Appendix C
Noise Report

CEQA Lead Agency:
City of San José

Project Applicant:
Google Fiber Inc.

Initial Study/Mitigated Negative Declaration
Google Fiber Project

Appendix C:
Noise Assessment Report
Google Fiber Project

October 2015

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ACRONYMS AND DEFINITIONS

APN	Assessor's Parcel Number
CAGC	California Government Code
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	community noise exposure level
dB	decibel
dBA	A-weighted decibel
DNL	day-night average sound level
FTA	United States Federal Transit Administration
FTTP	fiber-to-the-premises
Google Fiber	Google Fiber Inc.
Hz	hertz
in/sec	inch per second
IS/MND	Initial Study/Mitigated Negative Declaration
kW	kilowatt
LAS	Local Aggregation Site
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
OSHA	Occupational Safety and Health Administration
PPV	peak particle velocity
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFHWA	United States Federal Highway Administration
VdB	vibration decibels

1.0 INTRODUCTION

Google Fiber Inc. (Google Fiber) is proposing to construct fiber-to-the-premises (FTTP) infrastructure that would allow Google Fiber to provide internet and video service to the City of San José. The proposed Project includes the installation of aggregators that connect to main line fiber-optic infrastructure. From these aggregators (either in prefabricated Fiber Huts or existing equipment rooms), the fiber cables would travel along existing utility corridors (either above or below ground) into underground Vaults or utility cabinets and to and from the vaults/cabinets directly to customers.

The Project would be constructed primarily in public rights of way, with limited Project facilities on either public land or commercial property and would be constructed adjacent to a variety of existing land uses. A detailed description of the Project is provided in Section 2, Project Description of the Initial Study/Mitigated Negative Declaration (IS/MND).

This report assesses the potential noise and vibration impacts associated with the proposed Project. Because operation of the prefabricated Fiber Huts include permanent noise sources, the noise assessment focuses on noise impacts from the two proposed Fiber Huts shown in Figure C-1. The noise generating equipment to be permanently located at the Fiber Huts include one backup generator and four air conditioning units, three of which will be operated, and the fourth is for backup use only.

This report provides an introduction to basic noise and vibration concepts, a description of background (or baseline) ambient noise levels, and a summary of regulations and policies pertaining to noise. This is followed by an assessment of the potential effects of the project on noise at sensitive receptors near the proposed Fiber Huts.

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Site 1

Site 2

Legend

Proposed Hut Locations

Note:
These are 2 of approximately 10 LAS sites. Only 2 are being pursued at this time and the other 8 LAS locations are still being studied and will be covered by a programmatic level by this IS/MND.

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0 0.25 0.5

Miles

Initial Study/Mitigated Negative Declaration
Google Fiber Project
San Jose, California

Figure C-1
LOCAL AGGREGATION SITES (LAS)
PROPOSED PREFABRICATED
HUT SITES
SHEET G

ERM

PREPARED BY: G.S.

JOB NO. 0272480
FILE: HutSites

2.0 CHARACTERISTICS OF SOUND AND NOISE

2.1 CHARACTERISTICS OF NOISE

2.1.1 Noise Exposure and Community Noise

Noise is undesirable sound that either disrupts daily life or minimizes the comfort, repose, or health of a recipient. Sound is composed of a pressure wave passing through a medium, usually air. The magnitude of sound is measured in decibels (dB), with the human hearing threshold sound level being zero dB. Since the range of sound levels detected by the human ear is quite large, sound is measured on a logarithmic scale.

One important characteristic of sound is the frequency, which is the number of sound wave cycles that pass an object in a second. The frequency is measured in hertz (Hz). Although the audible human hearing frequency range is typically 20 to 20,000 Hz, not all frequencies elicit the same human hearing response. Since humans are less sensitive to very low and very high frequencies, sound measurements are typically adjusted such that more weight is assigned to the mid-range frequencies to which humans are most sensitive. The conventional weighting scale required by local, state, and federal agencies is the A-weighted sound level (dBA), and is thus used in this analysis.

Because environmental noise fluctuates over time, most descriptors average the sound level over the time of exposure, and some add "penalties" during the times of day when intrusive sounds would be more disruptive to listeners. The most commonly used descriptors are:

Equivalent A-weighted noise level (L_{eq}). The L_{eq} is an average or constant sound level over a given period that would have the same sound energy as the time-varying, A-weighted sound over the same period.

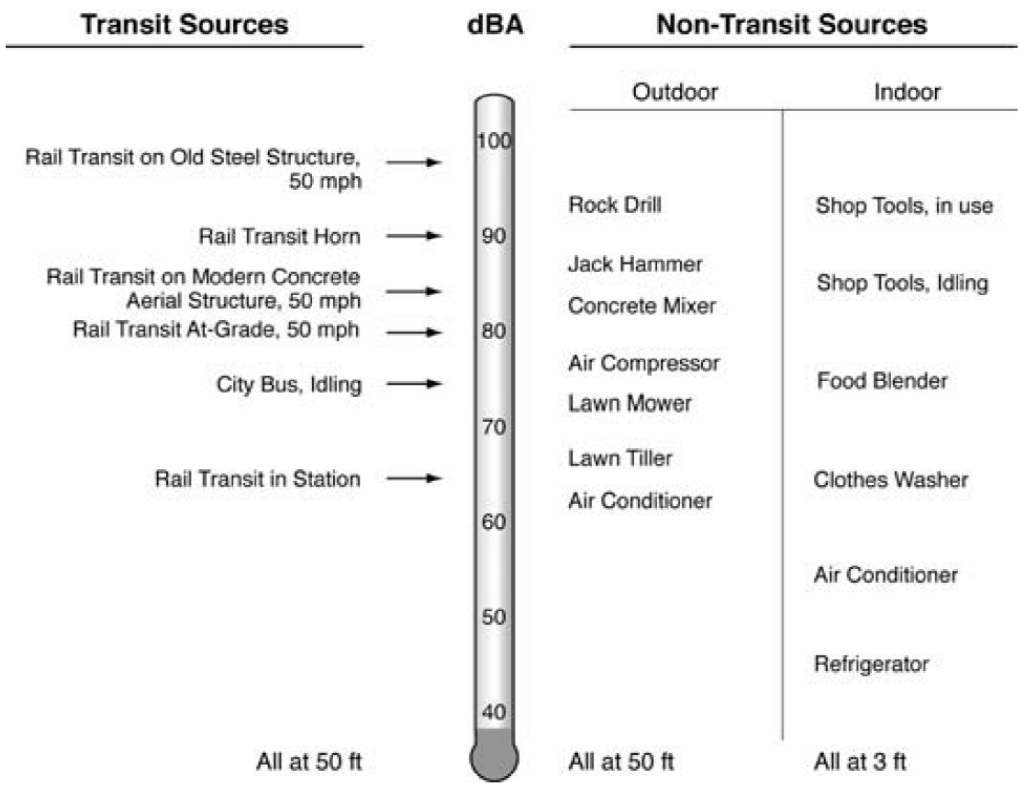
Day-night average noise level (DNL or L_{dn}). The DNL or L_{dn} is a 24-hour average sound level; however, for the night hours between 10:00 p.m. and 7:00 a.m., a penalty of 10 dBA is added to the average. This additional 10 dBA accounts for the tendency of people to perceive noise to be louder at night.

Community noise equivalent level (CNEL). The CNEL is similar to the DNL, except that, in addition to the 10:00 p.m. to 7:00 a.m. 10 dBA penalties, a 5 dBA penalty is applied to noise levels occurring from

7:00 p.m. to 10:00 p.m. Typically, day-night average noise levels are within 1 dBA of the CNEL.

Typical sound levels for common sources of noise are shown in Figure C-2.

Figure C-2 Typical Sound Levels for Common Noise Sources



Source: FTA 2006

2.1.2 *Effects of Noise on People*

The effects of noise on people can generally be divided into three categories:

- **Interference with activities such as speech, sleep, and learning** – The thresholds for speech interference indoors are generally considered to be about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors, the thresholds are about 15 dBA higher. Interior residential standards for multi-family dwellings are set by the State of California at 45 DNL. This standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses.

- **Subjective effects of annoyance, nuisance, and dissatisfaction –** Based on attitude surveys used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas, the main causes for annoyance due to noise are interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure for noise is considered to provide a valid correlation of noise level and the percentage of people annoyed. Three aspects of a community noise are most important in determining subjective response – the level of sound, the frequency composition or spectrum of the sound, and the variation of sound level with time.
- **Physiological effects such as hearing loss or sudden startling –** While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise, but may be due to a single event, such as an explosion. Natural hearing loss associated with aging may also be accelerated by chronic exposure to loud noise. The Occupational Safety and Health Administration (OSHA) has a standard which is set at the noise threshold where hearing loss may occur from long-term exposures. More specifically, the maximum allowable level is 90 dBA averaged over eight hours, and higher if the allowable exposure time is correspondingly shorter.

Environmental noise typically produces effects in the first two categories outlined above. Workers in industrial plants generally experience noise in the third category.

2.1.3 Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (i.e., atmospheric conditions and noise barriers, vegetative or manually created, etc.). Widely distributed noise, such as that from a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 3 to 6 dBA per distance doubled. Natural and man-made barriers can sometimes achieve up to 15 dBA reduction in noise level depending on the characteristics of the barrier.

2.2 CHARACTERISTICS OF VIBRATION

Vibration is the rapid periodic or oscillating motion of an object. This oscillating motion is caused by waves of energy originating from a vibration source and transmitted from particle to particle through a propagating material, either an object or the earth. As the wave passes from particle to particle, energy is dissipated and the oscillating motion gradually decreases as the distance from the vibration source increases. The magnitude of vibration is measured in peak particle velocity (PPV), which represents the maximum displacement (either positive or negative) within the vibration wave. The vibration velocity level can also be described in units of vibration decibels (VdB), which reduce the scale of vibration readings.

The perceptibility threshold for vibration by humans is approximately 65 VdB with residential neighborhoods having a typical vibration background of 50 VdB (United States Federal Transit Administration [FTA] 2006).

Vibration can originate from any object repeatedly striking the ground with typical sources, including trains, automobiles, large trucks, buses, and construction equipment. Though, it's unusual for vibration from most transportation sources to be perceptible. Vibration can cause annoyance and, in some extreme cases, cause damage to some buildings.

3.0 EXISTING SETTING

The proposed Project would be located throughout San José and installed within a mix of residential and business areas. Generally, the main existing source of noise in San José is vehicle traffic. However, other existing noise sources throughout the city include the same type of sources that would be used at a Fiber Hut, such as air conditioning units and backup generators.

In particular, two Local Aggregation Site (LAS) Fiber Hut locations are at Bird Ave./Virginia St. and Santa Teresa Blvd./SR 85, and are both located in urbanized areas of the City of San José. Both the sites are bordered by frequently used roadways and residential areas. One of the Fiber Hut sites is also near commercial development. The existing noise environment at both the sites result primarily from vehicular traffic on surrounding streets and major roadways as shown in Table C-1. Although specific locations are not known at this time for the other LAS sites, most are also anticipated to be located in similar noise environments adjacent to residential and commercial development.

Table C-1 Proposed Prefabricated Hut Sites

Hut Site	APN	Description
1 Bird Ave./Virginia St.	264-41-074	Located within an urban setting and borders with Bird Avenue to the west, which is a major arterial roadway with approximately 15,000 Average Daily Trips (based on 2005 counts performed by the City's Department of Transportation) and a railroad track to the south. Mature trees and fence border the site from residences on the eastern side of the parcel and vegetation and few mature trees border the site from the road on the west.
2 Santa Teresa Blvd./SR 85	464-28-010	Located within an urban setting and surrounded by Santa Teresa Blvd. on the west, which is a major arterial roadway with approximately 15,000 Average Daily Trips (based on 2005 counts performed by the City's Department of Transportation). The parcel is across the road from a shopping center and other commercial development. The lot is undeveloped with a few trees and borders SR 85 South off-ramp on the north and Thornwood Drive on the south. The site is bordered by vegetation and trees from the road on the west. Mature trees, thick low-lying bushes and a wire fence border the site from the residences on the east.

Typical sources of vibration include near the proposed Project can include heavy-duty trucks on surrounding streets, and major roadways and heavy equipment used in construction activities. Trains can also be potential sources of vibration.

A June 15, 2009, report prepared for the San José 2040 General Plan update (Illingworth & Rodkin, Inc. 2010) estimated 2008 noise levels associated with traffic near major roadways, including the areas where the two initial Fiber Huts would be located. This report shows that existing day-night average noise levels near the location of the two Fiber Hut locations were predicted to be at least 60 dBA.

Sensitive receptors are those deemed as having an increased sensitivity to potential noise impacts. These typically include locations where human populations, especially children, elderly, or sick persons, are to be found, such as schools, libraries, hospitals, motels, hotels, and single or multifamily homes. Sensitive receptors near the Fiber Huts include adjacent single family homes. In particular, as described in Table C-1, Fiber Hut Site 1 is located in a residential neighborhood. Site 2 is surrounded by a mix of commercial and residential property.

4.0 APPLICABLE POLICIES AND REGULATIONS

The following section summarizes the federal, state, and local requirements and guidelines associated with noise and vibration.

4.1 FEDERAL

Several federal agencies have developed criteria and guidelines to be used when assessing potential noise and vibration impacts from a project. These agencies include the United States Environmental Protection Agency (USEPA), the United States Department of Transportation (USDOT) of the FTA, and the United States Federal Highway Administration (USFHWA).

The Noise Control Act of 1972, codified in 42 U.S. Code, Chapter 65, Sections 4901 through 4918, established the USEPA Office of Noise Abatement and Control and mandated that it coordinate all federal noise control activities, identify major noise sources, develop noise standards, as well as conduct noise research. The Quiet Communities Act of 1978, codified in 42 U.S. Code, Chapter 65, Section 4913, expanded the responsibilities of the Office of Noise Abatement and Control while promoting State and local noise control programs. However, in 1982, the USEPA phased out all funding to the Office of Noise Abatement and Control after deciding that local and State agencies were best able to manage noise issues.

Title 40 of the Code of Federal Regulations (CFR), Chapter I, Subchapter G, Parts 201 through 211 list noise standards for interstate rail carriers, motor carriers, and construction equipment as well as transportation equipment noise controls.

4.2 STATE

California Government Code (CAGC) Section 65300 requires the planning department of each county and city within California to prepare a long-term general plan for the physical development of land within that county's or city's borders. CAGC Section 65302(f) requires that a noise element be prepared within the general plan that identifies and appraises noise problems within the county or city, that noise contours expressed in terms of CNEL or DNL be developed and used as a guide for future land

uses, and that implementation measures to address existing and foreseeable future noise problems be created.

The California Noise Control Act of 1973, promulgated in California Health and Safety Code Sections 46000 through 46080 created the California Office of Noise Control and tasked it with establishing and maintaining a noise control program that will research noise control methods, noise measurement techniques and technology, and the psychological and physiological effects of noise. The Office of Noise Control was also tasked to develop noise standards for use of noise-producing objects, model noise ordinances, and criteria and guidelines for setting human-exposure noise standards as well as adopt guidelines for the preparation and creation of general plan noise elements.

4.3 LOCAL

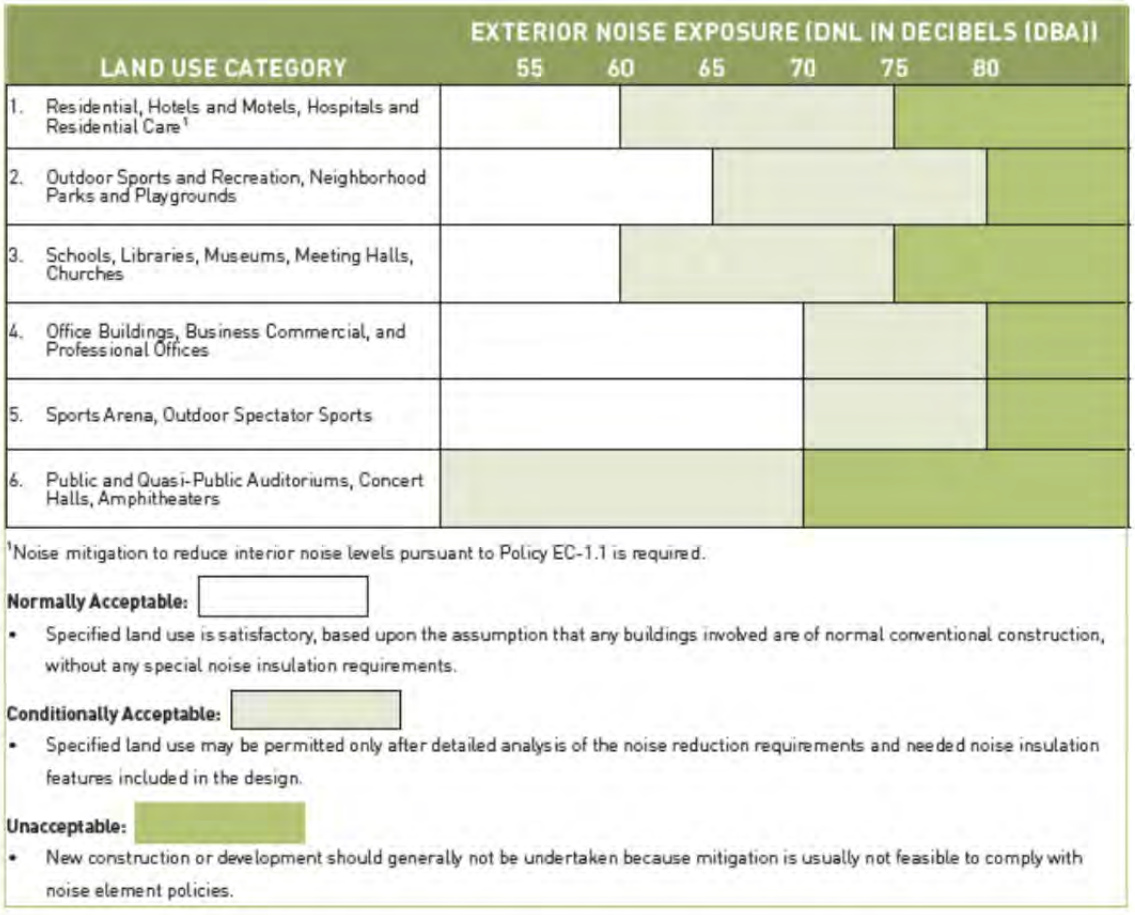
Noise requirements and guidelines contained in the City of San José 2040 General Plan and Municipal Code are discussed below.

4.3.1 General Plan

The City of San José has adopted a General Plan, Envision San José 2040 General Plan, dated November 2011. The Envision 2040 General Plan establishes objectives for acceptable levels of noise for development projects in San José (City of San José 2011). Per Policy EC-1.1, acceptable interior noise levels for residences, hotels, motels, residential care facilities, and hospitals are 45 decibels (dBA) day-night average noise level (DNL).This policy also establishes thresholds for exterior noise levels. For residences, hotels, motels, residential care facilities, hospitals, schools, libraries, and churches, the threshold for exterior noise is 60 dBA DNL at the property line. For neighborhood parks and playgrounds, the threshold for exterior noise is 65 dBA DNL at the property line. Finally, for office and commercial buildings, the threshold is 70 dBA DNL. The other guidelines for acceptable noise levels are summarized in Figure C-3. The City General Plan (Per Policy EC-1.2) considers new development to have significant noise impacts on residential areas if noise levels increase by 5 decibels on the A-weighted scale (dBA) DNL when below 60 dBA DNL or increase by 3 dBA DNL when equal to or above 60 dBA DNL. Also, the City General Plan considers construction noise impacts to be significant if such activities are within 500 feet of residential uses or 200 feet of commercial or offices, and the activity would last for more than 12 months.

In addition, the General Plan (Policy EC-2.3) requires new development to minimize vibration impacts to adjacent uses during construction. For sensitive historic structures, the General Plan specifies a vibration limit of 0.08 inch per second (in/sec) peak particle velocity (PPV) to minimize the potential for cosmetic damage to a building. For normal conventional buildings, the General Plan specifies a vibration limit of 0.20 in/sec PPV to minimize the potential for cosmetic damage at buildings.

Figure C-3 Land Use Compatibility Guidelines, dBA



Source: City of San José 2011

4.3.2 City of San José

The San José Municipal Code limits noise levels at any property line of residential, commercial, or industrial properties (City of San José 2002). For example, the Municipal Code limits levels from noise sources attributed to the proposed Project to 55 dBA at the property line a residential zoned property except upon issuance and compliance with a conditional use permit. In addition, construction activity is not allowed

within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. Monday through Friday or any time on weekends, unless specifically allowed by a development permit or other planning approval. The Municipal Code also states that activity on site shall not cause ground vibration that is perceptible without instruments at the property line of the site. Additionally, the Municipal Code limits testing of generators to 7:00 am and 7:00 pm, Monday through Friday.

5.0 IMPACT ANALYSIS

5.1 APPLICABLE THRESHOLDS

For the purposes of this noise report, noise and vibration impacts are characterized separately using thresholds from the General Plan and City ordinance.

5.1.1 Noise

Significance thresholds for construction and operations noise levels used in this analysis are shown in Tables C-2 and C-3, respectively**.**

Table C-2 Construction Noise Thresholds

Source	Construction Noise Threshold
General Plan	Construction noise impacts are significant if such activities are within 500 feet of residential uses or 200 feet of commercial or offices and the activity would last for more than 12 months.
City Ordinance	Construction activity is significant if within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. Monday through Friday or any time on weekends.

Table C-3 Operations Noise Thresholds

Source	Operations Noise Threshold
General Plan	If day-night average noise levels (DNL or L_{dn}) are less than 60 dBA, noise levels are significant if the increase from the Project is 5 dBA or more; or If day-night average noise levels (DNL or L_{dn}) are 60 dBA or more, noise levels are significant if the increase from the Project is 3 dBA or more.
City Ordinance	Noise impacts are significant if noise generated by equipment on the site exceed 55 dBA at any time at the property line.

5.1.2 Vibration

Significance thresholds for construction and operations vibration levels used in this analysis are shown in Tables C-4 and C-5, respectively.

Table C-4 Construction Vibration Thresholds

Source	Construction Vibration Threshold
General Plan	Vibration levels are significant during construction for historic structures if vibration levels reach 0.08 in/sec PPV (peak particle velocity). Vibration levels are significant during construction for conventional structure construction if vibration levels reach 0.20 in/sec PPV.
City Ordinance	Construction activity is significant if within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. Monday through Friday or any time on weekends.

Table C-5 Operations Vibration Thresholds

Source	Operations Vibration Threshold
General Plan	The General Plan does not contain explicit vibration limits during operations applicable to the proposed Project.
City Ordinance	Vibration levels are significant if activity on the site is causes ground vibration that is perceptible without instruments at the property line of the site.

5.2 METHODOLOGY

Construction noise impacts were assessed by reviewing the range and location of construction activity, proposed equipment types, and other factors presented in the Project Description (see Section 2 of the IS/MND). Noise and vibration from construction were evaluated, in part, based on the consistency of the expected time and duration of construction activities with the General Plan and Municipal Code requirements. In addition, vibration levels from construction equipment were estimated following the procedures contained in Transit Noise and Vibration Impact Assessment (FTA 2006). In particular, the analysis examined the vibration levels from a bulldozer which is expected to be the construction equipment to generate the most vibration.

For operations, the analysis is consistent with the procedures contained in Transit Noise and Vibration Impact Assessment (FTA 2006). To determine potential noise and vibration impacts from operations, Project noise and vibration levels were estimated and compared to the significance thresholds above.

The analysis assumes each LAS, including the prefabricated Fiber Huts and those installed within existing buildings, will have noise-generating equipment equivalent to the following:

- One emergency generator fueled by natural gas with an expected rating of 85 kilowatts (kW), and
- Three air conditioning units (the fourth, backup unit will not be operating except in cases when the other three units are not working).

For the purposes of the calculations, the four sources of noise are treated as being located at the same distance to sensitive receptors. Manufacturer reference noise levels for the equipment used in the analysis are included in Attachment A of this report. The analysis conservatively assumes the three air conditioner units are run continuously throughout the day. It is also assumed that the generator would be operated for 1 hour for testing purposes, even though actually testing is expected to last no more than 30 minutes in one day (and testing is expected to occur only once per month).

For the purposes of comparing impacts to the above General Plan criteria, which is incorporated into the CEQA analysis, the level of impact is dependent on existing background noise levels. A June 15, 2009, report prepared for the San José 2040 General Plan update (Illingworth & Rodkin, Inc. 2010) estimated 2008 noise levels near major roadways, including the areas where the two initial Fiber Huts would be located. This report predicted that existing day-night average noise level near the location of the two Fiber Hut locations are at least 60 dBA. Therefore, the analysis conservatively assumes a day-night average existing background noise level of 60 dBA.

More details on the methodology are included as Attachment B.

5.3 NOISE IMPACT ANALYSIS

Potential noise impacts from the construction and operation of the proposed Project are described below.

5.3.1 Construction Noise Impacts

Construction of the proposed Project is expected to last approximately 36 months, but construction activities at any one location would in most cases last no more than 5 business days. As a result, construction activities from the proposed Project would temporarily increase noise levels at different locations throughout the City. Actual noise levels would vary throughout the day, depending on the type of construction equipment

involved, activities being implemented, and distance between the source of the noise and receptors. For example, at 50 feet from peak use of rock-sawing or trenching, day-night average noise levels may reach 85 to 88 dBA.

General Plan Criteria

The General Plan also specifically addresses short-term construction projects by considering such activities to be significant if they are within 500 feet of residential uses or 200 feet of commercial or offices and last more than 12 months. Construction activities for the proposed Project would not exceed 12 months at any one location and so will be consistent with this provision of the General Plan.

Municipal Code Criteria

The Municipal Code (see Table C-2) specifies that construction activity is generally not allowed within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. on the weekdays and any time on the weekends. In cases where activity will occur within 500 feet of a residential unit, the construction activities for the proposed Project would be limited to these times and therefore consistent with this provision of the Municipal Code.

5.3.2 Operational Noise Impacts

5.3.2.1 Noise

Once construction is complete, at each LAS site, whether in a prefabricated Fiber Hut or within an existing commercial building, noise will be periodically generated by occasional maintenance activities using pickup trucks and landscaping equipment, consistent with noise levels from existing activities throughout the City. In addition, noise will be generated by three air conditioners and a small backup emergency generator located at each Fiber Hut. A fourth air conditioner will physically reside within the Fiber Hut but will only be activated upon failure of one of the three main air conditioners. These emergency generators will be fueled by natural gas and are expected to be rated at 85 kilowatt or similar size. The emergency generators would incorporate standard noise attenuation features (e.g., a muffler) and will only be used in emergency situations and tested intermittently. The two Fiber Huts will be located near residential land uses.

As stated in the methodology, the analysis conservatively assumes the three air conditioners are run continuously throughout the day. It is also assumed that the generator would be operated for 1 hour for testing purposes, even though actual testing is expected to last no more than 30 minutes in one day (and testing is expected to occur only once per month). The analysis also conservatively assumes a day-night average existing background noise level of 60 dBA.

The results of the noise analysis of the Fiber Huts are summarized in Tables C-6 through C-8. Specific locations of the air conditioners and generator at the two identified LAS sites are not known at this time and so these tables provide predicted noise levels are different distances. In particular, Table C-6 and C-7 show maximum noise levels and day-night average noise levels, respectively, attributed to the air conditioners and generator without considering existing background noise levels. Thus, Table C-6 and C-7 present the predicted noise level from the project, hypothetically assuming there are no other existing noise sources. Table C-8 presents estimated day-night average noise levels from the air conditioners and generators added to existing background noise levels of 60 dBA.

Certain design features can reduce noise levels. For example, appropriately designed barriers surrounding the air conditioners and generator and blocking the line of site between the equipment and noise sensitive receptors can reduce noise levels by 10 dBA. Examples of appropriate materials for a barrier include concrete or masonry. In addition, one important design feature to consider is the height of the barrier. The appropriate height will depend on various site specific factors such as height of noise source and receptor and distances between the source, barrier, and receptor. Section 6.3.2 of the FTA's Transit Noise and Vibration Impact Assessment (FTA 2006) provides one methodology for estimating the appropriate height of a barrier. Each of the three tables show predicted noise levels with and without attenuation associated with a barrier or equivalent design.

General Plan Criteria

According to the General Plan, noise levels are significant when day-night average noise levels are greater than 60 dBA DNL and the proposed Project increase noise levels by 3 dBA DNL or more. Noise estimates shown inTable C-8 show that, without any noise abatement, the continuous operation of three air conditioners combined with one hour of generator testing may increase day-night average noise levels by approximately 3 dBA above existing levels if the equipment is located less than 120 feet from noise sensitive receptors. In other words, noise levels without barriers or equivalent design features may be significant if the equipment is located less than 120 feet to noise sensitive receptors, which is the case with the two identified LAS Fiber Hut sites.

Table C-8 also shows the predicted noise levels with attenuation (barriers or equivalent design features) is installed around the equipment to achieve a 10 dBA reduction in noise level. With the barriers or equivalent design features, the predicted distance at which impacts are significant is between 35 and 40 feet. Therefore, with appropriately designed barriers or equivalent design features, noise impacts would be less than significant if the equipment is located at least 40 feet from noise sensitive receptors.

The above analysis assumes normal testing of the generators. However, when the main power source of the Fiber Hut fails, the generators will be operating until the main power is restored. The duration of operation under a loss of main power scenario is unknown; however, a power outage would be temporary.

Municipal Code Criteria

Based on the Municipal Code, noise impacts during operation may be significant if noise produced by project associated activities, without background levels, result in a noise level greater than 55 dBA at the property line (for any duration). Based on the results shown in Table C-6, noise levels would be greater than 55 dBA if the equipment is located less than 175 feet from the property line. With attenuation that would achieve at least a 10 dBA reduction, equipment would need to be located 50 feet or more from the property line to comply with the Municipal Code.

Table C-6 Predicted Maximum Noise Level (L_{eq}) from Equipment Only

Source		L_{eq}, Noise level (dBA) at Specified Distance, No Background Noise						
		25 ft	**50 ft**	**75 ft**	**100 ft**	**125 ft**	**150 ft**	**175 ft**
Without Attenuation(1)	Generator	69	63	60	57	55	54	52
	Air Conditioners (3)	64	61	57	55	53	51	50
	Combined Equipment	70	65	62	59	57	56	54
With Attenuation(2)	Combined Equipment	60	55	52	49	47	46	44

Note: Assumes equipment is located the same distance from receptors, generator running 1 hour during a single day and 3 air conditioners running continuously.

(1) "Without attenuation" estimates account for only natural attenuation.

(2) "With attenuation"estimates account for a barrier or equivalent design that would reduce noise levels by 10 dBA.

Table C-7 Predicted Day-Night Average Noise Level (DNL) from Equipment Only

Source		L_{dn}, Noise level (dBA) at Specified Distance, No Background Noise						
		25 ft	**50 ft**	**75 ft**	**100 ft**	**125 ft**	**150 ft**	**175 ft**
Without Attenuation(1)	Generator	55	49	46	43	41	40	39
	Air Conditioners (3)	70	67	64	61	59	58	56
	Combined Equipment	70	67	64	61	59	58	56
With Attenuation(2)	Combined Equipment	60	57	54	51	49	48	46

Note: Assumes equipment is located the same distance from receptors, generator running 1 hour during a single day and 3 air conditioners running continuously.

(1) "Without attenuation" estimates account for only natural attenuation.

(2) "With attenuation"estimates account for a barrier or equivalent design that would reduce noise levels by 10 dBA.

Table C-8 Predicted Combined Day-Night Average Noise Level (DNL)

		DNL, Noise level (dBA) with Background at Specified Distance						
		25 ft	**50 ft**	**75 ft**	**100 ft**	**125 ft**	**150 ft**	**175 ft**
Without Attenuation(1)	Noise Level	71	68	65	64	63	62	62
	Noise Increase form Baseline	11	8	5	4	2.7	2	2
With Attenuation	Noise Level	63	62	61	61	60	60	60
	Noise Increase form Baseline	3.2	1.9	0.9	0.5	0.4	0.2	0.2

Note: Assumes equipment is located the same distance from receptors, generator running 1 hour during a single day and 3 air conditioners running continuously.

(1) "Without attenuation" estimates account for only natural attenuation.

(2) "With attenuation"estimates account for a barrier or equivalent design that would reduce noise levels by 10 dBA. Assumes background noise level of 60 dBA DNL.

5.4 VIBRATION IMPACT ANALYSIS

Potential vibration impacts from the construction and operation of the proposed Project are described below.

5.4.1 Construction Impacts

During construction, bulldozers may be used for the prefabricated Fiber Hut construction and dump trucks may be used at various stages of the Project. Construction equipment can expose persons and buildings to elevated vibration levels.

General Plan Criteria

For construction activities, the General Plan specifies a vibration limit of 0.08 in/sec PPV for sensitive historic structures and 0.2 in/sec PPV for conventional building construction. The construction equipment expected to generate the largest amount of noise would be the bulldozer. A large bulldozer may generate vibration levels of 0.08 in/sec or more within 28 feet of a historical structure. A bulldozer of similar size would be able to operate even closer to conventional structures without exceeding the General Plan Criteria. A bulldozer is not expected to operate close enough to a residential structure to exceed the vibration criteria identified in the General Plan.

Municipal Code Criteria

The Municipal Code does not have explicit quantitative vibration limits during construction. However, the code specifies that construction activity is generally not allowed within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. on the weekdays and any time on the weekends. In cases where activity will occur within 500 feet of a residential unit, the construction activities for the proposed Project would be limited to these times.

5.4.2 Operational Impacts

Once construction is complete, occasional maintenance activities will be needed using pickup trucks and landscaping equipment, consistent with equipment from existing activities throughout the City. In addition, three air conditioners and a small backup emergency generator located at each Fiber Hut will be used. A fourth air conditioner will physically reside

within the Fiber Hut but will only be activated upon failure of one of the three main air conditioners. These activities would not be expected to generate vibration at levels that would be perceptible at the property line.

6.0 REFERENCES

City of San José. 2002. City of San José Municipal Code, Ordinance No. 26594, effective May 10, 2002. April 9. Accessed on August 12, 2014, at http://www.sanjoseca.gov/DocumentCenter/View/6739

City of San José. 2011. Envision San José 2040 General Plan. November. Accessed on August 12, 2014, at http://www.sanjoseca.gov/index.aspx?NID=1736

Illingworth & Rodkin Inc. 2010. Envision San José 2040 General Plan Comprehensive Update Noise Background Report San José, California. December 7. Accessed on August 12, 2014 at http://www.sanjoseca.gov/DocumentCenter/View/9389

United States of America Federal Transit Administration (FTA). 2006. Transit Noise and Vibration Impact Assessment. May. Accessed April 15, 2014 at http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf

Attachment A
Equipment Specifications

Sound Data

85GGHG 60Hz

Sound Pressure Level @ 7 meters, dB(A)

See Notes 1-8 listed below

Configuration		Measurement Location Number								Average
		1	2	3	4	5	6	7	8	
Standard - Unhoused	Infinite Exhaust	81	82	82	81	78	81	79	82	81
F182 and F216 –Weather w/Exhaust Silencer	Mounted Muffler	80	82	78	79	78	80	77	82	80
F172 - Quiet Site II First Stage	Mounted Muffler	78	80	72	71	68	72	72	80	76
F173 and F217 - Quiet Site II Second Stage	Mounted Muffler	69	70	69	70	68	71	70	70	70

Sound Power Level, dB(A)

See Notes 2-6, 9, 10 listed below

Configuration		Octave Band Center Frequency (Hz)								Overall Sound Power Level
		31.5	63	125	250	500	1000	2000	4000	8000	
Standard - Unhoused	Infinite Exhaust	56	71	88	94	102	102	100	98	95	108
F182 and F216 -Weather w/Exhaust Silencer	Mounted Muffler	57	78	89	94	101	101	100	97	94	107
F172 - Quiet Site II First Stage	Mounted Muffler	57	72	89	92	97	99	97	95	91	104
F173 and F217- Quiet Site II Second Stage	Mounted Muffler	58	71	88	90	90	90	90	90	87	98

Exhaust Sound Pressure Level @ 1 meter, dB(A)

Open Exhaust (No Muffler Rated Load)	Octave Band Center Frequency (Hz)								Sound Pressure Level
	63	125	250	500	1000	2000	4000	8000	
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note:

1. Position 1 faces the engine front. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All positions are at 7m (23 ft) from the surface of the generator set and 1.2m (48") from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Sound data with remote-cooled generator sets are based on rated loads without cooling fan noise.
4. Sound levels for aluminum enclosures are approximately 2 dB(A)s higher than listed sound levels for steel enclosures.
5. Sound data for generator set with infinite exhaust do not include exhaust noise.
6. Data is based on full rated load with standard radiator-cooling fan package
7. Sound Pressure Levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
8. Reference sound pressure is 20 µPa.
9. Sound Power Levels per ISO 3744 and ISO 8528-10, as applicable.
10. Reference power = 1 pw (10^{-12} W)
11. Exhaust Sound Pressure Levels are per ISO 6798, as applicable.

Model: HVESA60 Outdoor Sound Levels

Distance from unit (ft)	5	10	20	30	40	50	60
Sound Pressure level dB(A)	75	66	61	60	58	56	54

Attachment B
Noise and Vibration Calculations

Predicted Noise Levels from Generator and HVAC at Varying Distances

L_{eq} (equipment-soft surfaces) = E.L. + 10 log (U.F.) – 20 log (D/50) – 10G log (D/50)

L_{eq} (equipment-hard surfaces) = E.L. + 10 log (U.F.) – 20 log (D/50)

Leq = Leq at the receptor from the operation of a single piece of equipment
E.L. = Noise Emission Level of equipment at reference distance of 50 feet
U.F. = Usage Factor (fraction of time equipment is in use over specified time period)
G = constant that accounts for ground effects
D = distance between the equipment and receptor

SOURCE: United States Federal Transit Administration. May 2006. *Transit Noise and Vibration Impact Assessment. Soft surfaces adjustment from California Department of Transportation, October 1998, Technical Noise Supplement.*

$L_{dn} = 10*\log [(15)*10^{(Leq(day)/10)} + (9)*10^{(Leq(night)/10)}] - 13.8$

SOURCE: United States Federal Transit Administration. May 2006. Transit Noise and Vibration Impact Assessment.
Note: Original Equation adds a 10 dB penalty to the Leq(night). However, the nighttime penalty was assigned by multiplying the nighttime usage factor by 10 per instructions within the FTA Guidance document.

L_{eq} (total) = $10\log(\sum 10^{Leq/10})$

L_{dn} (total) = $10\log(\sum 10^{Ldn/10})$

SOURCE: United States Federal Transit Administration. May 2006. Transit Noise and Vibration Impact Assessment.

Reference Noise Levels

Equipment	Typical Noise Level (dBA)	Reference Distance (ft)	Noise Level at 50 Feet
Generator	70	23	63
HVAC	61	20	53

Notes

Assumes equipment will be similar or equivalent to following equipment:
(1) Cummins spec for 85GGHG, F173 and F217 - Quiet Site II Second Stage
(2) Marvair Spec for HVESA60 Outdoor Sound Levels
Assuming hard surfaces

	Scenario # 1 - Baseline Noise of 60 dBA		Distance 25 feet			Baseline: 60 dBA L_{dn}				
						Day-Night Average From ONE Equipment Per Type				Noise Level (Any One Time) for ALL
	Equipment	Time Period	Noise Level (dBA) @	Hours Used	Usage Factor	L_{eq} (daytime) (dBA)	L_{eq} (nighttime, with	L_{dn} (dBA)	Ldn for ALL Equipment of EACH Type (dBA)	Leq Max (dBA)
		Day (7 AM to 10 PM)		1	0.07	58				
1	Generator	Night (10 PM to 7 AM)	63	0	0.00		0	55	55	69
		Day (7 AM to 10 PM)		15	1.00	59				
1	HVAC	Night (10 PM to 7 AM)	53	9	10.00		69	65	65	59
1		Day (7 AM to 10 PM)		15	1.00	59				
	HVAC	Night (10 PM to 7 AM)	53	9	10.00		69	65	65	59
1		Day (7 AM to 10 PM)		15	1.00	59				
	HVAC	Night (10 PM to 7 AM)	53	9	10.00		69	65	65	59
No Attenuation	**All Equipment, no Background Noise**								**65.89**	**70**	**70.39**
	All Equipment with Baseline Noise (With No Additional Attenuation)								**67**	**NA**
	Increase from Baseline Noise (With No Additional Attenuation)								**6.9**	**NA**
With Additional Attenuation	**Assumed Level of Additonal Attenuation**								**-10**	**-10**
	All Equipment, no Background Noise (With Additional Attenuation)								**56**	**60**
	All Equipment with Baseline Noise (With Additional Attenuation)								**61**	**NA**
	Increase from Baseline Noise (With Additional Attenuation)								**1.4**	**NA**

Note: Assume designed to achieve 10 dBA reduction in nose level. For example. a well designed barrier blocking the line of sight can achieve a 10 dBA reduction in noise levels
Ldn = day-night average noise levels
Leq = maximum noise level at any one time
Based on empircal data for HVAC at 20 feet