ATTACHMENT 3
NOISE AND VIBRATION TECHNICAL RPEORT

Noise and Vibration Technical Report

for the

North Torrance Wellfield Project

Located in the City of Torrance
County of Los Angeles, California

Prepared for:

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TABLE OF CONTENTS

Section **Page**

SECTION 1.0 – INTRODUCTION 1

SECTION 2.0 – PROJECT DESCRIPTION.....5
2.1 Project Description..... 5
2.2 Surrounding Land Uses..... 7
2.3 Surrounding Roadway Network 7

SECTION 3.0 – DEFINITION OF TERMS.....9
3.1 Noise 9
3.2 Vibration 12

SECTION 4.0 – APPLICABLE STANDARDS 15
4.1 Operational Noise Levels..... 15
4.2 Construction Noise..... 18
4.3 Vibration 19

SECTION 5.0 – EXISTING CONDITIONS.....21
5.1 Project Area 21
5.2 Existing Noise Levels 21

SECTION 6.0 – IMPACTS 23
6.1 Methodology..... 23
6.2 Assumptions..... 27
6.3 Construction Noise Impact Assessment..... 27
6.4 Operation Noise Impact Assessment 30

SECTION 7.0 – NOISE ABATEMENT MEASURES.....33
7.1 Required Noise Abatement Measures..... 33
7.2 Noise Abatement Measures 33

SECTION 8.0 – REFERENCES.....35

APPENDICES

A Noise Measurement Data
B Calculations

LIST OF FIGURES

Figure **Page**

1 Regional Map 2
2 Project Location 3
3 Concept Site Plan 8
4 Noise Measurement Locations 22

LIST OF TABLES

Table **Page**

1 Typical Noise Levels 10
2 City of Torrance Interior and Exterior Land Use Compatibility Noise Standards 16
3 City of Torrance Stationary Noise Source Standards 17
4 City of Torrance Noise Standard Adjustments 17
5 Potential Structural Damage Thresholds 20
6 Noise Measurement Data 21
7 Typical Maximum Construction Equipment Noise Levels 24
8 Vibration Levels Measured during Construction Activities 26

SECTION 1.0
INTRODUCTION

The City of Torrance, Department of Public Works is proposing the construction of the North Torrance Wellfield (NTWF) project. The NTWF project consists of developing two additional groundwater wells; a 3-million-gallon potable water storage reservoir; water treatment facilities; a booster pump station, a site access road; approximately 9,000 feet of associated pipelines; and the demolition of existing, deficient groundwater pumping/storage facilities.

The NTWF project site is located in the City of Torrance, Los Angeles County, California (see Figure 1). More specifically, the NTWF project site is an approximate 1.5-acre undeveloped parcel (APN-4087-037-902) located directly west of Yukon Elementary School and north of the California Department of Transportation's (Caltrans) right-of-way for Interstate 405 (I-405) and the City of Torrance's 24-foot utility easement, which are both along the southern boundary of Yukon Elementary School (see Figure 2). The NTWF project site is bounded by Yukon Elementary School, I-405, and the Southern California Edison (SCE) transmission line property, which Big Seven Nursery currently leases and occupies. The NTWF project site does not currently have roadway access. To utilize the NTWF project site, access would be obtained through the City's 24-foot utility easement and from the Torrance Unified School District. No residences are directly adjacent to the proposed NTWF project site.

The NTWF project also includes off-site work at the southeast corner of McMaster Park, which is located north of the project site; a median between Yukon Avenue and Yukon Elementary School; and work within Yukon Avenue, between McMaster Park and 182nd Street.

This noise analysis has been prepared to address construction and operations noise impacts to sensitive receptors in the vicinity of the proposed project.

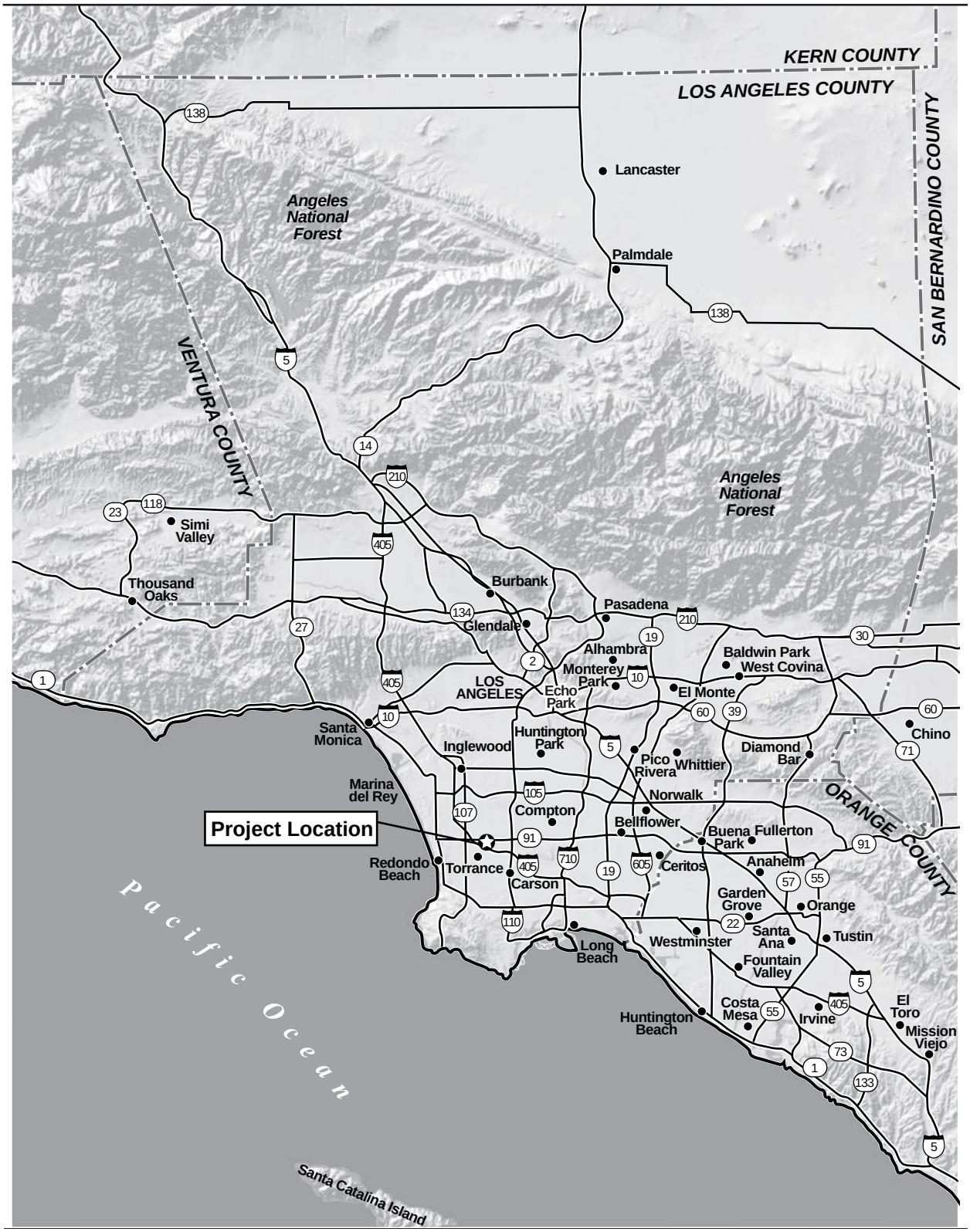

Figure 1
Regional Map

NO SCALE

Figure 2
Project Location

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SECTION 2.0
PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION

The NTWF project is envisioned to include the features described below (see Figure 3).

On-site Features

- A new wellhead water treatment system, a new 3-million-gallon water storage reservoir, a new booster pump station, a new emergency generator, and a new Well No. 10.

- A new paved access road (construction/operation) from Yukon Avenue, using the existing City 24-foot utility easement and portion of the Yukon Elementary School property. This new access road would parallel the existing Caltrans right-of-way adjacent to the I-405.

- Two mobile generators to be stored on-site, which will be used for Well No. 9 and No. 11 in case an emergency power supply is needed.

Off-site Features

- A new Well No. 11, to be located in the median between Yukon Avenue and Yukon Elementary School.

- Demolition of the existing reservoir, booster pump station, Well No. 6, and pump house building at McMaster Park. Work would include grading, repair of damaged pavement and gutters, and landscape restoration following demolition. It is estimated approximately 100 cubic yards of soil would be imported to fill the foundations to be demolished.

- A new 16-inch/20-inch discharge pipeline from Well No. 9 to the proposed wellhead treatment system on the NTWF project site. This line would extend approximately 2,500 feet within Yukon Avenue and the utility easement.

- A new discharge pipeline from the NTWF project site through the utility easement to the existing water distribution system in Yukon Avenue. The first branch of the discharge

pipeline would be a 24-inch line, approximately 1,000 feet in length, to tie into an existing 12-inch water main in Yukon Avenue in front of Yukon Elementary School. The second branch would be reduced to an 18-inch line, which would extend south, approximately 800 feet within Yukon Avenue, from the tie-in point in front of Yukon Elementary School to an existing 12-inch water line in 182nd Street at Yukon Avenue.

- New drain system piping from the NTWF project site through the utility easement to existing City sewer and County of Los Angeles storm drain in Yukon Avenue. This would involve approximately 1,500 feet of new 6-inch sewer line to be tied into the existing sewer line in Yukon Avenue in front of Yukon Elementary School, and approximately 1,700 feet of new 30-inch and 24-inch drain line to be tied into an existing storm drain manhole in Yukon Avenue, just north of 182nd Street.

The construction area within the City's 24-foot utility easement, which parallels the proposed access road, will be fenced off for safety purposes as this area will be dug up to accommodate the new discharge pipelines. Once construction is complete, the 24-foot utility easement will be returned to its previous condition.

New Access Road

The City must develop a new point of access to the NTWF project site. Currently, the City has access to the NTWF project site via the SCE property to the north. At this location, SCE has leased the property to a nursery operation, so City staff members currently traverse through the nursery site to reach the NTWF project site. As part of the NTWF project, the City would develop a new point of access directly from Yukon Avenue and the Yukon Elementary School parking area. The City currently has a 24-foot utility easement along the south boundary of the school site. A new paved access road and fence would be constructed within the City's 24-foot utility easement and a portion of the school property.

Construction

A construction crew of up to 30 workers is estimated to be working at the site during the project construction phase. Equipment to be used includes an excavator, bulldozer, backhoe/front end loader, crane, compactor, drill rig, grader, scraper, concrete truck, steam roller, and water trucks for dust control.

Work will include clearing and grubbing of both the temporary access road and the Well No. 10/treatment plant site prior to construction. Construction is anticipated to occur from February 2012 through August 2013.

General Operation

After the facilities are constructed, the project site will be staffed by one person for an average of 4 hours per day on weekdays and weekends. This will vary, and on some days, additional personnel will be at the site. An average of two maintenance trips per month will be required. Therefore, operation of the project site will result in approximately 389 annual vehicle trips.

Much of the project site will include area and task lighting controlled by motion sensor, photocell, or both.

2.2 SURROUNDING LAND USES

The project site is located within a highly developed area of Torrance and is bounded to the north by a nursery with single-family residential development north of the nursery, Yukon Elementary School to the east, and I-405 to the west and south. Across I-405 from the project site are additional single-family residences; however, due to the high levels of traffic noise in the immediate vicinity of I-405 and the existing sound barriers along I-405, these residences would not be affected by noise generated at the project site during construction or operation. The nearest single-family residence is approximately 150 feet north of the project site boundary. Yukon Elementary School buildings are located approximately 300 feet east of the project site. School play fields are directly adjacent to the project site.

2.3 SURROUNDING ROADWAY NETWORK

The site is bounded by utility and roadway easements and institutional land uses on all sides. Local roadway access to the site is provided by 177th Street and Yukon Avenue. Future access would also include the new access road from Yukon Avenue discussed above. Freeway access from I-405 would be from the Artesia Boulevard exit to the north or the Crenshaw Boulevard exit to the south.

Source: Aerial Imagery: Digital Globe (March 1, 2008), and AECOM (2011).

0 150 300 600 Feet

Figure 3
Concept Site Plan

SECTION 3.0
DEFINITION OF TERMS

3.1 NOISE

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (Caltrans 2009).

3.1.1 Decibels and Frequency

In its most basic form, a continuous sound can be described by its frequency or wavelength (pitch) and its amplitude (loudness). Frequency is expressed in cycles per second, or hertz. Frequencies are heard as the pitch or tone of sound. High-pitched sounds produce high frequencies; low-pitched sounds produce low frequencies. Sound pressure levels are described in units called the decibel (dB).

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; a halving of the energy would result in a 3-dB decrease.

3.1.2 Perception of Noise at the Receptor and A-Weighting

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale was devised, which approximates the frequency response of the average young ear when listening to most ordinary everyday sounds. Relative judgments of the loudness or annoyance of a sound correlate well with the A-scale sound levels of those sounds. Therefore, the “A-weighted” noise scale is used for measurements and standards involving the human perception of noise. Noise levels using A-weighted measurements are written dB(A) or dBA. Table 1 shows the relationship of various noise levels to commonly experienced noise events.

Table 1
Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 meters (1,000 feet)	--100--	
Gas Lawn Mower at 1 meter (3 feet)	--90--	
Diesel Truck at 15 meters (50 feet), at 80 km/hr (50 mph)	--80--	Food Blender at 1 meter (3 feet) Garbage Disposal at 1 meter (3 feet)
Noisy Urban Area, Daytime Gas Lawn Mower at 30 meters (100 feet)	--70--	Vacuum Cleaner at 3 meters (10 feet)
Commercial Area Heavy Traffic at 90 meters (300 feet)	--60--	Normal Speech at 1 meter (3 feet)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans 2009

Human perception of noise has no simple correlation with acoustical energy. The perception of noise is not linear in terms of dBA or in terms of acoustical energy. Two noise sources do not "sound twice as loud" as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease; that a change of 5 dBA is readily perceptible; and that an increase (decrease) of 10 dBA sounds twice (half) as loud (Caltrans 2009).

3.1.3 Noise Propagation

From the source to the receptor, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on the important factors described in the following discussion.

Geometric spreading from point and line sources. Sound from a small localized source (approximating 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 the distance. Movement of vehicles makes the source of the sound appear to emanate

from a line (line source) rather than a point when viewed over some time interval. The sound level attenuates or drops off at a rate of 3 dBA per doubling of distance for line sources.

Ground absorption. Acousticallly hard sites (i.e., sites with a reflective surface between the source and the receptor, such as parking lots or smooth bodies of water) receive no excess ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading of the source. Acoustically soft sites have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees, and receive an excess ground attenuation value of 1.5 dBA per doubling of distance.

Atmospheric effects. Wind speed will bend the path of sound to "focus" it on the downwind side and make a "shadow" on the upwind side of the source. At short distances of up to 164 feet, the wind has minor influence on the measured sound level. For longer distances, the wind effect becomes appreciably greater. Temperature gradients create effects similar to those of wind gradients, except that they are uniform in all directions from the source. On a sunny day with no wind, temperature decreases with altitude, giving a shadow effect for sound. On a clear night, temperature may increase with altitude, focusing sound on the ground surface.

Shielding by natural and man-made features, noise barriers, diffraction, and reflection. A large object in the path between a noise source and a receptor can significantly attenuate noise levels at that receptor location. The amount of attenuation provided by this "shielding" depends on the size of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, as well as man-made features such as buildings and walls, can significantly alter noise levels.

3.1.4 Noise Descriptors

Several rating scales (or noise "metrics") exist to analyze adverse effects of noise on a community. These scales include the equivalent noise level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average sound level (DNL or L_{dn}). Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq}, meaning the equivalent noise level for that period of time. The period of time averaging may be specified; $L_{eq(3)}$ would be a 3-hour average. When no period is specified L_{eq}, a 1-hour average is assumed. It is important to understand that noise of short duration, that is, times substantially less than the averaging period, is averaged into ambient noise during the period of interest. Thus, a loud noise lasting many seconds or a few minutes may have minimal effect on the measured sound level averaged over a 1-hour period.

To evaluate community noise impacts, DNL and CNEL were developed to account for human sensitivity to nighttime noise. DNL represents the 24-hour average sound level with a penalty for noise occurring at night. The DNL computation divides the 24-hour day into two periods: daytime (7:00 a.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.). The nighttime sound levels are assigned a 10-dBA penalty prior to averaging with daytime hourly sound levels. CNEL is similar to DNL except that it separates a 24-hour day into three periods: daytime (7:00 a.m. to 7:00 p.m.), evening (7:00 p.m. to 10:00 p.m.), and nighttime (10:00 p.m. to 7:00 a.m.). The evening nighttime sound levels are assigned a 10-dBA penalty prior to averaging with daytime hourly sound levels.

3.1.5 Noise-Sensitive Receptors

Noise-sensitive receptors are generally considered humans engaged in activities, or involved with land uses, that may be subject to the stress of significant interference from noise. Activities usually associated with sensitive receptors include, but are not limited to, talking, reading, and sleeping. Land uses often associated with sensitive receptors include residential dwellings, mobile homes, hotels, motels, hospitals, nursing homes, education facilities, and libraries.

Noise-sensitive human receptors in the project vicinity include the residences located to the north and east of the project site along 177th Street, and residences along Yukon Avenue as project traffic would use this street to access the regional transportation network.

3.2 VIBRATION

3.2.1 Frequency

Groundborne vibration consists of oscillatory waves that propagate from the source through the ground to adjacent structures. The frequency of a vibrating object describes how rapidly it is oscillating. The number of cycles per second of oscillation is the vibration frequency, which is described in terms of hertz, or abbreviated as Hz. The normal frequency range of most groundborne vibration that can be felt generally ranges from a low frequency of less than 1 Hz to a high of about 200 Hz.

3.2.2 Perception of Vibration at the Receptor

While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings caused by construction activities may be perceived as motion of building surfaces or rattling of windows, items on

shelves, and pictures hanging on walls. Vibration of building components can also take the form of an audible low-frequency rumbling noise, which is referred to as groundborne noise. Groundborne noise is usually only a problem when the originating vibration spectrum is dominated by frequencies in the upper end of the range (60 to 200 Hz), or when the structure and the construction activity are connected by foundations or utilities, such as sewer and water pipes.

Although groundborne vibration is sometimes noticeable in outdoor environments, groundborne vibration is almost never annoying to people who are outdoors (FTA 2006). The primary concern from vibration is the ability to be intrusive and annoying to local residents and other vibration-sensitive land uses.

3.2.3 Vibration Propagation

Vibration energy spreads out as it travels through the ground, causing the vibration level to diminish with distance away from the source. High-frequency vibrations reduce much more rapidly than low frequencies, so that low frequencies tend to dominate the spectrum at large distances from the source. Discontinuities in the soil strata can also cause diffractions or channeling effects that affect the propagation of vibration over long distances. When vibration encounters a building, a ground-to-foundation coupling loss will usually reduce the overall vibration level. However, under certain circumstances, the ground-to-foundation coupling may also amplify the vibration level due to structural resonances of the floors and walls.

3.2.4 Vibration Descriptors

Vibration levels are usually expressed as single-number measure of vibration magnitude, in terms of velocity or acceleration, which describes the severity of the vibration without the frequency variable. The peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal, usually measured in inches per second. Since it is related to the stresses that are experienced by buildings, PPV is often used in monitoring of blasting vibration. Although PPV is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response. It takes some time for the human body to respond to vibrations. In a sense, the human body responds to an average vibration amplitude (FTA 2006). Because vibration waves are oscillatory, the net average of a vibration signal is zero. Thus, the root mean square (rms) amplitude is used to describe the "smoothed" vibration amplitude (FTA 2006). The rms of a signal is the square root of the average of the squared amplitude of the signal, usually measured in inches per second. The average is typically calculated over a 1-second period. The rms amplitude is always less than the PPV and is always

positive. Decibel notation is used to compress the range of numbers required to describe vibration. For purposes of this report, the rms vibration velocity level in decibels is defined as:

$$L_v = 20 \times \log_{10}(v/v_{ref})$$

Where: L_v is the velocity level in decibels, v is the rms velocity amplitude, and v_{ref} is the reference velocity amplitude.

A reference must always be specified whenever a quantity is expressed in terms of decibels. The accepted reference quantity for vibration velocity is microinches per second ($1x10^{-6}$). The abbreviation VdB is used in this report for vibration decibels to reduce the potential for confusion with sound decibels.

3.2.5 Vibration-Sensitive Receptors

Vibration-sensitive receptors are generally considered humans engaged in activities, or involved with land uses, that may be subject to significant interference from vibration. Activities and land uses often associated with vibration-sensitive receptors are similar to those associated with noise-sensitive receptors. The primary vibration source for the proposed project would be equipment used to prepare the project site and the project access road. Thus, vibration-sensitive receptors in the project vicinity are generally limited to the residences located to the north of the project site and Yukon Elementary School for the future access road.

SECTION 4.0
APPLICABLE STANDARDS

The City's policies and ordinances with respect to noise are included in Chapter 6 "Noise Regulation" of the City's Municipal Code, and in the Noise Element of the City's General Plan.

4.1 OPERATIONAL NOISE LEVELS

4.1.1 City of Torrance General Plan Noise Element

The Noise Element of the City's General Plan is the guiding document for the City's noise policy and contains four objectives, N.1 through N.4, with accompanying policies designed to protect residents and businesses from excessive and persistent noise intrusions. Objectives and policies relevant to the project are presented below. Table 2 provides the City's interior and exterior noise standards.

Objective N.1: To identify noise pollution and establish effective noise abatement methods

> Policy N.1.1: Continue to strictly enforce the provisions of the City's Noise Ordinance to ensure that stationary noise, traffic-related noise, railroad noise, airport-related noise, and noise emanating from construction activities and special events are minimized.
>
> Policy N.1.4: Minimize unnecessary outdoor noise through enforcement of the noise ordinance and through permit processes that regulate noise-producing activities.

Objective N.3: To minimize noise incompatibilities between land uses

> Policy N.3.1: Review industrial, commercial, or other noise-generating land use proposals for compatibility with nearby noise-sensitive land uses, and require that appropriate mitigation be provided.
>
> Policy N.3.2: Require the inclusion of noise-reducing design features for developments near noise-sensitive land uses.
>
> Policy N.3.4: Work with property and business owners to avoid or resolve noise incompatibilities in commercial or industrial areas.

Objective N.4: To research and implement new means of noise abatement

Policy N.4.1: Encourage and support efforts by the State of California to abate noise pollution by using stricter quantitative noise standards, shorter compliance time governing operation of all types of motor vehicles, etc.

Policy N.4.2: Maintain open lines of communication between the City and all federal, State, and County agencies involved in noise abatement.

Policy N.4.3: Educate residents and businesses of the effects of noise pollution, ways they can assist in noise abatement, and noise abatement programs within the City.

Table 2
City of Torrance Interior and Exterior Land Use Compatibility Noise Standards

Land Use Categories		Energy Average CNEL	
Categories	**Uses**	**Interior**	**Exterior**
Residential	Low/ Medium Low/ Medium Density Residential	45	60/65[1]
	Medium High Residential	45	65/70[2]
	High Density Residential	45	70[1]
Commercial and Office	General Commercial / Commercial Center	-	70
	Residential Office	50	70
Industrial	Business Park	55	75
	Light Industrial		
	Heavy Industrial		
Public and Medical Uses	Public / Quasi-Public / Open	50	65
	Hospital / Medical	50	70
Airport	Airport	-	70[3]

[1] The normally acceptable standard is 60 dB(A). The higher standard is acceptable subject to inclusion of noise-reduction features in project design and construction.
[2] Maximum exterior noise levels up to 70 dB CNEL are allowed for Multiple-Family Housing.
[3] Regarding aircraft-related noise, the maximum acceptable exposure for new residential development is 60 dB(A) CNEL.
Source: City 2010

4.1.2 City of Torrance Municipal Code

Chapter 6 “Noise Regulation” of the City’s Municipal Code regulates noise within the City limits. The noise metric used for stationary sources, such as industrial or construction noise, is defined as noise level limits that cannot be exceeded for certain periods of time. The noise standards shown in Table 3 are for regulating the impact of stationary noise sources to a neighboring private property.

The stationary source noise level limits identified in Table 3 also have several possible corrections or adjustments based on the existing noise level, relative zoning of all affected properties, source, tone, and duration. Table 4 presents correction factors for applicable noise standards for specific types of noise sources.

Table 3
City of Torrance Stationary Noise Source Standards

Region[1]	Maximum Allowable Noise Levels	
	Exterior Noise Level. dBA L_{eq} (h)	
	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
Region 1	70	65
Region 2	60	55
Region 3	50	45
Region 4	55	50

[1] The project site is located entirely within Region 4 with no other regions located within ¾ mile.
L_{eq} (h) = hourly equivalent noise level
Source: City 2008

Table 4
City of Torrance Noise Standard Adjustments

Noise Condition	Adjustment Factor (dBA)
Noise contains a steady, audible tone, such as a whine, screech or hum	-5
Noise is a repetitive impulsive noise, such as hammering or riveting	-5
Noise occurs less than 90 minutes per day or less than 20 minutes per night	+5
Noise occurs less than 30 minutes per day or less than 6 minutes per night	+10
Noise occurs less than 30 minutes per day or less than 6 minutes per night	+15
Noise occurs on Sunday morning (between 12:01 A.M. and 12:01 P.M. Sunday)	-5

Source: City 2008

The following additional sections of the City's Municipal Code (Noise Ordinance) are relevant to the project.

Section 46.2.4. - Schools, Hospitals, and Churches.

It shall be unlawful for any person to create any noise on any street, sidewalk or public place adjacent to any school, institution of learning or church while the same is in use or adjacent to any hospital, which noise unreasonably interferes with the workings of such institution or which disturbs or unduly annoys patients in the hospital, provided conspicuous signs are displayed in such streets, sidewalks or public place indicating the presence of a school, church or hospital.

Section 46.2.6. - Machinery, Equipment, Fans, and Air Conditioning.

It shall be unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any residential land to exceed the ambient noise level by more than five (5) decibels.

4.2 CONSTRUCTION NOISE

Construction noise is regulated by the following section in the City's Municipal Code (Noise Ordinance).

Section 46.3.1. - Construction of Buildings and Projects.

a) It shall be unlawful for any person within the City of Torrance to operate power construction tools, equipment, or engage in the performance of any outside construction or repair work on buildings, structures, or projects in or adjacent to a residential area involving the creation of noise beyond 50 decibels (db) as measured at property lines, except between the hours of 7:30 A.M. to 6:00 P.M. Monday through Friday and 9:00 A.M. to 5:00 P.M. on Saturdays. Construction shall be prohibited on Sundays and Holidays observed by City Hall. An exception exists between the hours of 10:00 A.M. to 4:00 P.M. for homeowners that reside at the property.

b) The Community Development Director may allow expanded hours and days of construction if unusual circumstances and conditions exist. Such requests must be made in writing and must receive approval by the Director prior to any expansion of the hour and day restrictions listed above.

c) Every construction project requiring Planning Commission review or considered to be a significant remodel as defined by Section 231.1.2, shall be required to post an information board along the front property line that displays the property owner's name and contact number, contractor's name and contact number, a copy of TMC Section 46.3.1, a list of any special conditions, and the Code Enforcement phone number where violations can be reported.

d) Properties zoned as commercial, industrial or within an established redevelopment District, are exempted from the above day and hour restrictions if a minimum buffer of 300 feet is maintained from the subject property's property line to the closest residential property. The Community Development Director, may, however, revoke such exemption for a particular project if the noise level exceeds 50 decibels (db) at the property line of a residential property beyond the 300 linear foot buffer.

e) Heavy construction equipment such as pile drivers, mechanical shovels, derricks, hoists, pneumatic hammers, compressors or similar devices shall not be operated at any time, within or adjacent to a residential area, without first obtaining from the Community Development Director permission to do so. Such request for permission shall include a list and type of equipment to be used, the requested hours and locations of its use, and the applicant shall be required to show that the selection of equipment and construction techniques has been based on minimization of noise within the limitations of such equipment as is commercially available or combinations of such equipment and auxiliary sound barriers. Such permission to operate heavy construction equipment will be revoked if operation of such equipment is not in accordance to approval. No permission shall be required to perform emergency work as defined in Article 1 of this Chapter.

4.3 VIBRATION

Numerous public and private organizations and governing bodies have provided guidelines to assist in the analysis of groundborne noise and vibration. However, the federal, state, and most local governments have yet to establish specific groundborne noise and vibration requirements. Therefore, there are no federal, state, or local vibration regulations or guidelines directly applicable to the project.

Publications of the FTA and Caltrans are two of the seminal works for the analysis of groundborne noise and vibration relating to transportation- and construction-induced vibration. The project is not subject to FTA or Caltrans regulations. However, these guidelines serve as a useful tool to evaluate vibration impacts. Therefore, this analysis uses the FTA and Caltrans guidance outlined below to help define California Environmental Quality Act significance thresholds.

Caltrans guidelines recommend that a standard of 0.2 inches per second (in/sec) PPV not be exceeded for the protection of normal residential buildings, and that 0.08 in/sec PPV not be exceeded for the protection of old or historically significant structures (Caltrans 2004). With respect to human response within residential uses (i.e., annoyance, sleep disruption), FTA recommends a maximum acceptable vibration standard of 80 VdB (FTA 2006).

Potential structural damage associated with vibration from construction activities is based on the Caltrans vibration limits identified in Table 5. For pile driving, Caltrans indicates that extreme care should be taken whenever pile driving would occur within 25 feet of any building and within 100 feet of a building in poor condition.

Table 5
Potential Structural Damage Thresholds

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

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls.
Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans 2004

SECTION 5.0
EXISTING CONDITIONS

5.1 PROJECT AREA

The project area is currently an undeveloped parcel located between I-405 and Yukon Elementary School. Residential and school land uses are located adjacent to the northern and eastern boundaries of the main project site. I-405 lies west and south of the project site.

5.2 EXISTING NOISE LEVELS

Existing noise level measurements were taken July 19, 2011, between the hours of 9:00 a.m. and 12:00 p.m. A 24-hour measurement was also taken from 9:00 a.m. on July 19 until 9:00 a.m. on July 20, 2011. The weather was clear and dry with moderate breezes blowing from the northeast averaging 1 to 2 miles per hour with occasional gusts of 3 to 8 miles per hour.

Noise measurements were taken with a Larson Davis 820 sound level meter set on "slow" response and "A-weighting." The meter was positioned 5 feet above the existing ground elevation at all measurement locations. The results of the field noise measurements on July 19 and 20, 2011, are summarized in Table 6 and detailed in Appendix A, and the noise measurement locations are shown in Figure 4.

Table 6
Noise Measurement Data

Site ID*	Location	Time	Noise Level (dBA)		
			L_{eq}	L_{min}	L_{max}
MS-1	Northwest end of Big Seven Nursery	9:18 a.m. – 9:38 a.m.	59.6	54.2	77.0
MS-2	Between 2 Electrical Towers at Big Seven Nursery	9:44 a.m. – 9:59 a.m.	57.9	51.0	62.9
MS-3	West of Big Seven Nursery Office Trailer	10:04 a.m. – 10:19 a.m.	56.4	51.3	60.4
MS-4	North Property Line of Project Site	10:40 a.m. – 11:02 a.m.	63.1	57.3	67.3
MS-5	Western Property Line of Yukon Elementary School	11:17 a.m. – 11:32 a.m.	61.9	59.1	65.2
MS-6	Yukon Elementary School Parking Lot	11:45 a.m. – 12:00 a.m.	62.7	57.0	74.1
24-hr (LT)	North Property Line of Project Site	9:00 a.m. – 9:00 a.m.	61.8	41.5	75.8
24-hr CNEL 68.0					

* The Site ID corresponds to locations shown in Figure 4.

Source: GoogleEarth 2011

Figure 4
Noise Measurement Locations

SECTION 6.0
IMPACTS

6.1 METHODOLOGY

Noise impacts associated with the proposed project would be related to project construction and operation. Construction noise would be related primarily to the use of heavy equipment, and operation noise would be related to new mechanical equipment and traffic generated by the residents of the proposed housing.

6.1.1 Traffic Noise Modeling

Due to the low volume of traffic related to the proposed project (less than 30 trips per day for construction and less than two trips per day for operations) no traffic noise modeling was conducted for this analysis.

6.1.2 Construction Noise Modeling

For purposes of noise assessment, construction equipment can be considered to operate in two modes, stationary and mobile. Stationary equipment operates in one location for one or more days at a time, with either a fixed-power operation, such as pumps, generators, and compressors, or a variable noise operation, such as pile drivers, rock drills, and pavement breakers. Mobile equipment moves around the construction site with power applied in cyclic fashion, such as bulldozers, graders, and loaders (FTA 2006). Noise impacts for stationary equipment are assessed from the center of the equipment, while noise impacts for mobile construction equipment are assessed from the center of the equipment activity or construction site. For linear construction, such as a roadway or pipeline, construction noise is assessed from the centerline of the alignment.

Variation in power imposes additional complexity in characterizing the noise source level from construction equipment. Power variation is accounted for by describing the noise at a reference distance from the equipment operating at full power and adjusting it based on the duty cycle of the activity to determine the L_{eq} of the operation (FTA 2006). Typical duty cycles and noise levels generated by representative pieces of equipment are listed in Table 7.

Table 7
Typical Maximum Construction Equipment Noise Levels

Equipment	Noise Level at 50 ft	Typical Duty Cycle
Auger Drill Rig	85	20%
Backhoe	80	40%
Blasting	94	1%
Chain Saw	85	20%
Clam Shovel	93	20%
Compactor (ground)	80	20%
Compressor (air)	80	40%
Concrete Mixer Truck	85	40%
Concrete Pump	82	20%
Concrete Saw	90	20%
Crane (mobile or stationary)	85	20%
Dozer	85	40%
Dump Truck	84	40%
Excavator	85	40%
Front End Loader	80	40%
Generator (25 KVA or less)	70	50%
Generator (more than 25 KVA)	82	50%
Grader	85	40%
Hydra Break Ram	90	10%
Impact Pile Driver (diesel or drop)	95	20%
Insitu Soil Sampling Rig	84	20%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pneumatic Tools	85	50%
Pumps	77	50%
Rock Drill	85	20%
Scraper	85	40%
Tractor	84	40%
Vacuum Excavator (vac-truck)	85	40%
Vibratory Concrete Mixer	80	20%
Vibratory Pile Driver	95	20%

Source: Thalheimer 2000
KVA = kilovolt amps

Each phase of construction has a specific equipment mix, depending on the work to be accomplished during that phase. Each phase also has its own noise characteristics; some will have higher continuous noise levels than others, and some have high-impact noise levels. The L_{eq} of each phase is determined by combining the L_{eq} contributions from each piece of equipment used in that phase (FTA 2006). In typical construction projects, grading activities typically generate the highest noise levels as grading involves the largest equipment.

The equation used for calculation of each individual piece of construction equipment at individual receptors is,

$NL_i = NL_{max@50\ ft} - 20\ LOG\ (D_i/50) + 10\ LOG\ (UF/100) - IL_i$ where,

NL_i	=	noise level at receptor i, dBA;
$NL_{max@50\ ft}$	=	maximum equipment noise level measured at 50 feet from the noise centroid of the equipment, dBA;
D_i	=	distance from equipment to receptor i, feet;
UF	=	utilization factor of the equipment, percent; and
IL_i	=	insertion loss between the equipment and receptor i, dBA.

This equation is described in *Mitigation of Nighttime Construction Noise, Vibrations, and Other Nuisances* (TRB 1999) and *Construction Noise Control Program and Mitigation Strategy as the Central Artery/Tunnel Project* (Thalheimer 2000).

While all construction sites for the proposed project are in open field and would be considered acoustically soft sites, which typically attenuate noise at a rate of 7.5 dBA per doubling of distance, the referenced equation assumes a drop-off rate of 6 dBA per doubling of distance and is conservative.

6.1.3 Vibration Assessment

A quantitative assessment of potential vibration impacts from construction activities, such as blasting, pile-driving, vibratory compaction, demolition, drilling, or excavation, may be conducted using the following equations (FTA 2006). Table 8 shows typical vibration levels for various pieces of construction equipment (FTA 2006).

Damage Assessment

Vibration impacts to structures may be estimated at any distance D from the following equation:

$PPV^{equip} = PPV_{ref} \times (25/D)^{1.5}$.
(this formula is based on point vibration sources with normal propagation conditions)

Table 8
Vibration Levels Measured during Construction Activities

Equipment		PPV at 25 ft (in/sec)	Approximate L_v[1] VdB at 25 ft
Pile Driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Hydromill (slurry wall)	Soil	0.008	66
	Rock	0.017	75
Clam shovel drop (slurry wall)		0.202	94
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

[1] rms velocity in decibels (VdB) re 1 micro-inch/second
Source: FTA 2006

Where: PPV_{equip} is the peak particle velocity in in/sec of the equipment adjusted for distance, PPV_{ref} is the reference vibration level in in/sec at 25 feet from Table 8, and D is the distance from the equipment to the receptor.

Annoyance Assessment

Vibration impacts to humans due to annoyance or interference with vibration-sensitive activities may be estimated at any distance D from the following equation:

$L_{v(D)} = L_{v(ref)} - 30\log(D/25)$
(this formula is based on point vibration sources with normal propagation conditions)

Where: $L_{v(D)}$ is the rms of the peak velocity in microinches per second expressed in VdB of the equipment adjusted for distance, $L_{v(ref)}$ is the reference vibration level at 25 feet, taken from Table 8, and D is the distance from the equipment to the receptor.

6.2 ASSUMPTIONS

6.2.1 Construction

A construction crew of up to 30 workers would be working at the project site during the construction phase. Equipment that will be used includes excavator, bulldozer, backhoe/front end loader, crane, compactor, drill rig, grader, scraper, concrete truck, steam roller, and water trucks for dust control. Due to variability in construction noise, modeling assumes the use of the four loudest pieces of equipment operating simultaneously.

Work will include clearing and grubbing of both the access road and Well No. 10/treatment plant site prior to construction. Construction is anticipated to occur from February 2012 through August 2013.

6.2.2 Operation

Noise during project operation would be primarily related to the operations of new well, pumping, and generator facilities. One worker trip per day would occur for maintenance. Wells, pumps, and fixed generators are all assumed to be housed in concrete structures with interior acoustical treatment and best design practices implemented. Best design practices would include locating doors and ventilation systems away from direct line of sight of sensitive receptors. No significant vibration sources are associated with project operation.

6.3 CONSTRUCTION NOISE IMPACT ASSESSMENT

On-Site Construction

On-site construction would include the grading, clearing, and installation of a new 3-million-gallon water storage reservoir, a new booster pump station, a new generator, and the new Well No. 10. Typical heavy construction equipment would include bulldozers, excavators, dump trucks, front-end loaders, graders, and water trucks. It is assumed that diesel engines would power all construction equipment. Peak noise levels measured at a distance of 50 feet from an individual piece of construction equipment can reach as high as 90 dBA (FTA 2006). However, with construction equipment moving around the project site and pausing for measurements and worker breaks, average hourly noise levels would be 75 L_{eq} at 50 feet, as measured from the edge of the construction site. Noise levels from construction activities are typically considered as point sources and would drop off at a rate of 6 dB per doubling of distance over acoustically hard sites,

such as streets and parking lots. The drop-off rate would increase slightly over acoustically soft sites, such as grass fields and open terrain with vegetation. For this analysis, a drop-off rate of 7.5 dBA per doubling of distance has been used as the ground between the project site and the local residences is soft soil and has vegetation.

As the project site is currently undeveloped, there are no on-site noise-sensitive receptors. The nearest off-site noise-sensitive receptors, for construction assessment purposes, are the single-family residences located north of the project site and the Yukon Elementary School located east of the project site. The residences approximately 150 feet from the nearest edge of the main construction site across from the Big Seven Nursery facility and elementary school playground abut the project site; however, the nearest school buildings are located 315 feet east. At these distances, short-term construction noise levels from the main construction site are estimated to reach 63 dBA L_{eq} at the residences without shielding and 55 dBA L_{eq} at Yukon Elementary School classroom buildings without shielding. Exterior locations within Yukon Elementary School would be exposed to construction noise levels in excess of, or equal to, 60 dBA L_{eq} within 200 feet of the project boundary, and 65 dBA L_{eq} within 126 feet. Based on the 24-hour noise measurement, noise levels of this magnitude are similar to the existing noise levels (61 to 63 dBA L_{eq}) as measured at the northern property line of the project between 7:00 a.m. and 4:00 p.m. Therefore, on-site construction noise would not result in a substantial increase (i.e., 10 dBA) in noise levels at local receptors.

Additionally, maximum noise levels at these receptors could reach as high as 75 dBA for short periods when equipment is under maximum load and adjacent to the property lines. Maximum construction noise levels at the nearest receptors would be heard above the existing noise levels and could create temporary annoyance; however, maximum noise levels would typically last less than 1 minute and occur only sporadically and are not considered significant.

Off-site Construction

Off-site construction would include the construction of a new access road and 24-foot utility easement adjacent to I-405 from Yukon Avenue to the project site; a new Well No. 11 located in the median between Yukon Elementary School and Yukon Avenue; new pipeline construction between Wells No. 9, 10, and 11 along Yukon Avenue and the new access road; and demolition of existing infrastructure at McMaster Park. Similar to on-site construction, heavy construction equipment would include bulldozers, excavators, dump trucks, front-end loaders, graders, and water trucks. Thus, noise levels and general assumptions would be similar to the on-site construction.

The nearest noise-sensitive receptors to off-site construction activities are Yukon Elementary School and residences located adjacent to Yukon Avenue, both approximately 50 feet from construction activities along Yukon Avenue. Yukon Elementary School is approximately 100 feet at the nearest point from access road construction. At these distances, short-term construction noise levels from the Yukon Avenue construction site are estimated to reach 75 dBA L_{eq} at Yukon Elementary School and adjacent residences without shielding and 69 dBA L_{eq} at Yukon Elementary School from access road construction. Based on the noise measurements taken in front of the school, peak traffic hour noise levels are on the order of 66 dBA L_{eq}. Therefore, maximum construction noise would potentially result in a 9-dBA increase. As with on-site construction, maximum noise levels at these receptors would be higher (approximately 90 dBA L_{max}) for short periods when equipment is under maximum load and adjacent to the property lines. As with on-site construction, maximum construction noise levels at the nearest receivers would be heard above the existing noise levels and could create temporary annoyance; however, maximum noise levels would typically last less than 1 minute and occur only sporadically.

In addition to off-site construction activities, construction noise would also be generated off-site on local roadways by workers commuting to and from the job site and construction material deliveries, and on-site by construction equipment during demolition activities, site preparation, and building construction activities. It is estimated that construction activities would require a maximum of 30 workers per day and a maximum of five truck trips per day for material deliveries. These vehicles would access the project site via Yukon Avenue from the larger transportation network. To be conservative this analysis assumes 36 total construction trips are expected in any peak hour. Based on traffic counts along Yukon Avenue in the vicinity of the project, construction traffic volumes would not double overall roadway traffic volumes (Counts Unlimited 2011). As a doubling of traffic volumes would be required to generate a 3-dBA increase in ambient noise levels, construction-related traffic would not result in a substantial increase in traffic noise (Caltrans 2009).

Summary

Construction operations are exempt from City regulations between the hours of 7:30 a.m. to 6:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturdays. No construction would occur on Sundays or City recognized holidays. Construction of the proposed project would adhere to the exempted hours and would comply with the City's Noise Ordinance. Based on the preceding analysis, on-site construction would generate noise levels of approximately 63 dBA L_{eq} at the nearest residences (approximately 150 feet to the north) and 55 dBA L_{eq} at Yukon Elementary School (approximately 315 feet to the nearest classroom) while off-site construction

would generate noise levels on the order of 69 dBA L_{eq} at the nearest residence and 75 dBA L_{eq} at Yukon Elementary School. Based on existing noise levels in the project vicinity, this would not result in a substantial temporary increase, i.e., greater than 10 dBA, in ambient noise levels. Maximum construction noise levels at the nearest receptors would be above the existing noise levels and could create temporary annoyance; however, maximum noise levels would typically last less than 1 minute and would occur only sporadically. Therefore, construction of the proposed project would not result in significant noise impacts to noise-sensitive receptors.

6.3.1 Construction Vibration Impact Assessment

Although it is possible for vibrations from construction projects to cause building damage, the vibrations from typical construction activities are almost never of sufficient amplitude to cause more than minor cosmetic damage to buildings when in proximity to the buildings (FTA 2006). Groundborne vibration generated by construction projects is usually highest during pile driving, soil compacting, jackhammering, and demolition-related activities.

The vibration data provided in Table 8 and the propagation equations for structural damage and human annoyance indicate that construction equipment vibration levels are well below the threshold of damage at distances ranging beyond 15 feet and threshold for annoyance beyond 45 feet. The nearest sensitive receptors to on-site vibration sources would be the residences north of the project site, where all structures are at least 200 feet from the nearest point of construction. The nearest sensitive receptors to off-site vibration sources would be Yukon Elementary School and residences west of Yukon Avenue, approximately 50 feet from the nearest point of construction. At these distances, the nearest receptors would be exposed to approximately 60 VdB (0.0004 in/sec rms) during on-site grading operations and approximately 78 VdB (0.03 in/sec rms) during off-site grading operations. This is below recommended thresholds and thus the local receptors would not be exposed to substantial vibration during project construction. All other receptors are farther away; thus vibrations at those locations would be less than identified. Therefore, the proposed project would not expose local sensitive receptors to significant impacts resulting from groundborne vibrations.

6.4 OPERATION NOISE IMPACT ASSESSMENT

6.4.1 Land Use Compatibility

The primary source of noise in the project area is traffic on area roadways. The City noise standard for industrial land uses, such as the project site, is 75 dBA CNEL. Based on a review of the City's Noise Element, the nearest roadway of concern would be I-405, adjacent to the project

site. Based on Figure N-2 of the Noise Element, the project site and adjacent receptors are within the 70-dBA CNEL contour from I-405, and outside the 75-dBA CNEL. Additionally, based on the 24-hour noise measurement, the existing CNEL at the project site is approximately 68 dBA CNEL. Thus, the proposed project would be compatible with future noise levels.

6.4.2 On-Site Noise

Multiple stationary noise sources are proposed for the project. On-site noise sources include Well No. 10, three booster pumps, and one emergency generator. Based on the project description, all noise sources at the project site would be enclosed in structures and treated with internal acoustical panels. The structures are assumed to be composed of masonry block. Interior to exterior noise reductions attributable to this type of construction would be approximately 50 dBA (BBN 1981) with the assumption that the building is constructed with ventilation and doors facing away from residences and Yukon Elementary School. The rooms for the generator and booster pumps would also have acoustical treatments on 70 percent of the interior walls, which would decrease the noise level inside the building for occupational safety and health compliance. However, no adjustment factor related to the acoustical treatment has been applied to the exterior noise levels.

Including the assumed enclosure, noise levels from the three booster pumps, Well No. 10, and the 1,250-kilowatt (kW) emergency generator at the project site would combine to be 43 dBA L_{eq} at the nearest residential property line and 48 dBA L_{eq} at the elementary school property line (see Appendix B for modeling results). To be conservative, these noise levels include the generator operation; however, the generator would normally be tested once a month for about 15 minutes. Without the generator operating, noise levels would be approximately 30 dBA L_{eq} less. Based on this analysis, City noise standards would not be exceeded. Therefore, mechanical equipment noise is not anticipated to result in a significant impact. However, the specific building design has not been identified and noise levels without the identified assumptions would likely be up to 50 dBA higher and could exceed the City's standards if the building is not constructed as planned. Thus, the City will be required to conduct a detail noise study to verify noise levels comply with the City Noise Ordinance once design plans are finalized and equipment is selected. However, as demonstrated in this analysis, the proposed structures would reduce the impact to less than significant.

6.4.3 Off-Site Noise

Stationary noise sources off-site are Well No. 11, the Well No. 11 emergency generator, and the Well No. 9 emergency generator. All other off-site project components, such as the access road

and utility line connections, do not have any permanent noise sources. As with on-site sources, off-site sources would be enclosed in masonry structures that would have any ventilation facing away from local residences or Yukon Elementary School. Based on the assumed enclosure, noise levels from Well No. 11 and the 300-kW emergency generator would combine to be 14 dBA L_{eq} at the Yukon Elementary School property line. No other receptors are adjacent to Well No. 11. Based on the assumed enclosure, noise levels from the Well No. 9 250-kW emergency generator would be 42 dBA L_{eq} at the nearest property line to the project site (see Appendix B for modeling results). As with the on-site sources, these noise levels conservatively include the generator operation; however, the generator would only operate once a month for about 15 minutes during servicing. Without the generator operating, noise levels would be approximately 30 dBA L_{eq} less. Therefore, mechanical equipment noise is not anticipated to result in a significant impact. However, the specific building design has not been identified and noise levels without the identified assumptions would likely be up to 50 dBA higher and could exceed the City's standards if the building is not constructed as planned. Thus, the City will be required to conduct a detailed noise study to verify noise levels comply with the City Noise Ordinance, design plans are finalized, and equipment is selected. However, as demonstrated in this analysis, the proposed structures would reduce the impact to less than significant.

In addition to stationary sources, off-site traffic generated by the proposed project would disperse onto Yukon Avenue from the new service drive. Based on the project traffic report and the project description, the project would add one worker on weekdays plus an additional two maintenance trips per month in the peak hour. Since less than one trip per day is expected in any peak hour, project-related traffic would not cause a substantial increase in traffic noise (Caltrans 2009).

SECTION 7.0
NOISE ABATEMENT MEASURES

7.1 REQUIRED NOISE ABATEMENT MEASURES

No construction- or operation-related noise impacts to sensitive receptors were determined in the preceding analysis. As a result, no mitigation is required for project-related construction or operation.

7.2 NOISE ABATEMENT MEASURES

Construction

While no construction noise impacts would occur, the following measures are recommended to minimize construction noise-related annoyance at local receptors:

- All internal combustion engines on construction equipment should be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine should be operated on the project without said muffler.

- Staging areas should be located as far as possible from occupied residences. Work in staging areas that generate loud noises, such as equipment maintenance, should not occur during the hours prohibited for construction work.

- If traffic control and construction signs that require power for lighting or flashing are located near residences, the source of power should be batteries, solar cells, or another quiet source. Gas- or diesel-fueled internal combustion engines should not be used.

- During on-site and off-site construction, where noise levels are in excess of 5 dBA above the ambient at the nearest residential property line and at Yukon Elementary School, acoustical blankets or similar sound absorbing material shall be erected to mitigate noise levels.

Operation

While operational noise impacts are not anticipated, the following measure is required to verify operation-related noise levels at local receptors comply with the City Noise Ordinance:

Prior to issuance of a grading permit for the project, the City shall require a noise study verifying the final design complies with the City Noise Ordinance for exterior noise levels and interior noise levels comply with occupational health and safety worker exposure limits.

SECTION 8.0
REFERENCES

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APPENDIX A
NOISE MEASUREMENT DATA

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
1	19Jul 11	9:17:59	0.6	59.4	59.5	59.4	59.4	69.9	57.6	59.5	59.5	59.5	59.5	59.4
1	19Jul 11	9:18:00	60	57.6	61.1	54.5	55.3	73.7	75.4	60.2	59.7	57.6	57.1	54.5
1	19Jul 11	9:19:00	60	63.2	77	56.5	56.7	97.8	81	70.1	65.8	59.4	58.6	56.5
1	19Jul 11	9:20:00	60	60.6	70.1	58	58.2	76.5	78.4	63.7	62.8	60.3	59.5	58
1	19Jul 11	9:21:00	60	60.2	62.7	58.5	59.1	74.2	78	61.9	61.6	60.5	59.9	58.5
1	19Jul 11	9:22:00	60	60.8	64.1	59.5	60	78.6	78.6	62.8	61.9	60.9	60.6	59.5
1	19Jul 11	9:23:00	60	58	60.1	55.1	56.1	77.6	75.8	59.8	59.5	58.5	57.9	55.1
1	19Jul 11	9:24:00	60	58.9	61.4	57.4	57.4	73.8	76.7	61.2	60.5	59.4	58.8	57.4
1	19Jul 11	9:25:00	60	60	62	58.1	58.8	75.3	77.8	61.7	61.3	60.4	59.9	58.1
1	19Jul 11	9:26:00	60	59.6	62.6	56.8	58.1	75.7	77.4	60.9	60.8	60	59.5	56.8
1	19Jul 11	9:27:00	60	57	59.2	54.7	55.3	71.6	74.7	58.4	57.9	57.4	57.1	54.7
1	19Jul 11	9:28:00	60	59.2	61.5	58	58.3	74.6	77	60.5	60	59.6	59.3	58
1	19Jul 11	9:29:00	60	59.2	61.2	58.1	58.2	73.7	77	60.8	60.2	59.5	59.2	58.1
1	19Jul 11	9:30:00	60	60	64.9	57.1	57.4	77.1	77.7	64.1	63.1	59.7	59.1	57.1
1	19Jul 11	9:31:00	60	59.5	64.5	57.6	57.6	80.8	77.2	61.9	61.2	59.4	58.8	57.6
1	19Jul 11	9:32:00	60	58	62.5	55.4	56	77.5	75.7	61.5	60.1	57.8	57.4	55.4
1	19Jul 11	9:33:00	60	57.1	59.5	55.4	55.5	72.6	74.8	58.8	58.5	57.4	56.8	55.4
1	19Jul 11	9:34:00	60	57.7	61	54.2	55.3	72.8	75.5	60.1	59.5	58.2	57.5	54.2
1	19Jul 11	9:35:00	60	59.7	61.7	57.9	58.4	74.2	77.5	61.5	61	60	59.6	58
1	19Jul 11	9:36:00	60	61.1	63.6	59.6	59.8	77.8	78.9	63.4	62.8	61.3	60.8	59.6
1	19Jul 11	9:37:00	60	60.2	61.9	58.4	59.1	75.9	78	61.6	61.3	60.5	60.1	58.4
1	19Jul 11	9:38:00	20.6	58.2	58.8	57.8	57.8	71.2	71.4	58.8	58.8	58.6	58.4	57.8
		sum	1221.2		**77.0**	**54.2**	**57.8**	**97.8**	**81.0**	**62.7**	**61.3**	**59.5**	**59.0**	**57.3**
		min/ave	20.4	**59.6**						**58.4**	**57.9**	**57.4**	**56.8**	**54.2**
		Hours	0.3							**70.1**	**65.8**	**61.3**	**60.8**	**59.6**

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
2	19Jul 11	9:43:59	0.4	57.7	57.8	57.5	57.5	67.9	54.1	57.8	57.8	57.7	57.5	57.5
2	19Jul 11	9:44:00	60	57.9	59.5	55.8	56.7	72	75.6	59.4	59	58.1	57.7	55.8
2	19Jul 11	9:45:00	60	58.6	62.9	55.9	56.4	73.9	76.4	61.6	60.5	58.9	58	56
2	19Jul 11	9:46:00	60	56.5	58	54.9	55.3	71.9	74.3	57.9	57.7	56.8	56.4	54.9
2	19Jul 11	9:47:00	60	57.6	59.4	55.8	56.2	71.6	75.4	59.4	58.9	58.1	57.5	55.8
2	19Jul 11	9:48:00	60	58.1	60.1	56.4	57	73.6	75.8	59.7	59.3	58.4	57.9	56.4
2	19Jul 11	9:49:00	60	56.1	58.5	53.1	54.4	74.5	73.9	58.1	57.8	56.6	55.9	53.2
2	19Jul 11	9:50:00	60	56.9	59.1	55.2	56.1	74.7	74.7	58	57.9	57.3	56.9	55.2
2	19Jul 11	9:51:00	60	58.7	60.6	56.5	57.1	73.3	76.5	60.6	60.4	59.4	58.4	56.5
2	19Jul 11	9:52:00	60	58.6	60	57.4	57.4	77.5	76.3	59.7	59.5	58.8	58.5	57.4
2	19Jul 11	9:53:00	60	58.9	61.2	56.7	57.3	73.6	76.7	60.7	60.3	59.3	58.7	56.7
2	19Jul 11	9:54:00	60	56.7	59.5	51	51.9	73.6	74.5	58.9	58.6	57.7	57.2	51
2	19Jul 11	9:55:00	60	56.7	59	54.6	54.8	70.7	74.4	58.2	57.9	57.1	56.6	54.6
2	19Jul 11	9:56:00	60	58.3	60.3	55.7	56.3	80.8	76.1	60.3	59.9	58.8	58	55.7
2	19Jul 11	9:57:00	60	58.1	59.8	57.1	57.2	73.6	75.9	59.2	58.9	58.3	57.9	57.1
2	19Jul 11	9:58:00	60	59.4	61.2	57.6	58	83.5	77.2	60.8	60.5	59.7	59.4	57.6
2	19Jul 11	9:59:00	13.6	58.9	59.8	58.4	58.4	72.5	70.3	59.8	59.8	59.3	58.9	58.4
		sum	914.0		**62.9**	**51.0**	**56.4**	**83.5**	**77.2**	**59.6**	**59.3**	**58.3**	**57.8**	**55.9**
		min/ave	15.2	**57.9**						**57.8**	**57.7**	**56.6**	**55.9**	**51.0**
		Hours	0.3							**61.6**	**60.5**	**59.7**	**59.4**	**58.4**

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
3	19Jul 11	10:03:59	0.7	53.7	53.9	53.5	53.5	64.9	52.1	53.9	53.9	53.7	53.5	53.5
3	19Jul 11	10:04:00	60	54.8	56.5	53.6	53.6	69.3	72.6	56	55.8	55	54.6	53.6
3	19Jul 11	10:05:00	60	56.6	58.9	54.6	55	71.2	74.4	58.7	58.4	56.8	56.3	54.6
3	19Jul 11	10:06:00	60	57.4	60.4	55.4	56.2	73.5	75.2	58.9	58.7	57.8	57.4	55.4
3	19Jul 11	10:07:00	60	57.2	59.1	55.4	55.5	72.5	75	59.1	58.8	57.8	56.9	55.4
3	19Jul 11	10:08:00	60	57.5	58.9	55.8	56.6	77.1	75.3	58.7	58.5	57.8	57.5	55.8
3	19Jul 11	10:09:00	60	55.7	57.3	54.4	54.7	69.9	73.4	56.9	56.7	55.9	55.6	54.4
3	19Jul 11	10:10:00	60	56.5	58.7	54.1	54.8	74.1	74.2	57.9	57.7	57	56.5	54.1
3	19Jul 11	10:11:00	60	55.9	58.3	53.7	54.4	71.2	73.7	57.2	56.9	56.3	55.9	54
3	19Jul 11	10:12:00	60	54.2	55.7	53	53.2	70.9	72	55.2	54.9	54.5	54.1	53
3	19Jul 11	10:13:00	60	53.4	56.2	51.3	51.5	66.9	71.2	55.6	55.1	53.7	53	51.3
3	19Jul 11	10:14:00	60	55.6	57.4	53.3	54.2	77.4	73.4	57	56.8	56.1	55.6	53.3
3	19Jul 11	10:15:00	60	55.5	56.9	54.2	54.3	72	73.2	56.8	56.5	55.8	55.4	54.2
3	19Jul 11	10:16:00	60	57.4	59.3	55.7	55.9	71.4	75.2	58.9	58.7	57.8	57.3	55.7
3	19Jul 11	10:17:00	60	58.3	59.7	56.9	57.2	71.6	76.1	59.7	59.6	58.7	58.3	56.9
3	19Jul 11	10:18:00	60	57	58.6	55.3	55.5	70.6	74.7	58.6	58.3	57.3	56.8	55.3
3	19Jul 11	10:19:00	2.1	56	56.2	55.8	55.8	67.8	59.1	56.2	56.2	56.2	56	55.8
		sum	902.8		**60.4**	**51.3**	**55.1**	**77.4**	**76.1**	**57.9**	**57.6**	**56.8**	**56.3**	**54.7**
		min/ave	15.0	**56.4**						**53.9**	**53.9**	**53.7**	**53.0**	**51.3**
		Hours	0.3							**59.7**	**59.6**	**58.7**	**58.3**	**56.9**

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
4	19Jul 11	10:39:50	9.4	61.8	63.3	60	60.3	76.3	71.5	63.3	63.3	62.2	61.5	60
4	19Jul 11	10:40:00	60	61	63	59.6	59.6	77.1	78.8	62.5	62.1	61.3	60.8	59.6
4	19Jul 11	10:41:00	60	60.8	62.9	58.3	59.2	76.3	78.5	62.6	62.3	60.9	60.5	58.3
4	19Jul 11	10:42:00	60	59.2	62.7	57.3	57.4	76.8	77	61.4	60.8	59.5	58.9	57.3
4	19Jul 11	10:43:00	60	61.5	64.2	58.1	58.4	78.7	79.3	63.9	63.7	62.4	61.3	58.1
4	19Jul 11	10:44:00	60	62.6	64.1	61.3	61.5	77.4	80.4	63.9	63.7	63	62.6	61.3
4	19Jul 11	10:45:00	60	62.5	65.2	60.7	61	77.8	80.3	64.8	64.3	62.6	62	60.7
4	19Jul 11	10:46:00	60	64	65.8	62.4	62.6	79	81.8	65.6	65.2	64.4	63.9	62.4
4	19Jul 11	10:47:00	60	63.4	65.7	60.6	61.6	78.2	81.2	65	64.8	63.9	63.3	60.6
4	19Jul 11	10:48:00	60	62.6	64.5	60.6	61.3	79.3	80.4	64.3	63.9	62.9	62.5	60.6
4	19Jul 11	10:49:00	60	63.8	65.5	62.2	62.3	78.2	81.6	65.5	65.3	64.2	63.5	62.2
4	19Jul 11	10:50:00	60	63.2	64.7	61.4	62.1	78.5	81	64.2	63.9	63.5	63.2	61.4
4	19Jul 11	10:51:00	60	64.3	67.3	61.5	61.9	79.1	82.1	66.4	65.8	64.8	64.4	61.5
4	19Jul 11	10:52:00	60	63.6	64.8	61.7	62.2	77.8	81.3	64.8	64.7	64.1	63.6	61.7
4	19Jul 11	10:53:00	60	63.4	65.4	61.4	62	81.9	81.1	64.7	64.4	63.6	63.3	61.4
4	19Jul 11	10:54:00	60	64.4	66.5	62.7	63	81.1	82.2	66.2	65.9	65.1	63.9	62.7
4	19Jul 11	10:55:00	60	63.6	64.9	62	62.3	77.6	81.4	64.8	64.7	64	63.5	62
4	19Jul 11	10:56:00	60	63.2	65.6	59.6	60.6	78.3	81	65.3	64.9	63.8	63.3	59.6
4	19Jul 11	10:57:00	60	64	65.1	63	63.2	77.6	81.8	65	64.9	64.4	64.1	63
4	19Jul 11	10:58:00	60	63.2	64.6	61.6	62.1	77.4	81	64.6	64.1	63.5	63.2	61.6
4	19Jul 11	10:59:00	60	63.1	65.5	61.5	61.7	77.5	80.9	64.9	64.6	63.4	62.9	61.5
4	19Jul 11	11:00:00	60	62.9	64.8	61	61.3	77.4	80.7	64.6	64.3	63.5	63	61
4	19Jul 11	11:01:00	60	63.9	65.4	62.8	63.1	78.4	81.7	65.3	64.9	64.1	63.8	62.8
4	19Jul 11	11:02:00	23.8	62.4	63.5	61.1	61.2	77.6	76.2	63.5	63.5	62.7	62.3	61.1
		sum	1353.2		**67.3**	**57.3**	**61.6**	**81.9**	**82.2**	**64.7**	**64.4**	**63.5**	**62.9**	**61.2**
		min/ave	22.6	**63.1**						**61.4**	**60.8**	**59.5**	**58.9**	**57.3**
		Hours	0.4							**66.4**	**65.9**	**65.1**	**64.4**	**63.0**

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
5	19Jul 11	11:16:59	0.4	62.4	62.7	62.2	62.2	72.3	58.8	62.7	62.7	62.7	62.5	62.2
5	19Jul 11	11:17:00	60	61.1	62.7	59.4	59.4	75.8	78.9	62.7	62.5	61.6	61.2	59.4
5	19Jul 11	11:18:00	60	61.8	64	59.6	60.2	76.4	79.5	63.7	63.4	62.1	61.6	59.6
5	19Jul 11	11:19:00	60	60.7	62.1	59.1	59.4	82.5	78.4	61.9	61.8	61	60.6	59.1
5	19Jul 11	11:20:00	60	61.8	63.5	60.5	60.6	76.1	79.5	63.2	62.8	61.9	61.6	60.5
5	19Jul 11	11:21:00	60	61.8	63.6	60.4	60.7	81	79.6	62.9	62.8	62.1	61.7	60.4
5	19Jul 11	11:22:00	60	62.7	65.2	61.1	61.3	88.5	80.5	64.5	63.9	62.9	62.5	61.1
5	19Jul 11	11:23:00	60	61.7	62.9	60.7	60.7	75.7	79.5	62.8	62.7	62	61.7	60.7
5	19Jul 11	11:24:00	60	62	63.8	60.7	61.1	76.6	79.8	63.4	63	62.3	61.9	60.7
5	19Jul 11	11:25:00	60	61.7	63.8	60.1	60.3	76.9	79.4	63.1	62.8	62	61.5	60.1
5	19Jul 11	11:26:00	60	62.4	64.4	60.2	60.4	79	80.1	64.2	63.8	62.8	62.3	60.2
5	19Jul 11	11:27:00	60	62	64.1	60.4	61	78	79.7	63.6	63.2	62.3	61.8	60.4
5	19Jul 11	11:28:00	60	61.4	63.5	59.7	60.1	76.9	79.2	63	62.7	61.7	61.4	59.7
5	19Jul 11	11:29:00	60	61.7	63.2	60.1	60.4	75.9	79.5	62.9	62.7	62	61.5	60.1
5	19Jul 11	11:30:00	60	61.8	63.2	59.8	60.4	76.3	79.5	62.9	62.8	62.2	61.7	59.8
5	19Jul 11	11:31:00	60	62	64.6	60.5	60.6	79.3	79.7	63.9	63.5	61.9	61.6	60.5
5	19Jul 11	11:32:00	38.3	63.7	64.9	61.7	62.1	80.3	79.5	64.9	64.7	64.1	63.7	61.7
		sum	938.7		**65.2**	**59.1**	**60.6**	**88.5**	**80.5**	**63.4**	**63.1**	**62.2**	**61.8**	**60.3**
		min/ave	15.6	**61.9**						**61.9**	**61.8**	**61.0**	**60.6**	**59.1**
		Hours	0.3							**64.9**	**64.7**	**64.1**	**63.7**	**62.2**

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(90)	Peak	SEL	L(5)	L(10)	L(33)	L(50)	L(99)
6	19Jul 11	11:44:59	0.3	61.6	62.1	61.4	61.4	75.9	57	62.1	62	61.8	61.6	61.4
6	19Jul 11	11:45:00	60	60.2	64.9	57	58.1	80.1	78	63.9	62.5	60.2	59.5	57.1
6	19Jul 11	11:46:00	60	60	64.4	57.1	57.6	79.3	77.8	63.3	62.1	60.2	59.5	57.1
6	19Jul 11	11:47:00	60	63.3	68	58	59.1	80.7	81.1	67.3	66.3	63.6	62.6	58.1
6	19Jul 11	11:48:00	60	61.5	67.1	58.6	59.1	89.7	79.2	64.4	63.9	61.3	60.3	58.6
6	19Jul 11	11:49:00	60	61.9	65.5	58.3	58.9	77.6	79.7	65.2	64.5	62.4	60.8	58.3
6	19Jul 11	11:50:00	60	65.9	71.1	60.6	60.9	83.3	83.6	69.4	68.5	66.4	65.1	60.6
6	19Jul 11	11:51:00	60	62	65.1	59	60	78.3	79.8	64.4	63.8	62.5	61.8	59.1
6	19Jul 11	11:52:00	60	60.5	65.3	57.9	58.4	80.7	78.3	62.9	62.3	60.8	59.9	58
6	19Jul 11	11:53:00	60	63.2	66.3	59.3	60.5	79.8	80.9	65.8	65.4	63.7	62.8	59.3
6	19Jul 11	11:54:00	60	62.4	65.2	57.9	58.7	79.3	80.1	64.5	64	63	62.5	58
6	19Jul 11	11:55:00	60	61.7	65.3	58.5	59.3	79.3	79.5	63.9	63.4	62	61.5	58.5
6	19Jul 11	11:56:00	60	61.8	67.2	59.2	59.5	86.6	79.6	65.7	64.4	61.6	61.1	59.2
6	19Jul 11	11:57:00	60	62.7	68.7	57.7	58.4	82.2	80.5	67.2	65.7	62.5	61.1	57.7
6	19Jul 11	11:58:00	60	65.5	74.1	59.8	61	88.7	83.3	71.7	68.4	64.2	63.1	59.8
6	19Jul 11	11:59:00	60	63.7	69.4	58.6	59.5	80.8	81.4	68.1	66.7	64	61.6	58.6
6	19Jul 11	12:00:00	9.2	59.7	60.3	58.9	59.1	72.5	69.3	60.3	60.2	59.7	59.6	59
		sum	909.5		**74.1**	**57.0**	**59.4**	**89.7**	**83.6**	**66.6**	**65.2**	**62.9**	**61.8**	**58.6**
		min/ave	15.2	**62.7**						**60.3**	**60.2**	**59.7**	**59.5**	**57.1**
		Hours	0.3							**71.7**	**68.5**	**66.4**	**65.1**	**61.4**

Site	Date	Time	Duration	Leq		Lmax	Lmin	Peak	L(90)	SEL	Uwpk	L(5)	L(10)	L(33)	L(50)	L(99)
LT	19Jul 11	9:00:00	900	56.5	4.02E+08	69.3	51.1	84.7	54.1	86.1	0	58.8	58	56.8	56.2	52.3
LT	19Jul 11	9:15:00	900	58.1	5.81E+08	73.7	53.4	94.5	55.7	87.6	106.5	60	59.4	58.1	57.5	53.6
LT	19Jul 11	9:30:00	900	58.1	5.81E+08	62.5	52.2	78.1	54.5	87.6	0	60.9	60.4	58.8	57.8	52.9
LT	19Jul 11	9:45:00	900	58.8	6.83E+08	64.3	51.7	76.9	56.4	88.4	0	60.9	60.6	59.3	58.6	53.2
LT	19Jul 11	10:00:00	900	59.9	8.80E+08	64.1	54.3	78.4	57.2	89.5	0	62.6	62	60.5	59.5	55.2
LT	19Jul 11	10:15:00	900	61	1.13E+09	65.8	55.4	79.4	59	90.6	0	63.2	62.7	61.5	60.9	57.1
LT	19Jul 11	10:30:00	900	60.8	1.08E+09	70.1	55.6	89.1	57.5	90.4	115.4	63.2	62.8	61.4	60.6	56.1
LT	19Jul 11	10:45:00	900	62.5	1.60E+09	66.7	58.6	80.8	60.9	92	0	64.3	63.9	62.9	62.3	59.4
LT	19Jul 11	11:00:00	900	62.6	1.64E+09	67.1	59.7	81	61	92.1	0	64.5	63.9	62.9	62.5	60
LT	19Jul 11	11:15:00	900	62.8	1.71E+09	66.7	59.8	79.8	61.2	92.3	0	64.7	64.1	63	62.5	60.2
LT	19Jul 11	11:30:00	900	62.9	1.75E+09	69.7	59.4	83.1	61.2	92.5	0	64.9	64.3	63.3	62.7	59.8
LT	19Jul 11	11:45:00	900	62.4	1.56E+09	65.5	59	80.1	60.7	92	0	64.2	63.8	62.8	62.3	59.4
LT	19Jul 11	12:00:00	900	62.2	1.49E+09	70.1	58	84.3	60.1	91.7	0	65	63.9	62.4	61.7	58.3
LT	19Jul 11	12:15:00	900	62.2	1.49E+09	65.5	57.4	80	60.8	91.8	0	63.9	63.6	62.6	62.1	59.1
LT	19Jul 11	12:30:00	900	62.8	1.71E+09	72.8	58.4	86.4	60.7	92.4	0	65.1	64.5	63.2	62.5	59.3
LT	19Jul 11	12:45:00	900	62.9	1.75E+09	68	59.5	84.3	61.1	92.5	0	64.8	64.3	63.3	62.8	59.8
LT	19Jul 11	13:00:00	900	63.5	2.01E+09	70.3	59.2	85	61.5	93	0	65.7	64.9	63.7	63.1	59.6
LT	19Jul 11	13:15:00	900	63.7	2.11E+09	69.2	60.3	82.6	62.1	93.3	0	65.9	65.2	64	63.5	61
LT	19Jul 11	13:30:00	900	64.2	2.37E+09	71.7	61.2	83.1	62.4	93.7	0	65.9	65.5	64.5	64	61.3
LT	19Jul 11	13:45:00	900	63.5	2.01E+09	68.7	60.4	82	62	93.1	0	65.1	64.8	63.9	63.4	60.8
LT	19Jul 11	14:00:00	900	63.9	2.21E+09	71.8	60.7	84.4	62.1	93.4	0	66	65.5	64	63.4	61.1
LT	19Jul 11	14:15:00	900	63	1.80E+09	67.8	59.6	84.7	61.4	92.6	0	64.9	64.4	63.4	62.8	60
LT	19Jul 11	14:30:00	900	62.5	1.60E+09	66.6	58.8	91.9	60.8	92.1	0	64.2	63.8	62.9	62.4	59.4
LT	19Jul 11	14:45:00	900	62.9	1.75E+09	73.3	59.6	89	61.2	92.5	0	64.6	63.9	63	62.5	60.1
LT	19Jul 11	15:00:00	900	62.8	1.71E+09	67.3	58.6	90	61.1	92.4	0	64.7	64.2	63.2	62.7	59.7
LT	19Jul 11	15:15:00	900	62.8	1.71E+09	74	57.9	90.6	60.6	92.4	0	64.7	64	62.9	62.3	59
LT	19Jul 11	15:30:00	900	62.5	1.60E+09	65.6	59.2	81.5	61.2	92.1	0	64	63.7	62.9	62.5	59.7
LT	19Jul 11	15:45:00	900	61.9	1.39E+09	65.4	58	79	60.3	91.4	0	63.7	63.2	62.3	61.8	59.2
LT	19Jul 11	16:00:00	900	61.9	1.39E+09	66.6	58.3	81.3	60.2	91.4	0	63.7	63.2	62.2	61.7	58.6
LT	19Jul 11	16:15:00	900	62.1	1.46E+09	68.6	58	83.1	60.4	91.7	0	64	63.5	62.4	61.9	58.8
LT	19Jul 11	16:30:00	900	62.2	1.49E+09	66.9	57.8	80.9	60.3	91.7	0	64.5	63.8	62.4	61.8	59.1
LT	19Jul 11	16:45:00	900	61.9	1.39E+09	65.8	57.5	79.9	60.2	91.4	102.1	63.8	63.3	62.2	61.6	59
LT	19Jul 11	17:00:00	900	62.3	1.53E+09	66.1	59.3	81.8	60.5	91.8	0	64.3	63.8	62.6	62	59.6
LT	19Jul 11	17:15:00	900	62.4	1.56E+09	72	58.6	90	60.2	92	0	64.6	63.8	62.3	61.7	59
LT	19Jul 11	17:30:00	900	61.9	1.39E+09	65.2	58.9	81.8	60.4	91.4	0	63.7	63.3	62.2	61.7	59.3
LT	19Jul 11	17:45:00	900	61.6	1.30E+09	65.8	58.5	82.2	60.1	91.2	0	63.3	62.8	61.9	61.5	59
LT	19Jul 11	18:00:00	900	62.5	1.60E+09	65.5	59.4	84.5	60.8	92	0	64.5	63.9	62.8	62.3	60
LT	19Jul 11	18:15:00	900	62.8	1.71E+09	70.3	58.8	83.2	60.8	92.3	0	65	64	62.8	62.3	59.8
LT	19Jul 11	18:30:00	900	63.6	2.06E+09	71	59.4	89.8	61.8	93.1	0	65.7	65	63.8	63.3	60.2
LT	19Jul 11	18:45:00	900	61.9	1.39E+09	66.3	57.1	80.3	60	91.4	0	63.8	63.3	62.3	61.7	58
LT	19Jul 11	19:00:00	900	61.4	1.24E+09	65.3	57	79.5	59.2	90.9	0	63.6	63	61.8	61.3	57.5
LT	19Jul 11	19:15:00	900	61.5	1.27E+09	67.2	57	81.8	59.4	91	102.1	63.7	62.9	61.7	61.2	57.7
LT	19Jul 11	19:30:00	900	61.3	1.21E+09	65.8	57	79.1	59.3	90.8	0	63.5	62.8	61.6	61.1	57.8
LT	19Jul 11	19:45:00	900	59.3	7.66E+08	70.3	47.3	84	49.9	88.8	0	63.9	63	60.6	55.8	48
LT	19Jul 11	20:00:00	900	56.4	3.93E+08	62.1	53.1	74.5	54.4	86	0	58.5	57.9	56.7	56.3	53.2
LT	19Jul 11	20:15:00	900	58	5.68E+08	65.2	55	78.3	56.2	87.5	0	60	59.3	58.2	57.6	55.2
LT	19Jul 11	20:30:00	900	57.4	4.95E+08	63.1	53.2	76.3	55.1	87	0	60.2	58.9	57.6	57	53.6
LT	19Jul 11	20:45:00	900	58.2	5.95E+08	65.9	53.9	78.9	55.9	87.7	0	60.6	59.8	58.4	57.7	54.2

LT	19Jul 11	21:00:00	900	58.6	6.52E+08	75.8	53.4	91.1	56.1	88.2	0	60.6	59.7	58.2	57.6	54.8
LT	19Jul 11	21:15:00	900	58.5	6.37E+08	67.6	54.9	82.4	56.4	88	0	60.7	59.9	58.7	58.2	55.2
LT	19Jul 11	21:30:00	900	57.5	5.06E+08	65.6	52.1	81.2	54.4	87	0	60.8	59.8	57.5	56.5	53
LT	19Jul 11	21:45:00	900	57.3	4.83E+08	70.3	53.7	82.3	55	86.9	0	59.3	58.6	57.2	56.6	54
LT	19Jul 11	22:00:00	900	59.6	8.21E+08	64.7	53	79.4	55.6	89.2	0	62.7	62	60.2	59.3	53.9
LT	19Jul 11	22:15:00	900	60.3	9.64E+08	66.4	55.8	82.2	57.7	89.8	0	62.8	62.1	60.7	59.9	56.2
LT	19Jul 11	22:30:00	900	59.3	7.66E+08	64	54.9	85.3	57.1	88.8	0	61.7	61	59.8	59.1	55.4
LT	19Jul 11	22:45:00	900	59.1	7.32E+08	64.4	52.4	78.7	56.3	88.6	0	61.8	61.1	59.5	58.7	53.6
LT	19Jul 11	23:00:00	900	59.6	8.21E+08	63.8	54.9	77	57.3	89.1	0	62	61.5	60	59.3	55.9
LT	19Jul 11	23:15:00	900	59.2	7.49E+08	63.4	53.6	79.1	56.6	88.7	0	61.8	61.2	59.7	58.9	54.5
LT	19Jul 11	23:30:00	900	58.3	6.08E+08	65.7	52.7	79.8	55.5	87.9	0	61.2	60.4	58.7	57.7	53.4
LT	19Jul 11	23:45:00	900	58.5	6.37E+08	66.1	53.2	78.9	54.7	88	0	62	60.8	58.7	57.8	53.4
LT	20Jul 11	0:00:00	900	58.5	6.37E+08	65.2	52.4	82.4	55.6	88	0	61.5	60.6	58.7	57.9	53
LT	20Jul 11	0:15:00	900	58.6	6.52E+08	65	51.1	79.6	54.7	88.1	0	62.1	61	58.9	57.7	52.2
LT	20Jul 11	0:30:00	900	56.8	4.31E+08	64.8	51.2	82.4	53.2	86.4	0	60.1	59.1	57	56	51.5
LT	20Jul 11	0:45:00	900	56.5	4.02E+08	63.7	48.4	84.3	52.3	86.1	0	60.1	59	56.9	55.7	50.2
LT	20Jul 11	1:00:00	900	56.7	4.21E+08	64.4	50.3	80	52.3	86.2	0	60.4	59.5	56.9	55.7	50.8
LT	20Jul 11	1:15:00	900	57.6	5.18E+08	68.3	48.9	82.2	52.6	87.2	0	61.6	60.3	57.4	56.3	49.8
LT	20Jul 11	1:30:00	900	56.3	3.84E+08	65.2	48.9	76.3	52.1	85.8	0	59.8	58.8	56.6	55.5	49.7
LT	20Jul 11	1:45:00	900	55.5	3.19E+08	62.8	47.2	79.8	50.4	85.1	0	59.6	58.4	55.9	54.6	48.2
LT	20Jul 11	2:00:00	900	56.3	3.84E+08	64.2	48.3	78.3	50.8	85.9	0	60.9	59.5	56.5	55.1	49
LT	20Jul 11	2:15:00	900	56.6	4.11E+08	63.9	45.3	77.9	51	86.2	0	61.2	60.2	56.8	55.1	46.1
LT	20Jul 11	2:30:00	900	56.8	4.31E+08	64.9	46.5	78.8	50.6	86.4	0	60.9	59.7	57.2	55.8	47.6
LT	20Jul 11	2:45:00	900	56.1	3.67E+08	63.9	46.1	79.2	50.2	85.6	0	60.7	59.2	56.3	54.9	46.5
LT	20Jul 11	3:00:00	900	55.9	3.50E+08	64.6	47.8	79.2	50.7	85.4	0	60.5	58.9	55.9	54.6	48.8
LT	20Jul 11	3:15:00	900	58.1	5.81E+08	68.8	48.1	82.9	52.6	87.6	0	63	61.5	57.6	56.1	49.1
LT	20Jul 11	3:30:00	900	57.2	4.72E+08	65.3	49.3	78.5	52.5	86.7	0	60.7	59.8	57.7	56.5	50.1
LT	20Jul 11	3:45:00	900	57.5	5.06E+08	64.1	50	77.3	53.5	87.1	0	61.2	60.3	58.1	56.8	51.5
LT	20Jul 11	4:00:00	900	58.6	6.52E+08	70.5	49.9	87.3	53.4	88.2	0	62.8	61.3	58.4	57.1	50.5
LT	20Jul 11	4:15:00	900	60.6	1.03E+09	67.1	53.6	80.8	57.3	90.1	0	63.6	62.5	60.8	60	55.4
LT	20Jul 11	4:30:00	900	60.7	1.06E+09	66.6	53.6	81.4	56.9	90.3	0	63.8	62.9	61	60.1	55.1
LT	20Jul 11	4:45:00	900	59.2	7.49E+08	70	50.7	90	53.1	88.8	105.6	64.1	63	59	56.6	51.3
LT	20Jul 11	5:00:00	900	59.7	8.40E+08	65	50	80.8	54.2	89.3	106.5	63.3	62.7	60.7	58.8	51.1
LT	20Jul 11	5:15:00	900	66.7	4.21E+09	72.6	56.6	86.5	62.9	96.3	114.1	69.9	69.3	67.3	66	59.2
LT	20Jul 11	5:30:00	900	65.4	3.12E+09	69.6	50.3	82.9	62.1	94.9	114.8	67.8	67.3	65.9	65.3	54.2
LT	20Jul 11	5:45:00	900	66.9	4.41E+09	70.9	59	86	64.9	96.4	114.8	68.8	68.4	67.3	66.7	61.4
LT	20Jul 11	6:00:00	900	66.8	4.31E+09	71.5	55.5	83.8	64.2	96.3	116.6	68.9	68.5	67.4	66.7	60
LT	20Jul 11	6:15:00	900	66.7	4.21E+09	72.5	53.5	86.7	64.1	96.3	121.2	69	68.5	67.2	66.6	59.1
LT	20Jul 11	6:30:00	900	66.7	4.21E+09	71.4	49.9	86.2	63.1	96.3	117.7	69.4	68.8	67.5	66.7	56.2
LT	20Jul 11	6:45:00	900	64	2.26E+09	69.2	47.3	81.8	59.7	93.5	125	66.8	66.2	64.9	63.9	55
LT	20Jul 11	7:00:00	900	64.1	2.31E+09	69.6	51.2	85.6	60.7	93.6	120.1	66.7	66	64.6	63.9	55.4
LT	20Jul 11	7:15:00	900	63.4	1.97E+09	68.4	48.8	83.5	60.8	93	115.4	65.9	65.3	63.8	63.2	55.6
LT	20Jul 11	7:30:00	900	63.9	2.21E+09	68.3	53.2	82.6	61.1	93.5	114.1	66.4	65.8	64.4	63.6	57.2
LT	20Jul 11	7:45:00	900	64.5	2.54E+09	67.8	55.1	81.4	62	94	117.2	66.6	66	65	64.4	58
LT	20Jul 11	8:00:00	900	64.6	2.60E+09	70.4	44.4	84.2	59.1	94.1	119.4	67.4	66.7	65.3	64.5	50.1
LT	20Jul 11	8:15:00	900	63.5	2.01E+09	67.7	47.3	81.8	59.2	93	116	66.2	65.7	64.3	63.5	52.8
LT	20Jul 11	8:30:00	900	62.7	1.68E+09	74.5	41.5	90.9	59.1	92.3	112.5	64.1	63.8	62.7	62.1	47.6
LT	20Jul 11	8:45:00	900	61.8	1.36E+09	69.6	48	84.7	58.6	91.4	111.7	63.8	63.4	62.3	61.7	51.8
		sum	86400		1.31E+11	**75.8**	**41.5**	**94.5**		**96.4**	**125.0**	**52.6**	**52.0**	**50.6**	**49.9**	**45.5**
		min/ave	1440	**61.8**					**L(90)**			**58.5**	**57.9**	**55.9**	**54.6**	**46.1**
		Hours	24.0					**Averge**	**47.7**			**69.9**	**69.3**	**67.5**	**66.7**	**61.4**
								Minimum	**49.9**							
								Maximu	**64.9**							

Hour	Leq
9:00 AM	58
10:00 AM	61
11:00 AM	63
12:00 PM	63
1:00 PM	64
2:00 PM	63
3:00 PM	63
4:00 PM	62
5:00 PM	62
6:00 PM	63
7:00 PM	61
8:00 PM	58
9:00 PM	58
10:00 PM	60
11:00 PM	59
12:00 AM	58
1:00 AM	57
2:00 AM	56
3:00 AM	57
4:00 AM	60
5:00 AM	65
6:00 AM	66
7:00 AM	64
8:00 AM	63
Average	**62**
Min	**56**
Max	**66**

24-Hour Leq	61.8
CNEL	68.0
Ldn	67.9
Max Leq	66.2
Min Leq	56.5
Lmax	75.8
Lmin	41.5
Peak	94.5
Average L_{10}	52.0
Average L_{33}	50.6
Average L_{50}	49.9
Average L_{90}	47.7

	Leq	Lmax	L50avg	L90avg
Daytime-Evenin	62.4	74.5	63.7	62.5
Nighttime	60.9	59.0	61.6	59.6

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-6 SLM Model: B20 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

LOCATION

Location Description: IN PARKING LOT OF YUKON ELEMENTARY

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: >00 ft

Distance from barriers: 300 ft Barrier Type: CONCRETE WALL Barrier Height: 10 ft

Location Comments: THE BARRIER IS ONLY PARTIAL. REFER TO DRAWING.

METEOROLOGY

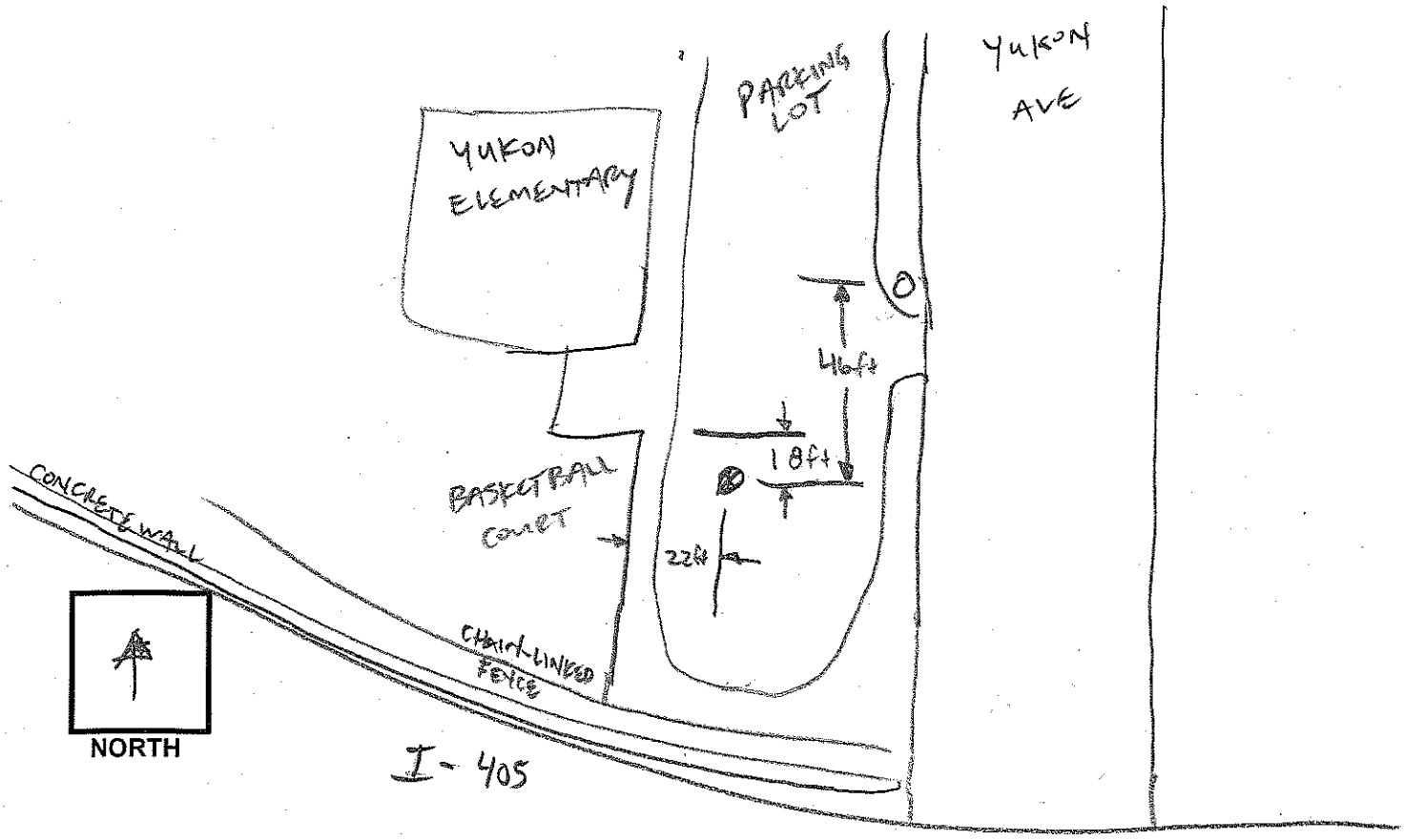
Temperature: 83°F Wind Speed: 1.9 mph

Wind Direction: EAST SOUTH Other (gusts, etc.): ____

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-6 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 11:45 Stop Time: 12:00

Principal Source(s): TRAFFIC ON I-405

Other Source(s): BIRD VOCALIZATION TRAFFIC ON YUKON AVE
HEAVY TRUCKS ENTERING/EXITING BUSINESS ACROSS THE STREET (48M)

Average Observed Noise Level: ____

Maximum L_{eq} Observed: 74 Source(s): TRUCK PULLING OUT OF DRIVEWAY NEAR METER

Minimum L_{eq} Observed: ____

Comments: ____

MISC. DATA/SKETCH

TRAFFIC WEST BOUND ONLY ON I-405 65 mph

	AUTOS	MED	HEAVY
11:50-11:55	100 X \ 100 100 100 (415)	X ||| (13)	X X ~~||||~~ ||| (28)
TRAFFIC ON YUKON 35 mph 11:55 12:00 BOTH DIRECTIONS	~~||||~~ ~~||||~~ ~~||||~~ X |||| (29)	|| (2)	

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLOS

Receptor ID: ML-5 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 576B) Data File: ____

LOCATION

Location Description: WESTERN PROPERTY BOUNDARY OF YUKON ELEMENTARY SCHOOL

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 190 ft

Distance from barriers: 190 ft Barrier Type: CONCRETE BLOCK Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

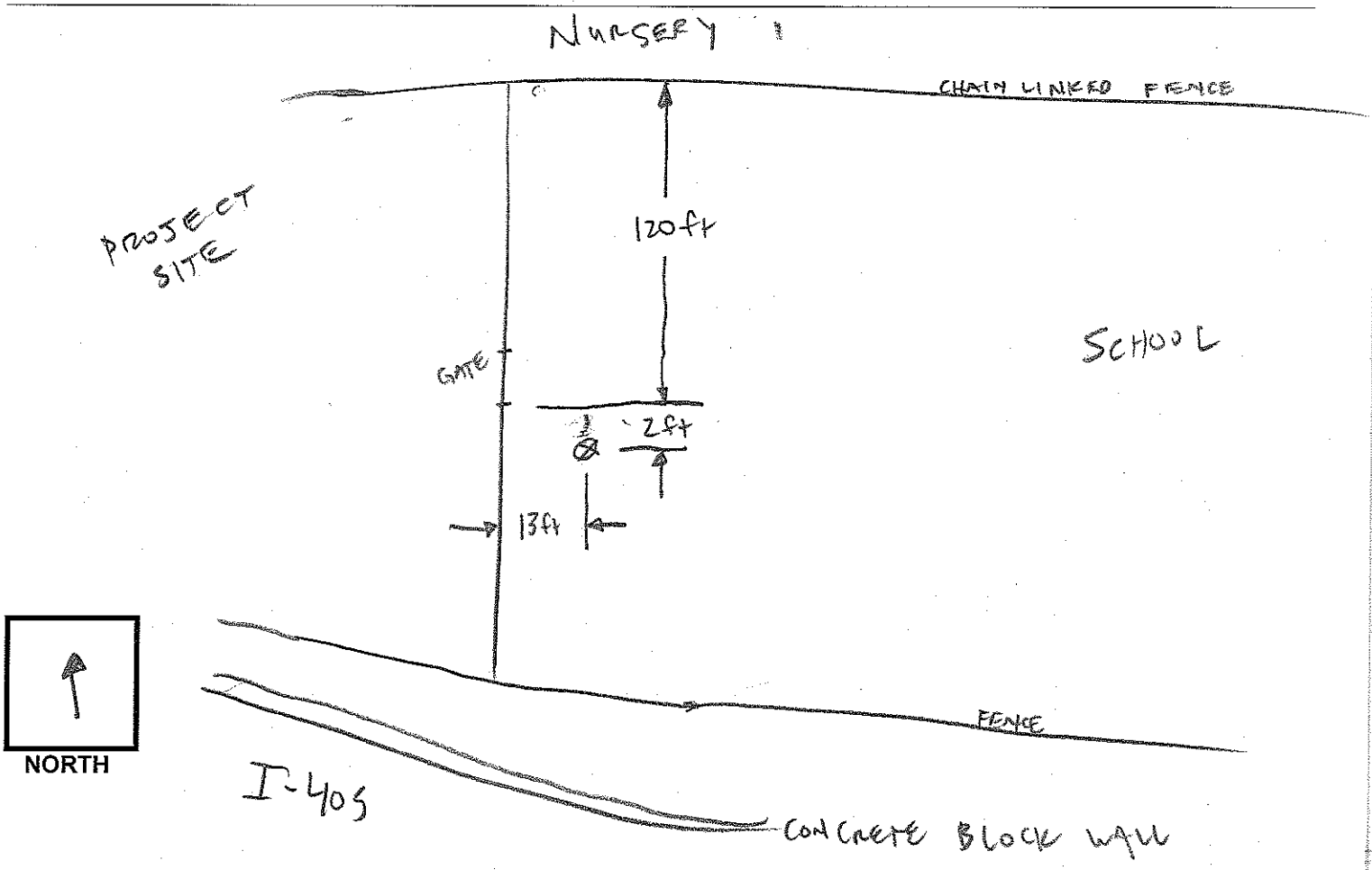
Temperature: 78°F Wind Speed: 1.9 mph

Wind Direction: EASTBOUND Other (gusts, etc.): ____

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187514 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-5 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 11:17 Stop Time: 11:32

Principal Source(s): TRAFFIC ON I-405

Other Source(s): BIRD VOCALIZATIONS

Average Observed Noise Level: 61

Maximum L_{eq} Observed: 64 Source(s): TRAFFIC ON I-405

Minimum L_{eq} Observed: 58

Comments:

MISC. DATA/SKETCH

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12,000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: LT SLM Model: 820 (SN: 1573) Calibrator Model: 200 (SN: 4637) Data File: ____

LOCATION

Location Description: IN THE MIDDLE OF THE NORTHERN PROPERTY LINE OF PROJECT SITE

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 175 ft

Distance from barriers: 175 ft Barrier Type: CONCRETE Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

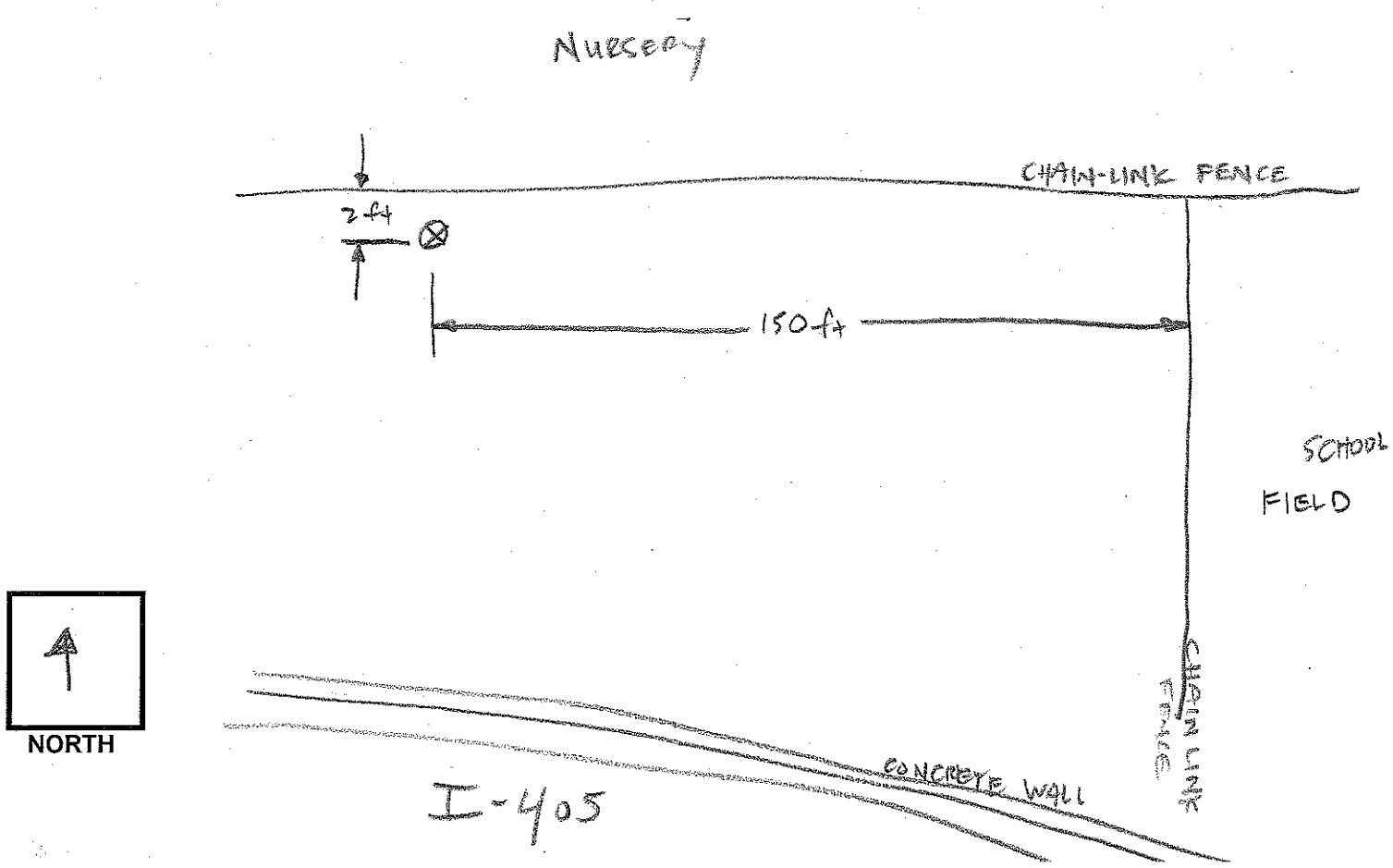
Temperature: ____ Wind Speed: ____

Wind Direction: ____ Other (gusts, etc.): ____

Meteorological Comments: ____

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLS

Receptor ID: LT SLM Model: 820 (SN: 1573) Calibrator Model: 200 (SN: 4637) Data File: ____

MEASUREMENT INFORMATION

Start Time: 8:06 Stop Time: 10:16 7/20/11

Principal Source(s): 7/19/11 TRAFFIC ON I-405

Other Source(s): ACTIVITY AT NURSERY

Average Observed Noise Level: ____

Maximum L_{eq} Observed: ____ Source(s): ____

Minimum L_{eq} Observed: ____

Comments:

10:31 – HEARD AN ACCIDENT OCCUR ON I-405

A DUMP TRUCK DELIVERED DECOMPOSED GRANITE AND DUMPED IT AROUND THE ELECTRICAL TOWERS IN THE NURSERY.

THERE IS POTENTIAL FOR IT TO CONTINUE ALL DAY.

MISC. DATA/SKETCH

PROJECT: TORRANCE WELLFIELD **PROJECT #:** 60187814 12,000

DATE: 7/19/11 **ENGINEER/ANALYST:** P PELLOS

Receptor ID: ML-1 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

LOCATION

Location Description: NORTH WESTERN END OF THE BIG SEVEN NURSERY
17715 YUKON AVE

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 133 ft

Distance from barriers: 133 ft Barrier Type: CONCRETE WALL Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

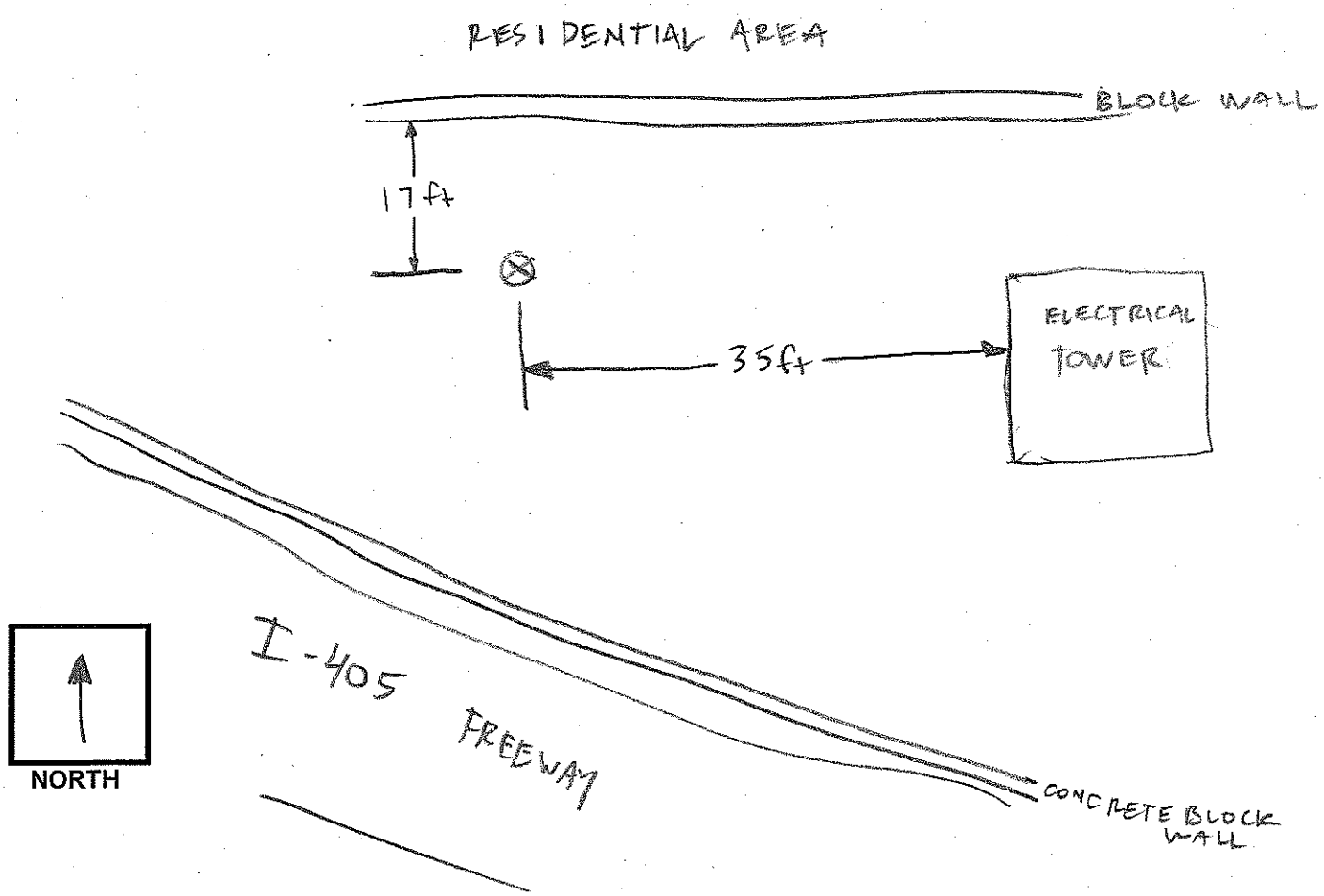
Temperature: 78°F Wind Speed: 0.8 mph

Wind Direction: WEST BOUND Other (gusts, etc.): ____

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRENCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLOS

Receptor ID: M2-1 SLM Model: 820 (SN: 1671) Calibrator Model: CAL 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 9:18 Stop Time: 9:38

Principal Source(s): TRAFFIC ON I-405

Other Source(s): ACTIVITY AT NURSERY; BIRD VOCALIZATIONS; AIRPLANES

Average Observed Noise Level: 60

Maximum L_{eq} Observed: 77 Source(s): DUMP TRUCK DUMPING D.G. IN NURSERY AREA

Minimum L_{eq} Observed: 55

Comments:

RELATIVELY STEADY NOISE LEVEL FROM THE I-405.

D.G. — DECOMPOSED GRANITE

MISC. DATA/SKETCH

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-2 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

LOCATION

Location Description: BETWEEN 2 ELECTRICAL TOWERS IN THE BIG SEVEN NURSERY 17715 YUKON AVE

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 234 ft

Distance from barriers: 234 ft Barrier Type: CONCRETE Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

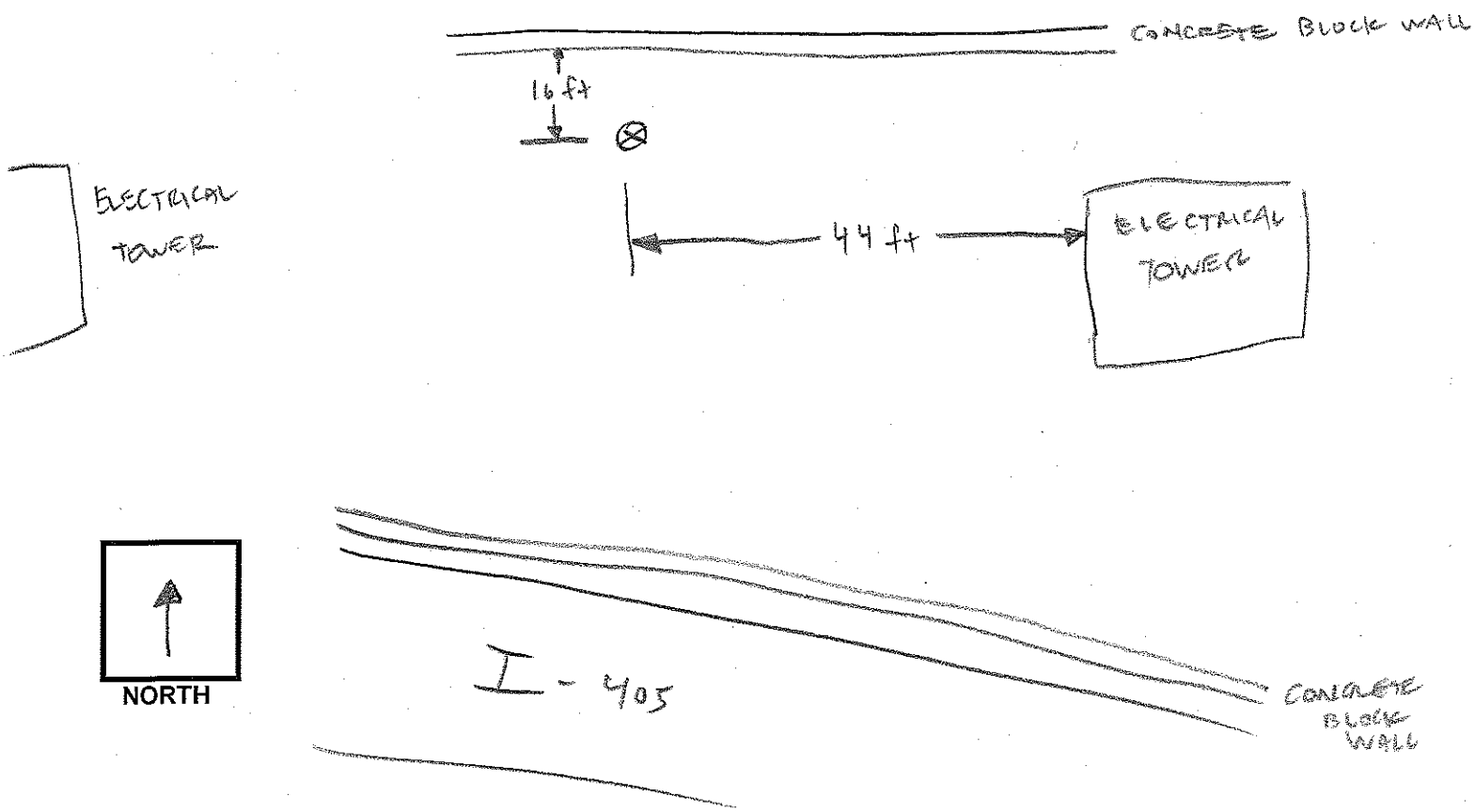
Temperature: 78°F Wind Speed: 0.8 mph

Wind Direction: EAST BOUND Other (gusts, etc.): ____

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-2 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 9:44 Stop Time: 9:59

Principal Source(s): TRAFFIC ON I-405

Other Source(s): BIRD VOCALIZATIONS

Average Observed Noise Level: 58

Maximum L_{eq} Observed: 61 Source(s): TRAFFIC ON 405

Minimum L_{eq} Observed: 56

Comments:

NO OTHER OBSERVED NOISE SOURCES

MISC. DATA/SKETCH

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187314 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLOS

Receptor ID: ML-3 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

LOCATION

Location Description: WEST OF THE OFFICE TRAILER FOR THE BIG SEVEN NURSERY 17715 YUKON AVE

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 377 ft

Distance from barriers: 377 ft Barrier Type: CONCRETE BLOCK Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

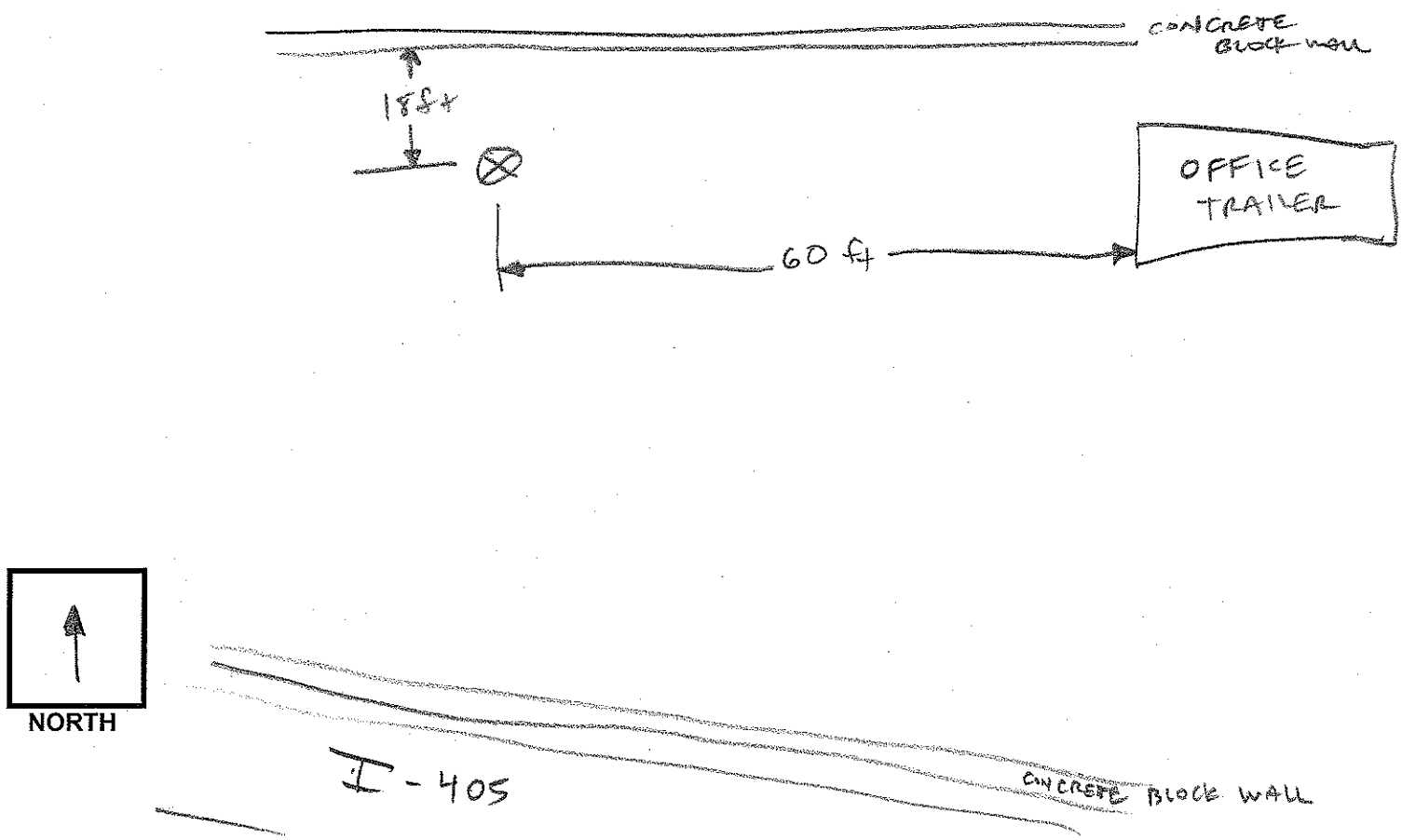
Temperature: 85 °F Wind Speed: 0

Wind Direction: — Other (gusts, etc.): —

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R PELLOS

Receptor ID: ML-3 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 10:04 Stop Time: 10:19

Principal Source(s): TRAFFIC ON I-405

Other Source(s): BIRD VOCALIZATIONS

Average Observed Noise Level: 57

Maximum L_{eq} Observed: 60 Source(s): TRAFFIC ON I-405

Minimum L_{eq} Observed: 53

Comments:

MISC. DATA/SKETCH

PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60187814 12.000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLOS

Receptor ID: ML-4 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 576B) Data File: ____

LOCATION

Location Description: NEXT TO LT METER; ALONG SOUTHERN PROPERTY LINE OF THE BIG SEVEN NURSERY 17715 YUKON AVE

(Sketch meter location below and take at least 2 photographs of meter location)

Distance from noise source: 170 ft

Distance from barriers: 170ft Barrier Type: CONCRETE BLOCK Barrier Height: 10 ft

Location Comments: ____

METEOROLOGY

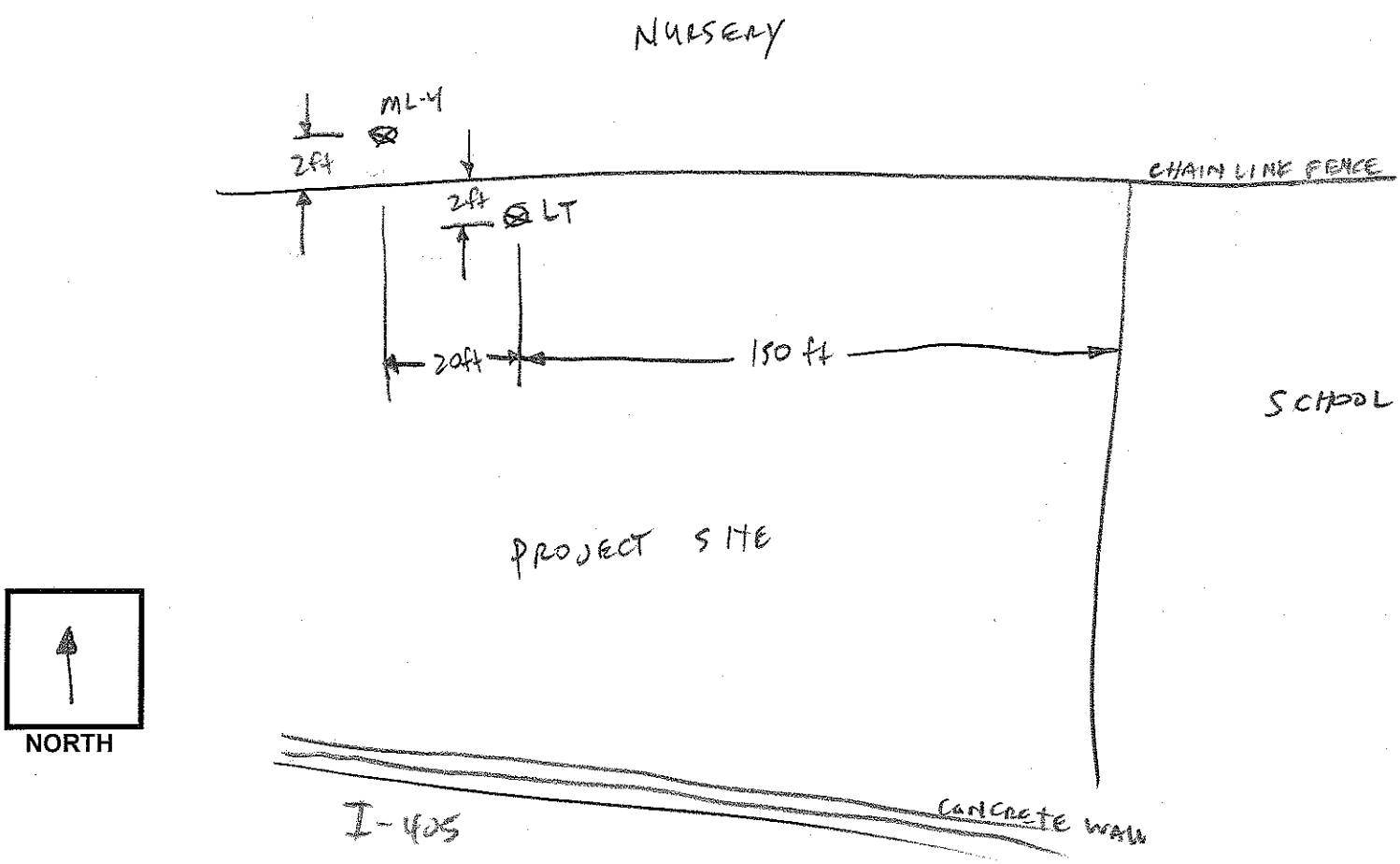
Temperature: 80 °F Wind Speed: 1.5 mph

Wind Direction: EAST BOUND Other (gusts, etc.): ____

Meteorological Comments: SUNNY

Sketch Area

(Sketch must include a minimum of 2 (X and Y) distances from major physical objects, e.g. buildings, roadways, walls, etc.)



PROJECT: TORRANCE WELLFIELD PROJECT **PROJECT #:** 60157514 12,000

DATE: 7/19/11 **ENGINEER/ANALYST:** R. PELLOS

Receptor ID: ML-4 SLM Model: 820 (SN: 1671) Calibrator Model: 200 (SN: 5768) Data File: ____

MEASUREMENT INFORMATION

Start Time: 10:40 Stop Time: 11:02

Principal Source(s): TRAFFIC ON I-405

Other Source(s): BIRD VOCALIZATIONS; AIRPLANES (HIGHLEVEL COMMERCIAL JETS)

Average Observed Noise Level: 62

Maximum L_{eq} Observed: 65 Source(s): TRAFFIC ON I-405

Minimum L_{eq} Observed: 58

Comments:

MISC. DATA/SKETCH

APPENDIX B
CALCULATIONS

Appendix B

Stationary Source Noise Prediction Model

North Torrance Wellfield Project

AECOM

Scenario	Reference Noise Level	Enclosure Reduction Factor	Reference Distance	Type of Source (Point, Line, Point-Line)	Distance to Property Line	Noise Level At Receiver
On Site Noise to Yukon Elementary Property Line						
Booster Pump 1, 400 hp	92.0	-50.0	3	Point	50	12
Booster Pump 2, 400 hp	92.0	-50.0	3	Point	50	12
Booster Pump 3, 400 hp	92.0	-50.0	3	Point	50	12
Well 10, 200 hp	87.0	-50.0	3	Point	285	0
1,250 kW Genset, Well 10	106.0	-50.0	23	Point	50	48
Combined Noise Level at Yukon Elementary without Generator	17					
Combined Noise Level at Yukon Elementary with Generator	48					
On Site Noise to North Property Line						
Booster Pump 1, 400 hp	92.0	-50.0	3	Point	75	8
Booster Pump 2, 400 hp	92.0	-50.0	3	Point	75	8
Booster Pump 3, 400 hp	92.0	-50.0	3	Point	75	8
Well 10, 200 hp	87.0	-50.0	3	Point	75	2
1,250 kW Genset, Well 10	106.0	-50.0	23	Point	75	43
Combined Noise Level at North Property Line without Generator	13					
Combined Noise Level at Yukon Elementary with Generator	43					
Well 11 Site Noise to Nearest Property Line						
Well 11, 200 hp	87.0	-50.0	3	Point	85	1
300 kW Genset, Well 11	91.6	-50.0	23	Point	85	27
Combined Noise Level at Nearest Property Line	27					
Well 9 Site Noise to Nearest Property Line						
250 kW Genset, Well 9	90.7	-50.0	23	Point	20	42

Combined Noise Level at Nearest Property Line	42

Source: Cummins 2011, CMS Solutions 2011, Caltrans 2009

Appendix B

Project-Generated Construction Source Vibration Prediction Model

North Torrance Wellfield Project

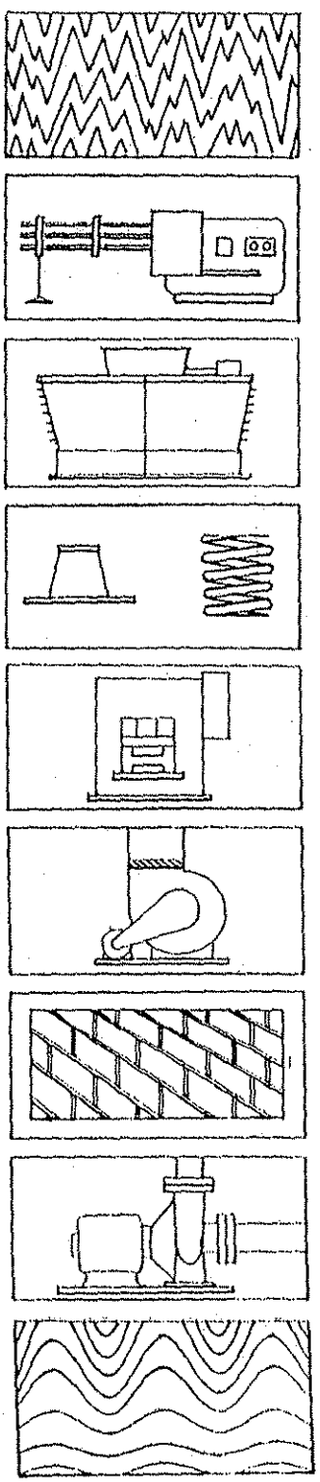
Distance to Nearest Receiver in feet	**Predicted Vibration Level (PPV)**	**Predicted Vibration Level (VdB)**	Equipment	Reference Distance	PPV at 25 feet (in/sec)[1]	Approximate Lv (VdB) at 25 feet[2]
50	0.031	77.9	Large Bulldozer	25	0.089	87
200	0.004	59.9				

Sources:

[1] Where PPV is the peak particle velocity

[2] Where Lv is the RMS velocity expressed in vibration decibels (VdB), assuming a crest factor of 4.

Source: Caltrans 2002, FTA 2006



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Second Printing - 1982

A. NOISE REDUCTION PROVIDED BY EXTERIOR FACADE. When outdoor noise enters a building, it is reduced, even if the building has open windows. The actual amount of noise reduction depends on many factors: building construction, orientation, wall area, window area, open window area, interior acoustic absorption, etc. The approximate noise reduction values provided by a few typical building constructions are given in Table 6-7. These values assume the walls in question generally face toward the incoming sound. Sound entering other walls might be slightly reduced, depending on the nature and directivity of the noise paths from the source and on the presence of other buildings in the area that can reflect sound onto the back and side walls of the building in question. If more exact information on wall construction and building orientation is available, perhaps more accurate estimates can be made.

B. INDOOR SOUND PRESSURE LEVELS. Indoor octave band SPLs are calculated by subtracting the Table 6-7 noise reduction values from the outdoor SPLs measured or estimated at the outdoor receiver position. These will vary, of course, depending on interior room layouts and absorption. The resulting SPLs should be compared with NC or PNC curves judged appropriate for the area to determine if the intruding noise may be acceptable or unacceptable to the building's occupants.

6-5. SOUND REFLECTION FROM WALLS AND BUILDINGS

Any flat, large-area solid surface facing a sound source will reflect sound, somewhat as a mirror reflects light, that is, the angle of incidence equals the angle of reflection. Depending on the geometry of the layout, a receiver may receive an increase in sound level due to this type of reflection. If the receiver is remote from the reflecting wall or walls, the sound build-up is evaluated simply by "ray-acoustics." If the source and receiver are inside a court that partially contains the sound

Table 6-7. Approximate reduction of outside noise provided by typical exterior wall constructions.

Octave Frequency Band (Hz)	Wall Type						
	A	B	C	D	E	F	G
31	0	8	12	17	10	22	28
63	0	9	13	19	14	24	32
125	0	10	14	20	20	25	34
250	0	11	15	22	26	27	36
500	0	12	16	24	28	30	38
1000	0	13	17	26	29	33	42
2000	0	14	18	28	30	38	48
4000	0	15	19	30	31	43	53
8000	0	16	20	30	33	48	58

A: No wall; outside conditions.

B: Any exterior wall construction, with open windows covering about 5% of exterior wall area.

C: Any typical wall construction, with small open air vents of about 1% of exterior wall area; all windows closed.

D: Any typical wall construction, with closed but operable windows covering about 10-20% of exterior wall area.

E. Sealed glass wall construction, 1/4 in. glass thickness over approximately 50% of exterior wall area.

F. Approximately 20 lb/sq ft solid wall construction with no windows and no cracks or openings.

G. Approximately 50 lb/sq ft solid wall construction with no windows and no cracks or openings.