APPENDIX D

NOISE TECHNICAL REPORT

BonTerra PSOMAS

Noise Impact Analysis

Santa Anita Stormwater Management and Seismic Strengthening Project, County of Los Angeles, California

Prepared for | Los Angeles County Flood Control District
900 South Fremont Avenue
Alhambra, California 91803
Contact: Matthew Frary, P.E.
T: (626) 458-6111

Prepared by | BonTerra Psomas
225 South Lake Avenue, Suite 1000
Pasadena, California 91101
Contact: James Kurtz
T: (626) 351-2000 F: (626) 351-203

October 2014

TABLE OF CONTENTS

TABLES

Table **Page**

EXHIBITS

Exhibit **Follows Page**

APPENDICES

Appendix

1.0 PROJECT LOCATION AND DESCRIPTION

The proposed Santa Anita Stormwater Flood Management and Seismic Strengthening Project (Project) is located within the jurisdictions of the City of Arcadia, City of Monrovia, and a County-owned inholding within the U.S. Forest Service (USFS) boundary, and property within the USFS Angeles National Forest. The Project site is located in the foothills of the San Gabriel Mountains, in the western San Gabriel Valley in Los Angeles County, approximately 15 miles northeast of downtown Los Angeles, as depicted in Exhibit 1, Regional Location and Local Vicinity Map. Land uses adjacent to the Project area include the natural open space and mountains within the Angeles National Forest (i.e., San Gabriel Mountains) to the north; the recreational and open space uses associated with the City of Arcadia Wilderness Park and City of Monrovia to the east; and City of Arcadia single-family residential uses to the south and west.

The Los Angeles County Flood Control District's (LACFCD) Santa Anita Stormwater Management and Seismic Strengthening Project would modify existing flood management and water conservation facilities along the Santa Anita Canyon Watershed, including the Santa Anita Dam, Santa Anita Headworks, Wilderness Park Culvert Crossing, and the Santa Anita Debris Dam. The Project benefits and the contributing LACFCD facility improvements are as follows:

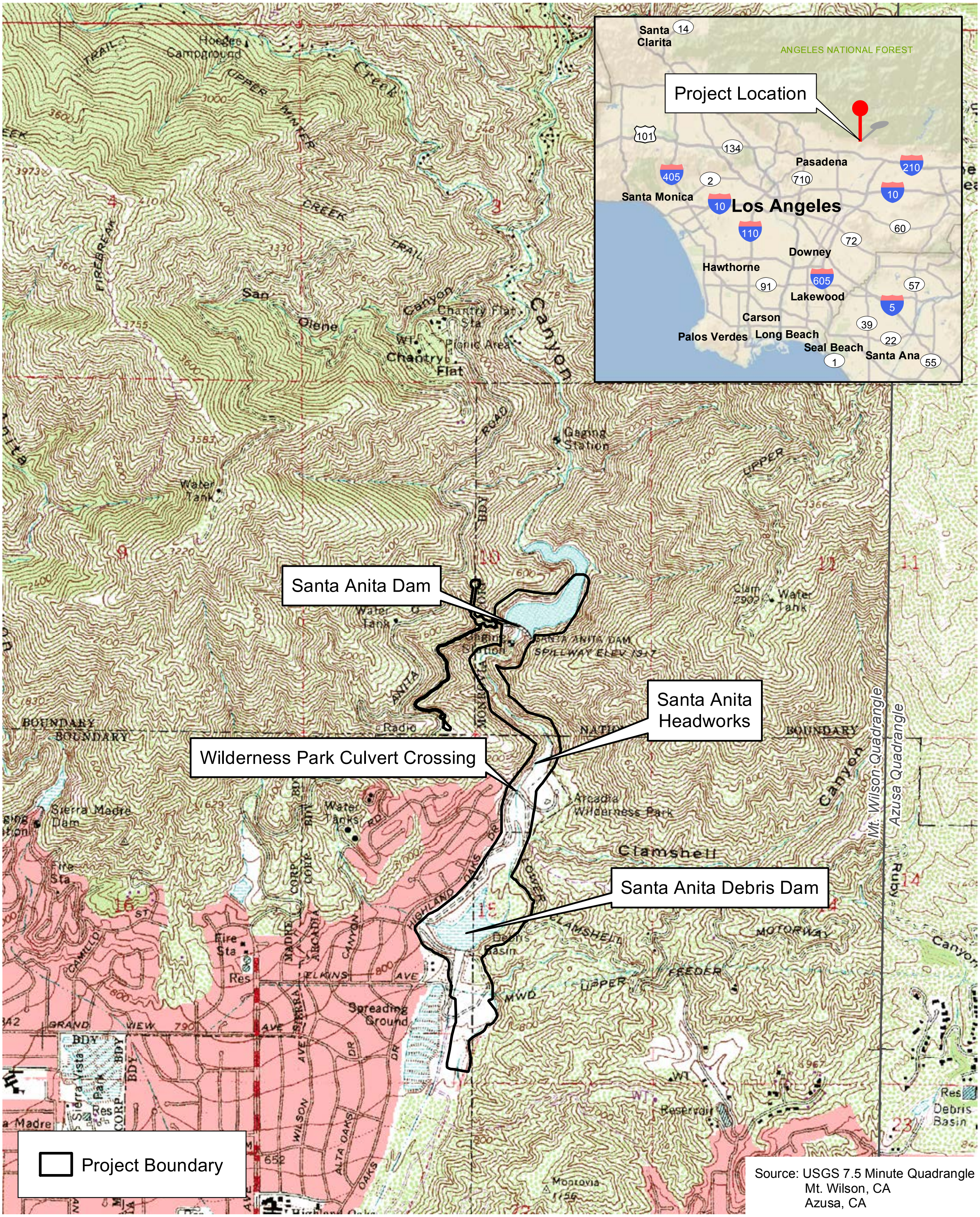
- Reduce flood risk to downstream communities by:
    - Modifying the Santa Anita Dam spillway to safely pass the Probable Maximum Flood
    - Remediating seismic safety issues at the Santa Anita Dam and Debris Dam
- Enhance sustainability of the local water supply and increase recharge to the groundwater basin by over 500 acre-feet per year by:
    - Restoring storage capacity at Santa Anita Debris Dam
    - Rehabilitating the Santa Anita Headworks for more reliable diversion of stormwater runoff to the spreading grounds
    - Modernizing facilities and implementing new monitoring and control systems

Improve all-weather access to the Arcadia Wilderness Park by constructing a new culvert crossing

1.1 DAM

The Dam would be structurally altered to accommodate a new spillway with sufficient capacity to pass the probable maximum flood (PMF) of 26,100 cubic feet per second (cfs) in order to reduce the risk of Dam failure from uncontrolled overtopping during major storm events. The proposed improvements to the Dam would not result in changes to the existing maximum water surface elevation restrictions; therefore, the reservoir's capacity to retain water would not be altered by Project implementation.

The spillway modification would consist of cutting a "notch" in the Dam crest to allow the PMF to overtop in a controlled manner. The proposed notch would be centered on the crest of the Dam, similar to the existing emergency crest spillway, and would require concrete removal from the Dam. An existing spillway on the far western edge of the Dam would remain and be unaltered by the Project; however, the existing auxiliary orifice spillway beneath the proposed new spillway would be removed. A new pedestrian bridge would be constructed over the notch and the existing



D:\Projects\COLADPW\J166\Graphics\Noise\Ex_LV_usgs.mxd

Regional Location and Local Vicinity Map

Exhibit 1

Santa Anita Stormwater Flood Management and Seismic Strengthening Project

N W E S

2,000 1,000 0 2,000 Feet

BonTerra PSOMAS

(Rev: 10-16-2014 JAZ) H:\PAS\Projects\CoLADPW\J166\Graphics\Noise\Ex1_LV_usgs.pdf hoist system would be upgraded to have a higher load capacity and re-aligned to accommodate the new spillway. The upgrade work includes the relocation of the lower hoist tower along the Dam crest (and potentially cantilevered of the back side, if necessary). The proposed improvements would not change the height of the Dam; the crest of the Dam would remain at an elevation of 1,325 feet above mean sea level (msl) and the parapet wall would remain at an elevation of 1,328 feet above msl.

To better manage stormwater runoff and to ensure reliability and efficiency of operations, six of the existing valves would be replaced (three control valves and three backup valves), along with new electrical and control systems. The Dam's structural concrete would be repaired to ensure that it meets acceptable standards consistent with the required seismic performance of the Dam.

The downstream canyon walls and the toe of the Dam would be re-armored with additional reinforced gunite or equivalent concrete erosion protection to dissipate the energy from the potential overtopping water as the flow cascades through the spillway notch and the orifice spillway or sluiceway. The flow would be directed onto the downstream armoring before flowing into the channel downstream of the Dam. The new re-armoring would reinforce the existing armoring that extends approximately 100 feet downstream from the toe of the Dam. The re-armoring would be held in position with tie-back anchors to be drilled and grouted into the bedrock. The tie-ins for the re-armoring may include superficial rock excavation, grading, and subsurface pressure grouting. The color of the material used for re-armoring would be the same as the existing concrete.

The Project would also include improvements to ancillary facilities of the Dam. The existing garage/storage shed would be demolished and replaced with a new three-bay garage (the third bay would house a new back-up generator). The existing Dam Operator's house would be removed and replaced with a helipad to provide aerial access to the Dam in the event of an emergency. It is anticipated that the helipad would only be used 1 or 2 times per year. The existing relief quarters and control house would remain to serve as an office. Although the Dam Operator would no longer reside at the Dam, he/she would still be on-site daily and available on-call after hours. The Project would include remote control capabilities that provide redundant control options from multiple off-site locations. The Dam also has a built-in safety mechanism to automatically pass water through the Dam once the reservoir surface level reaches the California Department of Water Resources, Division of Safety of Dams (DSOD) restriction.

The existing potable water system that serves the Dam site would be replaced. The water system currently consists of a 60,000-gallon upper tank located off Chantry Flats Road that connects to two 5,000-gallon lower tanks located near the Dam access road via a pipeline that runs down the mountainside. The slope adjacent to the upper tank has erosion damage and would be repaired as part of the Project. To repair the slope, an approximate 216-square-foot eroded gully located near the tank's foundation would be grubbed and stabilized with engineered fill and geotextile fabric or with support piles. The exposed portions of the existing water pipeline would be removed while any underground portions would be capped and abandoned in place. The replacement pipeline would run along the same general alignment as the existing pipeline. The two lower tanks would be removed and would not require replacement.

The existing manual swing gate at Chantry Flats Road that provides secured entry to the Dam access road would be replaced with a new electric slide gate. In order to provide electricity to the gate and new lighting/intercom systems, a power line would be strung on up to 7 new power poles to be installed along the outer edge of the Dam's access road, or where possible, in conduit along the inner slope of the access road.

1.2 HEADWORKS AND WILDERNESS PARK CULVERT CROSSING

1.2.1 Headworks

The Headworks structure would be replaced and the associated earthen levee would be partially reconstructed to better manage the diversion of flows to the downstream spreading grounds and the downstream Debris Dam. A rehabilitation of the Headworks is needed to protect facilities from stormwater damage and to direct stormwater runoff to the spreading grounds for groundwater recharge. Redevelopment of the Headworks would include reconstruction of the levee to ensure it can withstand flows produced by a 25-year storm event and replacement of the existing tainter gate (used to divert flows) with a new rubber diversion structure. The new rubber diversion structure would be a pneumatically operated, bottom hinged, spillway gate system.

The majority of the existing Headworks structure would be demolished and removed, including the tainter gate, supporting walls, catwalk, and keys. The new facility would increase the width of the structure by approximately 20 feet in order to house the 34-foot rubber diversion structure. Operation of the rubber diversion structure would result in the retention of waters behind the levee to allow for the diversion of flows through the intake gates and into the existing 30-inch RCP leading to the Santa Anita Spreading Grounds and/or Sierra Madre Spreading Grounds. The pool created by the new rubber diversion structure would remain the same as under existing conditions. Construction of the new diversion structure would require work in the creekbed extending approximately 25 feet downstream of the Headworks, including the placement of new riprap on the downstream side.

The rehabilitation of the Headworks would also include a new control system, including remote operation capabilities, to increase efficiency of water conservation operations. Currently, the response time required for County personnel to drive to the Headworks and manually operate the tainter gate, along with the limited flow rates that can be bypassed, results in the loss of a water conservation opportunity. A new control system integrated with the control system of the other Project components would optimize water conservation. A control house for the rubber diversion structure would be constructed on the other side of the channel next to the access road.

The earthen levee would be reinforced and raised approximately five feet higher to match the height of the Headworks structure by removing and under-excavating the existing levee and rebuilding the new levee using a combination of imported fill and suitable material from the existing levee. It would then be recompacted to the proposed height. The access road leading to the facility would be modified to match the height of the reinforced earthen levee. The existing riprap on the upstream side of the levee would be reinforced. A subsurface conduit would be installed along the length of the levee to connect the rubber diversion structure to the control house on the other side.

1.2.2 Wilderness Park Culvert Crossing

In addition to the improvements at the Headworks, armoring of the roadway and construction of a replacement culvert crossing to the Wilderness Park is needed to ensure that the structure can withstand flows produced by a larger storm event. The existing Culvert Crossing located approximately 450 feet downstream of the Headworks, including the concrete slab and corrugated metal culverts, would be removed and replaced with a new crossing structure.

The Culvert Crossing would be approximately 30 feet wide on the deck plate, allowing for two-way traffic. The new Culvert Crossing would be built on top of a new abutment and would be designed with a permanent guard rail and flexible pavement driving surface adequate for emergency vehicles. The new roadway elevation of the Culvert Crossing would be raised above the existing roadway elevation by approximately 4.5 feet to accommodate higher flows. Approximately 1,800 square feet of the roadways leading to and from the Culvert Crossing would be repaved and sloped to join the existing grade.

Approximately 30 feet of the channel upstream and downstream of the existing Culvert Crossing would be grubbed and graded to accommodate the new Culvert Crossing. It is anticipated that adequate vehicular and pedestrian access could be provided to the Arcadia Wilderness Park for the majority of the construction period for the Culvert Crossing, with only occasional closures required for periods of about a week or less at any given time during construction. Notification of any temporary closures would be posted at the entrance to the Wilderness Park. Those brief closures would avoid important events at the Wilderness Park, such as the overnight Boy Scout campouts every Friday and Saturday and youth day camps every weekday between mid-June to late-August. However, in order to provide a conservative analysis, the assembly of a temporary bypass crossing located north of the existing Culvert Crossing, which could require removal of a sycamore tree, has been assumed and assessed, to account for the event that the temporary crossing is used.

Therefore, access to the Wilderness Park would be maintained throughout construction with minimal interruptions to access. Two existing sycamore trees located adjacent to the crossing on the eastern shore of the Wash, south of the Culvert Crossing, would need to be removed. One sycamore located on the eastern shore of the Wash, north of the Culvert Crossing, may need to be removed, depending on whether or not the temporary bypass crossing is installed. In order to provide a conservative analysis, this IS/MND assumes that all three upstream and downstream sycamore trees would be removed.

The LACFCD may transplant the root ball(s) of the sycamores to a suitable riparian location, and/or utilize the woody debris from the sycamore to enhance habitat value at another nearby location, if determined to be feasible and if approved by the County and other appropriate parties. In addition, new sycamore trees would be planted within a 100-foot radius of the original location of any removed existing trees.

New riprap would be installed upstream and downstream of the Culvert Crossing. The roadways leading to and from the Culvert Crossing would be armored, 36 feet on the upstream side and 84 feet on the downstream side, to withstand flows and sloped to join the existing grade. The existing water and sewer lines that run through the current Culvert Crossing would need to be relocated to the new height and alignment of the structure. The sewer force main is on the downstream surface of the Culvert Crossing and the water line is on the upstream surface of the Culvert Crossing. Additionally, the fire hydrant, vault, water valve and standpipe would be demolished and relocated approximately 15 feet to the north in the case that the temporary bypass crossing is utilized. All utility trenching and relocations would remain within the area anticipated for impacts by the Culvert Crossing construction activities, and there would be no changes in water/sewer quantities or demands as a result of the Project.

1.3 DEBRIS DAM

Re Remediation of the seismic deficiencies at the Debris Dam would involve improvements to the existing structures, including the intake tower and embankment. As a result of the loss of water conservation capacity from the DSOD restrictions on the Dam, there is an increased need to capture as much stormwater runoff as possible in facilities below the Dam. As a result, the Debris Dam would also be enlarged by raising the existing spillway by four feet. Remediating the seismic deficiencies at the Debris Dam would result in the DSOD removing the operational restrictions on the facility, thereby restoring 119 acre-feet of water conservation capacity. Enlarging the Debris Dam would create an additional 40 acre-feet of additional storage capacity, for a total of 159 acre-feet. When captured stormwater is released from the Dam to the spreading grounds for groundwater recharge, the Debris Dam can then capture more runoff, which would allow for water storage capacity multiple times in a single season depending on the frequency, duration, and intensity of storm events.

The intake tower located in the Debris Dam is unable to resist seismic loading and would be strengthened or replaced. The improved intake tower would be connected to the existing 48-inch outlet pipe (being lined as part of this Project). The outlet pipe has an existing junction box, which is used to deliver water either into the spillway channel or into the spreading grounds. The upstream and downstream portions of the Debris Dam embankment and alluvial foundation material that are subject to potential liquefaction would be reinforced with structural buttressing. Currently, a cross-section of the Debris Dam resembles a triangle (e.g., sloped sides on the upstream and downstream sides of the dam) with a flat top (e.g., flattened to accommodate vehicular access). The top of the embankment ranges from an elevation of 796 feet above msl at its center to an elevation of 811 feet above msl at the western edge. The construction activities would involve the removal of the existing riprap exterior surface on portions of both the upstream (approximately 0.69 acre) and downstream (approximately 0.89 acre) slopes. Engineered fill materials beneath the riprap would be excavated and removed, and an engineered buttress would be constructed. Upon completion of construction activities, the sloped upstream and downstream surfaces of the Debris Dam would be reconfigured into a single stair-stepped terrace. The surface of the Debris Dam would be completed with a riprap similar to the existing condition.

As part of the improvements, six non-native deodar cedar trees located at the downstream toe of the embankment would be removed as mandated by the DSOD to ensure the structural integrity of the Debris Dam.

A new automated outlet gate and control system would be constructed to modernize operations and to ensure compatibility with other Project components. Upon completion of these improvements, the DSOD would issue a new certificate for the facility and remove the current operating restriction on the Debris Dam, which would increase the Debris Dam's available and allowable water conservation storage capacity from 0 acre-feet to 159 acre-feet.

2.0 NOISE BASICS AND TERMINOLOGY

"Sound" is a vibratory disturbance created by a moving or vibrating source and is capable of being detected. "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 1998).

2.1 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.

2.2 PERCEPTION OF NOISE AND A-WEIGHTING

A typical noise environment consists of a base of steady “background” noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. The local sources can vary from an occasional aircraft or train passing by, to intermittent periods of sound, such as amplified music, to virtually continuous noise from, for example, traffic on a major highway. In a large number of community attitudinal surveys, transportation noise has been ranked among the most significant causes of community dissatisfaction.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale, which approximates the frequency response of the average healthy ear when listening to most ordinary everyday sounds, was devised. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Therefore, the “A-weighted” noise scale is used for measurements and standards involving human perception of noise. Noise levels using A-weighted measurements are written dB(A) or dBA. Human perception of noise has no simple correlation with acoustical energy. Due to subjective thresholds of tolerance, the annoyance of a given noise source is perceived very differently from person to person. The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at 3 feet from the noise source is approximately 60 dBA, while loud jet engine noises equate to 110 dBA, which can cause serious discomfort. Exhibit 2, Typical Noise Levels and Their Subjective Loudness and Effects, shows the relationship of various noise levels to commonly experienced noise events.

Studies show that noise increases trigger community reactions varying from sporadic complaints to widespread complaints, legal threats, and/or vigorous action. It is widely accepted that (1) the average healthy ear can barely perceive changes of 3 dBA; (2) a change of 5 dBA is readily perceptible; and (3) an increase/decrease of 10 dBA sounds twice/half as loud, respectively (Caltrans 1998). In community situations, noise exposure and changes in noise levels occur over a number of years, unlike the immediate comparison made in a field study situation. The generally accepted level at which changes in community noise levels become “barely perceptible” typically occurs at values greater than 3 dBA. Changes of 5 dBA are defined as “readily perceptible”, and a 10-dBA increase is considered twice as loud. The 3-dBA increase criterion represents a balance of community benefits and reasonableness; it has been widely published, discussed, and referred by many professionals in acoustics.

2.3 NOISE PROPAGATION

From the source to the receiver, noise changes both in level and frequency spectrum. Noise levels decrease as the distance from the source increases; the manner in which noise reduces with distance depends on many factors.

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 (i.e., if the noise level is 70 dBA at 25 feet, it is 64 dBA at 50 feet). The movement of the 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: To account for the ground-effect attenuation (absorption), two types of site conditions are commonly used in noise prediction: soft site and hard site conditions. Hard sites (i.e., sites with a reflective surface between the source and the receiver, such as parking lots or

<table>
<tr><th>Common Outdoor Activities</th><th>Common Indoor Activities</th><th>A - Weighted Sound Level dBA</th><th>Subjective Loudness</th><th>Effects of Noise</th></tr>
<tr><td>Threshold of Pain</td><td></td><td>140</td><td rowspan="4">Intolerable or Deafening</td><td rowspan="6">Hearing Loss</td></tr>
<tr><td>Near Jet Engine</td><td></td><td>130</td></tr>
<tr><td></td><td></td><td>120</td></tr>
<tr><td>Jet Fly-Over at 1000 ft</td><td>Rock Band</td><td>110</td></tr>
<tr><td>Loud Auto Horn</td><td></td><td>100</td><td rowspan="3">Very Noisy</td></tr>
<tr><td>Gas Lawn Mower at 3 ft</td><td></td><td>90</td></tr>
<tr><td>Diesel Truck at 50 ft, at 50 mph</td><td>Food Blender at 3 ft</td><td>80</td><td rowspan="4">Speech Interference</td></tr>
<tr><td>Noisy Urban Area, Daytime</td><td>Vacuum Cleaner at 10 ft</td><td>70</td><td rowspan="2">Loud</td></tr>
<tr><td>Heavy Traffic at 300 ft</td><td>Normal Speech at 3 ft</td><td>60</td></tr>
<tr><td>Quiet Urban Daytime</td><td>Large Business Office</td><td>50</td><td rowspan="2">Moderate</td></tr>
<tr><td>Quiet Urban Nighttime</td><td>Theater, Large Conference Room (Background)</td><td>40</td><td>Sleep Disturbance</td></tr>
<tr><td>Quiet Suburban Nighttime</td><td>Library</td><td>30</td><td rowspan="2">Faint</td><td rowspan="4">No Effect</td></tr>
<tr><td>Quiet Rural Nighttime</td><td>Bedroom at Night, Concert Hall (Background)</td><td>20</td></tr>
<tr><td></td><td>Broadcast/Recording Studio</td><td>10</td><td rowspan="2">Very Faint</td></tr>
<tr><td>Lowest Threshold of Human Hearing</td><td>Lowest Threshold of Human Hearing</td><td>0</td></tr>
</table>

Source: Noise Technical Supplement by Caltrans

D:\Projects\COLADPW\J166\Graphics\Noise\Ex_TypNL.ai

Typical Noise Levels and Their Subjective Loudness and Effects

Exhibit 2

Santa Anita Stormwater Flood Management and Seismic Strengthening Project

BonTerra PSOMAS

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. Soft sites are sites that have an absorptive ground surface (e.g., 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, 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 receiver can significantly attenuate noise levels at that receiver 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 (e.g., hills and dense woods) and man-made features (e.g., buildings and walls) can significantly alter noise levels. For a noise barrier to work, it must be high enough and long enough to block the view from the receiver to a road or to the noise source.

2.4 NOISE DESCRIPTORS

Several rating scales (or noise “metrics”) exist to analyze 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}, which is the equivalent noise level for that period of time. The period of time averaging may be specified; $L_{eq(3)}$ would be a three-hour average. When no period is specified, a one-hour average is assumed. It is important to understand that noise of short duration (i.e., 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 one-hour period.

To evaluate community noise impacts, L_{dn} was developed to account for human sensitivity to nighttime noise. L_{dn} represents the 24-hour average sound level with a penalty for noise occurring at night. The L_{dn} computation divides the 24-hour day into 2 periods: daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM). The nighttime sound levels are assigned a 10-dBA penalty prior to averaging with daytime hourly sound levels. CNEL is similar to L_{dn} except that it separates a 24-hour day into 3 periods: daytime (7:00 AM to 7:00 PM), evening (7:00 PM to 10:00 PM), and nighttime (10:00 PM to 7:00 AM). The evening sound levels are assigned a 5-dBA penalty, and the nighttime sound levels are assigned a 10-dBA penalty prior to averaging with daytime hourly sound levels.

Several statistical descriptors are also often used to describe noise, including L_{max}, L_{min}, and L_x. L_{max} and L_{min} are respectively the highest and lowest A-weighted sound levels that occur during a noise event. L_x signifies the noise level that is exceeded “x” percent of the time; for example, L_{10} denotes the level that was exceeded 10 percent of the time.

2.5 NOISE-SENSITIVE RECEPTORS

Noise-sensitive receptors are generally considered to be humans who are engaged in activities or who are utilizing 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. Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals and places where quiet is an essential element of the intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure to excessive, disturbing, or offensive interior or exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are also considered sensitive to increases in exterior noise levels. Schools, hospitals, places of worship, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses.

There are no residential or other noise-sensitive land uses in the vicinity of the Dam, with the exception of the residence of the Dam Operator, located west if the dam. This residence would be removed by implementation of the Project; therefore, there would be no sensitive receptors in the vicinity of the Dam that could be impacted by construction noise.

There are no residential receptors in the vicinity of the Headworks. The nearest residences are approximately 550 feet southwest of the Headworks at the north end of Highland Vista Drive. There is no line of sight from the Headworks to these residences because of steep cliffs adjacent to the west and southwest side of the Headworks. There is also substantial forest growth between the Headworks and these homes that would attenuate noise.

The residences at the north end of Highland Vista Drive are approximately 250 feet west of the Wilderness Park Culvert Crossing. The elevation of the homes is approximately 150 feet above the crossing. The Wilderness Park is located east of the Wilderness Park Culvert Crossing and parking lot; the closest open space use area is approximately 150 feet east of the east end of the crossing.

There are single-family residences in the City of Arcadia adjacent to the west and south of the Debris Dam. The homes south of the Debris Dam are on Oaks Place. The homes west and northwest of the Debris Dam face Highland Oaks Drive. The residential structures closest to the Debris Dam are approximately 40 to 200 feet from the base (toe) of the downstream embankment. The homes near the Debris Dam are shown in Exhibit 4, Santa Anita Debris Dam Noise Monitoring Locations. The nearest sensitive receptors to the Debris Dam in the City of Monrovia are approximately ½ -mile east of the Debris Dam.

The Santa Anita Dam is in the Angeles National Forest. The Headworks, the Wilderness Park Culvert Crossing, the Wilderness Park, and the Debris Dam are in the City of Arcadia.

3.0 VIBRATION BASICS

Vibration is the periodic movement of mass over time. It is described in terms of frequency and amplitude, and unlike sound, there is no standard way of measuring and reporting amplitude. Vibration is described in units of velocity (inches per second [in/sec]), and discussed in dB units in order to compress the range of numbers required to describe vibration.

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 (Hz). The normal frequency range of most groundborne vibration that can be felt generally starts from a low frequency of less than 1 Hz to a high of about 200 Hz.

3.1 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 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 in/sec. Since it is related to the stresses that are experienced by buildings, ppv is often used in monitoring blasting vibration and the vibration of heavy construction equipment. Vibration is also described in decibel units, written as VdB, to distinguish from noise level decibels.

3.3 PERCEPTION OF VIBRATION

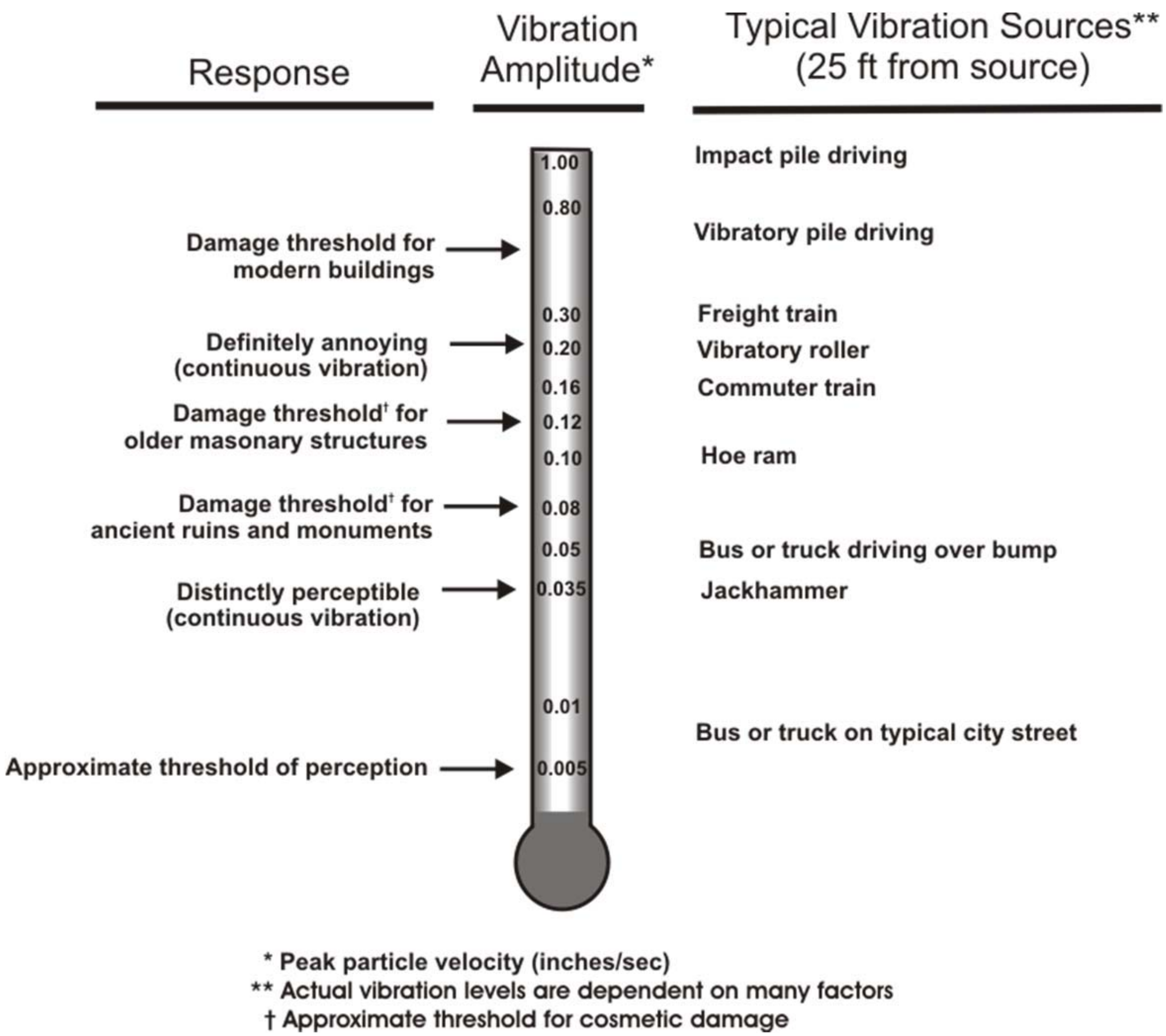
The primary concern from vibration is its ability to intrude and annoy local residents and other vibration-sensitive land uses. While people have varying sensitivities to vibrations at different frequencies, in general they are most sensitive to low-frequency vibration. Vibration in buildings caused 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.

The source of groundborne noise is typically from trains and similar transit vehicles and not from construction activities. 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. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Numerous studies have been conducted to characterize the human response to vibration and over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. These studies suggest that the thresholds for perception and annoyance vary according to duration, frequency, and amplitude of vibration. Exhibit 3, Typical Vibration Amplitudes and Thresholds, illustrates common vibration sources and typical human and structural responses.

3.4 VIBRATION-SENSITIVE RECEPTORS

Vibration-sensitive receptors are generally considered to be humans who are engaged in activities or who are utilizing 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. Construction vibration is generally associated with pile driving and rock blasting. Occasionally, large bulldozers and loaded trucks can cause perceptible vibration levels at close proximity. Vibration generated by construction activity has the potential



Source: WIA et al. 2012

Typical Vibration Amplitudes and Thresholds — Exhibit 3

Santa Anita Stormwater Flood Management and Seismic Strengthening Project

BonTerra PSOMAS

(10/16/14 JAZ) H:\PAS\Projects\CoLADPW\J166\Graphics\Noise\ex3_vibration.pdf

D:\Projects\COLADPW\J166\Graphics\Noise\ex_vibration.ai

to cause structural damage (i.e., cracking of floor slabs, foundations, columns, beams, or wells) or cosmetic/architectural damage (i.e., cracked plaster, stucco, or tile). Although it is possible for vibrations from construction projects to cause building damage, the vibrations from construction activities are almost never of sufficient amplitude to cause more than minor cosmetic damage to buildings (FTA 2006).

Vibration-sensitive receptors in the Project vicinity are the same as the noise-sensitive receptors previously described above and shown in Exhibit 4, Santa Anita Debris Dam Noise Monitoring Locations.

4.0 APPLICABLE NOISE AND VIBRATION STANDARDS

Public agencies have established noise guidelines and standards to protect citizens from potential hearing damage and other various adverse physiological and social effects associated with noise. The Santa Anita Dam is in U.S. Forest Service jurisdiction. The Headworks, the Wilderness Park Culvert Crossing, the Arcadia Wilderness Park, and the Debris Dam are in the City of Arcadia. The noise and vibration sensitive receptors associated with the Wilderness Park and the Debris Dam are located in the City of Arcadia. The City of Arcadia has not adopted quantitative noise standards for construction activity. Therefore, in order to quantitatively assess construction noise impacts, the County of Los Angeles Noise Ordinance standards have voluntarily been used in this analysis even though such activities are exempted from the ordinance. Since there are no sensitive receptors in the City of Monrovia adjacent to the Project site (only open space), the analysis using the County's noise standards would be appropriate.

4.1 COUNTY OF LOS ANGELES

4.1.1 County of Los Angeles General Plan Noise Element

The currently adopted General Plan Noise Element does not have quantitative noise standards but includes goals to reduce transportation noise, minimize future transportation noise, and address land use compatibility.

4.1.2 County of Los Angeles Noise Ordinance

Section 12.08 of the *County of Los Angeles Code* (County Code) contains the County's Noise Ordinance (Noise Ordinance). The Noise Ordinance prohibits unnecessary, excessive, and annoying sounds from sources on private properties by setting limits that cannot be exceeded at adjacent properties.

Transportation Sources

The County's Noise Ordinance requirements are not applicable to mobile noise sources such as automobiles or heavy trucks when traveling in a legal manner on public roadways or on private property. Mobile noise source control is preempted by federal and State laws. Los Angeles County does not address noise as it relates to land use compatibility for roadway noise in the Noise Ordinance.

Construction

Section 12.08.440 of the County Code prohibits construction noise between the hours of 7:00 PM and 7:00 AM on weekdays (including Saturday), and at any time on Sunday or a federal holiday if it creates a disturbance across a residential or commercial real-property line. The County also sets maximum construction noise levels "at residential structures". As shown in Table 1 below, the daytime noise level limit at single-family residences for mobile construction equipment is 75 dBA.

TABLE 1
COUNTY OF LOS ANGELES CONSTRUCTION EQUIPMENT NOISE LIMITS

Time Interval	Single-Family Residential (dBA)	Multi-Family Residential (dBA)	Semi-Residential or Commercial (dBA)
Mobile Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	75	80	85
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	60	64	70
Stationary Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	60	65	70
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	50	55	60

dBA: A-weighted decibels

Source: *County of Los Angeles Code* §12.08.

4.1.3 Vibration Standards

Section 12.08.560 of the County Code states, "Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz."

4.2 CITY OF ARCADIA

4.2.1 General Plan

The City of Arcadia General Plan does not address construction noise except as follows:

> Recognizing that construction noise, amplified sound, and noise from late night commercial activities near residential neighborhoods represent the chief sources of intermittent loud noise and noise complaints, the noise ordinance addresses these sources specifically. Among other provisions, the ordinance states that "it shall be unlawful for any person to willfully make or continue, or cause to be made and continued, any loud, unnecessary and unusual noise which disturbs the peace or quiet of any neighborhood, or which causes discomfort or annoyance to residents of the area" (City of Arcadia 2010).

4.2.2 Municipal Code

Construction noise is addressed in Article IV, Chapter 2, Part 6, Nighttime Construction, Sections 4261 and 4262 (Arcadia 2013).

> 4261. - PROHIBITED HOURS DEFINED.
>
> The term “prohibited hours” as used in this Part shall mean any time after the hour of 7:00 p.m. of any day; any time before the hour of 7:00 a.m. of any day; any time on any Sunday; and any time on any of the following holidays: January 1 (New Year's Day); May 30 (Memorial Day); July 4; Labor Day; November 11 (Veteran's Day); Thanksgiving Day; and December 25 (Christmas Day); provided that if in any calendar year any such holiday falls on a Sunday, the following Monday shall constitute the holiday.
>
> 4262. - CONSTRUCTION LIMITED.
>
> Unless a permit so to do shall first have been obtained as provided in Section 4263, no person shall during prohibited hours engage in any earth excavation, land fill or earth moving operation or in the construction of any portion of a building or structure, nor shall any person during prohibited hours use or operate any truck, tractor, crane, rig or any mechanical equipment of any kind in connection with, in the performance of or in furtherance of any of the foregoing.

4.2.3 Vibration Standards

There are no City of Arcadia vibration standards applicable to the proposed Project.

5.0 EXISTING NOISE ENVIRONMENT

The Project vicinity is a relatively quiet, suburban area. Noise sources include vehicles coming to and from the local residences and Arcadia Wilderness Park; maintenance and inspection activities at the Project facilities; and typical residential neighborhood sounds such as landscape maintenance machinery, barking dogs, and trash collection.

5.1 AMBIENT NOISE SURVEY

Ambient noise level measurements were taken at the Project site on December 20, 2012, using a Larson Davis Laboratories Model 831 integrating sound level meter (LD 831). The LD 831 sound level meter and microphone was mounted on a tripod four to five feet above the ground and equipped with a windscreen during all measurements. The LD 831 was calibrated before and after use. Monitoring was conducted at the Debris Dam because there are sensitive receptors close to the proposed work sites.

The monitoring locations were approximately 55 to 70 feet from the closest residences. Each short-term measurement was taken for a duration of approximately 20 minutes to provide representative average daytime noise levels. These ambient noise measurement locations are shown in Exhibit 4, Santa Anita Debris Dam Noise Monitoring Locations, and the average, maximum, and minimum (L_{eq}, L_{max}, and L_{min}) values taken at each short-term ambient noise measurement location are summarized in Table 2. The complete noise monitoring results are included in Appendix A.

As shown in Table 2, average daytime noise levels in the Project area when there is no construction work at the Debris Dam range from 44 to 48 dBA L_{eq}. The existing background noise environment (i.e., ambient noise) in the Project area is primarily influenced by occasional vehicle traffic on the roads adjacent to the Project sites

TABLE 2
SUMMARY OF SHORT-TERM AMBIENT NOISE LEVEL MEASUREMENTS IN THE PROJECT AREA

Location No.[a]	Location	Start Time, Duration	Noise Levels (dBA)			Primary Noise Source	Notes
			L_{eq}	L_{max}	L_{min}		
1	Debris Dam, south of east end of dam, on Lower Clam Shell Truck Road	12:57 PM 20 min	48	61	40	Vehicles on service road, residences	Construction nearby but not close; barking dog
2	Debris Dam, south of west end of dam, on Lower Clam Shell Truck Road	1:24 PM, 20 min	44	59	34	Vehicles on service road, residences	Construction nearby but not close

dBA: A-weighted decibel; L_{eq}: average noise level over a period of minutes or hours expressed as the equivalent noise level for that time period; L_{max} and L_{min}: the highest and lowest (respectively) A-weighted sound level that occurs during that noise event; min: minutes.

[a] Locations shown on Exhibit 4.

D:\Projects\CoLADPW\J166\mxd\Noise\ex_DebrisBasinNoise_v002.mxd

Noise Monitoring Locations

Exhibit 4

Santa Anita Stormwater Flood Management and Seismic Strengthening Project

N W E S

200 100 0 200 Feet

BonTerra PSOMAS

(Rev: 10-16-2014 JAZ) H:\PAS\Projects\CoLADPW\J166\Graphics\Noise\ex4_DebrisBasinNoise.pdf

6.0 REGULATORY REQUIREMENTS

As required by the County Code and consistent with the City of Arcadia municipal code, the following regulatory requirement (RR) shall be included in the proposed Project.

RR Noise-1 In compliance with the County Code and consistent with the City of Arcadia Municipal Code, Project construction activities that generate substantial noise, such as the operation of construction equipment and mechanical equipment, shall be limited to the hours of 7:00 AM to 7:00 PM Monday through Saturday.

7.0 NOISE IMPACTS

Noise impacts associated with the proposed Project would be limited to the construction phases of the proposed Project. The operations of the Santa Anita Dam, Headworks, Wilderness Culvert Crossing and Debris Dam would be the same as, or very similar to the current operations.

The primary noise sources during typical construction are the diesel engines of construction equipment and the impact noise from operations such as pile driving, blasting, and jackhammering. No blasting or pile driving activities are anticipated for the Project; jackhammering may be used for some demolition work.

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 from stationary equipment are assessed from the location of the specific equipment, while noise impacts from mobile construction equipment are assessed from the center of the equipment activity or construction site. As described in Section 2.3, the noise level at a receptor is dependent on the distance from the source to the receptor and the intervening topography and ground cover.

Variation in power is also a factor in characterizing the noise source levels from construction equipment. Power variation is accounted for by describing the noise at a reference distance from 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).[1] Typical duty cycles and noise levels generated by representative pieces of equipment are listed in Table 3, Typical Maximum Construction Equipment Noise Levels and Duty Cycles.

1 The duty cycle is the percentage of time that the equipment is typically at full power.

TABLE 3
TYPICAL MAXIMUM CONSTRUCTION EQUIPMENT NOISE LEVELS AND DUTY CYCLES

Equipment	Noise Level (dBA) 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%
Insitu Soil Sampling Rig	84	20%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pile Driver, Impact (diesel or pneumatic)	101	20%
Pile Driver, Vibratory	95	20%
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%

dBA: A-weighted decibels; ft: feet; KVA: kilovolt amps

Source: Thalheimer 2000, FTA 2006.

7.1 CONSTRUCTION PHASING

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 would 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). Table 4, Project Construction Schedule, provides the projected construction start dates and duration for the various Project components. As shown in Table 4, construction of the Project at the Dam is anticipated to commence in December 2015. While the schedule may be modified due to the date of County Project approval as well other Project approval/permits, this table illustrates the approximate duration of major Project activities.

**TABLE 4
PROJECT CONSTRUCTION SCHEDULE**

Construction Phase	Estimated Construction Start	Anticipated Duration
Dam	**December 2015**	10 months
Armor Canyon/Dam	December 2015	2 weeks
Garage, Helipad, Water System	December 2015	6 weeks
Remove/Replace Jib Crane	February 2016	2 weeks
Repair Concrete	February 2016	2 weeks
Hoist	March 2016	4 weeks
Construct New Spillway	April 2016	6 months
Install Valves	April 2016	2 weeks
Electrical	April 2016	4 weeks
Headworks and Wilderness Park Culvert Crossing	**March 2016**	**6 months**
Headworks Demolition	March 2016	1 week
Rubber Dam	March 2016	1 week
Construct Levee	March 2016	2 weeks
Culvert Crossing Demolition	April 2016	2 weeks
Site Clear/Grub	April 2016	4 weeks
Grading/Implement Temporary Access	May 2016	2 weeks
Abutments and Wing Walls	June 2016	4 weeks
Construct Culvert Crossing Deck	July 2016	6 weeks
Paving Culvert Crossing	August 2016	2 weeks
Debris Dam	**April 2016**	**6 months**
Modify Spillway	April 2016	2 months
Construct Buttresses	June 2016	2.5 months
Construct New Subdrain	August 2016	1 month
Remove/Construct Outlet Tower(s)	September 2016	2 weeks

7.1.1 Construction Equipment and Workforce

Trip generation for employees and delivery trucks would vary depending on the phase of construction. During the peak of construction, a typical day would include the transportation of workers; movement of heavy equipment; and transportation of materials. Detailed construction equipment and trip generation are shown in Table 5, Project Construction Equipment and Trip Generation, on the following page.

**TABLE 5
ESTIMATED PROJECT CONSTRUCTION EQUIPMENT AND TRIP GENERATION**

Construction Phase	Offroad Equipment	Worker Trips[a]	Truck Trips[a]
Dam			
Armor Canyon/Dam	1 Concrete Pump	3	500
Garage, Helipad, Water System	1 Concrete Pump, 1 Loader/Backhoe	5	10
Remove/Replace Jib Crane	1 Crane	3	5
Repair Concrete	1 Concrete Pump	3	5
Hoist	1 Crane	3	10
Construct New Spillway	1 Backhoe, 1 Concrete Pump, 1, Crane, 1 Loader, 1 Concrete Saw	8	56
Install Valves	1 Crane	3	5
Electrical	1 Crane	3	10
Headworks and Wilderness Park Culvert Crossing			
Headworks Demolition	1 Concrete Saw, 1 Excavator, 1 Backhoe	5	10
Rubber Dam	2 Backhoes	3	3
Construct Levee	1 Backhoe, 1 Concrete Pump	3	19
Culvert Crossing Demolition	1 Concrete Saw, 1 Excavator, 1 Backhoe	5	14
Site Clear/Grub	1 Backhoe	3	210
Grading/ Implement Temporary Access	2 Backhoes	5	--
Abutments and Wing Walls	2 Concrete Pumps	4	46
Construct Culvert Crossing Deck	1 Concrete Pump	3	18
Paving Culvert Crossing	1 Roller	3	15
Debris Dam			
Modify Spillway	1 Concrete Pump, 1 Concrete Saw, 1 Drilling Rig	4	63
Dam			
Construct Buttresses[b]	1 Excavator, 1 Dozer, 1 Backhoe, 1 Loader, 1 Water Truck	5	4,063
Construct New Subdrain	2 Loaders	3	157
Remove Outlet Tower	2 Backhoes, 1 Water Truck	3	5

[a] All trips are round trips.

[b] The 4,063 number of trips was estimated based on 65,000 cubic yards of material required for the buttressing, assuming use of 16 cubic yard trucks occurring over 55 workdays (i.e. 2.5 months). Approximately half of this material (32,500 cubic yards) is estimated to be harvested from the adjacent Sediment Placement Site (SPS); therefore, the first 27 workdays (i.e. 5 weeks) of the sediment/fill truck trips would occur on-site between the SPS and the Debris Dam, and would not affect local residential roadways. Once fill from the SPS is exhausted, the remaining fill amount would be imported to the Debris Dam site, requiring off-site trucking for approximately 5 weeks.

7.2 TEMPORARY CONSTRUCTION NOISE IMPACTS

Typical heavy construction equipment would include bulldozers, excavators, dump trucks, front-end loaders, graders, and industrial/concrete saws. Construction of the Project would include demolition, which would result in impact noise. Construction activities associated with the Project would not include blasting or pile driving.

Because of the effects of noise attenuation, the distance from the noise source to a receptor is a primary consideration in determining the noise level experienced at the receptor. The distances and locations of sensitive receptors near the Project site were discussed above and sensitive receptors near the Debris Dam are shown in Exhibit 4. Because different construction stages involve different pieces of equipment and may involve only localized portions of a site, each construction stage can result in different noise levels being generated depending on the distance to sensitive receptors. As described in RR Noise-1 above, all construction must be limited to the hours of 7:00 AM to 7:00 PM Monday through Saturday. However, in order to reduce construction-related impacts to nearby residences, the Project would only be under construction during the weekdays (Monday through Friday) and work would not occur on Saturdays.

7.2.1 Dam

Construction at the Dam would occur for approximately 10 months (starting in December 2015). There are no noise-sensitive receptors near the Dam or near the slope improvement area north of the Dam. Although construction activity would result in substantial temporary noise increases in the area near the Dam, there would be no impacts because there are no nearby sensitive receptors.

7.2.2 Headworks

Construction at the Headworks would occur for approximately one month (starting in March 2016). Construction noise would result in substantial temporary noise increases in the area around the Headworks. Although the nearest homes are more than 500 feet from the Headworks and there are topographic and vegetation barriers between the Headworks and the homes that would attenuate noise, some construction noise would be audible. Neither the magnitude nor the duration of the construction noise would be substantial and the impact would be less than significant.

7.2.3 Wilderness Park Culvert Crossing

Construction at the Wilderness Park Culvert Crossing would occur for approximately 4.5 months (starting in April 2016) after construction at the Headworks. Construction noise would result in substantial temporary noise increases in the area immediately adjacent to the Wilderness Park Culvert Crossing. The noisiest piece of equipment used at this site would be a concrete saw, which would be used intermittently in the demolition of the existing concrete slab and Culvert Crossing. As shown in Table 3, the maximum noise level for a concrete saw is 90 dBA at a distance of 50 feet. Another noise source would be the diesel engines of a bulldozer, excavator, truck, or backhoe. Two of the noisiest pieces of diesel engine driven equipment each generates noise levels of 85 dBA L_{max}, If operated at full power simultaneously, the combined maximum noise level would be 88 dBA at 50 feet. A concrete saw and a diesel engine at maximum noise levels together would be 91 dBA at 50 feet.

The nearest homes are approximately 250 feet from the Wilderness Park Culvert Crossing. At a distance of 250 feet and without absorbent vegetation or barriers blocking the line of sight, a noise level of 91 dBA at 50 feet would be reduced to 77 dBA. The topography between the homes and the Culvert Crossing (i.e., the bluff edges) would act as a barrier, blocking the line of sight; the topography would, therefore, act as a barrier along the noise transmission path between most or all of the construction activities and the homes, reducing noise by 3 to 5 dBA. Maximum noise levels, assuming they occur intermittently at the homes, are estimated at 72 to 74 dBA, and may be substantially less depending on the noise attenuation provided by the intervening topography. However, some construction noise would be audible and may occasionally be disturbing to persons in the backyards of the homes. The maximum noise levels would be less than the County

Noise Ordinance 75 dBA limit for construction noise from mobile equipment to single-family residential land uses. Therefore, the impact would be less than significant and no mitigation is required. However, in order to minimize noise impacts to residences in the vicinity of the Wilderness Park Culvert Crossing, the Project would implement MM NOI-1, which specifies construction practices to minimize noise effects upon sensitive receptors. The Project would also implement MM NOI-2, which would provide a process for identifying and correcting excessive construction noise levels. Neither MM NOI-1 nor MM NOI-2 is required to ensure that impacts at the Wilderness Park Culvert Crossing would be less than significant.

The County Noise Ordinance construction equipment noise limits are not applicable to the Wilderness Park because it is neither a residential nor commercial land use. However, it is noted that short-term construction noise levels at the Culvert Crossing may be annoying for some visitors. Construction noise is generally understood to be a temporary inconvenience, especially for people that are not obligated to stay near the noise source and can freely move to a quieter location. Therefore, there would be no impacts to park users from construction noise associated with the Culvert Crossing.

7.2.4 <u>Debris Dam</u>

Construction at the Debris Dam would occur for approximately six months (starting April of 2016). Construction noise would result in substantial temporary noise increases in the residential area immediately adjacent to the Debris Dam. The homes west and south of the Debris Basin are approximately 40 to 200 feet from the base of the downstream Debris Dam embankment, relatively close to the proposed structural buttressing that would occur at the toe of the downstream embankment. Excavation for the structural buttress at the toe of the Debris Dam would occur at distances 25 to 50 feet from the closest residences. When construction work would occur on the upstream side of the embankment, the embankment would act as a noise barrier to the residences on the downstream side, reducing the noise level at those receptors. Similarly, the Debris Dam would be a barrier between upstream receptors and noise generated on the downstream side. As previously discussed, the nearest sensitive noise receptors in the City of Monrovia are ½ mile to the east; noise impacts at that distance would be negligible. Thus, the focus of the noise analysis at the Debris Dam is potential impacts to receptors near the downstream embankment.

As previously discussed in Section 4.3, Air Quality, construction activities at the Debris Dam are expected to include one excavator, one dozer, one backhoe, one loader, as well as on-road trucks. As shown in Table 3, some of this equipment has a maximum noise level of 85 dBA at 50 feet. Two of the noisiest pieces of equipment, if at full power simultaneously, would have a maximum noise level of 88 dBA at 50 feet. If large diesel engine powered construction equipment would operate on or below the downstream embankment, the resulting noise level of 88 dBA at 50 feet would exceed the County Noise Ordinance 75 dBA limit at residences closer than 225 feet, and mitigation is required.

MM NOI-3 would be implemented, which requires, (1) the installation of a temporary 16 foot high noise barrier on between the Debris Dam and the residences closest to the downstream side of the Debris Dam to ensure a minimum noise transmission loss of 22 dBA and (2) that only 1 piece of equipment be operated at full power at any time for work that is done on the downstream side of the Debris Dam within 50 feet of residences.

For example, when a loader is at full power loading a truck, the truck should be shut down or on low idle; when the truck powers up to move, the loader should be shut down or a low idle. As previously noted, work on the structural buttress may occur as close as 25 feet from a residence. At that distance and without a noise barrier, the noise level from a piece of construction equipment that generates 85 dBA at 50 feet would be 91 dBA. With those parameters, the noise barrier would provide a minimum of 18 dBA noise reduction, reducing the maximum noise level to 73 dBA or less.

The effectiveness of a noise barrier, called insertion loss, varies with the locations of the noise source and receptor relative to the barrier. Table 6, Noise Levels with Noise Barrier, shows noise levels without and with a 16 foot high noise wall with various locations of the noise source.

TABLE 6
NOISE LEVELS WITH NOISE BARRIER

Source Noise Level at 50 ft (dBA)	Source to Receptor Distance (ft)	Receptor Noise Level w/o Wall (dBA)	Wall Height (ft)	Insertion Loss (dBA)	Receptor Noise Level with Wall (dBA)
85	25	91	16	18	73
85	50	85	16	16	69
85	75	81.5	16	16	65.5

dBA: A-weighted decibels; ft: feet

Note: Data for source and receptor at the same elevation. The source (construction equipment) may be at a higher elevation when working on the downstream side of the Debris Dam. In this case the effective wall height and insertion loss would be reduced, but noise levels at the receptor would not exceed 75 dBA.

Source: BonTerra Psomas 2014c (Appendix D).

As shown in Table 6, with one piece of equipment with a noise level of 85 dBA at 50 feet from the source, the receptor noise level would be 73 dBA at a 25-foot distance between the source and receptor with the 16-foot high noise barrier. A second piece of equipment with the same noise level would increase the receptor noise by 3 dBA, which would exceed the 75 dBA threshold. Therefore, MM NOI-3 limits the number of equipment at full power within 50 feet of residences. The proposed location of the noise barrier is shown on Exhibit 4. With implementation of MM NOI-3, construction equipment noise levels would not exceed 75 dBA at the adjacent residences and the impacts would be reduced to levels less than significant.

In order to further minimize noise impacts to residences in the vicinity of the Debris Dam, MM NOI-1 would be implemented, which specifies construction practices to minimize noise effects upon sensitive receptors. The Project would also implement MM NOI-2, which would provide a process for identifying and correcting excessive construction noise levels. Neither MM NOI-1 nor MM NOI-2 is required to ensure that impacts at the Debris Dam would be less than significant.

7.2.5 <u>On-Road Traffic Noise Impacts</u>

The Project would generate traffic on N. Santa Anita Avenue, Highland Oaks Drive, and Elkins Avenue. During the approximate 10-month construction period, the traffic noise impacts would be related to movement of construction equipment, trucks, and construction worker trips. Once construction equipment is transported to the various flood-control facilities, it is anticipated that the equipment would remain on site until the end of each phase and all Project-related traffic noise would be related to workers entering and leaving the Project site during the workday. The anticipated number of worker trips are detailed in Table 5. Individual truck passbys would be heard at residences adjacent to the roads used; the noise would be similar to the occasional noise of waste collection trucks, which would be approximately 73 to 77 dBA at a distance of 50 feet from the centerline of the road, depending on the speed of the truck.

Peak trucking periods, including concrete trucks and dump trucks for hauling fill material, would occur at two distinct construction phases: (1) a two-week period in December 2015, when construction at the Dam (reinforcement of the armoring on the downstream canyon wall and construction of the helipad) would occur, concrete pours and other material deliveries would require approximately 50 daily round trips (e.g. equates to approximately 6.3 round trips per hour per workday-assuming 8 hours of activity) per day; and (2) over approximately 5 weeks starting in August 2016, when construction of the Debris Dam buttresses would require approximately 74 round trips for soil import per day (e.g. equates to approximately 9.2 round trips per hour per workday-assuming 8 hours of activity per day).[2] The anticipated schedule for construction activities are shown in Table 4 and the anticipated number of truck/worker trips during each period are shown in Table 5.

With the exception of noise generated during the two construction activities described above, the hourly average noise increase due to construction traffic would be less than 3 dBA. Because there is relatively little existing traffic noise on Highland Oaks Drive and Elkins Avenue, the hourly average noise level could increase up to 8 dBA during trucking to the Dam and Wilderness Park Culvert Crossing and up to 12 dBA during trucking to the Debris Dam. During these periods of concrete truck activity, there would be a clearly audible increase in periodic noise events (i.e. the noise increase associated with each truck pass); however, these two periods of increased traffic noise would be short-term and would occur over a period of approximately 7 weeks. It is also noted that the community noise equivalent level (CNEL) would not exceed 60 dBA during these two peak traffic noise periods, which is the City's "Normally Acceptable" noise compatibility guideline for development in a low density residential area. This guideline is not applicable to the Project because traffic noise is short-term due to construction activities, whereas the guideline refers to long-term operational noise sources. However, it is mentioned to provide context and illustrate that even short-term construction activities would be within the City's "Normally Acceptable" noise compatibility guideline. The impact would be less than significant.

7.2.6 Summary of Construction Noise Impact Analyses

Table 7 summarizes the noise impact analyses above.

[2] Estimated soil import requirements of 65,000 cubic yards, delivered in 16 cubic yard trucks, would result in 4,063 truck trips over the course of 2.5 months. Because approximately half of the import fill material would be obtained from the adjacent SPS, the first 5 weeks of soil import would not require the dump trucks to travel through the adjacent neighborhoods. Once the full amount of soil is obtained from the SPS, import will be required for the remaining 32,500 cubic yards, which would occur over the remaining 5 week period.

TABLE 7
SUMMARY OF NOISE IMPACT ANALYSES

Section	Topic	Maximum Noise Level (dBA)	Less than Significant?	Mitigation Measures Required	Maximum Noise Level with Mitigation (dBA)	Less than Significant with Mitigation?
7.2.1	Dam	NA[a]	Yes	None	NA	NA
7.2.2	Headworks	NA[b]	Yes	None	NA	NA
7.2.3	Wilderness Park Culvert Crossing	72 to 74	Yes	None	NA	NA
7.2.4	Debris Dam	88	No	NOI-3	73	Yes
7.2.5	On-Road Traffic	increase of 8 to 11	Yes	None	NA	NA

NA: Not applicable

[a] No sensitive receptors near the Dam.
[b] Distance and topography prevent substantial noise at receptors.

7.2.7 Construction Noise Mitigation Measures

To reduce potential construction-related noise impacts associated with Project construction, the following noise abatement measures would be incorporated into the Project.

MM Noise-1 Even though measures set forth in this mitigation are not required to reduce noise to less than significant levels at either the Culvert Crossing or the Debris Dam, these measures will be implemented at these construction sites to further reduce noise impacts.

- The construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards.
- The construction contractors shall place all stationary construction equipment so that the equipment is as far as feasible from the noise-sensitive receptors and so that emitted noise is directed away from the noise-sensitive receptors.
- The construction contractors shall locate equipment staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during all Project construction.
- The construction contractors shall limit haul truck deliveries to the same hours specified for operation of construction equipment.

MM Noise-2 Even though measures set forth in this mitigation are not required to reduce noise to less than significant levels at either the Culvert Crossing or the Debris Dam, these measures will be implemented at these construction sites to further reduce noise impacts.

At least two weeks but not more than one month prior to the start of noise-generating construction activities, notification shall be mailed to owners and occupants of all developed land uses within 300 feet of the Culvert Crossing and Debris Dam providing a schedule for major construction activities that will occur through the duration of the construction period. The notification shall include the identification and contact number for a designated construction manager that would be available on site to monitor construction activities. Contact information for the Construction Manager shall also be located at the Arcadia City Hall and the Arcadia Police Department.

Complaints may be made during construction hours and a response shall be made within one work day. The Construction Manager shall document all complaints and resolutions and shall provide copies to the LACFCD within three working days of the complaint.

The Construction Manager, upon observation of excessive noise occurring near adjacent homes or upon receipt of a complaint about excessive noise shall do the following:

- Ensure that construction equipment is properly muffled according to industry standards and
- Modify operations to reduce the number of pieces of equipment operating near noise sensitive receptors or operating concurrently, unless the modification would prevent completion of the task or
- Implement corrective or additional noise-attenuation measures considered appropriate to address the complaint, which may include, but are not limited to, noise barriers or noise blankets.

MM Noise-3 Prior to the start of grading or similar heavy equipment operation on the downstream side of the Debris Dam, the County shall erect a temporary noise barrier between the structural buttressing work area and the residences to the southwest. The barrier shall be located along on the southwest edge of the site access road but the horizontal location may be adjusted as necessitated by geographical or topographical constraints or to avoid trees. The barrier shall be 16 feet high and solid from the ground to the top. The barrier shall be plywood of at least 0.75-inch thickness or other material with a noise transmission loss of 22 dBA or more.

When equipment is working on the downstream site of the Debris Dam within 50 feet of residences, only one piece of equipment shall be at full power at any time; other equipment shall be shut down or at low idle.

7.3 LONG-TERM OPERATIONAL NOISE IMPACTS

Once the Project is complete, there would be no long-term changes to the regular inspection and maintenance operations at the Dam, Headworks, or Debris Dam. Helicopter flights to and from the new helipad at the Dam would occur only in emergencies and would not be anticipated to occur more than once or twice per year. These occasional noise events would not permanently affect the ambient noise levels. Therefore, there would be no Project-generated change in long-term ambient noise levels in the Project vicinity. There would be no impact.

7.3.1 Operational Noise Mitigation Measures

Since there would be no Project-generated change in long-term ambient noise levels, no operational mitigation measures are required.

7.4 AIRPORT AND PRIVATE AIRSTRIP NOISE IMPACTS

The proposed Project would not develop land uses that would locate persons in an area subject to noise from public or private airports. Noise generated by helicopter flights would occur only in emergencies, is not anticipated to occur more than once or twice per year, and would not be excessive. The impact would be less than significant. No mitigation measures are required.

8.0 VIBRATION IMPACTS

The proposed Project has the potential to generate vibration to the nearest homes adjacent to the west and south of the Debris Dam. There are no applicable standards for structural damage from vibration. The California Department of Transportation (Caltrans) vibration damage potential guideline thresholds are shown in Table 8, Guideline Vibration Damage Potential Threshold Criteria.

TABLE 8
GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

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

ppv: peak particle velocity; in/sec: inch(es) per second

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.

8.1 SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

Groundborne vibration generated by construction activities is usually highest during pile driving, blasting, soil compacting, jack-hammering, and demolition-related activities. No blasting or pile driving; however, the Project would require demolition activities that may require jackhammers. Next to demolition, grading activity has the greatest potential for vibration impacts as the largest and heaviest equipment would be used during this stage.

Table 9, Vibration Levels During Construction, summarizes typical vibration levels measured during construction activities for various vibration-inducing pieces of equipment at a distance of 25 feet and the calculation of these levels at a distance of 50 feet. Excavation for the structural buttress at the toe of the Debris Dam would occur at distances 25 to 50 feet from the closest residences.

**TABLE 9
VIBRATION LEVELS DURING CONSTRUCTION**

Equipment		PPV at 25 ft (in/sec)	PPV at 50 ft (in/sec)
Pile driver - impact	Upper range	1.518	0.617
	Typical	0.644	0.262
Large bulldozer		0.089	0.036
Caisson drilling		0.089	0.036
Loaded trucks		0.076	0.031
Jackhammer		0.035	0.014
Small bulldozer		0.003	0.001
ft: feet; in/sec: inches per second. Source: FTA 2006.			

Although it is possible for vibration from construction projects to cause building damage, vibration from construction activities are almost never of sufficient amplitude to cause more than minor cosmetic damage to buildings. There are no off-site structures near the Dam or the Headworks. The closest residential structures to the Wilderness Park Culvert Crossing are 250 feet away. The closest residential structures to the Debris Dam work area are 25 feet away. The highest potential vibration level at a distance of 25 feet shown in Table 9 above (i.e., a large bulldozer at 0.089 ppv in/sec) would be substantially less than the 0.3 ppv in/sec structural damage guideline for older residential structures. Therefore, there would be no potential for structural damage to existing structures near the Project site.

Section 12.08.560 of the Los Angeles County Code considers the vibration perception threshold is a motion velocity of 0.01 in/sec. As shown in Table 9, if large equipment were to operate frequently within 25 feet of an occupied residence, vibration level would be approximately 0.09 in/sec and would be distinctly perceptible. At a distance of 140 feet, the vibration level from the largest equipment shown in Table 9, a heavy bulldozer, would not exceed 0.01 in/sec. In order to limit vibration at the residences to less than 0.01 in/sec, MM NOI-4 would be implemented. MM NOI-4 would prohibit the use of large bulldozers and large loaded trucks on the Project site within 140 feet of an occupied residential structure. Jackhammer vibration would not exceed 0.01 in/sec at distances greater than 60 feet. While jackhammers may be used for some demolition activities at the Debris Dam, no demolition is planned within 60 feet of an occupied residence. With the implementation of MM NOI-4, the impact would be less than significant.

8.2 OPERATIONAL VIBRATION IMPACTS

Once the Project is complete, there would be no long-term changes to the regular inspection and maintenance operations at the Santa Anita Dam, Headworks, or Debris Dam. Therefore, there would be no Project-generated change in vibration levels in the Project vicinity.

8.2.1 Vibration Mitigation Measures

MM Noise-4 Large bulldozers and large loaded trucks shall not be operated on the Project site within 140 feet of an occupied residence. Consistent with the County Code, this restriction does not apply to trucks on a public right-of-way.

9.0 REFERENCES

Arcadia, City of. 2013 (Codified through Ordinance No. 2306, passed January 15, 2013). Arcadia Municipal Code. http://library.municode.com/index.aspx?clientId=16197.

———. 2010 (November). *Arcadia General Plan* (Chapter 9: Noise Element). Arcadia, CA: the City. http://www.ci.arcadia.ca.us/docs/gp_noise.pdf.

California Department of Transportation (Caltrans). 2004 (June). *Transportation- and Construction-Induced Vibration Guidance Manual* (prepared by Jones and Stokes). Sacramento, CA: Jones and Stokes. http://www.dot.ca.gov/hq/env/noise/pub/vibrationmanFINAL.pdf.

———. 1998 (October). *Technical Noise Supplement: A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA: Caltrans. http://www.dot.ca.gov/hq/env/noise/pub/Technical%20Noise%20Supplement.pdf.

Thalheimer, E. 2000. Construction Noise Control Program and Mitigation Strategy as the Central Artery/Tunnel Project. *Noise Control Engineering Journal* 48(5), Sep–Oct. Indianapolis, IN: Institute of Noise Control Engineering.

U.S. Department of Transportation (USDOT), Federal Transit Administration (FTA). 2006 (May). *Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06* (prepared by Harris Miller Miller & Hanson, Inc. [HMMH]). Vienna, VA: HMMH. http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

APPENDIX A

NOISE LEVEL MEASUREMENT RESULTS

Summary			
Filename	831_Data.045		
Serial Number	1742		
Model	831		
Firmware Version	2.000		
User			
Location	1 - Debris Basin SE		
Job Description			
Note			
Measurement Description			
Start	2012/12/20 12:45:31		
Stop	2012/12/20 13:16:57		
Duration	0:20:08.0		
Run Time	0:20:08.0		
Pause	0:00:00.0		
Pre Calibration	2012/10/31 11:53:43		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRM831		
Integration Method	Linear		
Gain	0.0 dB		
Overload	143.8 dB		
	A	**C**	**Z**
Under Range Peak	**76.3**	73.3	78.3
Under Range Limit	**26.3**	26.6	32.1
Noise Floor	17.1	17.5	22.7
Results	Laeq and LASmax adjusted to delete calibration signal		
LAeq	48.2 ~~85.7~~ dB		
LAE	116.5 dB		
EA	49.912 mPa²h		
LApeak (max)	2012/12/20 12:45:32	117.0 dB	
LASmax	2012/12/20 12:45:33	60.7 ~~114.0~~ dB	
LASmin	2012/12/20 13:08:52	39.5 dB	
SEA	-99.9 dB		
Statistics			
LAS5.00	53.7 dB		
LAS10.00	50.5 dB		
LAS33.30	47.5 dB		
LAS50.00	44.3 dB		
LAS66.60	42.4 dB		
LAS90.00	40.7 dB		

Record #	Date	Time	Duration	Run Time	LAeq	energy	runtime	weighted	LAE	LASmin	Time	LASmax	Time
1	2012/12/20	12:45:31	00:00:01.8	00:00:01.8	114.0				116.5	114.0	12:45:31	114.0	12:45:33
2	2012/12/20	12:56:48	00:00:11.6	00:00:11.6	40.7				51.4	40.3	12:56:57	41.1	12:56:53
3	2012/12/20	12:57:00	00:01:00.0	00:01:00.0	44.9	30899	60	30899	62.7	40.2	12:57:59	58.6	12:57:51
4	2012/12/20	12:58:00	00:01:00.0	00:01:00.0	42.1	16099	60	16099	59.8	40.2	12:58:04	47.5	12:58:29
5	2012/12/20	12:59:00	00:01:00.0	00:01:00.0	42.1	16381	60	16381	59.9	41.1	12:59:53	43.9	12:59:25
6	2012/12/20	13:00:00	00:01:00.0	00:01:00.0	41.6	14338	60	14338	59.3	39.7	13:00:30	46.1	13:00:23
7	2012/12/20	13:01:00	00:01:00.0	00:01:00.0	42.7	18835	60	18835	60.5	40.3	13:01:03	50.1	13:01:28
8	2012/12/20	13:02:00	00:01:00.0	00:01:00.0	47.9	61194	60	61194	65.6	42.2	13:02:01	54.0	13:03:00
9	2012/12/20	13:03:00	00:01:00.0	00:01:00.0	51.8	151933	60	151933	69.6	45.6	13:03:28	58.2	13:03:04
10	2012/12/20	13:04:00	00:01:00.0	00:01:00.0	49.2	83967	60	83967	67.0	42.5	13:04:56	53.7	13:04:33
11	2012/12/20	13:05:01	00:01:00.0	00:01:00.0	46.2	41828	60	41828	64.0	42.0	13:05:55	56.6	13:05:37
12	2012/12/20	13:06:01	00:01:00.0	00:01:00.0	47.6	57961	60	57961	65.4	41.9	13:07:00	54.7	13:06:40
13	2012/12/20	13:07:01	00:01:00.0	00:01:00.0	42.0	15689	60	15689	59.7	40.6	13:08:01	45.7	13:07:09
14	2012/12/20	13:08:01	00:01:00.0	00:01:00.0	41.3	13411	60	13411	59.1	39.5	13:08:52	49.7	13:08:14
15	2012/12/20	13:09:01	00:01:00.0	00:01:00.0	43.7	23487	60	23487	61.5	39.7	13:09:12	49.0	13:09:37
16	2012/12/20	13:10:01	00:01:00.0	00:01:00.0	43.2	21111	60	21111	61.0	40.1	13:10:31	49.2	13:10:22
17	2012/12/20	13:11:01	00:01:00.0	00:01:00.0	49.9	98482	60	98482	67.7	42.0	13:11:05	57.0	13:11:51
18	2012/12/20	13:12:02	00:01:00.0	00:01:00.0	45.2	32925	60	32925	63.0	41.9	13:12:56	50.2	13:12:10
19	2012/12/20	13:13:02	00:01:00.0	00:01:00.0	55.6	364616	60	364616	73.4	42.1	13:13:03	60.7	13:13:37
20	2012/12/20	13:14:02	00:01:00.0	00:01:00.0	49.6	91404	60	91404	67.4	48.4	13:14:20	50.8	13:14:53
21	2012/12/20	13:15:02	00:01:00.0	00:01:00.0	49.1	80387	60	80387	66.8	47.7	13:15:41	55.3	13:15:26
22	2012/12/20	13:16:02	00:00:54.6	00:00:54.6	49.2	82475	55	75052	66.5	48.3	13:16:47	50.3	13:16:33
						sum	1195	1309999		39.5		60.7	
						minutes	19.91			min		max	
						average		65796.0188					
						Leq		48.2					

Summary			
Filename	831_Data.046		
Serial Number	1742		
Model	831		
Firmware Version	2.000		
User			
Location	2 - Debris Basin SW		
Job Description			
Note			
Measurement Description			
Start	2012/12/20 13:23:38		
Stop	2012/12/20 13:44:09		
Duration	0:20:29.3		
Run Time	0:20:29.3		
Pause	0:00:00.0		
Pre Calibration	2012/10/31 11:53:43		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRM831		
Integration Method	Linear		
Gain	0.0 dB		
Overload	143.8 dB		
	A	**C**	**Z**
Under Range Peak	**76.3**	73.3	78.3 dB
Under Range Limit	**26.3**	26.6	32.1 dB
Noise Floor	17.1	17.5	22.7 dB
Results			
LAeq	43.6 dB		
LAE	74.5 dB		
EA	3.160 µPa²h		
LApeak (max)	2012/12/20 13:28:33	87.6 dB	
LASmax	2012/12/20 13:25:32	58.6 dB	
LASmin	2012/12/20 13:31:55	33.7 dB	
SEA	-99.9 dB		
Statistics			
LAS5.00	48.5 dB		
LAS10.00	46.9 dB		
LAS33.30	43.0 dB		
LAS50.00	41.3 dB		
LAS66.60	39.4 dB		
LAS90.00	37.2 dB		

Record #	Date	Time	Duration	Run Time	Pause	LAeq	LAE	LASmin	Time	LASmax	Time
1	2012/12/20	13:23:38	00:00:22.0	00:00:22.0	00:00:00.0	45.4	58.8	36.5	13:23:38	54.4	13:23:54
2	2012/12/20	13:24:00	00:01:00.0	00:01:00.0	00:00:00.0	43.2	61.0	35.9	13:24:57	56.7	13:24:22
3	2012/12/20	13:25:00	00:01:00.0	00:01:00.0	00:00:00.0	45.1	62.9	35.1	13:25:26	58.6	13:25:32
4	2012/12/20	13:26:00	00:01:00.0	00:01:00.0	00:00:00.0	42.2	59.9	35.2	13:26:14	52.4	13:26:37
5	2012/12/20	13:27:00	00:01:00.0	00:01:00.0	00:00:00.0	39.5	57.3	37.4	13:27:33	43.3	13:27:09
6	2012/12/20	13:28:00	00:01:00.0	00:01:00.0	00:00:00.0	45.4	63.1	37.0	13:28:58	53.7	13:28:33
7	2012/12/20	13:29:00	00:01:00.0	00:01:00.0	00:00:00.0	41.2	59.0	37.0	13:29:01	45.2	13:29:38
8	2012/12/20	13:30:00	00:01:00.0	00:01:00.0	00:00:00.0	39.5	57.3	37.5	13:30:55	43.8	13:30:03
9	2012/12/20	13:31:01	00:01:00.0	00:01:00.0	00:00:00.0	39.3	57.1	33.7	13:31:55	46.7	13:31:16
10	2012/12/20	13:32:01	00:01:00.0	00:01:00.0	00:00:00.0	37.0	54.8	33.7	13:32:10	40.6	13:32:52
11	2012/12/20	13:33:01	00:01:00.0	00:01:00.0	00:00:00.0	44.0	61.7	39.6	13:33:59	49.0	13:33:32
12	2012/12/20	13:34:01	00:01:00.0	00:01:00.0	00:00:00.0	41.9	59.7	36.4	13:35:00	45.3	13:34:24
13	2012/12/20	13:35:01	00:01:00.0	00:01:00.0	00:00:00.0	42.2	60.0	36.6	13:35:03	47.1	13:35:46
14	2012/12/20	13:36:01	00:01:00.0	00:01:00.0	00:00:00.0	41.0	58.8	36.9	13:36:26	46.6	13:36:02
15	2012/12/20	13:37:01	00:01:00.0	00:01:00.0	00:00:00.0	45.1	62.9	38.0	13:37:08	52.2	13:37:21
16	2012/12/20	13:38:01	00:01:00.0	00:01:00.0	00:00:00.0	43.5	61.3	40.1	13:38:36	47.6	13:38:20
17	2012/12/20	13:39:01	00:01:00.0	00:01:00.0	00:00:00.0	45.4	63.2	40.7	13:39:26	50.1	13:39:55
18	2012/12/20	13:40:02	00:01:00.0	00:01:00.0	00:00:00.0	48.8	66.5	42.8	13:40:50	55.2	13:40:11
19	2012/12/20	13:41:02	00:01:00.0	00:01:00.0	00:00:00.0	41.3	59.1	37.0	13:41:31	48.8	13:41:02
20	2012/12/20	13:42:02	00:01:00.0	00:01:00.0	00:00:00.0	44.1	61.8	36.8	13:42:24	50.1	13:42:35
21	2012/12/20	13:43:02	00:01:00.0	00:01:00.0	00:00:00.0	45.6	63.4	40.0	13:43:49	52.6	13:43:17
22	2012/12/20	13:44:02	00:00:07.3	00:00:07.3	00:00:00.0	44.2	52.8	42.9	13:44:02	45.1	13:44:09