Temescal Canyon Road Bridge Project

Technical Noise Memorandum

City of Lake Elsinore, Riverside County

California Department of Transportation District 8

Federal Project No. BRLS 5074(015)

August 2017

CALIFORNIA DEPARTMENT OF TRANSPORTATION

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August 2017

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TEMESCAL CANYON ROAD BRIDGE PROJECT

INTRODUCTION

The City of Lake Elsinore (City), in coordination with the California Department of Transportation (Caltrans), is proposing to construct a new bridge over Temescal Wash in the City of Lake Elsinore, California. The proposed bridge is 98 feet wide (with a curb-to-curb width of 80 feet), 306 feet long, and a structure depth of 5 feet. The bridge will be striped with a 14-foot painted median, two 12-foot inside lanes, two 15-foot outside lanes, two 6-foot shoulders that can accommodate a Class II bike lane, and two 6-foot sidewalks separated from vehicular traffic with a concrete barrier, which is necessary due to a posted speed limit greater than 45 miles per hour (mph). This bridge and approximately 200 feet of the roadway northwest and southeast of the bridge will be constructed using Highway Bridge Program (HBP) and local funding. Figure 1 shows the regional and project location.

PROJECT DESCRIPTION

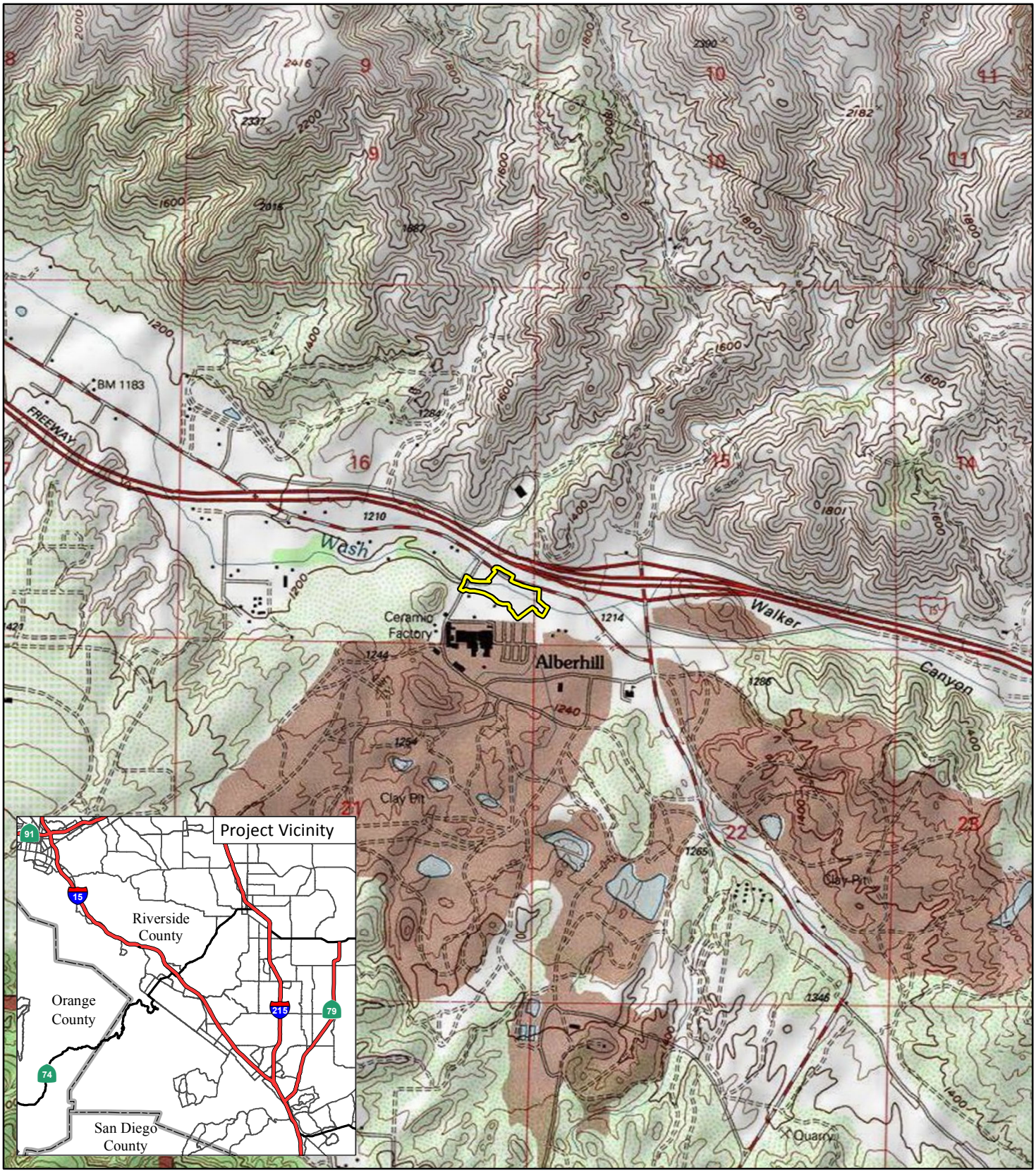
The realigned road from the bridge to Lake Street going southeast will conform to the City's standard for a "Major Highway" with a right-of-way width of 100 feet. The ultimate standard roadway section will consist of a painted 14-foot median, two 12-foot inside lanes, two 15-foot outside lanes, two 6-foot shoulders, and two 10-foot parkways that can accommodate a 6-foot wide sidewalk.

The roadway will connect to Lake Street approximately 180 feet south of the current intersection, which conforms to the location detailed in the City's General Plan Circulation Element. This segment of the roadway from approximately 200 feet southeast of the bridge to Lake Street will be constructed in conjunction with the Alberhill Villages Specific Plan (AVSP). In the interim, AVSP will construct a 2-lane roadway that will include a 696-foot roadway transition.
The project also includes an 850-foot roadway transition from the bridge to the existing 2-lane Temescal Canyon Road to the northwest. This roadway segment, from approximately 200 feet northeast of the bridge to the existing Temescal Canyon Road, will be constructed using local funding.

FEDERAL REGULATIONS

Code of Federal Regulations (CFR), Title 23, Part 772

Title 23 CFR, Part 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type 1, Type 2, or Type 3 projects. The Federal Highway Administration (FHWA) defines a Type 1 project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, the physical alteration of an existing highway where there is either substantial horizontal or substantial vertical alteration, or a project that increases the number of through-traffic lanes. A Type 2 project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type 3 project is a project that does not meet the classifications of a Type 1 or Type 2 project. Type 3 projects do not require a noise analysis.



LEGEND

Project Location

FIGURE 1

0 1000 2000
FEET

Temescal Canyon Road Bridge Project

Project Location and Vicinity

SOURCE: USGS 7.5' Quad - Lake Elsinore (1988), CA

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Type 1 projects include the addition of through-traffic lanes that function as high-occupancy vehicle lanes, high-occupancy toll lanes, bus lanes, or truck climbing lanes. Type 1 projects include the addition of an auxiliary lane (except when the auxiliary lane is a turn lane); the addition or relocation of interchange lanes or ramps; the restriping of existing pavement for the purpose of adding a through-traffic lane or auxiliary lane; and the addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza. Projects unrelated to increased noise levels (e.g., striping, lighting, signing, and landscaping projects) are not considered Type 1 projects.

Under 23 CFR 772.11, noise abatement must be considered for Type 1 projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor "consider" noise abatement before adoption of the final National Environmental Policy Act (NEPA) document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design year approaches or exceeds the Noise Abatement Criteria (NAC) specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (i.e., a "substantial" noise increase). The terms "substantial increase" or "approach" are not specifically defined in 23 CFR 772; these criteria are defined in the Protocol, as described below.

Table A summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category D) is used as the basis for determining a noise impact.

STATE REGULATIONS AND POLICIES

Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Caltrans Traffic Noise Analysis Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as "substantial" when the predicted noise levels under build conditions exceed existing noise levels by 12 dBA. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Caltrans TeNS (September 2013) and the Protocol provide detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

Table A: Activity Categories and Noise Abatement Criteria

Activity Category	Activity $L_{eq}(h)$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance, that serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	—	—	Agriculture, airports, bus yards, emergency services, industrial uses, logging, maintenance facilities, manufacturing, mining, railyards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—	—	Undeveloped lands that are not permitted.

Source: Federal Highway Administration Code of Federal Regulations Title 23, Part 772.

[1] The Leq(h) activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are in dBA.

[2] Includes undeveloped lands permitted for this activity category.

dBA = A-weighted decibels
FHWA = Federal Highway Administration
Leq(h) = equivalent continuous sound level per hour
NAC = Noise Abatement Criteria

Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA $L_{eq}(h)$ in the interior of public or private elementary or secondary school classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the "approach or exceed" NAC criterion for FHWA Activity Category D for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA $L_{eq}(h)$. If the noise levels generated from freeway and nonfreeway sources exceed 52 dBA $L_{eq}(h)$ prior to construction of the proposed freeway project, noise abatement must be provided to reduce noise to the level that existed prior to construction of the project.

LOCAL REQUIREMENTS

City of Lake Elsinore Noise Standards

Municipal Code. Section 17.176.080(F) of the City's Municipal Code limits activities related to operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between the hours of 7:00 a.m. and 7:00 p.m. on weekdays. Construction is prohibited on weekends and holidays.

STUDY METHODS AND PROCEDURES

Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receptor Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the project. Land uses in the project area were categorized by land use type, activity category (as defined in previously referenced Table A), and frequency of human use. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this noise impact analysis focuses on locations with defined outdoor activity areas (e.g., residential back yards and common-use areas outside of commercial buildings).

The geographical features of the project area relative to nearby existing and planned land uses were also identified.

Three short-term measurement locations were selected to represent land uses in the project area. One long-term measurement site was selected to capture the diurnal traffic noise level pattern in the project area. Short-term measurement locations were selected to serve as representative modeling locations. Also, other nonmeasurement locations were selected as modeling locations. A total of five receptor locations were modeled to represent land uses in the project area. Figure 2 shows these modeled receptor and monitoring locations.

Field Measurement Procedures

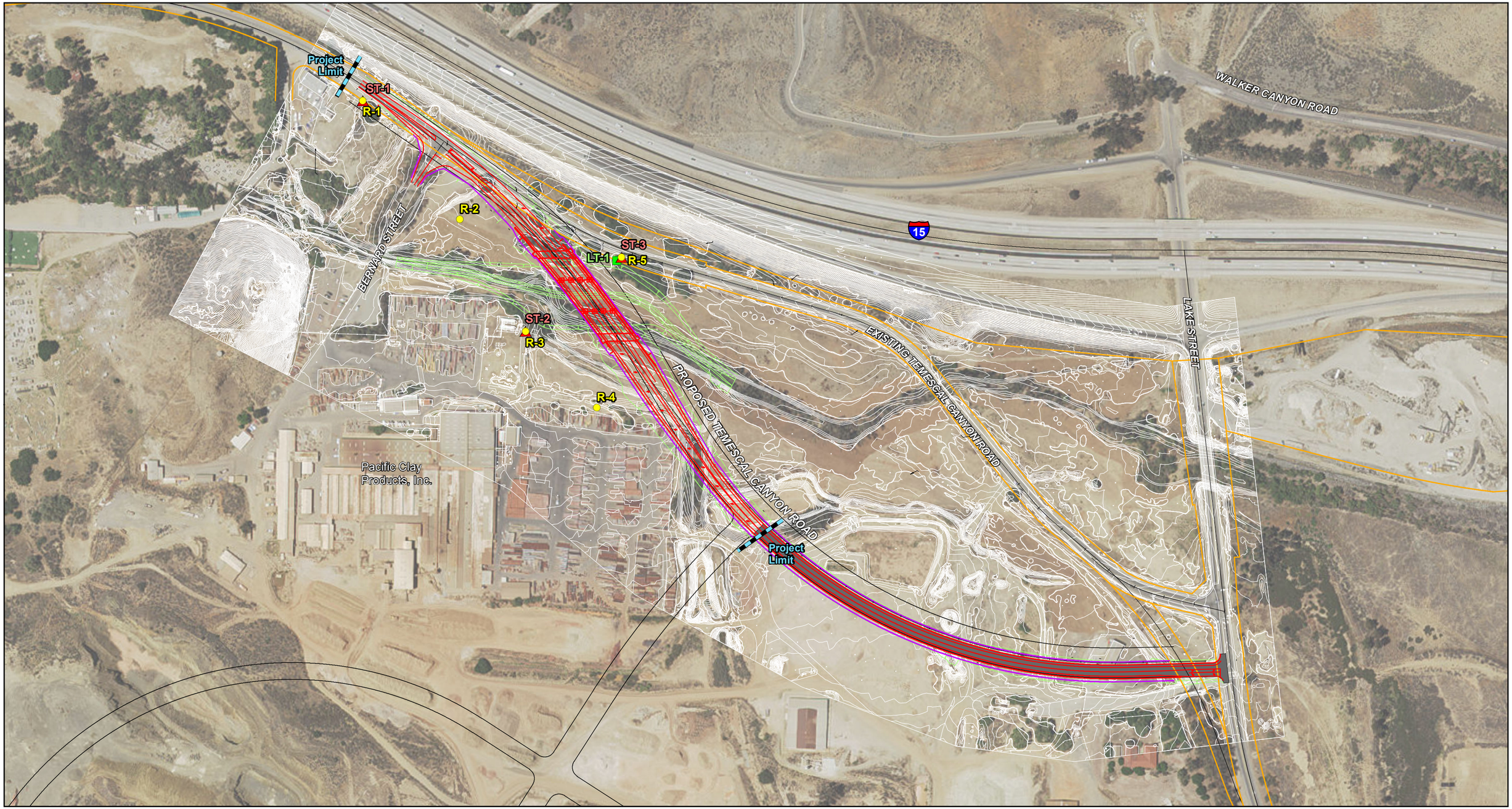
A field noise study was conducted in accordance with the recommended procedures in the TeNS (Caltrans 2013). The following is a summary of the procedures used to collect short-term and long-term sound level data.

Short-Term Measurements

Short-term noise level measurements in the project vicinity were sampled during off-peak traffic hours when traffic was flowing freely. Short-term noise level measurements were made using Larson Davis Model 820, 824, and 831 Type 1 sound level meters.

The following measurement procedures were used:

- Calibrate the sound level meter.



LEGEND

- Modeled Receptors
- Short-Term Monitoring Locations
- Long-Term Monitoring Locations
- Constructed By Others
- Proposed Improvements
- Existing Right-of-Way
- Proposed Right-of-Way
- Grading Lines

0 150 300
FEET

FIGURE 2

Temescal Canyon Road Bridge Project

Noise Monitoring and Modeled Receptor Locations

SOURCE: ESRI World Imagery (2015); Riverside County (2015)

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- Set up the sound level meter at a height of 5 feet.
- Commence noise monitoring.
- Collect site-specific data (i.e., date, time, direction of traffic, vehicle speed, and the location of the sound level meter relative to any existing feature).
- Count passing vehicles for a period of 20 minutes during noise level measurement. Vehicles are split into five categories: automobiles, medium trucks, heavy trucks, buses, and motorcycles.
- Stop measurement after 20 minutes.
- Calibrate the sound level meter.
- Proceed to the next monitoring site and repeat.

The traffic counts were expanded to hourly volumes (multiplied by three to normalize the results to hourly values) and entered into the FHWA Traffic Noise Model (TNM) 2.5 for each monitoring site. The monitoring results were used to calibrate the model outputs.

Long-Term Measurement

One long-term noise level measurement was conducted using a dosimeter in the study area. The purpose of the long-term measurement was to identify variations in sound levels throughout the day.

Traffic Noise Level Prediction Methods

Traffic noise levels were predicted using the FHWA TNM 2.5. The TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model were the locations of roadways, traffic mix, vehicle speeds, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using topographic maps provided by the engineer.

The existing and future traffic noise levels at all five receptor locations were modeled using either the peak-hour traffic volumes or the worst-case traffic operations (prior to speed degradation), whichever is lower. The worst-case traffic condition, which results in the highest traffic noise level, is based on the maximum number of vehicles that can typically travel in a given lane while still resulting in free-flowing traffic conditions. This traffic condition is assumed to be LOS D/E, which corresponds to 1,950 vehicles per lane per hour (vplph) on the highway mainline, 900 vplph on the highway on-ramps, 875 vplph on 4-lane local roadways (two lanes in each direction), and 775 vplph on 2-lane local roadways (one lane in each direction). The peak-hour traffic volumes were obtained from the Temescal Canyon Wash Bridge, Lake Elsinore-Traffic Volumes Memorandum (LLG 2017). The a.m. peak-hour traffic volume was selected for the peak-hour traffic volume because the results of the long-term 24-hour noise level measurement showed that the peak traffic noise hour occurs during this period. Appendix A presents a summary of traffic data inputs for existing and future conditions.

TNM 2.5 is sensitive to the volume of trucks on the roadway because trucks contribute disproportionally to traffic noise. Vehicle distributions on all roadways in the project area were

obtained in the Temescal Canyon Wash Bridge, Lake Elsinore-Traffic Volumes Memorandum (LLG 2017). For the I-15 mainline under the calibration run, traffic volumes were distributed evenly between the three travel lanes with heavy trucks and buses traveling on the outermost lane. For the I-15 mainline under the existing, future no build, and future build condition, traffic volumes were distributed evenly between the three travel lanes with heavy trucks traveling on the outermost lane. Table B shows the vehicle distribution and vehicle speeds for each vehicle category and roadway in the project area used to calculate existing and future traffic noise levels.

Table B. Vehicle Distribution

Roadway	Vehicle Distribution (%)			Vehicle Speed (mph)		
	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks
I-15 Mainline Segments						
I-15 NB, South of I-15 NB Off-Ramp	94.7	0.8	4.5	70	70	55
I-15 NB, Between I-15 NB Off-Ramp and I-15 NB On-Ramp	94.7	0.8	4.5	70	70	55
I-15 NB, North of I-15 NB On-Ramp	95.1	0.7	4.2	70	70	55
I-15 SB, North of I-15 SB Off-Ramp	86.2	2.1	11.7	70	70	55
I-15 SB, Between I-15 SB Off-Ramp and I-15 SB On-Ramp	85.3	2.2	12.5	70	70	55
I-15 SB, South of I-15 SB On-Ramp	86.3	2.0	11.7	70	70	55
I-15 Ramp Segments						
I-15 NB Off-Ramp	94.2	2.2	3.6	45	45	45
I-15 NB On-Ramp	97.8	0.9	1.3	70	70	55
I-15 SB Off-Ramp	88.1	5.2	6.7	45	45	45
I-15 SB On-Ramp	95.0	1.5	3.5	70	70	55
Temescal Canyon Road Segments						
Temescal Canyon Road, north of Lincoln Street	97.5	1.1	1.4	55	55	55
Temescal Canyon Road, between Lincoln Street and Lake Street	97.5	1.1	1.4	55	55	55
Lake Street Segments						
Lake Street, south of Temescal Canyon Road	96.2	1.1	2.7	50	50	50
Lake Street, between Temescal Canyon Road and I-15 SB Ramps	97.9	0.6	1.5	50	50	50
Lake Street, between I-15 SB Ramps and I-15 NB Ramps	96.4	1.1	2.5	50	50	50
Lake Street, north of I-15 NB Ramps	88.9	5.6	5.5	50	50	50

Source: LLG, March 2017.
I-15 = Interstate 15
mph = miles per hour

Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receptor locations where predicted design-year noise levels are at least 12 dBA greater than existing noise levels, or where predicted design-year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts

are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receptor locations where predicted design-year noise levels are at least 12 dBA greater than existing noise levels, or where predicted design-year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

According to the Protocol, an abatement measure is considered acoustically feasible if a minimum noise reduction of 5 dBA at impacted receptor locations is predicted with implementation of the abatement measure. In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receptors as required by the *Highway Design Manual*, Chapter 1100 (Caltrans 2015). Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross-streets, utility conflicts, other noise sources in the area, and safety considerations. The overall reasonableness of noise abatement is determined by considering factors including the construction cost of the barrier, the noise reduction design goal (a noise level reduction of 7 dBA or more at one or more benefited receptors), and the viewpoints of benefited receptors (including property owners and residents of the benefited receptors).

The Protocol defines the procedure for assessing the reasonableness of noise barriers from a cost perspective. A cost allowance per residence is assigned to each benefited residence (i.e., residences that receive at least 5 dBA of noise reduction from a noise barrier). The 2017 allowance is $92,000 per benefited residence. Total allowances are calculated by multiplying the cost allowance per residence by the number of benefited residences.

EXISTING NOISE ENVIRONMENT

Existing Land Uses

Developed and undeveloped land uses in the project vicinity were identified through land use maps, aerial photography, and site inspection. Receptors were identified within each land use category. Existing land uses in the project area include vacant land, industrial, and light industrial uses. Existing land uses in the project area are described in further detail below:

- **West side of Temescal Canyon Road, North of Lake Street:** Land uses in this area include vacant land and industrial and light industrial uses. Land uses in this area are similar in elevation to Temescal Canyon Road to approximately 6 feet lower than Temescal Canyon Road. I-15 is approximately 20 to 35 feet higher in elevation than the adjacent land uses. Industrial and light industrial uses were classified under Activity Category F for reporting purposes. Vacant land was classified under Activity Category G for reporting purposes.

- **East of Temescal Canyon Road, North of Lake Street:** Land uses in this area consist of I-15, which is approximately 20 to 35 feet higher in elevation than the adjacent land uses located on the west side of Temescal Canyon Road. This area of the project was not evaluated.

Noise Measurement Results

The existing noise environment in the project area is based on short-term and long-term 24-hour noise level measurements.

Short-Term Monitoring. The primary source of noise in the project area is traffic on I-15 and Temescal Canyon Road. Short term (20-minute) noise measurements were conducted to document existing noise levels at three representative receptor locations in the project area. Short-term (20-minute) noise level measurements were conducted using Larson Davis Models 820, 824, and 831 Type 1 sound level meters. Table C contains the results of the short-term noise level measurements along with a description of the physical location at each monitoring site. These short-term noise measurements were used to calibrate the noise model and to predict the noise levels at all five modeled receptors in the project area. Previously referenced Figure 2 shows the short-term monitoring locations. The concurrent traffic counts and observed vehicle speeds for each monitoring site are included in Appendix A. The noise monitoring results are included in Appendix B. Table D shows the meteorological conditions during the short-term noise measurements.

Long-Term Monitoring. Long-term traffic noise level measurement was conducted to document the peak traffic noise hour. Long-term ambient noise monitoring was conducted using a dosimeter at one representative location within the project area. The long-term noise level measurement at LT-1 was performed at a location south of Temescal Canyon Road, approximately 650 feet from the northeast corner of its intersection with Bernard Street, from 10:00 a.m. on Tuesday, March 14, 2017, to 10:00 a.m. on Wednesday, March 15. Previously referenced Figure 2 shows the long-term noise monitoring locations.

Table E shows that traffic noise peaks during the 7:00 a.m. to 8:00 a.m. hour at LT-1. To determine existing peak traffic noise levels in the project area, the difference between the hour in which the short-term ambient noise measurements were conducted and the peak traffic noise hour was added to the monitored noise levels. For example, monitoring at location ST-1 was conducted during the 11:00 a.m. hour. Table E shows that the noise level during this hour is generally 4 dBA lower than the level during the peak traffic noise hour. Therefore, 4 dBA is added to the measured noise level at ST-1 to determine the existing peak traffic noise level.

Noise Model Calibration

One model run was conducted using the traffic counts and observed vehicle speeds collected during the ambient noise monitoring. The results of these model runs were compared to the measured ambient noise levels to ensure the accuracy of TNM 2.5. Correction factors known as K-factors were applied to each of the modeled receptor locations so that the monitored and modeled noise levels were the same. Table F shows the measured ambient noise level, the modeled noise levels using

Table C: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Sources	Comments
ST-1	3/14/2017	11:02 AM	20 minutes	69.3	14881 Temescal Canyon Road, Lake Elsinore. Near the SoCal Boat and Trailer Services and next to the billboard.	Traffic on Temescal Canyon Road. Faint traffic from I-15.	None.
ST-2	3/14/2017	11:02 AM	20 minutes	66.4	16800 Bernard Street, Lake Elsinore. Pacific Clay Products, Inc. Next to the propane tanks.	Noise/activity from the clay factory. Traffic noise not audible	Engine type sound at the clay factory. Engine/motor/diesel sound that is constant.
ST-3	3/14/2017	11:02 AM	20 minutes	69.2	South of Temescal Canyon Road, Lake Elsinore. Approximately 650 feet from the northeast corner of the intersection of Bernard Street and Temescal Canyon Road.	Traffic on Temescal Canyon Road and I-15.	Faint constant machinery hum from the clay factory.

Source: LSA (August 2017).
dBA Leq = equivalent continuous sound level measured in A-weighted decibels
I-15 = Interstate 15

Table D: Meteorological Conditions During Noise Monitoring

Date	Temperature (°F)	Average Wind Speed (mph)
3/14	77.7–89.6	0.7–3.9

Source: LSA (August 2017).
°F = degrees Fahrenheit
mph = miles per hour

Table E: Long-Term 24-Hour Noise Level Measurement Results at Temescal Canyon Road, Lake Elsinore, CA (LT-1)

	Start Time	Date	Noise Level (dBA L_{eq})
1	10:00 AM	3/14/2017	68
2	11:00 AM	3/14/2017	67
3	12:00 PM	3/14/2017	67
4	1:00 PM	3/14/2017	69
5	2:00 PM	3/14/2017	70
6	3:00 PM	3/14/2017	69
7	4:00 PM	3/14/2017	69
8	5:00 PM	3/14/2017	69
9	6:00 PM	3/14/2017	69
10	7:00 PM	3/14/2017	69
11	8:00 PM	3/14/2017	69
12	9:00 PM	3/14/2017	68
13	10:00 PM	3/14/2017	67
14	11:00 PM	3/14/2017	66
15	12:00 AM	3/15/2017	67
16	1:00 AM	3/15/2017	66
17	2:00 AM	3/15/2017	64
18	3:00 AM	3/15/2017	65
19	4:00 AM	3/15/2017	67
20	5:00 AM	3/15/2017	69
21	6:00 AM	3/15/2017	70
22	7:00 AM	3/15/2017	**71**[1]
23	8:00 AM	3/15/2017	70
24	9:00 AM	3/15/2017	68

Source: LSA (August 2017).
[1] Bold numbers represent the peak traffic noise hour.
dBA Leq = equivalent continuous sound level measured in A-weighted decibels

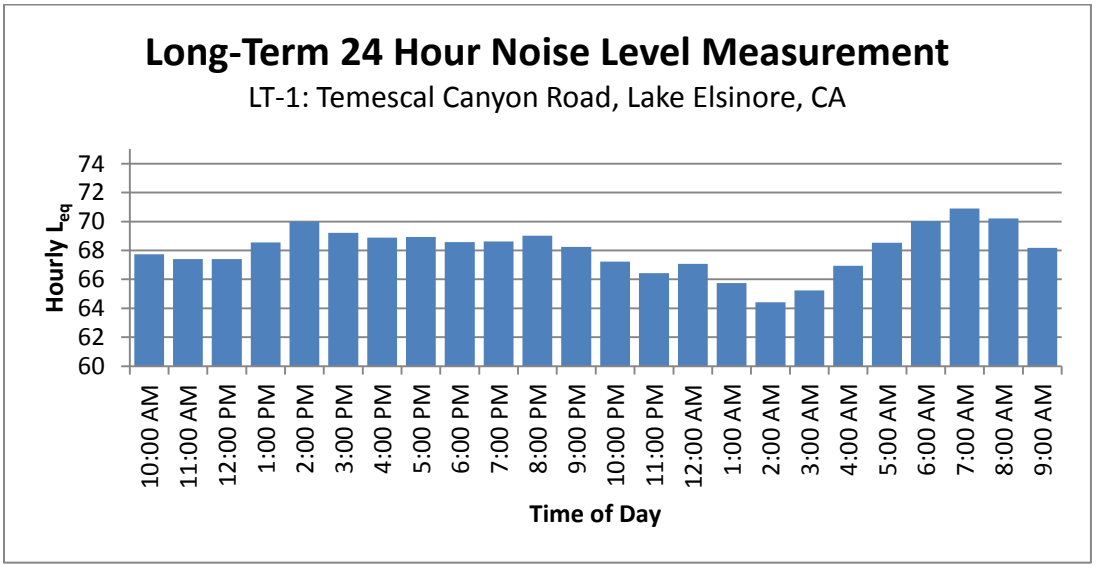

Table F: Model Calibration

Monitor No.	Measured Noise Level (dBA L_{eq})	Modeled Noise Level (dBA L_{eq})	K-Factor (dBA)
ST-1	69.3	67.4	1.9
ST-2	66.4	—[1]	—
ST-3	69.2	67.0	2.2

Source: LSA (August 2017).
[1] ST-2 was not modeled and is only for reporting purposes.
dBA = A-weighted decibels
Leq = equivalent continuous sound level

traffic counts and observed vehicle speeds during noise monitoring, and the K-factor at each of the three monitored locations. As shown in Table F, monitoring location ST-2 was not included in the model run because measured noise levels were dominated by noise generated at the clay factory and traffic noise on Temescal Canyon Road and I-15 was not audible. Therefore, the K-factors for ST-1 and ST-3 shown in Table F were used to calibrate the noise model.

Existing Noise Levels

The existing traffic noise levels were modeled using either the peak-hour traffic volumes or the worst-case traffic operations (prior to speed degradation), whichever is lower, as described under the Traffic Noise Level Prediction Methods discussion. The worst-case traffic condition, which results in the highest traffic noise level, is based on the maximum number of vehicles that can typically travel in a given lane while still resulting in free-flowing traffic conditions. This traffic condition is assumed to be LOS D/E, which corresponds to 1,950 vehicles per lane per hour (vplph) on the highway mainline, 900 vplph on the highway on-ramps, 875 vplph on 4-lane local roadways (two lanes in each direction), and 775 vplph on 2-lane local roadways (one lane in each direction). The peak-hour traffic volumes were obtained from the Temescal Canyon Wash Bridge, Lake Elsinore-Traffic Volumes Memorandum (LLG 2017). The a.m. peak-hour traffic volume was selected for the peak-hour traffic volume because the results of the long-term 24-hour noise level measurement showed that the peak traffic noise hour occurs during this period. The results of the existing traffic noise modeling are shown in Table C-1 in Appendix C. Previously referenced Figure 2 shows the locations of the modeled receptors.

FUTURE NOISE ENVIRONMENT, IMPACTS, AND CONSIDERED ABATEMENT

The noise study was conducted to determine the future traffic noise impacts at receptors along Temescal Canyon Road. Potential long-term noise impacts under Future Build condition are solely from traffic noise. Traffic noise was evaluated for the worst-case traffic condition. Using coordinates obtained from the topographic maps, five receptor locations were evaluated in the model.

Future traffic noise levels at all five receptor locations were determined using either the peak-hour traffic volumes or the worst-case traffic operations (prior to speed degradation), whichever is lower, as described under the Traffic Noise Level Prediction Methods discussion. The worst-case traffic condition, which results in the highest traffic noise level, is based on the maximum number of

vehicles that can typically travel in a given lane while still resulting in free-flowing traffic conditions. This traffic condition is assumed to be LOS D/E, which corresponds to 1,950 vplph on the highway mainline, 900 vplph on the highway on-ramps, 875 vplph on 4-lane local roadways (two lanes in each direction), and 775 vplph on 2-lane local roadways (one lane in each direction). The peak-hour traffic volumes were obtained from the Temescal Canyon Wash Bridge, Lake Elsinore-Traffic Volumes Memorandum (LLG 2017). The a.m. peak-hour traffic volume was selected for the peak-hour traffic volume because the results of the long-term 24-hour noise level measurement showed that the peak traffic noise hour occurs during this period.

Table C-1 in Appendix C summarizes the TNM results for the Existing, Future No Build, and Future Build conditions. As shown in Table C-1 in Appendix C, all the modeled receptors represent the highest expected traffic noise level for reporting purposes. There are no receptors within the project area that have a Noise Abatement Criteria (NAC).

CONSTRUCTION NOISE IMPACT

Two types of short-term noise impacts would occur during bridge construction. The first type would result from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and construction activities would be moved on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity. A high single-event noise exposure potential at a maximum level of 55 A-weighted decibels (dBA) maximum instantaneous noise level (L_{max}) from trucks passing at 50 feet would exist. However, the projected construction traffic would be minimal when compared to existing traffic volumes on I-15 and Temescal Canyon Road and other affected streets. Therefore, construction-related worker commutes and equipment transport noise impacts would be short-term and would not be substantial.

The second type of short-term noise impact is related to noise generated during roadway construction. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated, as well as the noise levels along the project alignment as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table G lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments based on a distance of 50 feet between the equipment and a noise receptor.

Typical noise levels at 50 feet from an active construction area range up to 86 dBA L_{max} during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, and front-end loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings.

Table G: Typical Construction Equipment Noise Levels

Equipment Description	Spec 721.560[1] L_{max} at 50 ft	Actual Measured[2] L_{max} at 50 ft
Backhoes	80	78
Compactor (ground)	80	83
Cranes	85	81
Dozers	85	82
Dump Trucks	84	76
Excavators	85	81
Flat Bed Trucks	84	74
Front-end Loaders	80	79
Graders	85	N/A
Impact Pile Drivers	95	101
Jackhammers	85	89
Pickup Truck	55	75
Pneumatic Tools	85	85
Pumps	77	81
Rock Drills	85	81
Rollers	85	80
Scrapers	85	84
Tractors	84	N/A

Source: *Federal Highway Administration Roadway Construction Noise Model* (January 2006).

[1] Maximum noise levels were developed based on Spec 721.560 from the Central Artery/Tunnel (CA/T) program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.

[2] The maximum noise level was developed based on the average noise level measured of each piece of equipment during the CA/T program in Boston, Massachusetts.

Note: Noise levels reported in this table are rounded to the nearest whole number.
ft = foot/feet
L_{max} = maximum instantaneous sound level
N/A = Not Applicable

Construction of the proposed project is expected to require the use of front-end loaders, bulldozers, and water trucks/pickup trucks. Noise associated with the use of construction equipment is estimated between 55 and 85 dBA L_{max} at a distance of 50 feet from the active construction area for the grading phase. As seen in Table G, the maximum noise level generated by each front-end loader is assumed to be approximately 80 dBA L_{max} at 50 feet from the front-end loader in operation. Each bulldozer would generate approximately 85 dBA L_{max} at 50 feet. The maximum noise level generated by water trucks/pickup trucks would be approximately 55 dBA L_{max} at 50 feet from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level during this phase of construction would be 86 dBA L_{max} at a distance of 50 feet from an active construction area.

In addition to the standard construction equipment, the project may require the use of pile drivers. As shown in Table G, pile driving generates noise levels of approximately 95 dBA L_{max} at 50 feet. If pile driving is conducted concurrently with standard construction activities, the active construction area could potentially generate noise levels of 96 dBA L_{max} at a distance of 50 feet.

The closest residence is located approximately 2,740 feet from the project construction areas and approximately 3,110 feet from potential pile driving. Therefore, the closest residence may be subject

to short-term noise reaching 69 dBA L_{max} generated by construction activities. Compliance with the construction hours specified by the City's Municipal Code and Caltrans Standard Specifications in Section 14-8.02 will be required to minimize construction noise impacts on land uses adjacent to the project site. The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA L_{max} at a distance of 50 feet. The Contractor should use an alternative warning method instead of a sound signal unless required by safety laws. In addition, the Contractor shall equip all internal combustion engines with the manufacturer-recommended muffler and shall not operate any internal combustion engine on the job site without its appropriate muffler.

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APPENDIX A

TRAFFIC COUNTS AND TRAFFIC DATA

Traffic Counts

	Traffic Count					Vehicle Distribution					Traffic Volume (1 hour)					Lane 1					Lane 2					Lane 3					Vehicle Speed				
Set 1 (ST-1, ST-3)	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**Medium**	**Heavy**	**Bus**	**Moto**	**Auto**	**MT**	**HT**	**Bus**	**Moto**
I-15 NB	757	30	74	1	3	0.88	0.03	0.09	0.00	0.00	2,271	90	222	3	9	828	33	0	0	3	828	33	0	0	3	615	24	222	3	3	70	70	55	55	70
I-15 SB	776	28	75	1	1	0.88	0.03	0.09	0.00	0.00	2,328	84	225	3	3	848	31	0	0	1	848	31	0	0	1	631	23	225	3	1	70	70	55	55	70
I-15 NB Off-Ramp	56	0	6	0	0	0.90	0.00	0.10	0.00	0.00	168	0	18	0	0																45		45		
I-15 NB On-Ramp	117	2	7	0	4	0.90	0.02	0.05	0.00	0.03	351	6	21	0	12																70	70	55		70
I-15 SB Off-Ramp	78	1	3	0	1	0.94	0.02	0.04	0.00	0.00	234	3	9	0	3																45	45	45		45
Lake Street WB	68	0	3	0	0	0.96	0.00	0.04	0.00	0.00	204	0	9	0	0																40		40		
Lake Street EB	128	0	2	0	5	0.95	0.00	0.01	0.00	0.04	384	0	6	0	15																40		40		40
Temescal Canyon Road NB	25	0	1	0	0	0.96	0.00	0.04	0.00	0.00	75	0	3	0	0																40		40		
Temescal Canyon Road SB	40	0	2	0	1	0.93	0.00	0.05	0.00	0.02	120	0	6	0	3																40		40		40

Existing Traffic Volumes

Roadway Segments	No. of Lanes	AM Peak Hour	PM Peak Hour	Worst-Case Traffic Volume	Selected Volume	Vehicle Distribution			Modeled Volumes			Lane 1			Lane 2			Lane 3			Vehicle Speed (mph)		
						Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy
I-15 NB - South of NB Off-Ramp	3	3612	3,908	5,850	3,612	0.947	0.008	0.045	3,420	29	163	1,194	10	0	1,194	10	0	1,032	9	163	70	70	55
I-15 NB - Between NB On-Ramp and Off-Ranp	3	3370	3,744	5,850	3,370	0.947	0.008	0.045	3,191	27	152	1,114	9	0	1,114	9	0	963	8	152	70	70	55
I-15 NB - North of NB On-Ramp	3	4028	4,090	5,850	4,028	0.951	0.007	0.042	3,831	28	169	1,333	10	0	1,333	10	0	1,165	9	169	70	70	55
I-15 SB - South of SB On-Ramp	3	5055	4,511	5,850	5,055	0.862	0.021	0.117	4,358	106	591	1,645	40	0	1,645	40	0	1,068	26	591	70	70	55
I-15 SB - Between SB On-Ramp and Off-Ramp	3	4775	4,359	5,850	4,775	0.853	0.022	0.125	4,073	105	597	1,552	40	0	1,552	40	0	970	25	597	70	70	55
I-15 SB - North of SB Off-Ramp	3	5000	5,082	5,850	5,000	0.863	0.020	0.117	4,315	100	585	1,629	38	0	1,629	38	0	1,057	24	585	70	70	55
I-15 NB Off-Ramp	1	242	164	900	242	0.942	0.022	0.036	228	5	9										45	45	45
I-15 NB On-Ramp	1	658	346	900	658	0.978	0.009	0.013	643	6	9										70	70	55
I-15 SB Off-Ramp	1	225	723	900	225	0.881	0.052	0.067	198	12	15										45	45	45
I-15 SB On-Ramp	1	280	152	900	280	0.950	0.015	0.035	266	4	10										70	70	55
Temescal Canyon Road NB - North of Lake Street	1	267	203	775	267	0.975	0.011	0.014	260	3	4										55	55	55
Temescal Canyon Road SB - North of Lake Street	1	307	191	775	307	0.975	0.011	0.014	300	3	4										55	55	55
Lake Street WB - West of Temescal Canyon Road	1	285	800	775	285	0.962	0.011	0.027	274	3	8										50	50	50
Lake Street WB - Between Temescal Canyon Road and SB Ramp	1	444	873	775	444	0.979	0.006	0.015	434	3	7										50	50	50
Lake Street WB - Between NB and SB Ramps	1	231	171	775	231	0.964	0.011	0.025	222	3	6										50	50	50
Lake Street WB - Between NB Ramp and Walker Canyon Road	1	8	18	775	8	0.889	0.056	0.055	8	0	0										50	50	50
Lake Street EB - West of Temescal Canyon Road	1	720	357	775	720	0.962	0.011	0.027	693	8	19										50	50	50
Lake Street EB - Between Temescal Canyon Road and SB Ramp	1	909	424	775	775	0.979	0.006	0.015	758	5	12										50	50	50
Lake Street EB - Between NB and SB Ramps	1	648	339	775	648	0.964	0.011	0.025	625	7	16										50	50	50
Lake Street EB - Between NB Ramp and Walker Canyon Road	1	13	12	775	13	0.889	0.056	0.055	11	1	1										50	50	50

Future No Build Traffic Volumes

Roadway Segments	No. of Lanes	AM Peak Hour	PM Peak Hour	Worst-Case Traffic Volume	Selected Volume	Vehicle Distribution			Modeled Volumes			Lane 1			Lane 2			Lane 3			Vehicle Speed (mph)		
						Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy
I-15 NB - South of NB Off-Ramp	3	3,783	5,566	5,850	3,783	0.947	0.008	0.045	3,583	30	170	1,251	10	0	1,251	10	0	1,082	9	170	70	70	55
I-15 NB - Between NB On-Ramp and Off-Ranp	3	3,485	5,315	5,850	3,485	0.947	0.008	0.045	3,300	28	157	1,152	10	0	1,152	10	0	996	8	157	70	70	55
I-15 NB - North of NB On-Ramp	3	4,233	5,828	5,850	4,233	0.951	0.007	0.042	4,025	30	178	1,401	10	0	1,401	10	0	1,224	9	178	70	70	55
I-15 SB - South of SB On-Ramp	3	6,704	4,842	5,850	5,850	0.862	0.021	0.117	5,043	123	684	1,904	46	0	1,904	46	0	1,236	30	684	70	70	55
I-15 SB - Between SB On-Ramp and Off-Ramp	3	6,339	4,518	5,850	5,850	0.853	0.022	0.125	4,990	129	731	1,901	49	0	1,901	49	0	1,188	31	731	70	70	55
I-15 SB - North of SB Off-Ramp	3	6,599	5,283	5,850	5,850	0.863	0.020	0.117	5,049	117	684	1,906	44	0	1,906	44	0	1,237	29	684	70	70	55
I-15 NB Off-Ramp	1	298	251	900	298	0.942	0.022	0.036	280	7	11										45	45	45
I-15 NB On-Ramp	1	748	513	900	748	0.978	0.009	0.013	731	7	10										70	70	55
I-15 SB Off-Ramp	1	260	765	900	260	0.881	0.052	0.067	229	14	17										45	45	45
I-15 SB On-Ramp	1	365	324	900	365	0.950	0.015	0.035	347	5	13										70	70	55
Temescal Canyon Road NB - North of Lake Street	1	275	655	775	275	0.975	0.011	0.014	268	3	4										55	55	55
Temescal Canyon Road SB - North of Lake Street	1	776	763	775	775	0.975	0.011	0.014	755	9	11										55	55	55
Lake Street WB - West of Temescal Canyon Road	1	420	943	775	420	0.962	0.011	0.027	404	5	11										50	50	50
Lake Street WB - Between Temescal Canyon Road and SB Ramp	1	587	944	775	587	0.979	0.006	0.015	574	4	9										50	50	50
Lake Street WB - Between NB and SB Ramps	1	359	310	775	359	0.964	0.011	0.025	346	4	9										50	50	50
Lake Street WB - Between NB Ramp and Walker Canyon Road	1	142	109	775	142	0.889	0.056	0.055	126	8	8										50	50	50
Lake Street EB - West of Temescal Canyon Road	1	893	1,013	775	775	0.962	0.011	0.027	745	9	21										50	50	50
Lake Street EB - Between Temescal Canyon Road and SB Ramp	1	1,285	940	775	775	0.979	0.006	0.015	758	5	12										50	50	50
Lake Street EB - Between NB and SB Ramps	1	737	607	775	737	0.964	0.011	0.025	711	8	18										50	50	50
Lake Street EB - Between NB Ramp and Walker Canyon Road	1	67	144	775	67	0.889	0.056	0.055	59	4	4										50	50	50

Future Build Traffic Volumes

Roadway Segments	No. of Lanes	AM Peak Hour	PM Peak Hour	Worst-Case Traffic Volume	Selected Volume	Vehicle Distribution			Modeled Volumes			Lane 1			Lane 2			Lane 3			Vehicle Speed (mph)		
						Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy	Auto	Medium	Heavy
I-15 NB - South of NB Off-Ramp	3	3,866	5,733	5,850	3,866	0.947	0.008	0.045	3,661	31	174	1,278	11	0	1,278	11	0	1,105	9	174	70	70	55
I-15 NB - Between NB On-Ramp and Off-Ranp	3	3,485	5,315	5,850	3,485	0.947	0.008	0.045	3,300	28	157	1,152	10	0	1,152	10	0	996	8	157	70	70	55
I-15 NB - North of NB On-Ramp	3	5,058	6,397	5,850	5,058	0.951	0.007	0.042	4,811	35	212	1,674	12	0	1,674	12	0	1,463	11	212	70	70	55
I-15 SB - South of SB On-Ramp	3	6,819	4,947	5,850	5,850	0.862	0.021	0.117	5,043	123	684	1,904	46	0	1,904	46	0	1,236	30	684	70	70	55
I-15 SB - Between SB On-Ramp and Off-Ramp	3	6,339	4,518	5,850	5,850	0.853	0.022	0.125	4,990	129	731	1,901	49	0	1,901	49	0	1,188	31	731	70	70	55
I-15 SB - North of SB Off-Ramp	3	6,701	5,325	5,850	5,850	0.863	0.020	0.117	5,049	117	684	1,906	44	0	1,906	44	0	1,237	29	684	70	70	55
I-15 NB Off-Ramp	1	381	418	900	381	0.942	0.022	0.036	359	8	14										45	45	45
I-15 NB On-Ramp	1	1,573	1,082	900	900	0.978	0.009	0.013	880	8	12										70	70	55
I-15 SB Off-Ramp	1	362	807	900	362	0.881	0.052	0.067	319	19	24										45	45	45
I-15 SB On-Ramp	1	480	429	900	480	0.950	0.015	0.035	456	7	17										70	70	55
Temescal Canyon Road NB - North of Lincoln Street	1	1,920	2,049	775	775	0.975	0.011	0.014	755	9	11										55	55	55
Temescal Canyon Road NB - North of Lincoln Street (Bridge Segr	2	1,920	2,049	1,750	1,750	0.975	0.011	0.014	1,706	19	25	853	10	13	853	10	13				55	55	55
Temescal Canyon Road NB - Between Lincoln Street and Lake Str	1	1,069	1,622	775	775	0.975	0.011	0.014	755	9	11										55	55	55
Temescal Canyon Road SB - North of Lincoln Street	1	1,506	3,436	775	775	0.975	0.011	0.014	755	9	11										55	55	55
Temescal Canyon Road SB - North of Lincoln Street (Bridge Segr	2	1,506	3,436	1,750	1,506	0.975	0.011	0.014	1,468	17	21	734	9	11	734	9	11				55	55	55
Temescal Canyon Road SB - Between Lincoln Street and Lake Str	1	1,556	2,161	775	775	0.975	0.011	0.014	755	9	11										55	55	55
Lake Street WB - South of Temescal Canyon Road	1	1,133	1,801	775	775	0.962	0.011	0.027	745	9	21										50	50	50
Lake Street WB - Between Temescal Canyon Road and I-15 SB Ra	1	686	1,712	775	686	0.979	0.006	0.015	672	4	10										50	50	50
Lake Street WB - Between I-15 SB Ramps and I-15 NB Ramps	1	457	1,003	775	457	0.964	0.011	0.025	441	5	11										50	50	50
Lake Street WB - North of I-15 NB Ramps	1	345	958	775	345	0.889	0.056	0.055	307	19	19										50	50	50
Lake Street EB - South of Temescal Canyon Road	1	1,655	1,649	775	775	0.962	0.011	0.027	745	9	21										50	50	50
Lake Street EB - Between Temescal Canyon Road and I-15 SB Ra	1	2,146	1,320	775	775	0.979	0.006	0.015	758	5	12										50	50	50
Lake Street EB - Between I-15 SB Ramps and I-15 NB Ramps	1	1,975	1,285	775	775	0.964	0.011	0.025	747	9	19										50	50	50
Lake Street EB - North of I-15 NB Ramps	1	682	685	775	682	0.889	0.056	0.055	606	38	38										50	50	50

APPENDIX B

SUPPLEMENTAL DATA

SHORT-TERM NOISE LEVEL MEASUREMENTS

Noise Measurement Survey

Project Number: ACN1401 Test Personnel: Akshay Newgi
Project Name: Temescal Canyon Road Bridge Equipment: Larson Davis 820

Site Number: ST-1 Date: 3/14/17 Time: From 11:02 AM To 11:22 AM

Site Location: 14881 Temescal Canyon Road. Near the SoCal Boat and Trailer Services and next to the billboard.

Primary Noise Sources: Traffic on Temescal Canyon Road. Faint traffic noise from I-15 freeway.

Measurement Results	
	dBA
L_{eq}	69.3
L_{max}	83.3
L_{min}	53.5
L_{peak}	100.5
L_2	77.5
L_8	73.8
L_{25}	68.5
L_{50}	66.5
L_{90}	62.2

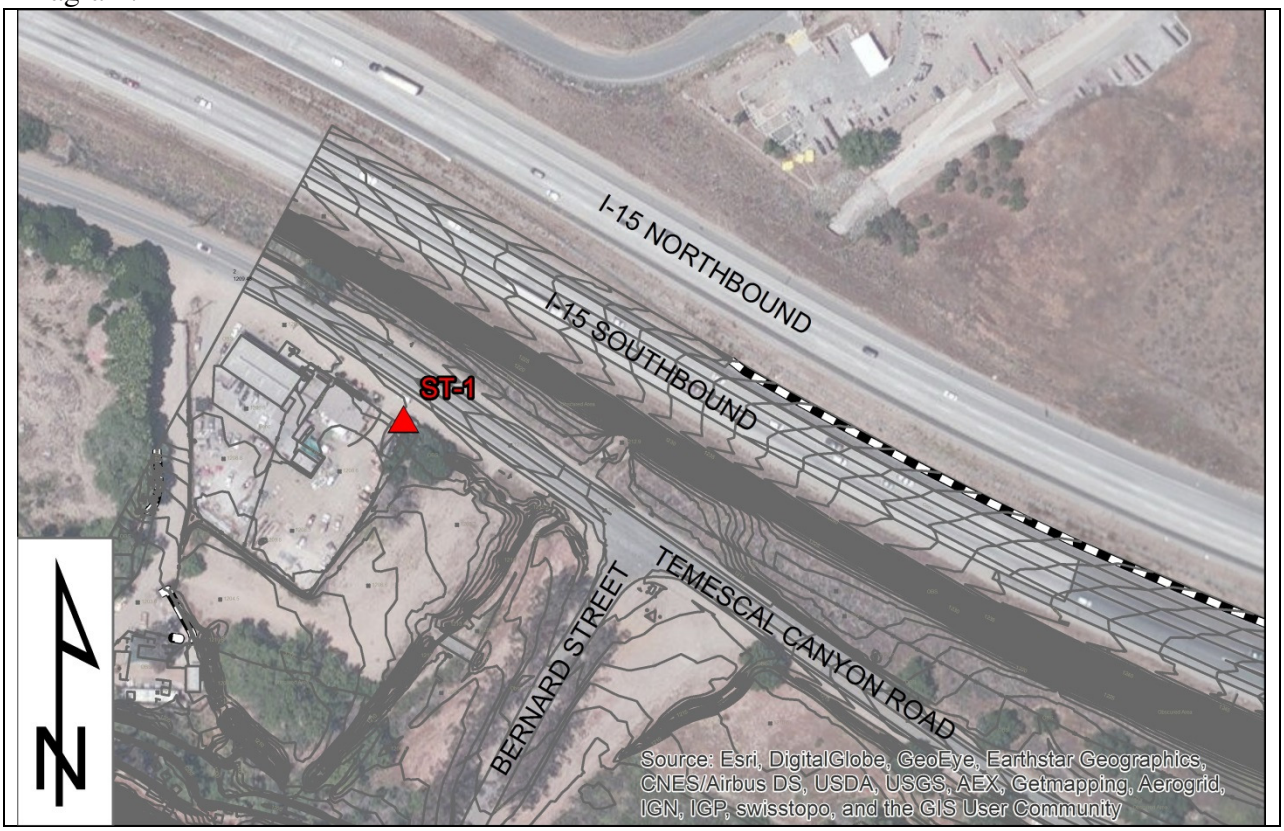
Atmospheric Conditions	
Average Wind Velocity (mph)	
Maximum Wind Velocity (mph)	
Temperature (F)	
Relative Humidity (%)	

Comments:

Traffic Description:

Roadway	# Lanes	Speeds	NB/EB Counts					SB/WB Counts				
			Auto	MT	HT	Bus	M	Auto	MT	HT	Bus	M
I-15	3/3	70/55 mph	757	30	74	1	3	776	28	75	1	1
I-15 NB Off-Ramp	1	45 mph	56	0	6	0	0					
I-15 NB On-Ramp	1	70/55 mph	117	2	7	0	4					
I-15 SB Off-Ramp	1	45 mph						78	1	3	0	1
Temescal Canyon	1/1	40 mph	25	0	1	0	0	40	0	2	0	1
Lake Street	1/1	30 mph	128	0	2	0	5	68	0	3	0	0

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: ACN1401 Test Personnel: Jason Lui
Project Name: Temescal Canyon Road Bridge Equipment: Larson Davis 831

Site Number: ST-2 Date: 3/14/17 Time: From 11:02 AM To 11:22 AM

Site Location: 16800 Bernard Street. Pacific Clay Products, Inc. Next to the propane tanks.

Primary Noise Sources: Noise/activity from the clay factory. Traffic noise not audible.

Measurement Results	
	dBA
L_{eq}	66.4
L_{max}	70.0
L_{min}	64.3
L_{peak}	83.2
L_2	67.4
L_8	67.1
L_{25}	66.7
L_{50}	66.4
SEL	

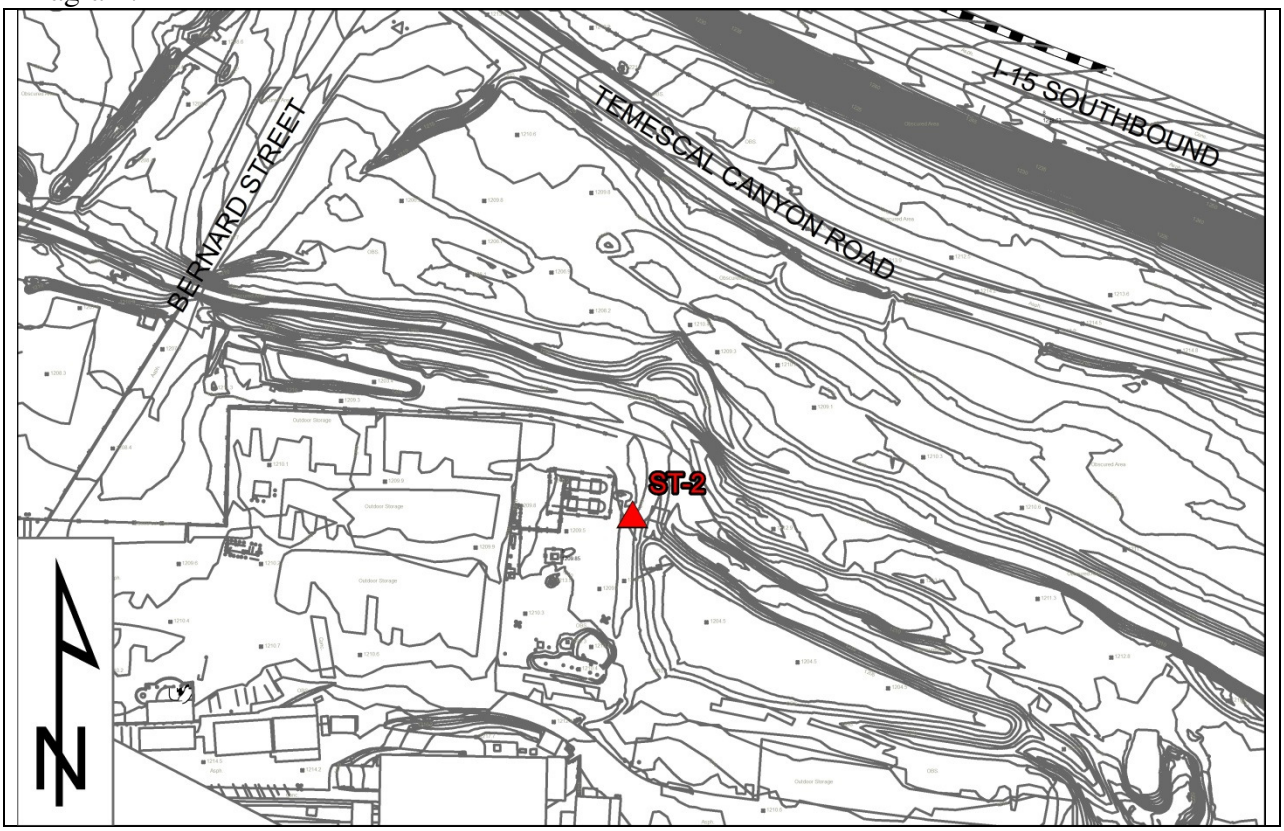
Atmospheric Conditions	
Average Wind Velocity (mph)	1.3
Maximum Wind Velocity (mph)	3.9
Temperature (F)	89.6
Relative Humidity (%)	34.9

Comments: Engine type sound at the clay factory. Engine/motor/diesel sound is constant.

Traffic Description:

Roadway	# Lanes	Speeds	NB/EB Counts					SB/WB Counts				
			Auto	MT	HT	Bus	M	Auto	MT	HT	Bus	M
I-15	3/3	70/55 mph	757	30	74	1	3	776	28	75	1	1
I-15 NB Off-Ramp	1	45 mph	56	0	6	0	0					
I-15 NB On-Ramp	1	70/55 mph	117	2	7	0	4					
I-15 SB Off-Ramp	1	45 mph						78	1	3	0	1
Temescal Canyon	1/1	40 mph	25	0	1	0	0	40	0	2	0	1
Lake Street	1/1	30 mph	128	0	2	0	5	68	0	3	0	0

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: ACN1401 Test Personnel: Daniel Kaufman
Project Name: Temescal Canyon Road Bridge Equipment: Larson Davis 824

Site Number: ST-3 Date: 3/14/17 Time: From 11:02 AM To 11:22 AM

Site Location: South of Temescal Canyon Road.

Primary Noise Sources: Traffic on Temescal Canyon Road and traffic on I-15 freeway.

Measurement Results	
	dBA
L_{eq}	69.2
L_{max}	87.0
L_{min}	57.9
L_{peak}	101.5
L_2	78.5
L_8	74.0
L_{25}	66.9
L_{50}	63.8
SEL	100.0

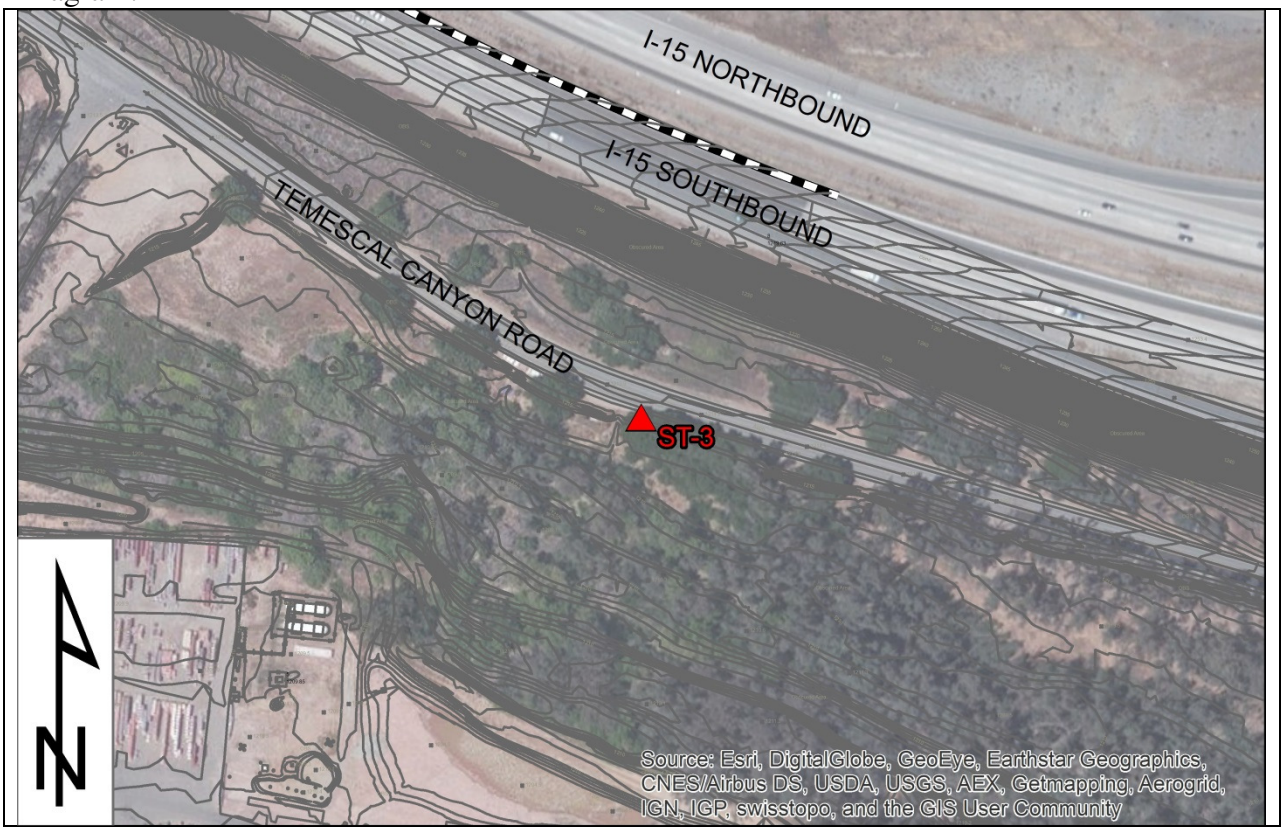
Atmospheric Conditions	
Average Wind Velocity (mph)	2.7
Maximum Wind Velocity (mph)	0.7
Temperature (F)	77.7
Relative Humidity (%)	38.0

Comments: Faint constant machinery hum.

Traffic Description:

Roadway	# Lanes	Speeds	NB/EB Counts					SB/WB Counts				
			Auto	MT	HT	Bus	M	Auto	MT	HT	Bus	M
I-15	3/3	70/55 mph	757	30	74	1	3	776	28	75	1	1
I-15 NB Off-Ramp	1	45 mph	56	0	6	0	0					
I-15 NB On-Ramp	1	70/55 mph	117	2	7	0	4					
I-15 SB Off-Ramp	1	45 mph						78	1	3	0	1
Temescal Canyon	1/1	40 mph	25	0	1	0	0	40	0	2	0	1
Lake Street	1/1	30 mph	128	0	2	0	5	68	0	3	0	0

Diagram:



Location Photo:

CALIBRATION CERTIFICATE FOR LARSON DAVIS 820

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2016-203752

Instrument Model 820, Serial Number 1584, was calibrated on 28 Jul 2016. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 28 Jul 2016
Calibration due: 28 Jul 2017

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0445 / 0111	12 Months	13 Nov 2016	2015-201964

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 31 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2484

Signed: Eric Olson
Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2016-203753

Instrument Model PRM828, Serial Number 2484, was calibrated on 28 Jul 2016. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 28 Jul 2016
Calibration due: 28 Jul 2017

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	2900 / 2239	0608 / 0110	12 Months	14 Dec 2016	2015-202220
Hewlett Packard	34401A	US36023299	12 Months	7 Jul 2017	2016006152

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 31 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.

Signed: Eric Olson
Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Calibration Certificate

Certificate Number 2016006689

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	377A60	***Procedure Number***	D0001.8387		
Serial Number	101355	***Technician***	Abraham Ortega		
Test Results	**Pass**	***Calibration Date***	25 Jul 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	25 Jul 2017		
Description	1/2 inch Microphone - RI - 200V	***Temperature***	23.8	°C	± 0.01 °C
		Humidity	34.4	%RH	± 0.5 %RH
		Static Pressure	101.58	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Sound Level Meter / Real Time Analyzer	07/15/2016	07/15/2017	001230
Microphone Calibration System	09/03/2015	09/03/2016	001233
1/2" Preamplifier	12/15/2015	12/15/2016	001274
Agilent 34401A DMM	12/04/2015	12/04/2016	001329
Larson Davis CAL250 Acoustic Calibrator	01/05/2016	01/05/2017	003030
1/2" Preamplifier	12/15/2015	12/15/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/11/2015	09/11/2016	006507
1/2 inch Microphone - RI - 200V	08/17/2015	08/17/2016	006511
1/2 inch Microphone - RI - 200V	08/12/2015	08/12/2016	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/11/2015	09/11/2016	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/14/2015	08/14/2016	006531

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2016006651

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	CAL200	***Procedure Number***	D0001.8386
Serial Number	4973	***Technician***	Scott Montgomery
Test Results	**Pass**	***Calibration Date***	22 Jul 2016
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	22 Jul 2017
		Temperature	23 °C ± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	38 %RH ± 3 %RH
		Static Pressure	101.1 kPa ± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/04/2015	09/04/2016	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/20/2015	08/20/2016	005446
1/2" Preamplifier	10/09/2015	10/09/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/20/2015	08/20/2016	006507
1/2 inch Microphone - RI - 200V	08/17/2015	08/17/2016	006511
Pressure Transducer	10/12/2015	10/12/2016	007204

CALIBRATION CERTIFICATE FOR LARSON DAVIS 824

PCB PIEZOTRONICS INC.
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2016-204337

Instrument Model 824, Serial Number A1612, was calibrated on 22 Nov 2016. The instrument meets factory specifications per Procedure D0001.8046, IEC 61672-1:2002 Class 1; IEC 60651-2001, 60804-2000 and ANSI S1.4-1983 Type 1 1/3, 1/1 Oct. Filters; S1.11-1986 Type 1C; IEC61260-am1-2001 Class 1 .

Instrument found to be in calibration as received: YES
Date Calibrated: 22 Nov 2016
Calibration due: 22 Nov 2017

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0617 / 0104	12 Months	18 Dec 2016	2015-202267

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 26 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.
Tested with PRM902 S/N 2104

Signed: Sean Childs

Technician: Sean Childs

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Calibration Certificate

Certificate Number 2016010395

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	2541		***Procedure Number***	D0001.8387	
Serial Number	7977		***Technician***	Abraham Ortega	
Test Results	**Pass**		***Calibration Date***	21 Nov 2016	
Initial Condition	AS RECEIVED same as shipped		***Calibration Due***	21 Nov 2017	
			Temperature	23.7 °C	± 0.01 °C
Description	1/2 inch Microphone - FF - 200V		***Humidity***	31.4 %RH	± 0.5 %RH
			Static Pressure	101.40 kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Sound Level Meter / Real Time Analyzer	07/15/2016	07/15/2017	001230
Microphone Calibration System	08/30/2016	08/30/2017	001233
1/2" Preamplifier	12/15/2015	12/15/2016	001274
Agilent 34401A DMM	12/04/2015	12/04/2016	001329
Larson Davis CAL250 Acoustic Calibrator	01/05/2016	01/05/2017	003030
1/2" Preamplifier	12/15/2015	12/15/2016	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2016	09/11/2017	006507
1/2 inch Microphone - RI - 200V	03/15/2016	03/15/2017	006510
1/2 inch Microphone - RI - 200V	08/08/2016	08/08/2017	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2016	09/12/2017	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/11/2016	08/11/2017	006531

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Provo, UT 84601, United States
716-684-0001

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Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	45.14	42.00	59.50	0.95	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [pF]				
Capacitance	19.00			‡	

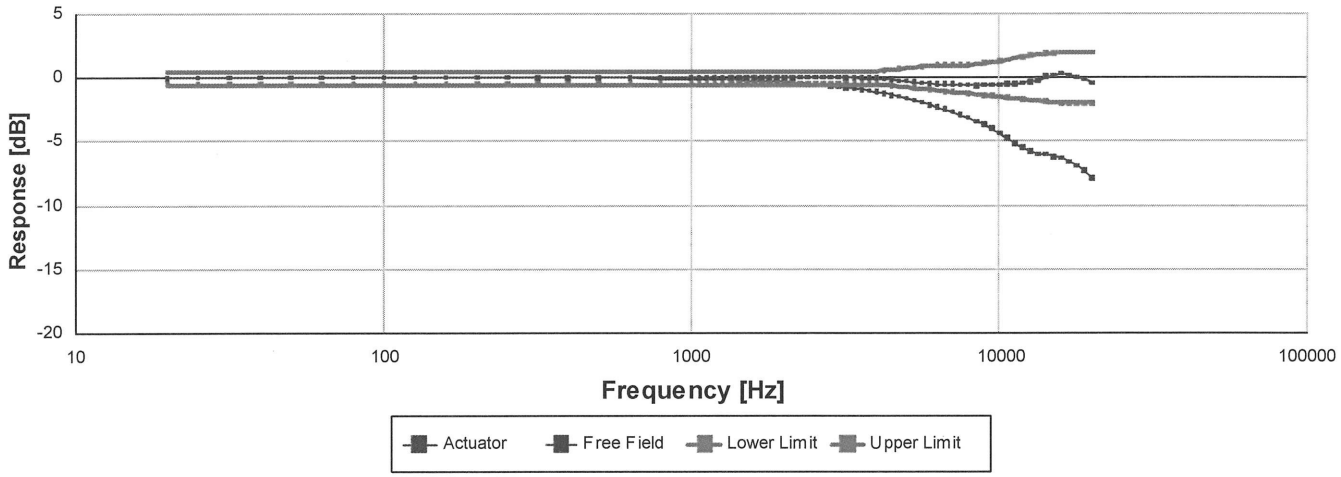
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]		Result
-3 dB Frequency	1.38	1.00	2.00		Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.03	-0.03	-0.50	0.50	Pass ‡
25.12	0.00	0.00	-0.50	0.50	Pass ‡
31.62	0.01	0.01	-0.50	0.50	Pass ‡
39.81	0.02	0.02	-0.50	0.50	Pass ‡
50.12	0.02	0.02	-0.50	0.50	Pass ‡
63.10	0.02	0.02	-0.50	0.50	Pass ‡
79.43	0.02	0.02	-0.50	0.50	Pass ‡
100.00	0.02	0.02	-0.50	0.50	Pass ‡
125.89	0.01	0.01	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.01	0.01	-0.50	0.50	Pass ‡

Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	-0.01	-0.01	-0.50	0.50	Pass ‡
398.11	-0.01	0.00	-0.50	0.50	Pass ‡
501.19	-0.03	-0.01	-0.50	0.50	Pass ‡
630.96	-0.04	-0.01	-0.50	0.50	Pass ‡
794.33	-0.07	-0.02	-0.50	0.50	Pass ‡
1,000.00	-0.10	-0.03	-0.50	0.50	Pass ‡
1,059.25	-0.11	-0.03	-0.50	0.50	Pass ‡
1,122.02	-0.13	-0.04	-0.50	0.50	Pass ‡
1,188.50	-0.13	-0.04	-0.50	0.50	Pass ‡
1,258.93	-0.15	-0.05	-0.50	0.50	Pass ‡
1,333.52	-0.17	-0.05	-0.50	0.50	Pass ‡
1,412.54	-0.19	-0.05	-0.50	0.50	Pass ‡
1,496.24	-0.20	-0.04	-0.50	0.50	Pass ‡
1,584.89	-0.23	-0.04	-0.50	0.50	Pass ‡
1,678.80	-0.26	-0.05	-0.50	0.50	Pass ‡
1,778.28	-0.28	-0.04	-0.50	0.50	Pass ‡
1,883.65	-0.31	-0.03	-0.50	0.50	Pass ‡
1,995.26	-0.34	-0.01	-0.50	0.50	Pass ‡
2,113.49	-0.37	0.02	-0.50	0.50	Pass ‡
2,238.72	-0.41	0.04	-0.50	0.50	Pass ‡
2,371.37	-0.46	0.05	-0.50	0.50	Pass ‡
2,511.89	-0.51	0.05	-0.50	0.50	Pass ‡
2,660.73	-0.56	0.05	-0.50	0.50	Pass ‡
2,818.38	-0.63	0.03	-0.50	0.50	Pass ‡
2,985.38	-0.69	0.01	-0.50	0.50	Pass ‡
3,162.28	-0.78	-0.03	-0.50	0.50	Pass ‡
3,349.65	-0.85	-0.04	-0.50	0.50	Pass ‡
3,548.13	-0.94	-0.05	-0.50	0.50	Pass ‡
3,758.37	-1.03	-0.06	-0.50	0.50	Pass ‡
3,981.07	-1.14	-0.08	-0.50	0.50	Pass ‡
4,216.97	-1.25	-0.12	-0.56	0.56	Pass ‡
4,466.84	-1.37	-0.18	-0.63	0.63	Pass ‡
4,731.51	-1.50	-0.24	-0.69	0.69	Pass ‡
5,011.87	-1.64	-0.30	-0.75	0.75	Pass ‡
5,308.84	-1.79	-0.37	-0.81	0.81	Pass ‡
5,623.41	-1.96	-0.43	-0.88	0.88	Pass ‡
5,956.62	-2.12	-0.47	-0.94	0.94	Pass ‡
6,309.57	-2.31	-0.51	-1.00	1.00	Pass ‡
6,683.44	-2.49	-0.52	-1.06	1.00	Pass ‡
7,079.46	-2.70	-0.53	-1.13	1.00	Pass ‡
7,498.94	-2.92	-0.55	-1.19	1.00	Pass ‡
7,943.28	-3.15	-0.59	-1.25	1.00	Pass ‡
8,413.95	-3.40	-0.61	-1.31	1.08	Pass ‡
8,912.51	-3.65	-0.57	-1.38	1.15	Pass ‡
9,440.61	-3.98	-0.56	-1.44	1.23	Pass ‡
10,000.00	-4.37	-0.55	-1.50	1.30	Pass ‡
10,592.54	-4.73	-0.49	-1.56	1.41	Pass ‡
11,220.19	-5.15	-0.50	-1.63	1.53	Pass ‡
11,885.02	-5.50	-0.45	-1.69	1.64	Pass ‡
12,589.25	-5.74	-0.32	-1.75	1.75	Pass ‡
13,335.21	-5.98	-0.21	-1.81	1.81	Pass ‡
14,125.38	-6.03	0.07	-1.88	1.88	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

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Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-6.20	0.20	-1.94	1.94	Pass ‡
15,848.93	-6.32	0.32	-2.00	2.00	Pass ‡
16,788.04	-6.60	0.19	-2.00	2.00	Pass ‡
17,782.80	-6.93	0.05	-2.00	2.00	Pass ‡
18,836.49	-7.30	-0.09	-2.00	2.00	Pass ‡
19,952.62	-7.90	-0.40	-2.00	2.00	Pass ‡

-- End of measurement results--

Signatory: *Abraham Ortega*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA
ACCREDITED
Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2016-204335

Instrument Model PRM902, Serial Number 2104, was calibrated on 22 Nov 2016. The instrument meets factory specifications per Procedure D0001.8126.

Instrument found to be in calibration as received: YES
Date Calibrated: 22 Nov 2016
Calibration due: 22 Nov 2017

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0662/0114	12 Months	10 Dec 2016	2015-202190
Agilent Technologies	34401A	MY41038589	12 Months	6 Jan 2017	2016-000146

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 26 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

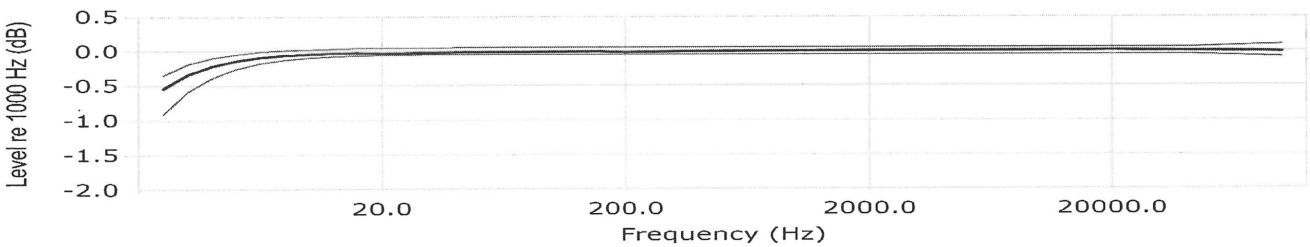
Signed:

Technician: Sean Childs

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Preamplifier Model: PRM902 Serial Number: 2104
Frequency Response Test Report

Frequency response electrically tested at 120.0 dBµV using a 18 pF capacitor to simulate microphone capacitance.



Frequency (Hz)	Relative Level (dB)	Uncertainty (dB)	Limits (dB)	Frequency (Hz)	Relative Level (dB)	Uncertainty (dB)	Limits (dB)
2.5	-0.54	0.08	-0.35,-0.91	631.0	-0.00	0.02	0.05,-0.05
3.2	-0.34	0.06	-0.19,-0.59	794.3	-0.00	0.02	0.05,-0.05
4.0	-0.22	0.06	-0.10,-0.39	1000.0	0.00	0.02	0.05,-0.05
5.0	-0.14	0.04	-0.05,-0.26	1258.9	0.00	0.02	0.05,-0.05
6.3	-0.09	0.04	-0.01,-0.18	1584.9	0.00	0.02	0.05,-0.05
7.9	-0.06	0.04	0.01,-0.13	1995.3	0.00	0.02	0.05,-0.05
10.0	-0.05	0.02	0.02,-0.10	2511.9	0.00	0.02	0.05,-0.05
12.6	-0.03	0.02	0.03,-0.08	3162.3	0.00	0.02	0.05,-0.05
15.8	-0.03	0.02	0.04,-0.07	3981.1	0.01	0.02	0.05,-0.05
20.0	-0.04	0.02	0.04,-0.06	5011.9	0.00	0.02	0.05,-0.05
25.1	-0.03	0.02	0.04,-0.06	6309.6	0.00	0.02	0.05,-0.05
31.6	-0.02	0.02	0.04,-0.05	7943.3	0.00	0.02	0.05,-0.05
39.8	-0.02	0.02	0.05,-0.05	10000.0	0.00	0.02	0.05,-0.05
50.1	-0.02	0.02	0.05,-0.05	12589.3	0.01	0.02	0.05,-0.05
63.1	-0.01	0.02	0.05,-0.05	15848.9	0.01	0.02	0.05,-0.05
79.4	-0.01	0.02	0.05,-0.05	19952.6	0.01	0.02	0.05,-0.05
100.0	-0.01	0.02	0.05,-0.05	25118.9	0.00	0.02	0.05,-0.05
125.9	-0.01	0.02	0.05,-0.05	31622.8	0.00	0.02	0.05,-0.05
158.5	-0.01	0.02	0.05,-0.05	39810.7	0.00	0.02	0.05,-0.05
199.5	-0.02	0.02	0.05,-0.05	50118.7	-0.00	0.02	0.06,-0.06
251.2	-0.01	0.02	0.05,-0.05	63095.7	-0.00	0.05	0.07,-0.07
316.2	-0.01	0.02	0.05,-0.05	79432.8	-0.01	0.05	0.08,-0.08
398.1	-0.01	0.02	0.05,-0.05	100000.0	-0.01	0.05	0.09,-0.09
501.2	-0.00	0.02	0.05,-0.05				

1000 Hz measured level: 119.742 dBµV, -0.258 dB re input (0.033 dB uncertainty; -0.483 dB to -0.017 dB limit)
1 kHz (1/3 Octave) Noise Floor : 0.37 µV, -8.70 dBµV (0.47 dB uncertainty; -4.00 dB limit)
Flat (20 Hz - 20 kHz) Noise Floor : 3.38 µV, 10.59 dBµV (0.47 dB uncertainty; 15.00 dB limit)
A-weight Noise Floor : 1.89 µV, 5.55 dBµV (0.46 dB uncertainty; 10.00 dB limit)
Environmental conditions: 23.4 °C, 26.8 %RH (0.3 °C, 3 %RH uncertainty)
Uncertainties are given as expanded uncertainty at ~95 percent confidence level (k = 2).
Test Procedure: D0001.8126 with PRM902 (SMD).xml
This frequency response is in compliance with manufacturers specification for the item tested.
This report may not be reproduced, except in full, without the written approval of the issuer.

Technician: Sean Childs Test Date: 22 Nov 2016 10:11:52

Test Location: Larson Davis, a division of PCB Piezotronics, Inc.
1681 West 820 North, Provo, Utah 84601
Tel: 716 684-0001 www.LarsonDavis.com

Calibration Certificate

Certificate Number 2016010306

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	3228	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	18 Nov 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	18 Nov 2017		
		Temperature	25	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	28	%RH	± 3 %RH
		Static Pressure	101.4	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/07/2016	09/07/2017	001021
Sound Level Meter / Real Time Analyzer	04/07/2016	04/07/2017	001051
Microphone Calibration System	08/17/2016	08/17/2017	005446
1/2" Preamplifier	10/06/2016	10/06/2017	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/22/2016	08/22/2017	006507
1/2 inch Microphone - RI - 200V	03/15/2016	03/15/2017	006510
Pressure Transducer	07/01/2016	07/01/2017	007368

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
94	101.4	94.02	93.80	94.20	0.14	Pass
114	101.1	114.01	113.80	114.20	0.13	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	101.4	1,000.18	990.00	1,010.00	0.20	Pass
114	101.1	1,000.18	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	101.4	0.37	0.00	2.00	0.25	Pass
114	101.1	0.32	0.00	2.00	0.25	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 32 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
101.3	101.4	0.00	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	0.00	-0.30	0.30	0.04 ‡	Pass
108.0	108.0	-0.02	-0.30	0.30	0.04 ‡	Pass
92.0	92.0	0.01	-0.30	0.30	0.04 ‡	Pass
74.0	73.8	-0.05	-0.30	0.30	0.04 ‡	Pass
65.0	65.2	-0.16	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 32 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.0	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.4	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	92.0	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	73.8	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.2	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 32 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.0	0.32	0.00	2.00	0.25 ‡	Pass
101.3	101.4	0.32	0.00	2.00	0.25 ‡	Pass
92.0	92.0	0.34	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.36	0.00	2.00	0.25 ‡	Pass
74.0	73.8	0.39	0.00	2.00	0.25 ‡	Pass
65.0	65.2	0.43	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

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LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR LARSON DAVIS 831

Calibration Certificate

Certificate Number 2016003215

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	831	***Procedure Number***	D0001.8378		
Serial Number	0002441	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	12 Apr 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	12 Apr 2017		
		Temperature	23.07	°C	± 0.01 °C
Description	Larson Davis Model 831	***Humidity***	50.7	%RH	± 0.5 %RH
		Static Pressure	86.46	kPa	± 0.03 kPa

Evaluation Method Tested electrically using PRM831 S/N 017139 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
SRS DS360 Ultra Low Distortion Generator	07/07/2015	07/07/2016	007118

Calibration Certificate

Certificate Number 2016003212

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	PRM831	***Procedure Number***	D0001.8383		
Serial Number	017139	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	12 Apr 2016		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	12 Apr 2017		
		Temperature	23.25	°C	± 0.01 °C
Description	Larson Davis 1/2" Preamplifier for Model 831 Type 1	***Humidity***	50.9	%RH	± 0.5 %RH
		Static Pressure	86.46	kPa	± 0.03 kPa

Evaluation Method Tested electrically using a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 μPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Sound Level Meter / Real Time Analyzer	11/05/2015	11/05/2016	001150
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
Agilent 34401A DMM	06/25/2015	06/25/2016	007165
SRS DS360 Ultra Low Distortion Generator	11/10/2015	11/10/2016	007167

Calibration Certificate

Certificate Number 2016003241

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	831	***Procedure Number***	D0001.8384	
Serial Number	0002441	***Technician***	Ron Harris	
Test Results	**Pass**	***Calibration Date***	12 Apr 2016	
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	12 Apr 2017	
		Temperature	23.29 °C	± 0.01 °C
Description	Larson Davis Model 831	***Humidity***	51.1 %RH	± 0.5 %RH
		Static Pressure	86.34 kPa	± 0.03 kPa

Evaluation Method

Tested with:
PRM831. S/N 017139
377B02. S/N 120629

Data reported in dB re 20 µPa.

Compliance Standards

Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	06/24/2015	06/24/2016	006311
Hart Scientific 2626-H Temperature Probe	06/17/2015	06/17/2016	006798
Larson Davis CAL200 Acoustic Calibrator	08/12/2015	08/12/2016	007027
Larson Davis Model 831	03/01/2016	03/01/2017	007182
1/2 inch Microphone - P - 0V	03/07/2016	03/07/2017	007185
Larson Davis CAL291 Residual Intensity Calibrator	09/24/2015	09/24/2016	007287

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

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LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR QUEST NOISEPRO

INSTRUMENT CALIBRATION REPORT

Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID R10801
Description Quest NoisePro DLX-1 Dosimeter
Calibrated 6/24/2016

Manufacturer Quest
Model Number NoisePro DLX-1 Dosimeter
Serial Number NNI020005
Location New Jersey
Temp 77

Classification
Status pass
Frequency Yearly EOM
Department Lab
Humidity 33

Calibration Specifications

Group # 1
Group Name Acoustic Tests Performed
Test Performed: Yes **As Found Result: Fail** **As Left Result: Pass**

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
B&K 4226	Brüel & Kjær 4226	Brüel & Kjær	2590968	3/15/2016	3/15/2017
B&K 4228	Brüel & Kjær 4228	Brüel & Kjær	2667476	3/15/2016	3/15/2017
FLUKE 114	Fluke 114 NIST Traceable Multimeter	Fluke	15310288	5/6/2016	5/6/2017

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Kevin Cole

Advanced Labs, Inc. hereby certifies that this instrument is calibrated and functions to meet the manufacture's specifications using NIST traceable standards, or is derived from accepted values of physical constants.

INSTRUMENT CALIBRATION REPORT

Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID R9067
Description Quest QC-10 Acoustic Calibrator
Calibrated 12/13/2016

Manufacturer Quest
Model Number QC-10
Serial Number QIF050044
Location New Jersey
Temp 71

Classification
Status pass
Frequency Yearly EOM
Department Lab
Humidity 27

Calibration Specifications

Group # 1
Group Name Acoustic Tests Performed
Test Performed: Yes **As Found Result: Fail** **As Left Result: Pass**

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
B&K 4226	Brüel & Kjær 4226	Brüel & Kjær	2590968	3/15/2016	3/15/2017
B&K 4228	Brüel & Kjær 4228	Brüel & Kjær	2667476	3/15/2016	3/15/2017
FLUKE 114	Fluke 114 NIST Traceable Multimeter	Fluke	15310288	5/6/2016	5/6/2017

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated David Galego

Advanced Labs, Inc. hereby certifies that this instrument is calibrated and functions to meet the manufacture's specifications using NIST traceable standards, or is derived from accepted values of physical constants.

APPENDIX C

PREDICTED FUTURE NOISE LEVELS

Table C-1: Predicted Future Noise Levels

Receptor No.	Location	Land Use	No. of Dwelling Units/ Receptors	Existing Noise Level, dBA L_{eq}(h)	Future (2040) Noise Levels, dBA L_{eq}(h)					
					Future No Build	Future Build	Future Build Minus No Build Conditions	Future Build Minus Existing Conditions	Activity Category	Impact Type
R-1	14881 Temescal Canyon Road	Light Industrial	1	74	76	77	1	3	F	None
R-2	Temescal Canyon Road	Vacant Land	1	68	69	70	1	2	G	None
R-3	16800 Bernard Street	Industrial	1	66	67	68	1	2	F	None
R-4	16800 Bernard Street	Industrial	1	64	65	66	1	2	F	None
R-5	Temescal Canyon Road	Vacant Land	1	75	77	71	-6	-4	G	None

Source: LSA (August 2017).
dB = decibel(s)
dBA = A-weighted decibel(s)
L_{eq}(h) =1-hour A-weighted equivalent continuous sound level