.0	76.9			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator w/PwrTools	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Generator- Vent. Fans	Generator	80%	1	50 hp	80.6	1.15E+08	91852289.72	79.6	91852289.7	91852289.7	79.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Soil Compacter	Compactor (ground)	80%	1	100 hp	83.2	2.09E+08	167143690.5	82.2	167143690.5	167143690.5	82.2			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Roller	Roller	80%	1	90 hp	80	1E+08	80000000	79.0	80000000.0	80000000.0	79.0			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	81.6	1.45E+08	28908795.41	74.6	28908795.4	28908795.4	74.6			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Supply Trips (asphalt)	Flat Bed Truck	40%	3		74.3	26915348	10766139.22	70.3	10766139.2	32298417.6	75.1			1040	60	1850	1200			1100	193			220	60	148	200	40	
	Supply Trips (access structures)	Flat Bed Truck	40%	6		74.3	26915348	10766139.22	70.3	10766139.2	64596835.3	78.1			1040	60	1850	1200			1100	193			220	60	148	200	40	
6.3.2	Haul Trips (staging)	Dump Truck	40%	34		76.5	44668359	17867343.69	72.5	17867343.7	607489685.3	87.8			1040	60	1850	1200			1100	193			220	60	148	200	40	

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Equipment Noise at Receptor Location, Leq											Nearest Residence				Total Construction Noise Leq at Receptor Location										Nearest Residence			
						LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy	LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy
	Connecting Sewers (Each)																																			
5.1.1	**Excavation and Shoring**																						88.7	107.6	96.0	104.0			62.3	53.0								
	Concrete Saw	Concrete Saw	50%	1	60 hp	81.7	100.6	89.0	97.0			55.3	46.0																								
	Pavement Breaker	Jackhammer	50%	1	100 hp	81.0	99.9	88.3	96.3			54.6	45.3																								
	Loader	Front End Loader	50%	1	150 hp	71.2	90.1	78.5	86.5			44.8	35.5																								
	Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	80.3	99.2	87.6	95.6			53.9	44.6																								
	Service Crane	Crane	40%	2	250 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Excavator	Excavator	80%	1	162 hp	74.8	93.7	82.1	90.2			48.5	39.1																								
	Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																								
	Forklift	Man Lift	50%	1	90 hp	66.8	85.7	74.1	82.1			40.4	31.1																								
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	69.7	88.6	77.0	85.1			43.3	34.0																								
	Pumping Equipment	Pumps	50%	2	50 hp	76.0	94.9	83.3	91.4			49.6	40.3																								
	Haul Truck -net export	Dump Truck	40%	4		73.6	92.5	80.9	89.0			47.3	37.9																								
	Haul Truck --staging	Dump Truck	40%	15		79.4	98.3	86.7	94.7			53.0	43.7																								
	Supply Truck (materials)	Flat Bed Truck	40%	10		75.4	94.3	82.7	90.8			49.1	39.7																								
	Concrete or Gravel Truck	Concrete Mixer Truck	40%	1		69.9	88.8	77.2	85.3			43.6	34.2																								
	Bedding																						77.3	96.1	84.6	92.6			50.9	41.5								
5.2.1	Loader	Front End Loader	50%	1	150 hp	71.2	90.1	78.5	86.5			44.8	35.5																								
	Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Supply Trips	Flat Bed Truck	40%	3		70.2	89.1	77.5	85.5			43.8	34.5																								
	Pipe Laying																						80.2	99.1	87.5	95.6			53.8	44.5								
5.3.1	Service Crane	Crane	50%	1	250 hp	72.7	91.6	80.0	88.0			46.3	37.0																								
	Loader	Front End Loader	30%	1	150 hp	69.0	87.9	76.3	84.3			42.6	33.3																								
	Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	71.8	90.7	79.1	87.2			45.5	36.1																								
	Supply Trips	Flat Bed Truck	40%	1		65.4	84.3	72.7	80.8			39.1	29.7																								
	Restoration																						85.1	104.0	92.4	100.5			58.7	49.4								
5.4.1	Loader	Front End Loader	40%	1	150 hp	70.2	89.1	77.5	85.6			43.9	34.5																								
	Generator w/PwrTools	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Generator- Vent. Fans	Generator	80%	1	50 hp	74.7	93.6	82.0	90.1			48.4	39.0																								
	Soil Compacter	Compactor (ground)	80%	1	100 hp	77.3	96.2	84.6	92.7			51.0	41.6																								
	Roller	Roller	80%	1	90 hp	74.1	93.0	81.4	89.5			47.8	38.4																								
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	69.7	88.6	77.0	85.1			43.3	34.0																								
	Asphalt Paver	Paver	50%	1	100 hp	69.3	88.2	76.6	84.6			42.9	33.6																								
	Haul Truck (staging)	Dump Truck	40%	15		79.4	98.3	86.7	94.7			53.0	43.7																								
	Haul Truck (shoring)	Dump Truck	40%	9		77.2	96.0	84.4	92.5			50.8	41.4																								
	Supply Trips (asphalt)	Flat Bed Truck	40%	2		68.4	87.3	75.7	83.8			42.1	32.7																								
	Concrete Trips	Concrete Mixer Truck	40%	1		69.9	88.8	77.2	85.3			43.6	34.2																								
6	**Microtunneling (Each)**																																			
6.1.1	**Excavation and Shoring**																								66.7	91.5	61.7		45.5					66.2	81.3	80.2	91.5	83.6	81.0	95.0
	Concrete Saw	Concrete Saw	20%	1	60 hp			56.2	81.0	51.2		35.0		55.8	70.9			69.7	81.0	73.2	70.6	84.5															
	Pavement Breaker	Jackhammer	30%	1	100 hp			57.3	82.1	52.3		36.1		56.8	71.9			70.8	82.1	74.2	71.6	85.6															
	Loader	Front End Loader	80%	1	150 hp			51.8	76.5	46.8		30.5		51.3	66.4			65.3	76.5	68.7	66.1	80.1															
	Drill Rig/Auger	Auger Drill Rig	60%	1	150 hp			55.8	80.6	50.8		34.6		55.3	70.4			69.3	80.6	72.8	70.1	84.1															
	Service Crane	Crane	30%	1	250 hp			49.0	73.8	44.0		27.8		48.5	63.6			62.5	73.8	65.9	63.3	77.3															
	Excavator	Excavator	60%	1	162 hp			52.1	76.9	47.1		30.9		51.6	66.7			65.6	76.9	69.1	66.4	80.4															
	Generator w/PwrTools	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Generator- Vent. Fans	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp			50.4	75.1	45.4		29.1		49.9	65.0			63.9	75.1	67.3	64.7	78.7															
	Forklift	Man Lift	50%	1	90 hp			45.3	70.1	40.3		24.1		44.8	60.0			58.8	70.1	62.3	59.6	73.6															
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp			48.2	73.0	43.2		27.0		47.8	62.9			61.7	73.0	65.2	62.6	76.5															
	GW Pumping Equipment	Pumps	50%	2	75 hp			54.5	79.3	49.5		33.3		54.1	69.2			68.0	79.3	71.5	68.9	82.8															
	Haul Trips -staging	Dump Truck	40%	34				61.5	86.3	56.5		40.2		61.0	76.1			75.0	86.3	78.4	75.8	89.8															
	Supply Trips - materials	Flat Bed Truck	40%	17				56.3	81.0	51.3		35.0		55.8	70.9			69.8	81.0	73.2	70.6	84.6															
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3				53.2	78.0	48.2		32.0		52.7	67.9			66.7	78.0	70.2	67.6	81.5															
6.2.1	**Pipe Installation**																								63.5	88.3	58.5		42.3					63.1	78.2	77.0	88.3	80.5	77.9	91.8
	Large Crane	Crane	40%	1	350 hp			50.3	75.0	45.3		29.0		49.8	64.9			63.8	75.0	67.2	64.6	78.6															
	Loader	Front End Loader	40%	1	150 hp			48.8	73.5	43.8		27.5		48.3	63.4			62.3	73.5	65.7	63.1	77.1															
	Generator w/PwrTools	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Generator- Vent. Fans	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp			50.4	75.1	45.4		29.1		49.9	65.0			63.9	75.1	67.3	64.7	78.7															
	Tunnel Boring Machine	Horizontal Boring Hydr. Jack	80%	1	250 hp			54.7	79.4	49.7		33.4		54.2	69.3			68.2	79.4	71.6	69.0	83.0															
	Slurry Pumps	Concrete Pump Truck	80%	3	75 hp			58.8	83.6	53.8		37.6		58.4	73.5			72.3	83.6	75.8	73.2	87.1															
	Slurry Mixing/Separation	Slurry Plant	80%	1	75 hp			50.7	75.4	45.7		29.4		50.2	65.3			64.2	75.4	67.6	65.0	79.0															
	Hydraulic Jack System	Horizontal Boring Hydr. Jack	40%	1	75 hp			51.7	76.4	46.7		30.4		51.2	66.3			65.2	76.4	68.6	66.0	80.0															
	Water Truck	Flat Bed Truck	40%	1	150 hp			44.0	68.7	39.0		22.7		43.5	58.6			57.5	68.7	60.9	58.3	72.3															
	Haul Trips (daily) – soil	Dump Truck	40%	3				50.9	75.7	45.9		29.7		50.4	65.6			64.4	75.7	67.9	65.3	79.2															
	Supply Trips	Flat Bed Truck	40%	3				48.7	73.5	43.7		27.5		48.2	63.4			62.2	73.5	65.7	63.1	77.0															
6.3.1	**Restoration**																								64.6	89.4	59.6		43.4					64.2	79.3	78.1	89.4	81.6	79.0	92.9
	Large Crane	Crane	40%	1	350 hp			50.3	75.0	45.3		29.0		49.8	64.9			63.8	75.0	67.2	64.6	78.6															
	Loader	Front End Loader	60%	1	150 hp			50.5	75.3	45.5		29.3		50.0	65.1			64.0	75.3	67.5	64.8	78.8															
	Generator w/PwrTools	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Generator- Vent. Fans	Generator	80%	1	50 hp			53.3	78.0	48.3		32.0		52.8	67.9			66.8	78.0	70.2	67.6	81.6															
	Soil Compacter	Compactor (ground)	80%	1	100 hp			55.9	80.6	50.9		34.6		55.4	70.5			69.4	80.6	72.8	70.2	84.2															
	Roller	Roller	80%	1	90 hp			52.7	77.4	47.7		31.4		52.2	67.3			66.2	77.4	69.6	67.0	81.0															
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp			48.2	73.0	43.2		27.0		47.8	62.9			61.7	73.0	65.2	62.6	76.5															
	Supply Trips (asphalt)	Flat Bed Truck	40%	3				48.7	73.5	43.7		27.5		48.2	63.4			62.2	73.5	65.7	63.1	77.0															
	Supply Trips (access structures)	Flat Bed Truck	40%	6				51.7	76.5	46.7		30.5		51.3	66.4			65.2	76.5	68.7	66.1	80.0															
6.3.2	Haul Trips (staging)	Dump Truck	40%	34				61.5	86.3	56.5		40.2		61.0	76.1			75.0	86.3	78.4	75.8	89.8															

Construction Analysis with RCNM Methodology

Stage	Client Equipment	RCNM Equipment	Client Percent Usage (each)	Number of Pieces	HP (each) or other info	Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	Nearest Residence 1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy	Overall Lmax LTN1	LTN2	LTN3	LTN4	LTN5	LTN6	STN1	STN2	STN3	STN4	STN5	STN6	1. SR-170	2. Tujunga	3. Kester	4. Sepulvec	5. 405 Fwy
	Connecting Sewers (Each)																																						
5.1.1	**Excavation and Shoring**																						84.7	103.6	92.0	100.1			58.3	49.0									
	Concrete Saw	Concrete Saw	50%	1	60 hp	84.7	103.6	92.0	100.1			58.3	49.0																									
	Pavement Breaker	Jackhammer	50%	1	100 hp	84.0	102.9	91.3	99.4			57.6	48.3																									
	Loader	Front End Loader	50%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																									
	Drill Rig/Auger	Auger Drill Rig	60%	2	150 hp	79.5	98.4	86.8	94.9			53.1	43.8																									
	Service Crane	Crane	40%	2	250 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Excavator	Excavator	80%	1	162 hp	75.8	94.7	83.1	91.2			49.4	40.1																									
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																									
	Forklift	Man Lift	50%	1	90 hp	69.8	88.7	77.1	85.2			43.4	34.1																									
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	76.7	95.6	84.0	92.1			50.3	41.0																									
	Pumping Equipment	Pumps	50%	2	50 hp	76.0	94.9	83.3	91.4			49.6	40.3																									
	Haul Truck -net export	Dump Truck	40%	4		71.6	90.5	78.9	87.0			45.2	35.9																									
	Haul Truck -staging	Dump Truck	40%	15		71.6	90.5	78.9	87.0			45.2	35.9																									
	Supply Truck (materials)	Flat Bed Truck	40%	10		69.4	88.3	76.7	84.8			43.0	33.7																									
	Concrete or Gravel Truck	Concrete Mixer Truck	40%	1		73.9	92.8	81.2	89.3			47.5	38.2																									
	Bedding																						75.7	94.6	83.0	91.1			49.3	40.0									
5.2.1	Loader	Front End Loader	50%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Supply Trips	Flat Bed Truck	40%	3		69.4	88.3	76.7	84.8			43.0	33.7																									
	Pipe Laying																						75.7	94.6	83.0	91.1			49.3	40.0									
5.3.1	Service Crane	Crane	50%	1	250 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Loader	Front End Loader	30%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																									
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp	72.8	91.7	80.1	88.2			46.4	37.1																									
	Supply Trips	Flat Bed Truck	40%	1		69.4	88.3	76.7	84.8			43.0	33.7																									
	Restoration																						78.3	97.2	85.6	93.7			51.9	42.6									
5.4.1	Loader	Front End Loader	40%	1	150 hp	74.2	93.1	81.5	89.6			47.8	38.5																									
	Generator w/PwrTools	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Generator- Vent. Fans	Generator	80%	1	50 hp	75.7	94.6	83.0	91.1			49.3	40.0																									
	Soil Compacter	Compactor (ground)	80%	1	100 hp	78.3	97.2	85.6	93.7			51.9	42.6																									
	Roller	Roller	80%	1	90 hp	75.1	94.0	82.4	90.5			48.7	39.4																									
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp	76.7	95.6	84.0	92.1			50.3	41.0																									
	Asphalt Paver	Paver	50%	1	100 hp	72.3	91.2	79.6	87.7			45.9	36.6																									
	Haul Truck (staging)	Dump Truck	40%	15		71.6	90.5	78.9	87.0			45.2	35.9																									
	Haul Truck (shoring)	Dump Truck	40%	9		71.6	90.5	78.9	87.0			45.2	35.9																									
	Supply Trips (asphalt)	Flat Bed Truck	40%	2		69.4	88.3	76.7	84.8			43.0	33.7																									
	Concrete Trips	Concrete Mixer Truck	40%	1		73.9	92.8	81.2	89.3			47.5	38.2																									
6	**Microtunneling (Each)**																																					
6.1.1	**Excavation and Shoring**																								63.2	88.0		58.2		42.0		62.8	77.9		76.7	88.0	80.2	77.6	91.5
	Concrete Saw	Concrete Saw	20%	1	60 hp			63.2	88.0		58.2		42.0		62.8	77.9		76.7	88.0	80.2	77.6	91.5															
	Pavement Breaker	Jackhammer	30%	1	100 hp			62.5	87.3		57.5		41.3		62.1	77.2		76.0	87.3	79.5	76.9	90.8															
	Loader	Front End Loader	80%	1	150 hp			52.7	77.5		47.7		31.5		52.3	67.4		66.2	77.5	69.7	67.1	81.0															
	Drill Rig/Auger	Auger Drill Rig	60%	1	150 hp			58.0	82.8		53.0		36.8		57.6	72.7		71.5	82.8	75.0	72.4	86.3															
	Service Crane	Crane	30%	1	250 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Excavator	Excavator	80%	1	162 hp			54.3	79.1		49.3		33.1		53.9	69.0		67.8	79.1	71.3	68.7	82.6															
	Generator w/PwrTools	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Generator- Vent. Fans	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp			51.3	76.1		46.3		30.1		50.9	66.0		64.8	76.1	68.3	65.7	79.6															
	Forklift	Man Lift	50%	1	90 hp			48.3	73.1		43.3		27.1		47.9	63.0		61.8	73.1	65.3	62.7	76.6															
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp			55.2	80.0		50.2		34.0		54.8	69.9		68.7	80.0	72.2	69.6	83.5															
	GW Pumping Equipment	Pumps	50%	2	75 hp			54.5	79.3		49.5		33.3		54.1	69.2		68.0	79.3	71.5	68.9	82.8															
	Haul Trips -staging	Dump Truck	40%	34				50.1	74.9		45.1		28.9		49.7	64.8		63.6	74.9	67.1	64.5	78.4															
	Supply Trips - materials	Flat Bed Truck	40%	17				47.9	72.7		42.9		26.7		47.5	62.6		61.4	72.7	64.9	62.3	76.2															
	Concrete or Gravel Trips	Concrete Mixer Truck	40%	3				52.4	77.2		47.4		31.2		52.0	67.1		65.9	77.2	69.4	66.8	80.7															
6.2.1	**Pipe Installation**																								55.6	80.4		50.6		34.4		55.2	70.3		69.1	80.4	72.6	70.0	83.9
	Large Crane	Crane	40%	1	350 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Loader	Front End Loader	40%	1	150 hp			52.7	77.5		47.7		31.5		52.3	67.4		66.2	77.5	69.7	67.1	81.0															
	Generator w/PwrTools	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Generator- Vent. Fans	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Compressor w/PwrTools	Compressor (air)	80%	1	50 hp			51.3	76.1		46.3		30.1		50.9	66.0		64.8	76.1	68.3	65.7	79.6															
	Tunnel Boring Machine	Horizontal Boring Hydr. Jack	60%	1	250 hp			55.6	80.4		50.6		34.4		55.2	70.3		69.1	80.4	72.6	70.0	83.9															
	Slurry Pumps	Concrete Pump Truck	80%	3	75 hp			55.0	79.8		50.0		33.8		54.6	69.7		68.5	79.8	72.0	69.4	83.3															
	Slurry Mixing/Separation	Slurry Plant	80%	1	75 hp			51.6	76.4		46.6		30.4		51.2	66.3		65.1	76.4	68.6	66.0	79.9															
	Hydraulic Jack System	Horizontal Boring Hydr. Jack	40%	1	75 hp			55.6	80.4		50.6		34.4		55.2	70.3		69.1	80.4	72.6	70.0	83.9															
	Water Truck	Flat Bed Truck	40%	1	150 hp			47.9	72.7		42.9		26.7		47.5	62.6		61.4	72.7	64.9	62.3	76.2															
	Haul Trips (daily) – soil	Dump Truck	40%	3				50.1	74.9		45.1		28.9		49.7	64.8		63.6	74.9	67.1	64.5	78.4															
	Supply Trips	Flat Bed Truck	40%	3				47.9	72.7		42.9		26.7		47.5	62.6		61.4	72.7	64.9	62.3	76.2															
6.3.1	**Restoration**																								56.8	81.6		51.8		35.6		56.4	71.5		70.3	81.6	73.8	71.2	85.1
	Large Crane	Crane	40%	1	350 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Loader	Front End Loader	60%	1	150 hp			52.7	77.5		47.7		31.5		52.3	67.4		66.2	77.5	69.7	67.1	81.0															
	Generator w/PwrTools	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Generator- Vent. Fans	Generator	80%	1	50 hp			54.2	79.0		49.2		33.0		53.8	68.9		67.7	79.0	71.2	68.6	82.5															
	Soil Compacter	Compactor (ground)	80%	1	100 hp			56.8	81.6		51.8		35.6		56.4	71.5		70.3	81.6	73.8	71.2	85.1															
	Roller	Roller	80%	1	90 hp			53.6	78.4		48.6		32.4		53.2	68.3		67.1	78.4	70.6	68.0	81.9															
	Sweeper	Vacuum Street Sweeper	20%	1	150 hp			55.2	80.0		50.2		34.0		54.8	69.9		68.7	80.0	72.2	69.6	83.5															
	Supply Trips (asphalt)	Flat Bed Truck	40%	3				47.9	72.7		42.9		26.7		47.5	62.6		61.4	72.7	64.9	62.3	76.2															
	Supply Trips (access structures)	Flat Bed Truck	40%	6				47.9	72.7		42.9		26.7		47.5	62.6		61.4	72.7	64.9	62.3	76.2															
6.3.2	Haul Trips (staging)	Dump Truck	40%	34				50.1	74.9		45.1		28.9		49.7	64.8		63.6	74.9	67.1	64.5	78.4															

FHWA TRAFFIC NOISE CALCULATOR

FUTURE TRAFFIC NOISE

ROADWAY	Peak Hour Volume	Vehicle Distribution %Auto	%MT	%HT	Vehicle Speed mph	Receiver Distance CL, ft	Grade % NL	FL	CNEL Correction	PREDICTED TRAFFIC NOISE LEVEL, dBA Leq @ Rec.	CNEL @ Rec.	DISTANCE TO CNEL CONTOURS 80	75	70	65	60
Victory Boulevard, between Haskell Avenue and Sepulveda Boulevard	6922	97.5	0.0	2.5	40	50	0	0	0.7	75.6	76.3	23	66	187	370	716
Victory Boulevard, between Kester Avenue and Van Nuys Boulevard	5329	97.5	0.0	2.5	40	50	0	0	0.7	73.5	74.2	15	42	120	255	507
Victory Boulevard, between Hazeltine Avenue and Woodman Avenue	4853	97.5	0.0	2.5	40	50	0	0	2.3	73.1	75.4	19	54	154	314	616
Victory Boulevard, between Fulton Avenue and Coldwater Canyon Avenue	4075	97.5	0.0	2.5	40	50	0	0	2.4	72.3	74.7	17	47	134	280	553
Victory Boulevard, between Whitsett Avenue and Laurel Canyon Boulevard	6473	97.5	0.0	2.5	40	50	0	0	1.9	74.3	76.2	23	65	184	366	708
Victory Boulevard, between Lankershim Boulevard/Colfax Avenue and Tujunga Avenue	4176	97.5	0.0	2.5	40	50	0	0	1.2	72.4	73.6	13	38	107	231	463

FHWA TRAFFIC NOISE CALCULATOR

FUTURE WITH PROJECT CONSTRUCTION TRAFFIC NOISE

ROADWAY	Peak Hour Volume	Vehicle Distribution %Auto	%MT	%HT	Vehicle Speed mph	Receiver Distance CL, ft	Grade % NL	FL	CNEL Correction	PREDICTED TRAFFIC NOISE LEVEL, dBA Leq @ Rec.	CNEL @ Rec.	DISTANCE TO CNEL CONTOURS 80	75	70	65	60
Victory Boulevard, between Haskell Avenue and Sepulveda Boulevard	5218	97.0	0.0	3.0	40	50	0	0	0.7	74.7	75.4	19	54	155	316	619
Victory Boulevard, between Kester Avenue and Van Nuys Boulevard	4030	96.7	0.2	3.2	40	50	0	0	0.7	72.6	73.3	12	35	100	217	439
Victory Boulevard, between Hazeltine Avenue and Woodman Avenue	3661	96.9	0.2	2.9	40	50	0	0	2.3	72.1	74.4	15	44	125	263	523
Victory Boulevard, between Fulton Avenue and Coldwater Canyon Avenue	3107	95.8	0.4	3.8	40	50	0	0	2.4	71.8	74.2	15	42	119	253	505
Victory Boulevard, between Whitsett Avenue and Laurel Canyon Boulevard	4895	96.7	0.2	3.1	40	50	0	0	1.9	73.4	75.3	19	54	153	312	612
Victory Boulevard, between Lankershim Boulevard/Colfax Avenue and Tujuna Avenue	3132	97.5	0.0	2.5	40	50	0	0	1.2	71.2	72.4	10	29	82	185	378

LASAN EWVIS Construction Vibration Analysis

Equipment		PPV Velocity, in/sec											RMS Velocity Level, VdB[1]										
		Relative Distances				Vibration Receptor Distance, ft							Relative Distances				Vibration Receptor Distance, ft						
						STV1	Nearest VSR	STV2	STV3	STV4	STV5	STN6					STV1	Nearest VSR	STV2	STV3	STV4	STV5	STN6
		25 ft	50 ft	100 ft	200 ft	10	35	168	15	30	34	193	25 ft	50 ft	100 ft	200 ft	10	35	168	15	30	34	193
Hydromill (slurry wall)	In soil	0.008	0.003	0.001	0.000	0.032	0.005	0.000	0.017	0.006	0.005	0.000	66	57	48	39	78	62	41	73	64	62	39
	In rock	0.017	0.006	0.002	0.001	0.067	0.010	0.001	0.037	0.013	0.011	0.001	73	64	55	45	85	68	48	79	70	69	46
Hoe Ram		0.089	0.031	0.011	0.004	0.352	0.054	0.005	0.191	0.068	0.056	0.004	87	78	69	60	99	83	62	94	85	83	60
Large Bulldozer		0.089	0.031	0.011	0.004	0.352	0.054	0.005	0.191	0.068	0.056	0.004	87	78	69	60	99	83	62	94	85	83	60
Caisson Drilling		0.089	0.031	0.011	0.004	0.352	0.054	0.005	0.191	0.068	0.056	0.004	87	78	69	60	99	83	62	94	85	83	60
Loaded Trucks		0.076	0.027	0.010	0.003	0.300	0.046	0.004	0.164	0.058	0.048	0.004	86	77	68	58	98	81	61	92	83	82	59
Jackhammer		0.035	0.012	0.004	0.002	0.138	0.021	0.002	0.075	0.027	0.022	0.002	79	70	61	52	91	74	54	85	76	75	52
Small Bulldozer		0.003	0.001	0.000	0.000	0.012	0.002	0.000	0.006	0.002	0.002	0.000	58	48	39	30	69	53	33	64	55	53	31

Note: 1 - RMS velocity in decibles (VdB) re 1 micro-inch/second