Rush Creek Project, FERC Project No. 1389

LAND 2 – Noise
Draft Technical Study Report

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List of Acronyms

AAM	Advanced Acoustic Model
ANSI	American National Standards Institute
Caltrans	California Department of Transportation
cfs	cubic feet per second
CNEL	Community Noise Equivalent Level
DNL	Day-Night Average Sound LEvel
DoD	U.S. Department of Defense
FERC	Federal Energy Regulatory Commission
IEC	International Electrotechnical Commission
kPa-s/m^2	kilopascal-seconds per square meter
lb	pound(s)
L_{eq}	Equivalent Sound Level
L_n	percentile level
L_{max}	Maximum Sound Level
NED	National Elevation Dataset
Noise TSP	LAND 2 – Noise Technical Study Plan
POI	point of interest
RCNM	Road Construction Noise Model
RNM	Rotorcraft Noise Model
SCE	Southern California Edison Company
SEL	Sound Exposure Level
SR-158	State Route 158
TSP	Technical Study Plan
TSR	Technical Study Report
US-395	U.S. Highway 395
USGS	U.S. Geological Survey

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1 INTRODUCTION

This Technical Study Report (TSR) describes the methods and results associated with implementation of the LAND 2 – Noise Technical Study Plan (Noise TSP) for the Rush Creek Project (Project) in 2023. The Noise TSP was included in Southern California Edison Company's (SCE's) Revised Study Plan[1] and was approved by the Federal Energy Regulatory Commission (FERC) on October 26, 2022, as part of its Study Plan Determination. This TSR provides a detailed discussion of the methods and results of analyzing noise associated with Project construction activities (helicopter, construction equipment, and truck use) with the focus on noise sensitive areas in the vicinity of proposed activities. The analysis presents measured ambient noise levels for existing conditions and estimated noise levels due to Project-generated noise as calculated by computer noise modeling.

2 STUDY OBJECTIVES

The objective of this study was to characterize ambient and Project-generated noise at sensitive receptor areas (i.e., residences, businesses, and recreation areas) and compare these to applicable state and local noise regulations/ordinances[2]. Project-generated noise analyzed was associated with the following activities:

- Routine operations of the Rush Creek Powerhouse.
- Retrofitting and removal of dams and potential enhancement of the lower Rush Creek channel, which would involve:
  - Helicopter use for movement of materials and equipment;
  - Construction equipment operation; and
  - Truck use for hauling materials.

3 STUDY IMPLEMENTATION

Study elements described in the Noise TSP were initiated in 2023. A summary of the study elements that have been completed, study elements that are outstanding, and any deviations or proposed modifications to the Noise TSP are discussed in the following subsections.

[1] SCE filed a Proposed Study Plan on May 26, 2022 (SCE 2022a). Four comment letters were filed on the Proposed Study Plan, and six study plans were revised. SCE filed a Revised Study Plan on September 23, 2022 (SCE 2022b). FERC subsequently issued a Study Plan Determination on October 26, 2022.

[2] Analysis of potential noise impacts will be included in the license application considering the overall scope, duration, and frequency of the project activities.

3.1 Study Elements Completed

Identification of noise sensitive receptors/points of interest (POIs):

- Noise sensitive receptors or POIs were identified by reviewing aerial imagery and by on-the-ground investigation. Assessed locations included areas in the vicinity of the Rush Creek Powerhouse and June Mountain Ski Area Parking Lot area; the helicopter flight paths between June Mountain Ski Area Parking Lot and Gem and Rush Meadows dams; the potential enhancement area in the lower Rush Creek channel; and proposed truck haul routes on State Route 158 (SR-158) (refer to Map LAND 2-1).

- Consultation with resource agencies and interested stakeholders on the selection of POIs was completed.

Measurement of ambient noise levels at the following POIs in October 2023:

- Near the Rush Creek Powerhouse to characterize powerhouse equipment noise;

- Along proposed helicopter flight paths;

- Near proposed construction areas; and

- Along proposed truck haul routes.

Noise modeling and analysis to:

- Analyze the Rush Creek Powerhouse noise level and frequency spectra;

- Calculate noise levels at POIs in the vicinity of proposed helicopter flight paths with computer software modeling;

- Calculate noise levels at POIs in the vicinity of proposed construction areas at the June Mountain Ski Area Parking Lot and the potential enhancement areas in the lower Rush Creek channel with computer noise modeling; and

- Calculate noise levels at POIs along the truck haul routes.

3.2 Variances from the Noise TSP

As described in detail in Section 5, the study includes 20 individual POIs, which is an increase from the quantity of POI identified for establishment in the Noise TSP as explained below.

- Powerhouse POIs: The POIs in the vicinity of the powerhouse (two to three) identified in the Noise TSP were increased to 12 locations to cover additional residential areas, identified as a concern by stakeholders, and measure the variance in powerhouse noise levels by angle from the tailrace. No change was made to the number of POIs in the vicinity of helicopter flight paths, construction areas, or truck routes.

- An additional powerhouse noise measurement was added in November 2023 to determine the influence on noise levels and sound characteristics when the Rush Creek Powerhouse does not generate power, but the turbine is spinning.
- The version of the software used for aircraft noise modeling was updated from the Rotorcraft Noise Model (RNM) identified in the Noise TSP to the Advanced Acoustic Model (AAM) due to U.S. Department of Defense (DoD) policy change, as described in Section 5.2.2.2.
- Percentile levels (L_n)[3] (L_{10}, L_{50}, and L_{90}) were added to the reported noise metrics to further characterize the noise environment. This metric adds statistical information of how noise levels vary during each measurement.

3.3 OUTSTANDING STUDY ELEMENTS

The TSP identified that ambient noise measurements be performed at each POI in June, August, and October – corresponding to the early, peak, and end of the recreational season, respectively. In the spring of 2023 local stakeholders expressed concern that the substantial snowpack in 2023 and associated high runoff created an ambient noise environment not representative of typical conditions. As a result, the June and August 2023 noise measurements were rescheduled for June and August 2024. Because power generation and creek flow rates had normalized by September 2023, the October 2023 measurements were conducted on schedule and are presented in this report. Data collected in 2024 will be analyzed and reported following the end of the 2024 field season and included as an appendix in the Final License Application.

4 EXTENT OF STUDY AREA AND STUDY SITES

Refer to Map LAND 2-1 for the noise assessment study area, which includes the Rush Creek Powerhouse area, the June Mountain Ski Area Parking Lot area, the helicopter flight paths between June Mountain Ski Area Parking Lot and work areas (including dam work areas), construction activities at the potential enhancement area in the lower Rush Creek channel, and truck haul routes on SR-158.

5 STUDY APPROACH

5.1 GENERAL APPROACH

The analysis focused on Project-related single-day or single-event noise events associated with Project construction activities: helicopters, construction equipment, and truck use..

[3] Ln is the percentile noise level where “n” is between 0.01S and 99.9 percent of the time calculated by statistical analysis and usually includes a descriptor—L10, L50, and L90 are commonly used in the assessment of environmental noise levels and regulations.

5.1.1 Identify Noise Sensitive Receptors/Points of Interest

The California Department of Transportation (Caltrans) defines but does not limit the definition of noise sensitive locations to developed lands such as subdivisions, residences, schools, churches, hospitals, and libraries (Caltrans 2013). The Federal Aviation Administration defines noise sensitive areas to include residential, educational, health, and religious structures and sites, along with parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites.

In the study area, residences, businesses, recreation areas, and wildlife areas represent locations considered noise sensitive receptors or POIs. The identification of applicable POIs for the noise analysis considered the local terrain, existing land uses, and recreational activities while the TERR2 TSR addresses the potential for noise effects to wildlife. For each of the study components, POIs were selected in consultation with resource agencies and interested stakeholders.

5.1.2 Field Characterize Ambient/Project-Induced Noise

At each POI, the ambient noise level was characterized in terms of L_{max}, L_{eq}, L_{10}, L_{50}, and L_{90} noise metrics with appropriate equipment for the necessary level of accuracy. Noise measurements capture two consecutive 10-minute periods collected on either October 24 or 25, 2023. Additional measurements were taken on November 14, 2023, around the powerhouse to capture noise when the powerhouse was not generating power.

Field measurements used integrating sound level meters that included both a Larson Davis 824 and Larson Davis 831 with associated pre-amplifiers and microphones. The entire system was certified by an independent authority attesting to the accuracy of the equipment meeting the following performance standards relating to tolerance limits and operational temperature range:

- International Electrotechnical Commission (IEC) 61672-1:2013, Class 1 (IEC 2013); and
- American National Standards Institute (ANSI) S1.4 and ANSI S1.43 Type 1 (ANSI 1983, 1997).

A separate acoustic calibrator was used before and after field measurements to ensure proper equipment function. Copies of the equipment calibration certificates are provided in Appendix A.

5.1.3 Analysis Metrics

This study focuses on the following metrics to describe the noise environment in the study area as prescribed by FAA, DoD, and DoT as either primary or secondary metrics:

- **Maximum Sound Level (L_{max})** represents the highest A-weighted sound level measured during a single event in which the sound changes with time. L_{max} is the maximum level that occurs over a fraction of a second, so it does not fully describe the noise, because it does not account for how long the sound is heard.

- **Equivalent Sound Level (L_{eq})** is a “cumulative” metric that combines a series of noise events representing the decibel average of all sounds in a time period. The time period of an L_{eq} measurement is usually related to a particular activity that dictates the duration. Common periods for L_{eq} include 10-minute, 1-hour, and 24-hour durations, which depend upon the particular environment and nature of noise sources. For practicality the measurements of existing ambient noise levels for all study components captured $L_{eq(10min)}$ durations at all POI collected during times when proposed noise generating activity would occur. Noise due to proposed helicopter flights reported as $L_{eq(24hr)}$, which forms the basis of noise metrics commonly utilized for land use zoning restrictions. Construction equipment noise reported as $L_{eq(1hr)}$, which is the most commonly used duration because construction activity often varies throughout a construction project and throughout each day.

- **Sound Exposure Level** (SEL) is the equivalent of the total sound energy over a stated period. It takes into consideration both the received sound level and the extent of the exposure. It is similar to the L_{eq} as the total sound energy is integrated over the measurement period. However, instead of averaging over the measurement period, a reference duration of 1 second is used. SEL is a frequently used measure of noise exposure for an individual aircraft noise event; it measures the total noise energy produced during an event, from the time when the A-weighted sound level first exceeds a threshold (normally just above the background or ambient noise) to the time that it again drops below the threshold.

- **Percentile Levels (L_n) (L_{10}, L_{50}, and L_{90})** are statistical descriptors of sound defined as the sound level exceeded “n” percent of the measurement period. For example, the L_{90} metric reports the noise level that is exceeded 90 percent of the time during the measurement period and is considered to represent the background noise without transient sources of noise. In situations where the source of interest is constant, such as a generator, and ambient noise level varies (e.g., due to traffic noise), L_{90} may adequately describe the noise source (Federal Highway Administration [FHWA] 2017).

The noise study reports the following metrics by study component:

- Powerhouse
  - Ambient/Existing: L_{max}, $L_{eq(10min)}$, L_{10}, L_{50}, L_{90}
- Helicopter
  - Ambient/Existing: L_{max}, $L_{eq(10min)}$, L_{10}, L_{50}, L_{90}
  - Proposed Helicopter Flights: SEL, L_{max}, $L_{eq(24hr)}$
- Construction
  - Ambient/Existing: L_{max}, $L_{eq(10min)}$, L_{10}, L_{50}, L_{90}
  - Proposed Equipment Activity: L_{max}, $L_{eq(1hr)}$
- Truck Use
  - Ambient/Existing: L_{max}, $L_{eq(10min)}$, L_{10}, L_{50}, L_{90}
  - Proposed Truck Hauling: L_{max}

For any noise source, several factors affect the efficiency of sound transmission traveling from the source, which in turn affects the potential noise impact at offsite locations. Important factors include distance from the source, frequency of the sound, absorbency and roughness of the intervening ground (or water) surface, the presence or absence of obstructions such as buildings and their absorbency or reflectivity, and the duration of the sound. Table LAND 2-1 presents typical noise levels of some familiar noise sources and activities.

5.1.4 Software Noise Models

5.1.4.1 Helicopter

This noise study uses the DoD Noisemap suite of computer programs for aircraft noise modeling and analysis including the AAM (U.S. Department of Transportation 2020). The Noisemap suite of programs refers to BASEOPS as the software input module or user interface and AAM as the noise model for predicting noise exposure for subsonic aircraft noise, such as helicopter flights. Table LAND 2-2 presents noise modeling parameters used in the analysis and Appendix C provides additional details on the software.

5.1.4.2 Construction Noise and Truck Hauling

The Roadway Construction Noise Model (RCNM) is the Federal Highway Administration's (FHWA) national model for the prediction of construction noise. The RCNM provides a construction noise tool to predict noise levels at user-entered distances from various types of construction equipment or trucks for sound propagation paths over relatively flat ground, providing outputs for L_{max} and L_{eq} metrics. Additional details provided in Appendix C.

5.2 SPECIFIC STUDY COMPONENTS

The following subsections describe the approach for each study component associated with powerhouse operation, helicopter use, construction equipment operation, and truck hauling analysis.

5.2.1 Powerhouse Operation

5.2.1.1 Establish Points of Interest

The Noise TSP proposed establishing a POI within 100 meters (m) of the Rush Creek Powerhouse and two to three POIs in the vicinity of the powerhouse. Stakeholders engaged with the process suggested that additional POIs be established in adjacent neighborhoods, noting that the powerhouse equipment generates noise that is audible at multiple residential locations. Additionally, stakeholders requested further investigation into the directivity of the noise emanating from the powerhouse at angles to the north and south of the tailrace. Following this collaboration, and prior to establishing POIs in the field, the technical lead for the noise study mapped locations identified by stakeholders as potential locations to establish residential POIs.

During the first onsite noise measurements on October 24, 2023, the team deployed a Larson Davis 831 integrating sound level meter. With the goal of identifying the areas around and angles from the powerhouse experiencing the greatest sound levels, the team walked around along the eastern side of the Rush Creek Powerhouse, adjacent to the residential areas to the east. Measured A-weighted sound levels identified the area directly in front of the tailrace as experiencing the highest sound levels, with sound levels decreasing at wider angles to the north and south. The concrete sides of the tailrace appear to attenuate sound by blocking line of sight to the north and south. To document this condition and to respond to stakeholder comments on the measurement sites, the POI locations were expanded to include five POIs (PH-1a through PH-1e) to capture noise adjacent to the powerhouse. In addition, because powerhouse equipment generates noise that emanates on the east side of the powerhouse and can be heard in areas on adjacent properties and residential areas east of SR-158, an additional seven POIs were established at or near residential areas currently experiencing noise from the operation of the powerhouse. In total, 12 POI locations were established. The 12 POIs, collectively referred to as the “Powerhouse POIs,” are illustrated in Map LAND 2-1.

5.2.1.2 Characterize Ambient Noise and Noise Emanating from the Rush Creek Powerhouse Under Different Generation Loads

Two consecutive 10-minute-duration noise measurements at each of the 12 Powerhouse POIs were collected on October 24, 2023, to capture the minimum flow rate of approximately 4 cubic feet per second (cfs) during power generation. An additional measurement was completed at each of the 12 POIs on November 14, 2023, during which the minimum flow rate was also at 4 cfs but with no power generation. Measurements included L_{max}, L_{eq}, and L_n (L_{10}, L_{50}, and L_{90}).

When capturing the powerhouse noise contribution to ambient conditions, the loudest condition may not coincide with the highest power generation; rather a reduced load could excite the equipment's resonant frequency, which could create additional vibrations within a narrow range of frequencies. Powerhouse operators and local stakeholders were consulted to identify the periods of time when powerhouse noise is most noticeable. Based on stakeholder input, the period when the powerhouse creates the most noise was identified to be in October and November during periods of low power generation.

5.2.2 Helicopter Use

The base of operations for Project implementation will be established at the beginning of each construction season and will include a helicopter landing site at June Mountain Ski Area Parking Lot to function as the transportation hub for moving equipment and materials to and from each construction site by helicopter.

As shown in Map LAND 2-1, there are two average flight paths traveling approximately east to west, identified as the "northern flight track" and "southern flight track," along which helicopters will move materials and equipment between the base of operations at the June Mountain Ski Area Parking Lot to each work area.

During mobilization and demobilization (each a period of approximately 2-weeks), heavy equipment will be transported to/from the construction areas using a Skycrane helicopter (lift capacity of approximately 11,000 pounds [lb]). During the construction season lasting an estimated 5 months per year equipment and material will be transported to/from the construction areas primarily using sling loads attached to either, A-Star helicopter (lift capacity of 2,500 lb) or modified Black Hawk helicopters (lift capacity of 6,000 lb). Construction debris will be transported from the construction areas to the base of operations for stockpiling prior to transport to an approved disposal site.

5.2.2.1 Establish Points of Interest

Map LAND 2-1 depicts the two proposed helicopter flight paths projected across the ground (northern flight track and southern flight track). The POIs to capture ambient noise measurements associated with helicopter noise are HE-1 and HE-2, collectively referred to as "Helicopter POIs." These POIs are located nearest the helicopter flight paths and within the residential area and are illustrated in Map LAND 2-1.

5.2.2.2 Characterize Ambient and Project-induced Noise Generation

Two consecutive 10-minute-duration noise measurements at each Helicopter POI were collected on October 24, 2023. These measurements included L_{max}, L_{eq}, and L_n (L_{10}, L_{50}, and L_{90}).

To determine the noise levels that would occur at POIs HE-1 and HE-2 and within the general area of the proposed helicopter flight between the June Mountain Ski Area Parking Lot (the Base of Operations) and each work area during Project construction, software modeling provides the calculated noise levels. The Noise TSP identified the RNM for modeling (Wasmer Consulting 2006a, 2006b; Wyle 1998). However, since that time, the DoD officially approved the use of the AAM, which is the successor to RNM and contains the same propagation algorithms for helicopter use but primarily updates fixed-wing aircraft calculations (DoD 2022). The software includes inputs for local ground elevation, ground impedance and weather conditions. Table LAND 2-2 summarizes the software modeling inputs and Appendix C details additional modeling consideration. The results of the software analysis presents noise levels computed in the time domain with a variety of integrated metrics including Maximum Sound Level (L_{max}), sound exposure level (SEL), and L_{eq} at receiver positions for specific POIs.

5.2.3 <u>Construction Equipment</u>

Throughout the Project duration, construction equipment and personnel will deploy from the base of operations at the June Mountain Ski Area Parking Lot to the designated work areas located upstream and downstream of Project dams. In addition to helicopters (addressed previously), construction activities will involve the operation of various types of equipment, such as cargo vans, forklifts, 10-wheel dump trucks, excavators, and loaders. The base of operations at June Mountain Ski Area Parking Lot will also include office trailers for SCE project management and contractor personnel, both powered by generators up to 25 kilowatts. Stockpiles of construction material and debris will be stored at the base of operations. Project-associated construction equipment and associated noise source levels are detailed in Table LAND 2-3.

5.2.3.1 Establish Points of Interest

The locations of most of the designated work areas at the Project dams are sufficiently far from identified noise sensitive areas that they do not meet the Caltrans definition of a noise sensitive location. As such, the noise analysis focuses on the base of operations at the June Mountain Ski Area Parking Lot and the lower Rush Creek channel, which are closer to noise sensitive areas. The noise team identified the following POIs:

- JM-1, at the northwest corner of the June Mountain Ski Area Parking lot;
- CO-1, along SR-158 southeast of the Rush Creek Powerhouse and adjacent to the nearest residential property; and
- CO-2, along a publicly accessible hiking trail northeast of the base of operations and north of SR-158.

The three POIs, collectively referred to as “Construction Equipment POIs,” are illustrated in Map LAND 2-1.

5.2.3.2 Characterize Ambient and Project-induced Noise Generation

Two consecutive 10- minute-duration noise measurements were collected at the June Mountain Ski Area Parking Lot (JM-1) and at CO-1 and CO-2 in October 2023 that included L_{max}, L_{eq}, and L_n (L_{10}, L_{50}, and L_{90}).

This analysis uses the FHWA's Road Construction Noise Model (RCNM) to calculate the single-event and daily noise levels generated by construction equipment associated with Proposed Project activities (FHWA 2006). The RCNM software allows the calculation of noise levels at user-entered distances from various types of construction equipment for sound propagation paths over flat ground, providing outputs for L_{max} and L_{eq} metrics.

Table LAND 2-3 lists the modeled construction equipment, the acoustical use factor percentage, and measured L_{max} at 50 feet from the source data. The Project will not use impact equipment such as pile drivers. The analysis uses all standardized inputs from the RCNM user's guide, such as usage percentages (FHWA 2006). This study analyzes the types of equipment that may be used and provides the resulting noise levels at various distances, which can later be applied when more precise details become available on the enhancement plan for Rush Creek.

5.2.4 Truck Use

Construction equipment and vehicles hauling material will arrive/depart via SR-158 using the northern route of the loop road to avoid traffic through the community of June Lake. For the transport of disposal of non-hazardous debris, haul trucks traveling to the Pumice Valley Landfill (or another approved disposal site) on a daily/weekly basis will leave the Base of Operations and travel east on SR-158 for approximately 12 miles to the northern intersection with U.S. Highway 395 (US-395). Hazardous waste will be hauled by truck, consistent with state and federal regulations, for disposal at an approved hazardous waste disposal site (i.e., Ridgecrest, California; Los Angeles, California; or Beatty, Nevada).

5.2.4.1 Establish Points of Interest

The following POIs were identified adjacent to the proposed truck haul routes:

- TR-1, along the shore at Silver Lake on the east side of SR-158, which was observed as a common area where the public regularly accesses the lake recreational area.
- TR-2, at the Silver Lake Campground to the north of Silver Lake and east of SR-158.
- TR-3, adjacent to the campground along the western side of Grant Lake and east of SR-158.

The three POIs, collectively referred to as the "Truck POIs," are illustrated in Map LAND 2-1.

5.2.4.2 Characterize Ambient and Project-induced Noise Generation

Two consecutive 10-minute-duration noise measurements were collected at each Truck POI in October 2023, that included L_{max}, L_{eq}, and L_n (L_{10}, L_{50}, and L_{90}).

This analysis uses the FHWA's RCNM software to calculate the noise levels that will be generated by the haul trucks using the "Dump Truck" noise source (listed in Table LAND 2-3). The location of the source is measured from the edge of the roadway nearest each POI. This analysis uses all standardized inputs from the RCNM user's guide (FHWA 2006).

6 STUDY RESULTS

6.1 GENERAL APPROACH

6.1.1 Identify Noise Sensitive Receptors/Points of Interest

POIs were established at the locations specified below. Refer to Map LAND 2-1 for an illustration of each POI's location. Refer to Appendix B for POI Noise Measurement Photos. Overall, more POIs were established than proposed in the Noise TSP.

- Locations in the vicinity of the Rush Creek Powerhouse (powerhouse noise):
  - Five locations (PH-1a through PH-1e) on SCE property immediately adjacent to the powerhouse tailrace to determine the effect of the tailrace structure on sound propagation and to identify the loudest sound path that would affect adjacent properties.
  - Seven locations (PH-2 though PH-8) at or near residential areas currently experiencing noise from Rush Creek Powerhouse operations.
- Along the helicopter flight path from June Mountain Ski Area Parking Lot to top of the ridge near Agnew Dam (helicopter noise):
  - Two locations (HE-1 and HE-2) selected in the nearby residential areas and nearest the proposed helicopter flight paths.
- Adjacent to the June Mountain Ski Area Parking Lot and the potential enhancement area in lower Rush Creek channel (construction equipment noise):
  - One location (JM-1) at the northwest corner of the June Mountain Ski Area Parking Lot.
  - Two locations (CO-1 and CO-2) near residential properties adjacent to the lower Rush Creek Project channel area and along a hiking trail north of June Mountain Ski Area Parking Lot, respectively.

- Along SR-158 from June Mountain Ski Area Parking Lot to US-395 (truck noise):
  - Three locations (TR-1, TR-2, and TR-3) with two adjacent to recreation/camping areas on the west side of Silver Lake and one adjacent to the camping area on the west side of Grant Lake.

6.1.2 Field Characterize Ambient/Project-Induced Noise

At each POI, the ambient noise level was characterized in terms of L_{eq}, L_{10}, L_{50}, and L_{90} noise metrics with appropriate equipment for the necessary level of accuracy. Noise measurements capture two consecutive 10-minute periods collected on either October 24 or 25, 2023. Computer noise models provide noise level calculations of estimated Project-induced noise. The following subsections detail the collection and calculation of those results by specific study component. Section 6.3 summarizes the overall results.

6.2 Specific Study Components

This section provides short duration noise levels ranging from a single-event to a single-day of activity for the Proposed Project study components. The analysis between different alternatives (e.g. with varying construction duration and number and frequency of helicopter flights and truck haul trips) will be evaluated within the license application.

Map LAND 2-2 illustrates locations that would be exposed to an L_{max} (the greatest sound level measured during a single noise event) of 60 decibels (dB) or greater due to temporary Project-generated noise from either helicopter, construction equipment, or truck hauling. For context, an Lmax of 60 dB corresponds to the noise level from a conversation experienced three to six feet away (FHWA 2006). As illustrated by the map, only locations directly adjacent to the Base of Operations would be exposed to noise from construction equipment at an Lmax of 60 dB or higher, and only locations directly adjacent to SR-158 would be exposed to noise from passing trucks at an Lmax of 60 dB or higher. Comparatively, a large area would be exposed to noise at an Lmax of 60 dB or higher associated with helicopter flights. The following sub-sections provide more detail on the noise exposure associated with each of the three types of temporary construction noise: helicopters, construction equipment, and truck use while the Powerhouse noise section discusses ongoing operations.

6.2.1 Powerhouse

The powerhouse study component contains two main categories of POI:

1. Powerhouse source locations:
   a. PH-1a, PH-b, PH-1c, PH-1d, and PH-1e represent five locations immediately adjacent to the powerhouse within SCE property.

2. External community locations:

    a. PH-2 and PH-3 are located outside of the SCE gate along SR-158 near residential properties.
    b. PH-4 through PH-8 are located throughout residential neighborhoods.

The following subsections discuss the measured powerhouse source noise at PH-1a through PH-1e and community experienced noise at PH-2 through PH-8.

6.2.1.1 Sources of Existing Equipment Sound Originating at Rush Creek

As shown in Map LAND 2-1, the PH-1c location is nearest to the Rush Creek Powerhouse and positioned directly at the tailrace, which was identified as a principal source of noise by SCE personnel. Single-event $L_{eq(10min)}$ measured at PH-1c was 75.9 dB with power generation and 71.6 dB with no power generation, as listed in Table LAND 2-4. All noise levels in Table LAND 2-4 are presented as A-weighted decibels to more closely correspond to human hearing sensitivity. The L_{max} at PH-1c was 88.7 dB with power generation and 85.5 dB with no power generation and included an SCE vehicle passing through the nearby entrance gate. The L_{90} metric reports the noise level that is exceeded during 90 percent of the measurement period and, in an environment of sporadic vehicle traffic noise, provides insight on continuous sources like generators or equipment operating at steady state without those extraneous events. In this case, the L_{90} at PH-1c was 75.4 dB with power generation and 70.9 dB with no power generation. Both L_{50} and L_{10} levels at PH-1c differed less than 2 dB from L_{90} levels, which shows that the noise levels were relatively consistent throughout most of the measurement period except for the short periods (less than 10 percent of the time) when the SCE vehicles drove by.

The additional measurement sites nearest the Rush Creek Powerhouse—PH-1a and PH-1b to the north and PH-1d and PH-1e to the south, approximately parallel to SR-158—provide insight into other sources of noise near the powerhouse. Based on field observations, both PH-1a and PH-1b experienced a larger portion of noise from the electrical switching station north of the powerhouse, which produced sound levels at least 15 dB less than at the tailrace (PH-1c). The two sites south of the tailrace (PH-1d and PH-1e) experienced sound approximately 10 to 20 dB less than at the tailrace; at these sites, the sound of water in the creek to the south became more audible and influence of sound from the tailrace area decreased. These measurements show that the greatest sound levels originate nearest the powerhouse tailrace. The tailrace itself is not actually the source of noise; the noise is created by the equipment inside the powerhouse.

6.2.1.2 Influence of Power Generation on Sound Levels

Given that the greatest sound levels created by the powerhouse may not coincide with the highest power generation condition, this section compares two different power generation conditions: (1) the low flow of 4 cfs power generation condition, corresponding to the noise measurements obtained on October 24, 2023, and (2) the similarly low flow of 4 cfs but without power generation, obtained on November 14, 2023.[4] Table LAND 2-4 details the resulting noise levels in terms of single-event $L_{eq(10min)}$, L_{max}, and L_n percentile values for L_{10}, L_{50}, and L_{90}. All noise levels presented in Table LAND 2-4 are A-weighted, which more closely corresponds to human hearing sensitivity.

In general, the no-power-generation condition produced lower noise levels in nearly every instance when compared to the power generation condition. For instance, the $L_{eq(10min)}$ ranged from 2.3 to 5.2 dB less during the no-power-generation condition compared to the power-generation condition at all but one location, PH-6.[5]

Frequency Spectra

Noise measurement data collected at the Rush Creek Powerhouse include sound levels broken out by third-octave frequency band. Third-octave frequency bands provide a standardized way to quantify sound energy across the audible range and to characterize the nature of the sound (e.g., is the sound dominated by low frequencies, high frequencies, or balanced across the spectrum). Figure LAND 2-1 presents the third-octave band L_{90} (i.e., the level exceeded 90 percent of the time for each band) collected at PH-1c in front of the powerhouse tailrace. The red bars reflect the October 2023 measurement with low flow of 4 cfs and with power generation, while the blue bars reflect the November measurements with low flow of 4 cfs but no power generation. The overall distribution by frequency follows a similar pattern for both conditions, but with power generation results in greater noise at lower frequencies at and below the 630-Hz third-octave band, while no power generation results in greater noise above 630 Hz.

Figure LAND 2-2 presents a similar comparison between the power-generation and no-power-generation conditions, but is measured at PH-2, which is just outside of the SCE gate and on the west side of SR-158. In this case, the October measurements with power generation resulted in greater noise levels at nearly all third-octave bands. The PH-2 location is exposed more equally to noise from both the powerhouse tailrace area at the generator and the electrical switching station to the north. Also, PH-2 is closest to SR-158 so vehicle traffic noise is greater and more frequent, which could obscure subtle differences in powerhouse noise.

Figure LAND 2-3 presents another comparison of power-generation and no-power-generation conditions, but measured at PH-6, which is located on Nevada Street within a residential area. The overall noise levels are less than at the previous two POIs, and both conditions closely match each other at the 400 Hz third-octave band and above. However,

[4] As noted in 5.2.1.2 above, powerhouse operators and local stakeholders were consulted to identify the periods of time when powerhouse noise is most noticeable. Based on stakeholder input, the period when the powerhouse creates the most noise and annoyance was identified to be in October and November during periods of low power generation. The June and August studies planned for 2024 will capture noise levels at higher power generation rates.

[5] The measurements at PH-6 resulted in greater Leq(10min) during the no-power-generation condition because construction activity at a nearby property created additional background noise that was not present during the generation measurement in October. The L90 measurements at PH-6 show the noise levels exceeded 90 percent of the period, which effectively removes the contribution of the sporadic construction hammering noise from continuous sources like the powerhouse equipment running at steady state (FHWA-HEP-17-053). The L90 results at PH-6 do follow the same trend as other POIs, with the no-power-generation condition resulting in several dB less noise than with power generation.

below 400 Hz, the condition with power generation results in greater sound levels by approximately 5 dB in most third-octave bands. These greater lower-frequency levels mirror those measured in October with power generation in both Figures LAND 2-1 and LAND 2-3.

Based upon Figures LAND 2-1 through LAND 2-3, the power-generation condition and no-power-generation condition produce a different frequency distribution of sound energy that may be noticeable by observers; the power-generation condition produces greater noise levels in the community. The third-octave bands show the powerhouse noise spread over a range of frequencies, which is typical of industrial-type equipment.

6.2.2 Helicopter

6.2.2.1 Exposure to L_{max} of 60 and 80 dB

Table LAND 2-5 includes the results of the ambient noise measurements collected in October 2023 for the Helicopter POIs: HE-1 and HE-2. The $L_{eq(10min)}$ ranged from approximately 32 dB at HE-2 to 43 dB at HE-1. The loudest events reached an L_{max} of 80 dB at HE-1 and approximately 70 dB at HE-2. Nearly all of the measurement period contained few noise events, with L_{90}, L_{50}, and L_{10} ranging from 32 to 41 dB. As mentioned previously, an L_{max} of 60 dB corresponds to the noise level from a conversation experienced three to six feet away (FHWA 2006) while an L_{max} of 80 dB corresponds to the noise level from a garbage disposal at 3 feet (Caltrans 2013). Both measurement sites, located in a residential neighborhood, experienced minimal vehicle traffic noise, with SR-158 approximately 1,000 feet away and very few vehicles operating within the neighborhood.

Map LAND 2-2 illustrates locations that would be exposed to an L_{max} (the greatest sound level measured during a single noise event) of 60 decibels (dB) or greater. As depicted in that map the proposed helicopter flights would generate single-event noise levels that would exceed 60 dB L_{max} over the largest area of the proposed activity. Map 2-3 provides additional details on the helicopter noise component by separating the Skycrane from the Black Hawk and A-star noise and plots both the 60 and 80 dB L_{max} exposure areas. As shown, the heavy duty Skycrane helicopter would generate noise that affects a larger geographic area than the area that would be affected by noise from the medium duty A-Star helicopter or light duty Black Hawk helicopter. Specifically, the Skycrane flights would generate 80 dB L_{max} or greater extending approximately 1,500 feet to either side of the proposed flight tracks, reaching most of the residential area near POIs HE-1 and HE-2. The 80 dB L_{max} exposure generated by Black Hawk and A-Star flights would be roughly half that distance of the Skycrane and would not expose any of the analyzed noise sensitive areas or the residential area near HE-1 and HE-2 to 80 dB L_{max}. For comparison, the existing ambient $L_{eq(10min)}$ at HE-1 and HE-2 ranges from 32 to 43 dB with occasional L_{max} peaking from 70 to 80 dB due to vehicle traffic.

6.2.2.2 Noise Levels at Helicopter POI HE-1 and HE-2

Table LAND 2-6 presents a comparison of each proposed helicopter type and the resulting noise levels for both the northern and southern flight tracks. The smaller helicopters (Black Hawk and A-Star) on the northern flight track would generate single-event L_{max} from 74 to 77 dB at HE-1 and 70 to 75 dB at HE-2. These noise levels would similarly decrease while on the southern flight track, with an L_{max} of 67 to 70 dB at HE-1 and 62 to 65 dB at HE-2.

The largest helicopter (Skycrane) would generate the greatest L_{max} of 80 to 88 dB at HE-1 and 78 to 80 dB at HE-2 while traveling along the northern flight track. Due primarily to the farther distance from populated areas, the Skycrane traveling along the southern flight track would create an L_{max} from 75 to 76 dB at HE-1 and 69 to 70 dB at HE-2. The SEL would be 4 to 7 dB less on the southern flight track when compared with the northern flight track.

During the main construction period, there would be an average of six flights per day[6] and most would generally be flown by either the smaller Black Hawk or A-Star helicopters which would generate an $L_{eq(24hr)}$ of 42 to 45 dB at HE-1 compared to the existing 33 dB $L_{eq(10min)}$. Similarly, at HE-2 the Black Hawk or A-Star flights would result in $L_{eq(24hr)}$ of 39 to 43 dB compared to the existing $L_{eq(10min)}$ of 43 dB.

If all six flights were flown by the Skycrane representing the ‘worst case’ scenario that would apply during the shorter mobilization and demobilization period, the typical flying day would result in single-day $L_{eq(24hr)}$ of up to 54 dB at HE-1. This would represent an increase from the existing ambient measured condition of 33 dB $L_{eq(10min)}$. Similarly, at HE-2, Skycrane flights would generate an $L_{eq(24hr)}$ of 49 dB during mobilization/demobilization compared to an existing ambient $L_{eq(10min)}$ of 43 dB.

Overall, and as shown on Map 2-3, helicopter flights operating between the Base of Operations and construction work areas at Agnew, Gem, and Rush Meadows dams would result in elevated noise levels in the June Lake Loop area. Residential areas along SR-158 (HE-1, HE-2, PH-4, PH-5, and PH-6) and developed recreation areas at Gull Lake and Silver Lake would be most affected. In addition, backcountry areas along flight tracks would also experience elevated noise levels.

6.2.3 <u>Construction Equipment</u>

As depicted in Map 2-2, the orange shaded region reflects areas that would be exposed to elevated construction equipment noise at some point during the construction season of 60 dB L_{max} or greater. All areas exposed to 60 dB L_{max} or greater would be within 500 feet of the Base of Operations. Map 2-2 represents a conservative L_{max} estimate of the size of the 60 dB L_{max} because it assumes equipment would operate up to the boundary of the Base of Operations. Likely, construction equipment would often operate

[6] Six flights per day is the expected average number of flights on any one construction day.

further inside the boundary, which would generate a smaller 60 dB L_{max} contour on most days than is depicted on Map 2-2.

As presented in Table 2-7, single-event construction L_{max} would be 75 dB within 100 feet of the Base of Operations and would decrease to 55 dB L_{max} at 1,000 feet, which would be roughly equivalent to ambient conditions. There are no residential structures located within 1,000 feet of the June Mountain Ski Area Parking Lot and therefore residents would not be affected by construction equipment operating at that location. However, as seen at JM-1 the construction activities at the June Mountain Ski Area Parking Lot, though generating relatively low background noise levels, would be elevated compared to No-Action conditions and would be noticeable within 1,000 feet but less than 60 dB L_{max}, including along nearby hiking trails and at the developed recreational area of June Mountain Ski Area.

6.2.4 Truck Use

Table LAND 2-5 includes the ambient measured noise levels at the three POIs associated with truck hauling activity (TR-1, TR-2, and TR-3). The $L_{eq(10min)}$ was found to range from as low as 40 dB at TR-3 up to approximately 47 dB at TR-1. The maximum single event noise levels, captured by L_{max}, ranged from 71 to 88 dB due to a combination of passing vehicle traffic and people talking or recreating in the camping areas. However, these louder events only constituted a small portion of the measurement period, which is shown by the L_{90}, L_{50}, and L_{10} levels, almost all of which are below 50 dB. For instance, the L_{10} at TR-3, ranging from 40.4 to 45.8 dB, corresponds to sound levels less than those values during 90 percent of the time of the 10-minute measurement.

Table LAND 2-8 presents the measured sound levels at the three POIs associated with truck hauling activity along SR-158. The L_{max} from a single dump truck will be approximately 77 dB at TR-1, 72 dB at TR-2, and 67 dB at TR-3 due to increasing distance from SR-158. As detailed in Chapter 3.0 of the Pre-Application Document (Tables 3-6 through 3-11), the Proposed Project will require multiple truck trips per day for multiple months that will create temporary elevated noise levels at the POIs (SCE 2021). However, the noise levels of these truck trips will be similar to the louder existing vehicle traffic events, but the frequency of such events will increase during periods of hauling.

CO-1 represents the area beyond SCE property that includes several residences near the Rush Creek Powerhouse. The existing $L_{eq(10min)}$ at CO-1 ranges from 60 to 62 dB, with an L_{max} of 90 to 104 dB due to existing passing trucks on SR-158. L_{50} and L_{10} measurements show that at least half of the measurement period resulted in levels of 50 dB corresponding to the time without traffic or other activity. Although this location would be unaffected by construction equipment noise from construction activity at the June Mountain Parking Lot it would experience an increase in noise from truck trips along SR-158 resulting in single-event L_{max} of up to 77 dB.

6.3 SUMMARY

Table LAND 2-9 summarizes the estimated greatest construction-generated noise compared to ambient noise levels at noise sensitive POI. The following narrative supports interpretation of the results shown in the table.

- Residential Areas near HE-1 and HE-2 would experience elevated noise due to helicopter flights operating between the June Mountain Ski Area Parking Lot and project work areas, which would result in single-event L_{max} of over 80 dB compared to ambient levels as low as 33 dB.

- Residential Areas near PH-4, PH-5, and PH-6 would experience elevated noise due to helicopter flights operating between the June Mountain Ski Area Parking Lot and project work areas, which would result in single-event L_{max} of over 75 dB compared to ambient levels as below 43 dB.

- Developed Recreational areas near Gull, Silver, Grant, Agnew, and Gem Lakes would experience elevated noise from helicopter flights that would exceed 60 dB L_{max}, while recreational areas near Agnew and Gem Lake would exceed 80 dB L_{max}.

- Noise Sensitive locations along SR-158, such as TR-1, TR-2, and TR-3 would experience elevated vehicle noise of up to 77 dB due to truck hauling of non-hazardous materials. However, these noise levels would be similar to existing passing trucks or motorcycles measured at various POI along SR-158.

- In terms of long-term operational activity, the Rush Creek Powerhouse operation would continue as under existing conditions. The current and ongoing Powerhouse noise produces a frequency distribution of sound energy that is noticeable by observers due to the relatively low background noise from other sources. The third-octave bands show the powerhouse noise spread over a range of frequencies, which is typical of industrial-type equipment.

7 NEXT STEPS

Ambient noise measurements were collected al all POIs in June 2024 and will be collected again in August of 2024 to capture the peak-season and end-season ambient noise conditions. Data collected in 2024 will be analyzed and reported following the end of the 2024 field season and included as an appendix in the Final License Application. Analysis of potential noise impacts are included in the license application and consider the overall scope, duration, and frequency of the project activities associated with each alternative.

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TABLES

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Table LAND 2-1. Typical Noise Levels

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 miles per hour		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60	
		Larger business office
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, larger conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: Caltrans 2013

Table LAND 2-2. Helicopter Noise Modeling Parameters

Software	Analysis *Component*	Version
AAM	Rotary-wing aircraft	2.6.3
Aircraft	**Modeled As**	
Sikorsky Skycrane S-64	Sikorsky Sea Stallion CH-53E	
Sikorsky Black Hawk UH-60	Sikorsky Sea Hawk SH-60B	
Eurocopter ASTAR	Messerschmitt-Bölkow-Blohm Bo 105	
Parameter	**Description**	
Receiver Grid Spacing	500 ft in x and y	
Metrics	L_{max} and SEL	
Basis	Single-event and typical day operations	
Topography		
Elevation Data Source	USGS 30 m NED	
Elevation Grid Spacing	500 ft in x and y	
Impedance Data Source	USGS Hydrography DLG	
Impedance Grid spacing	500 ft in x and y	
Flow Resistivity of Ground (soft/hard)	225 kPa-s/m^2 for land, 6000 kPa-s/m^2, and 1,000,000 kPa-s/m^2 for water	
Modeled Weather (Monthly Averages 2018-2022; April *selected)*		
Temperature	70.7 °F	
Relative Humidity	57.1 %	
Barometric Pressure	29.99 in Hg	

Notes:
°F = degrees Fahrenheit
DLG = digital line graph
ft = feet
in Hg = inches mercury
kPa-s/m^2 = kilopascal-seconds per square meter
L_{eq} = equivalent sound level
L_{max} = maximum sound level
m = meters
NED = National Elevation Dataset
SEL = sound exposure level
USGS = U.S. Geological Survey

Table LAND 2-3. Project-Associated Construction Equipment and Noise Source Levels

Equipment[1]	Acoustical Use Factor (%)	Spec 721.560 L_{max} AT 50 ft (dBA, slow)	Actual Measured L_{max} AT 50 ft (dBA, slow)
Dump truck	40	84	76
Excavator	40	85	81
Flat-bed truck[2]	40	84	74
Front end loader	40	80	79
Generator (<25KVA, VMS signs)	50	70	73
Man lift[1]	20	85	75

Source: FHWA 2006

[1] No impact equipment, such as pile drivers, will be used.

[2] Flat-bed truck and man lift used as surrogates for 20-foot cargo van and telehandler forklift, respectively.

Table LAND 2-4. A-Weighted Powerhouse Sound Level Comparison—Low Flow Generation (October 2023) vs. Low Flow No-Generation (November 2023)

Location		PH-1a	PH-1b	PH-1c	PH-1d	PH-1e	PH-2	PH-6
Generation	Date	24-Oct	24-Oct	24-Oct	24-Oct	24-Oct	24-Oct	24-Oct
	Start Time	8:57 a.m.	8:59 a.m.	9:05 a.m.	9:08 a.m.	9:10 a.m.	3:42 p.m.	11:38 a.m.
No Generation	Date	14-Nov	14-Nov	14-Nov	14-Nov	14-Nov	14-Nov	14-Nov
	Start Time	9:53 a.m.	9:57 a.m.	9:25 a.m.	10:07 a.m.	10:13 a.m.	10:36 a.m.	11:42 a.m.
$L_{eq(10min)}$								
Generation		50.3	58.9	75.9	65.1	54.6	59.6	42.5
No Generation		48.0	56.3	71.6	56.7	51.1	54.4	47.5
Change Re No Generation		*-2.3*	*-2.6*	*-4.3*	*-8.4*	*-3.5*	*-5.2*	*5*
L_{max}								
Generation		77.5	72.9	88.7	77.9	66.8	85.3	76.3
No Generation		59	70.9	85.5	74.5	77.2	83.7	91.6
Change Re No Generation		*-18.5*	*-2*	*-3.2*	*-3.4*	*10.4*	*-1.6*	*15.3*
L_{10}								
Generation		50.8	59.3	76.5	65.6	54.9	59.8	43.7
No Generation		48.7	57.1	72.3	57.5	51.7	55.4	50.8
Change Re No Generation		*-2.1*	*-2.2*	*-4.2*	*-8.1*	*-3.2*	*-4.4*	*7.1*
L_{50}								
Generation		50.2	58.9	75.9	65.1	54.5	58.9	42.4
No Generation		48.0	56.3	71.6	56.5	51.0	51.5	43.8
Change Re No Generation		*-2.2*	*-2.6*	*-4.3*	*-8.6*	*-3.5*	*-7.4*	*1.4*
L_{90}								
Generation		49.8	58.5	75.4	64.6	54.2	58.2	41.2
No Generation		47.3	55.4	70.9	55.8	50.5	50.7	39.3
Change Re No Generation		*-2.5*	*-3.1*	*-4.5*	*-8.8*	*-3.7*	*-7.5*	*-1.9*

Table LAND 2-5. End-of-Season Ambient Noise Levels at POIs—October 2023

Location	Date	Start Time	$L_{eq(10min)}$	L_{max}	L_{10}	L_{50}	L_{90}
PH-2	24-Oct	9:42 a.m.	59.6	85.3	59.8	58.9	58.2
PH-2	24-Oct	9:27 a.m.	60.3	85.9	60.6	59.1	58.2
PH-3	24-Oct	9:25 a.m.	59	85.2	59.4	58	57.5
PH-4	24-Oct	10:45 a.m.	41.3	85.3	40.9	38.7	37
PH-4	24-Oct	10:30 a.m.	42.5	80.2	40.5	40.2	38.6
PH-5	24-Oct	10:43 a.m.	40.6	86.9	42.4	39.6	38.1
PH-5	24-Oct	10:27 a.m.	41.7	83.9	42.6	41.6	39.9
PH-6	24-Oct	11:38 a.m.	42.5	76.3	43.7	42.4	41.2
PH-6	24-Oct	11:21 a.m.	43.1	74.5	44.1	42.8	41.8
PH-7	25-Oct	11:41 a.m.	53	106.9	53	46.3	42.4
PH-7	25-Oct	11:23 a.m.	54.9	91.8	46.8	42.6	39.2
PH-8	25-Oct	11:42 a.m.	52.2	92.5	51.4	44.8	41.6
PH-8	25-Oct	11:25 a.m.	53.5	85.3	43.9	40.5	39.5
JM-1	24-Oct	1:03 p.m.	54.9	91.6	60	45.4	39.3
JM-1	24-Oct	12:52 p.m.	54.2	85	57	43.5	35.6
CO-1	25-Oct	10:49 a.m.	59.8	96.1	60	47.2	44.2
CO-1	25-Oct	10:34 a.m.	61.5	104	65	46.0	44.4
CO-1	25-Oct	10:18 a.m.	61.5	90.5	66	50.8	45.5
CO-2	25-Oct	9:45 a.m.	51.1	96.1	54	49.1	45.1
CO-2	25-Oct	9:29 a.m.	48.4	88.6	52	46.7	43.2
HE-1	24-Oct	1:58 p.m.	42.6	80.6	41	35.6	34.5
HE-2	24-Oct	1:37 p.m.	33.3	67	34	32.6	32.1
HE-2	24-Oct	1:24 p.m.	32.9	68.9	34	32.5	31.8
TR-1	24-Oct	3:40 p.m.	45.4	76.9	47.4	41.2	39.2
TR-1	24-Oct	3:27 p.m.	47.6	83.5	51.5	42.1	39.5
TR-2	24-Oct	15:11 p.m.	42.4	77.1	44.3	40.9	38.9
TR-3	24-Oct	2:47 p.m.	40.1	71.3	40.4	33.3	30.9
TR-3	24-Oct	2:36 p.m.	47	87.9	45.8	31.7	29.5

Table LAND 2-6. Helicopter Noise Levels

Northern Flight Track									
POI	Skycrane			Black Hawk			ASTAR		
	SEL	L_{max}	$L_{eq(24hr)}$	SEL	L_{max}	$L_{eq(24hr)}$	SEL	L_{max}	$L_{eq(24hr)}$
HE-1	90-95	80–88	49-54	84-87	74–77	42-45	84-86	74-76	43-44
HE-2	88–91	78-80	46-49	81–85	70-75	39-43	82-83	72-73	41-42
Southern Flight Track									
POI	Skycrane			Black Hawk			ASTAR		
	SEL	L_{max}	$L_{eq(24hr)}$	SEL	L_{max}	$L_{eq(24hr)}$	SEL	L_{max}	$L_{eq(24hr)}$
HE-1	87-88	75-76	42-43	80-82	67-70	35-37	80–82	68-70	35-37
HE-2	81-83	69–70	37-38	75–78	62-65	30-33	76-77	63–65	31-32

Notes: Calculated with Advanced Acoustic Model (AAM). See Table LAND 2-1 for modeling details. The nature of helicopter noise may produce greater annoyance than predicted at the same level from other sources; The U.S. Army found CH53E ASEL noise (the modeled surrogate for the Skycrane) to have produced the same annoyance as the white noise source up to 8 dB greater (Army 1991).

Table LAND 2-7. Typical Construction Equipment Noise Levels at Various Distances

Distance From Equipment (ft)	L_{max}	$L_{eq(1hr)}$
50	80.7	79.6
100	74.7	73.6
250	66.7	65.6
500	60.7	59.6
1,000	54.7	53.6

Source: RCNM v1.0 using standard input parameters (i.e., usage percentage) for all equipment types associated with the Project operating concurrently as identified in Table LAND 2-2.

Table LAND 2-8. Sound Levels Due to Truck Hauling

POI	Distance From SR-158	L_{max}
TR-1	50 feet	76.5
TR-2	80 feet	72.4
TR-3	150 feet	66.9

Source: RCNM v1.0 with dump truck source.

Table LAND 2-9. Ambient Noise Levels by Project-Induced Noise

POI	Location	Date of Measurement	Ambient Noise Level (dB Avg $L_{eq(10min)}$)	Estimated Greatest Project-induced Noise Level (dB L_{max})
PH-1 (a–e)	Powerhouse adjacent to tailrace	24 October	Various	>80
PH-2	Outside gate between powerhouse and SR-158	24 October	60	80
PH-3	Southeast of powerhouse along SR-158	24 October	59	80
PH-4	Southeastern end of Washington St	24 October	42	<55
PH-5	Northeastern end of Washington St	24 October	41	<55
PH-6	Private driveway off of Nevada St	24 October	43	55
PH-7	Nevada St northeast of powerhouse	25 October	54	<55
PH-8	Nevada St farthest northeast of powerhouse	25 October	53	<55
JM-1	June Mountain Ski Area Parking Lot	24 October	55	>80
CO-1	Along southern side of SR-158, adjacent to proposed enhancement area at Rush Creek Powerhouse	25 October	61	66
CO-2	Gravel road/hiking trail north of June Mountain Ski Area Parking Lot	25 October	50	80
HE-1	Eastern end of Palisades Dr	24 October	43	80
HE-2	Pine Crest Ave	24 October	33	70
TR-1	Western side of Silver Lake at shore	24 October	47	77
TR-2	Silver Lake Campground, eastern side of SR-158	24 October	42	72
TR-3	Grant Lake Campground	24 October	44	67

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FIGURES

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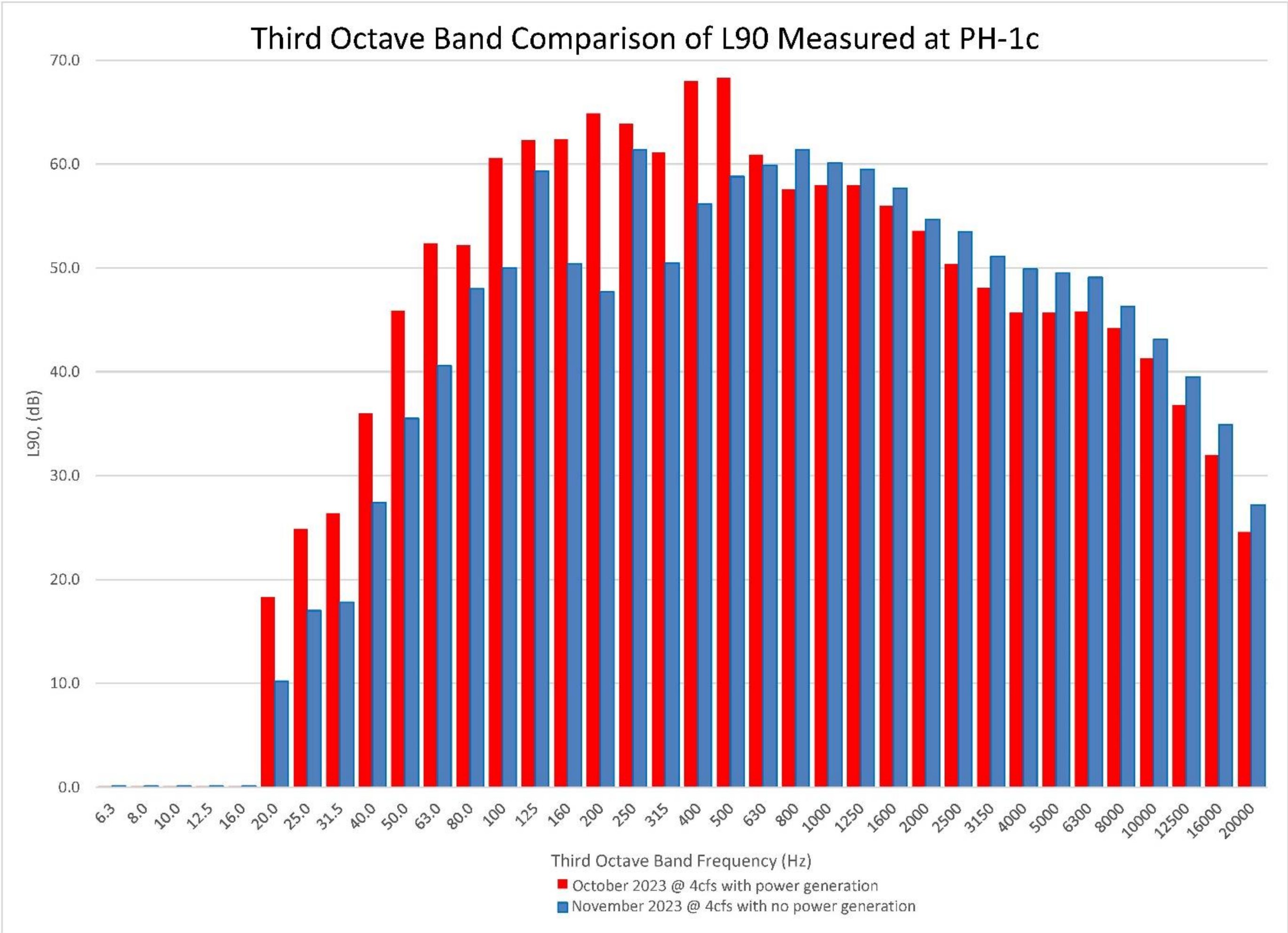

Figure LAND 2-1. Third Octave Band Comparison of L_{90} Measured at PH-1c

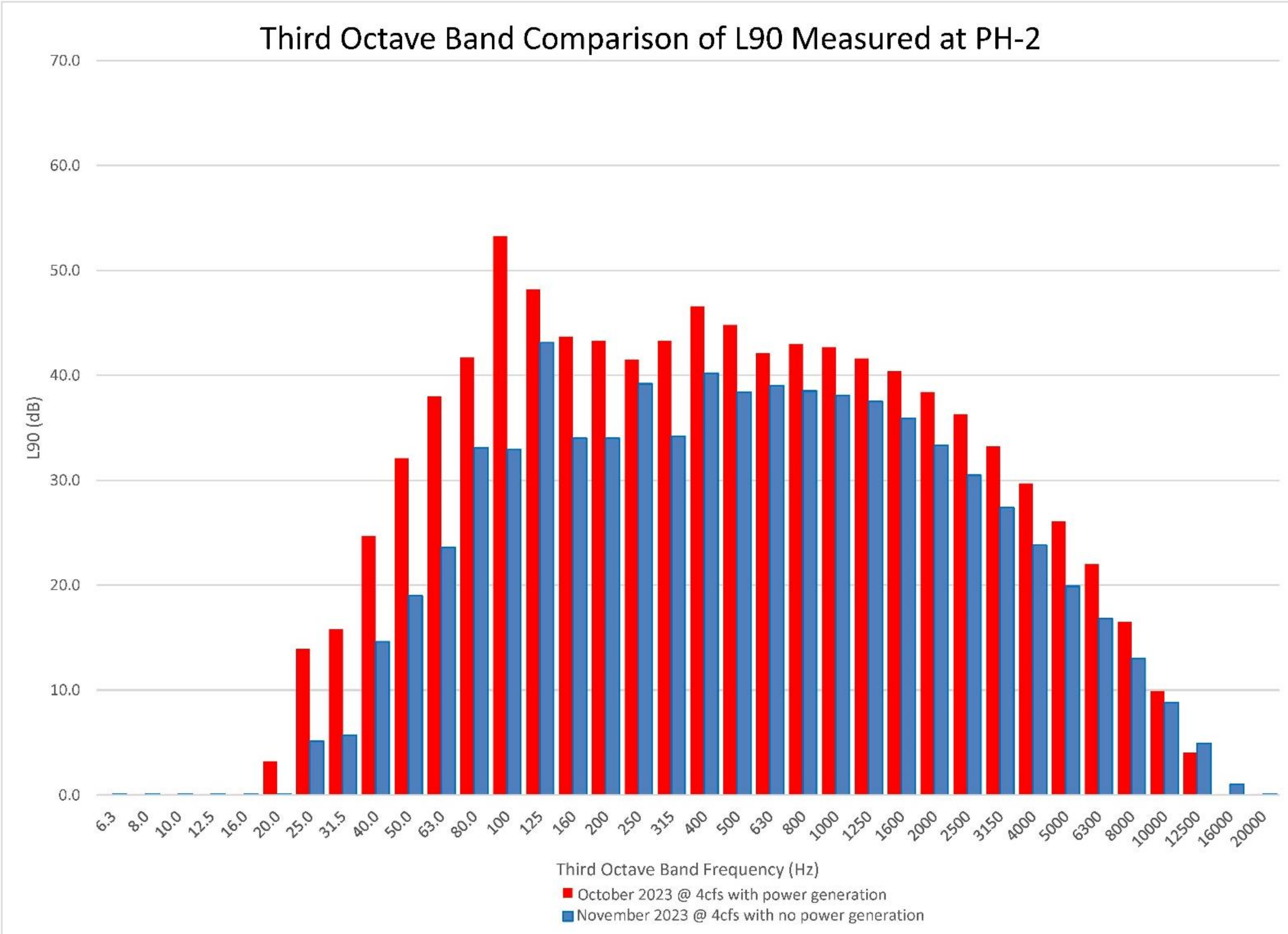

Figure LAND 2-2. Third Octave Band Comparison of L_{90} Measured at PH-2

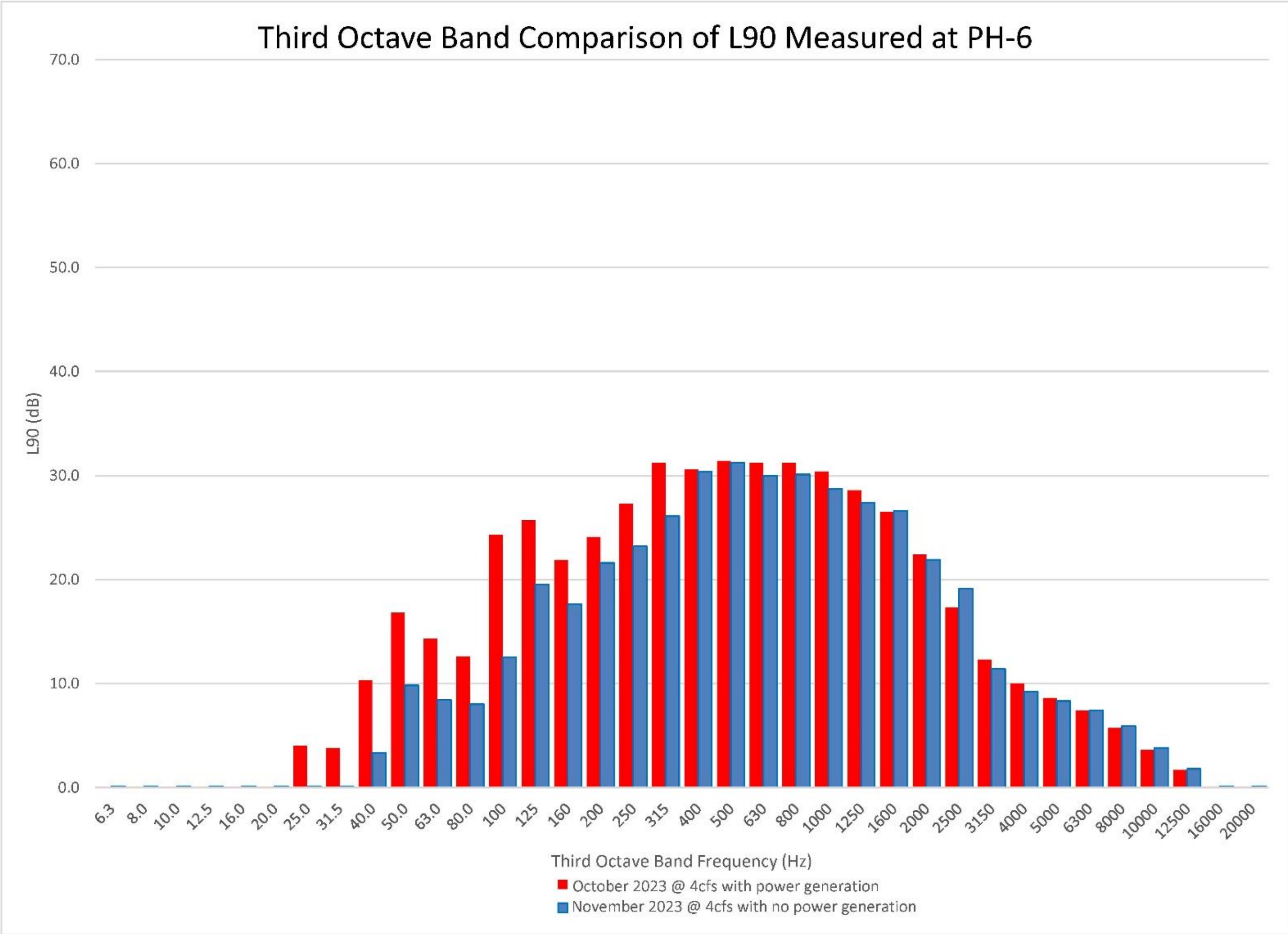

Figure LAND 2-3. Third Octave Band Comparison of L_{90} Measured at PH-6

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MAPS

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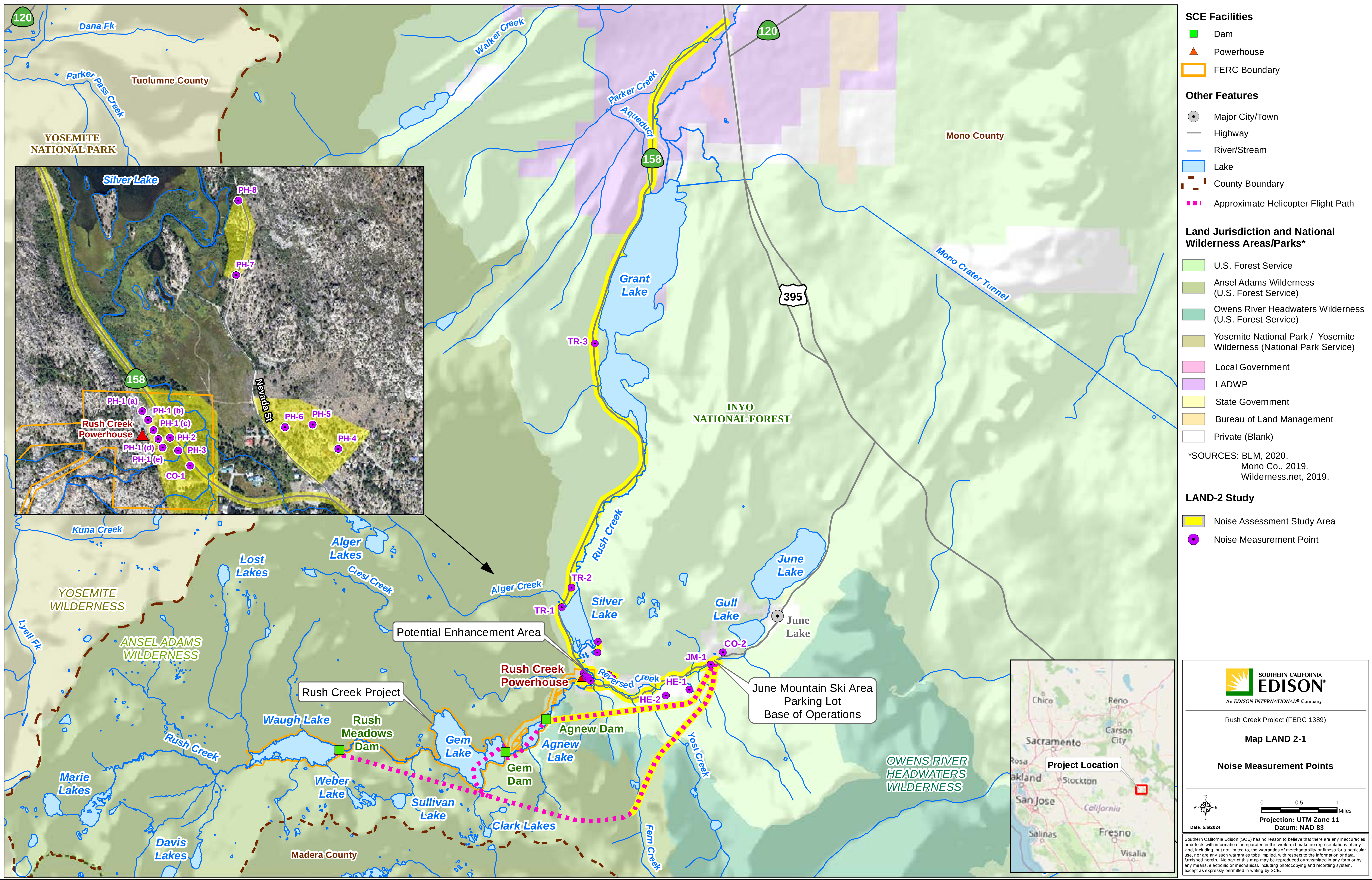

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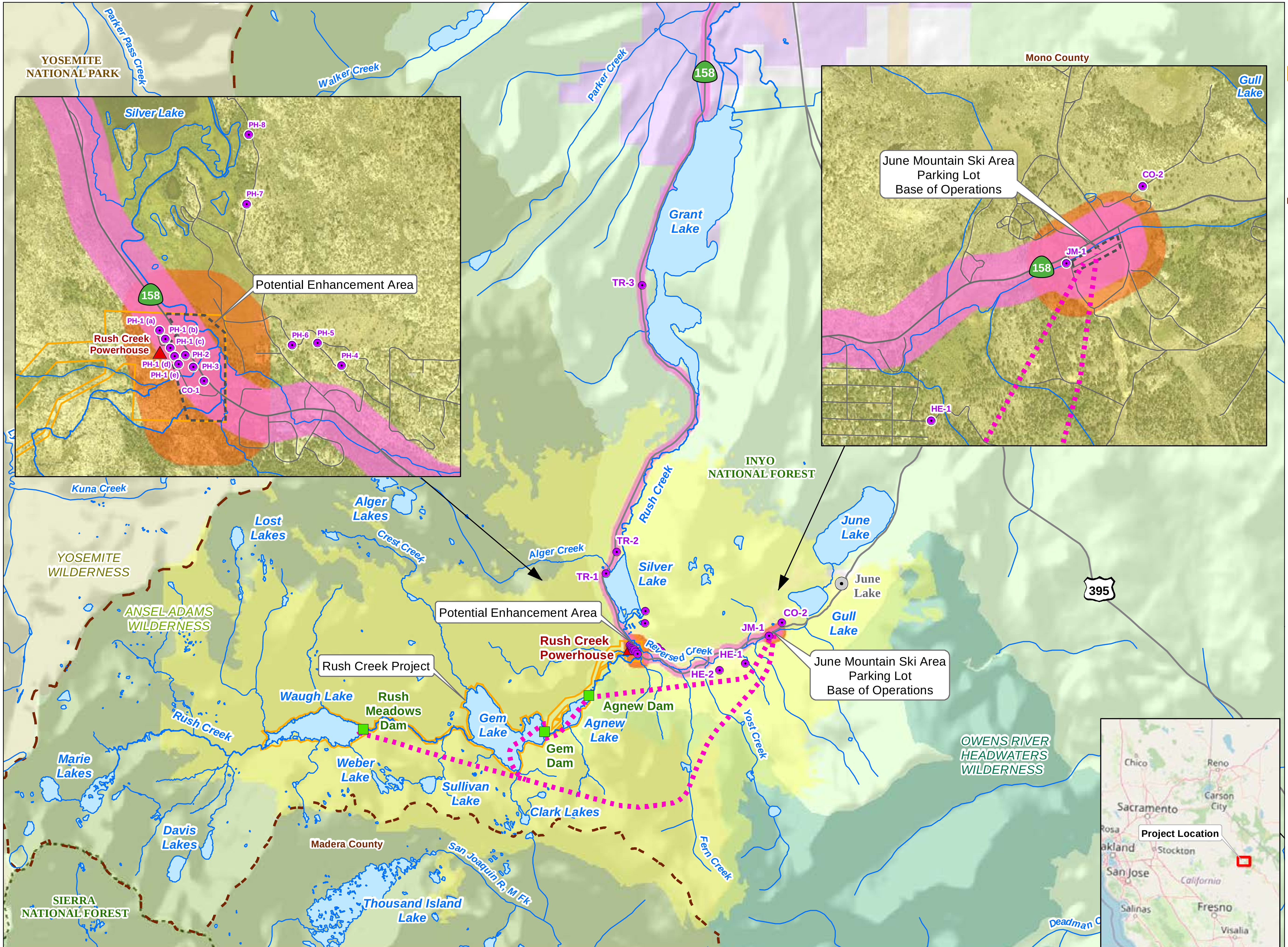

SCE Facilities
- Dam
- Powerhouse
- FERC Boundary

Other Features
- Major City/Town
- Highway/Road
- River/Stream
- Lake
- County Boundary
- Approximate Helicopter Flight Path

Land Jurisdiction and National Wilderness Areas/Parks*
- U.S. Forest Service
- Ansel Adams Wilderness (U.S. Forest Service)
- Owens River Headwaters Wilderness (U.S. Forest Service)
- Yosemite National Park / Yosemite Wilderness (National Park Service)
- Local Government
- LADWP
- Bureau of Land Management
- Private (Blank)

*SOURCES: BLM, 2020.
Mono Co., 2019.
Wilderness.net, 2019.

LAND-2 Study
- Noise Measurement Point

Single-Event 60 dB Lmax Exposure from Construction Noise Sources
- Helicopter Flights (All Types)
- Construction Equipment
- Truck Hauling

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Map LAND 2-2

Single-Event 60 dB Lmax Exposure From Construction Noise Sources

N W E S

Date: 8/8/2024

0 0.5 1 Miles

Projection: UTM Zone 11
Datum: NAD 83

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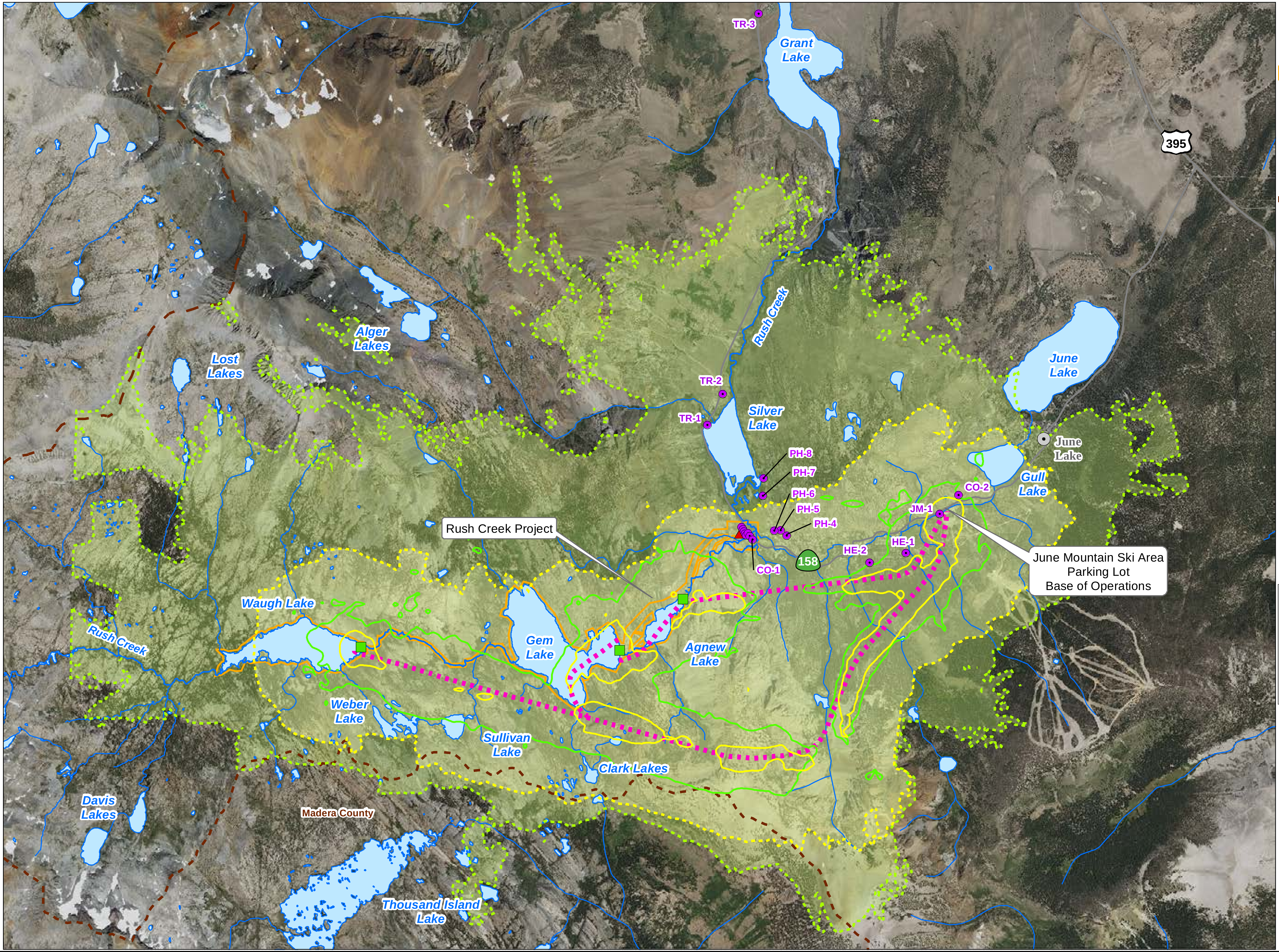

SCE Facilities

- Dam
- Powerhouse
- FERC Boundary

Other Features

- Major City/Town
- Highway/Road
- River/Stream
- Lake
- County Boundary
- Approximate Helicopter Flight Path

Land Jurisdiction and National Wilderness Areas/Parks*

- U.S. Forest Service
- Ansel Adams Wilderness (U.S. Forest Service)
- Owens River Headwaters Wilderness (U.S. Forest Service)
- Yosemite National Park / Yosemite Wilderness (National Park Service)
- Local Government
- LADWP
- Bureau of Land Management
- Private (Blank)

*SOURCES: BLM, 2020.
Mono Co., 2019.
Wilderness.net, 2019.

LAND-2 Study

- Noise Measurement Point

Single-Event 60 dB and 80dB Lmax Exposure from Helicopter Noise Sources

- Helicopter Flights (Skycrane)
  - 80 dB Lmax
  - 60 dB Lmax
- Helicopter Flights (ASTAR and Blackhawk)
  - 80 dB Lmax
  - 60 dB Lmax

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Map LAND 2-3

Single-Event 60 dB and 80dB Lmax Exposure from Helicopter Noise Sources

N W E S

0 0.5 1 Miles

Date: 8/8/2024

Projection: UTM Zone 11
Datum: NAD 83

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APPENDIX A

Sound Level Meter, Microphone, and Pre-Amplifier Calibration Certificates

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Calibration Certificate

Certificate Number 2023008250

Customer:

STANTEC CONSULTING LTD
2728 Alvord Lane
Redondo Beach, CA 90278, United States

Model Number	831C	***Procedure Number***	D0001.8384		
Serial Number	12264	***Technician***	Jacob Cannon		
Test Results	**Pass**	***Calibration Date***	28 Jun 2023		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.9	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.9.0R59	***Humidity***	50.6	%RH	± 2.0 %RH
		Static Pressure	86	kPa	± 0.13 kPa

Evaluation Method ***Tested with:*** ***Data reported in dB re 20 μPa.***

Larson Davis CAL200. S/N 9079
PCB 377B02. S/N 347522
Larson Davis CAL291. S/N 0108
Larson Davis PRM831. S/N 077465

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 61260:2014 Class 1	ANSI S1.11-2014 Class 1
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 International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.

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 9001:2015.

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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Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

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Certificate Number 2023008250

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 μPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2019-05-13 certificate number DE-17-M-PTB-0076.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2022-09-09	2023-09-09	001250
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
Larson Davis CAL200 Acoustic Calibrator	2022-07-21	2023-07-21	007027
Larson Davis Model 831	2023-02-22	2024-02-22	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2023-03-06	2024-03-06	007185
SRS DS360 Ultra Low Distortion Generator	2023-03-30	2024-03-30	007635
Larson Davis 1/2" Preamplifier for Model 831 Type 1	2022-09-28	2023-09-28	PCB0004783

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.00	113.80	114.20	0.14	Pass

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-26.25	-27.84	-24.74	0.14	Pass

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.01	-0.20	-1.20	0.80	0.23	Pass
1000	0.15	0.00	-0.70	0.70	0.23	Pass
8000	-3.19	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

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Certificate Number 2023008250

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	40.20

-- End of measurement results--

-- End of Report--

Signatory: *Jacob Cannon*

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Calibration Certificate

Certificate Number 2023007816

Customer:

STANTEC CONSULTING LTD
2728 Alvord Lane
Redondo Beach,CA 90278,United States

Model Number	831C	***Procedure Number***	D0001.8378		
Serial Number	12264	***Technician***	Eric Olson		
Test Results	**Pass**	***Calibration Date***	21 Jun 2023		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.54	°C	± 0.25 °C
Description	Larson Davis Model 831C Class 1 Sound Level Meter Firmware Revision: 04.9.0R59	***Humidity***	48.7	%RH	± 2.0 %RH
		Static Pressure	86.25	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 077465 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 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1
IEC 61260:2014 Class 1	ANSI S1.11-2014 Class 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 International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **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 9001:2015.

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.

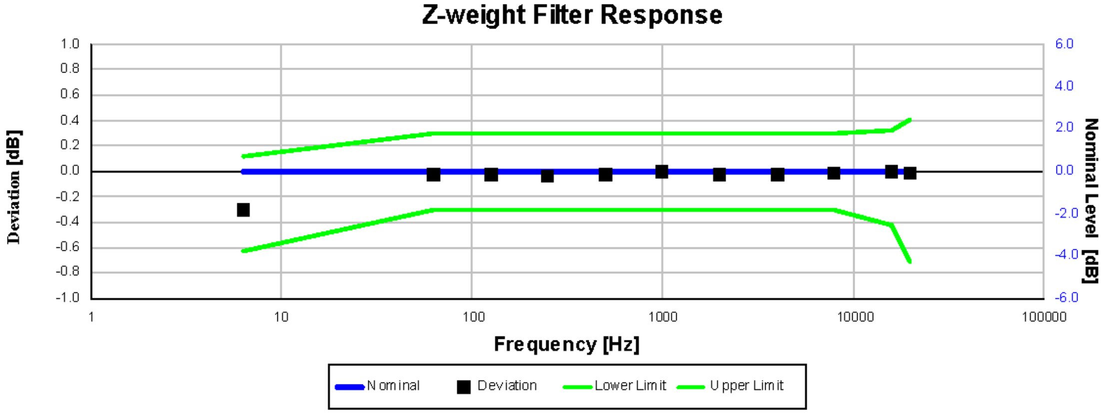
Correction data from Larson Davis SoundAdvisor Model 831C Reference Manual, I831C.01 Rev M, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 μPa; Reference Range: 0 dB gain

Certificate Number 2023007816

Standards Used			
Description	**Cal Date**	**Cal Due**	**Cal Standard**
Hart Scientific 2626-S Humidity/Temperature Sensor	2023-02-20	2024-08-20	006946
SRS DS360 Ultra Low Distortion Generator	2023-03-31	2024-03-31	007174

Certificate Number 2023007816



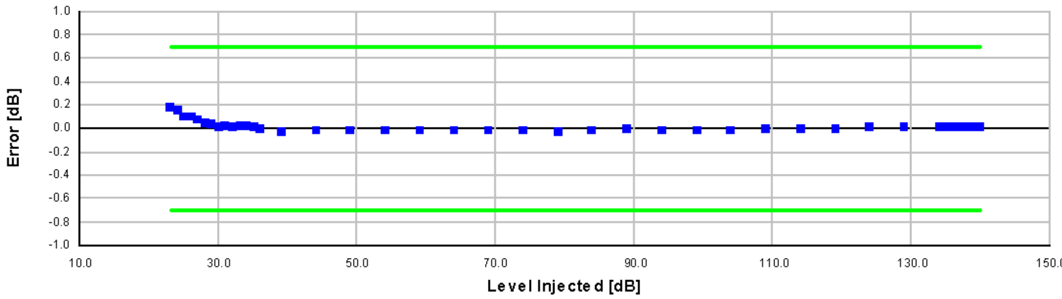
Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
6.31	-0.31	-0.31	-0.63	0.12	0.15	Pass
63.10	-0.02	-0.02	-0.30	0.30	0.15	Pass
125.89	-0.02	-0.02	-0.30	0.30	0.15	Pass
251.19	-0.04	-0.04	-0.30	0.30	0.15	Pass
501.19	-0.03	-0.03	-0.30	0.30	0.15	Pass
1,000.00	0.00	0.00	-0.30	0.30	0.15	Pass
1,995.26	-0.03	-0.03	-0.30	0.30	0.15	Pass
3,981.07	-0.03	-0.02	-0.30	0.30	0.15	Pass
7,943.28	-0.02	-0.02	-0.30	0.30	0.15	Pass
15,848.93	0.00	0.00	-0.42	0.32	0.15	Pass
19,952.62	-0.01	-0.01	-0.71	0.41	0.15	Pass

-- End of measurement results--

Certificate Number 2023007816

A-weighted 0 dB Gain Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
23.00	0.18	-0.70	0.70	0.16	Pass
24.00	0.16	-0.70	0.70	0.16	Pass
25.00	0.10	-0.70	0.70	0.16	Pass
26.00	0.10	-0.70	0.70	0.16	Pass
27.00	0.08	-0.70	0.70	0.16	Pass
28.00	0.05	-0.70	0.70	0.16	Pass
29.00	0.04	-0.70	0.70	0.18	Pass
30.00	0.02	-0.70	0.70	0.17	Pass
31.00	0.02	-0.70	0.70	0.17	Pass
32.00	0.01	-0.70	0.70	0.17	Pass
33.00	0.03	-0.70	0.70	0.16	Pass
34.00	0.02	-0.70	0.70	0.16	Pass
35.00	0.01	-0.70	0.70	0.16	Pass
36.00	0.00	-0.70	0.70	0.16	Pass
39.00	-0.03	-0.70	0.70	0.16	Pass
44.00	-0.01	-0.70	0.70	0.16	Pass
49.00	-0.01	-0.70	0.70	0.16	Pass
54.00	-0.01	-0.70	0.70	0.16	Pass
59.00	-0.01	-0.70	0.70	0.16	Pass
64.00	-0.01	-0.70	0.70	0.16	Pass
69.00	-0.01	-0.70	0.70	0.16	Pass
74.00	-0.01	-0.70	0.70	0.16	Pass
79.00	-0.02	-0.70	0.70	0.16	Pass
84.00	-0.01	-0.70	0.70	0.16	Pass
89.00	-0.01	-0.70	0.70	0.16	Pass
94.00	-0.01	-0.70	0.70	0.16	Pass
99.00	-0.01	-0.70	0.70	0.16	Pass
104.00	-0.01	-0.70	0.70	0.15	Pass
109.00	-0.01	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
124.00	0.01	-0.70	0.70	0.15	Pass
129.00	0.02	-0.70	0.70	0.15	Pass
134.00	0.01	-0.70	0.70	0.15	Pass
135.00	0.01	-0.70	0.70	0.15	Pass
136.00	0.02	-0.70	0.70	0.15	Pass

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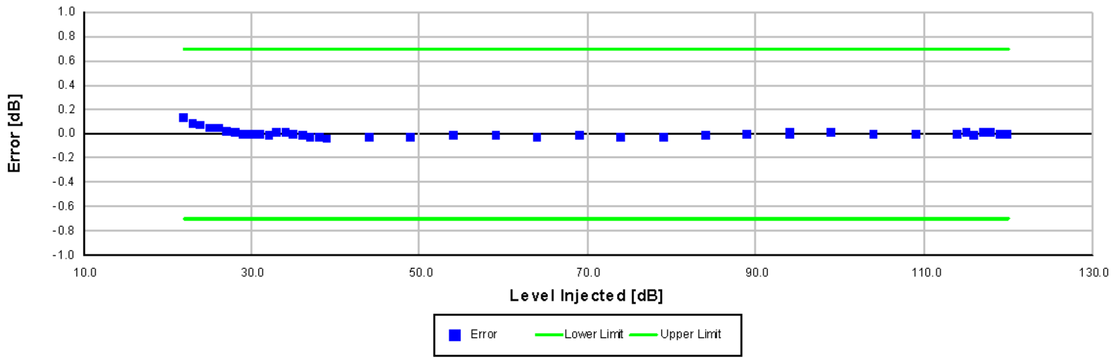
Certificate Number 2023007816

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	0.02	-0.70	0.70	0.15	Pass
138.00	0.02	-0.70	0.70	0.15	Pass
139.00	0.02	-0.70	0.70	0.15	Pass
140.00	0.01	-0.70	0.70	0.15	Pass

-- End of measurement results--

Certificate Number 2023007816

A-weighted 20 dB Gain Broadband Log Linearity: 8,000.00 Hz



Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
22.00	0.13	-0.70	0.70	0.16	Pass
23.00	0.09	-0.70	0.70	0.16	Pass
24.00	0.08	-0.70	0.70	0.16	Pass
25.00	0.05	-0.70	0.70	0.16	Pass
26.00	0.05	-0.70	0.70	0.19	Pass
27.00	0.03	-0.70	0.70	0.18	Pass
28.00	0.01	-0.70	0.70	0.19	Pass
29.00	0.00	-0.70	0.70	0.18	Pass
30.00	0.00	-0.70	0.70	0.17	Pass
31.00	0.00	-0.70	0.70	0.17	Pass
32.00	-0.02	-0.70	0.70	0.17	Pass
33.00	0.01	-0.70	0.70	0.16	Pass
34.00	0.01	-0.70	0.70	0.16	Pass
35.00	0.00	-0.70	0.70	0.16	Pass
36.00	-0.02	-0.70	0.70	0.16	Pass
37.00	-0.03	-0.70	0.70	0.16	Pass
38.00	-0.03	-0.70	0.70	0.16	Pass
39.00	-0.04	-0.70	0.70	0.16	Pass
44.00	-0.02	-0.70	0.70	0.16	Pass
49.00	-0.02	-0.70	0.70	0.16	Pass
54.00	-0.02	-0.70	0.70	0.16	Pass
59.00	-0.02	-0.70	0.70	0.16	Pass
64.00	-0.03	-0.70	0.70	0.16	Pass
69.00	-0.02	-0.70	0.70	0.16	Pass
74.00	-0.02	-0.70	0.70	0.16	Pass
79.00	-0.03	-0.70	0.70	0.16	Pass
84.00	-0.01	-0.70	0.70	0.16	Pass
89.00	0.00	-0.70	0.70	0.16	Pass
94.00	0.01	-0.70	0.70	0.16	Pass
99.00	0.01	-0.70	0.70	0.16	Pass
104.00	-0.01	-0.70	0.70	0.15	Pass
109.00	0.00	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.01	-0.70	0.70	0.15	Pass
116.00	-0.01	-0.70	0.70	0.15	Pass
117.00	0.01	-0.70	0.70	0.15	Pass

Certificate Number 2023007816

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
118.00	0.01	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
120.00	0.00	-0.70	0.70	0.15	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
139.00	40	Negative Pulse	135.88	134.56	136.56	0.15	Pass
		Positive Pulse	135.99	134.67	136.67	0.15	Pass
	30	Negative Pulse	135.04	134.56	136.56	0.15	Pass
		Positive Pulse	135.15	134.67	136.67	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.11	± 0.50	0.15 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	0.00	± 1.50	0.15 ‡	Pass
108.00	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.16	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Certificate Number 2023007816

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
138.00	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
128.00	3	-0.14	± 0.50	0.15 ‡	Pass
	5	-0.14	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
118.00	3	-0.15	± 0.50	0.15 ‡	Pass
	5	-0.14	± 1.00	0.15 ‡	Pass
	10	-0.12	± 1.50	0.15 ‡	Pass
108.00	3	-0.16	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	-0.27	± 1.50	0.16 ‡	Pass

-- **End of measurement results**--

Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	94.01	93.91	94.11	0.15	Pass
0 dB Gain, Linearity	28.05	27.31	28.71	0.16	Pass
20 dB Gain	94.02	93.91	94.11	0.15	Pass
20 dB Gain, Linearity	23.10	22.31	23.71	0.16	Pass
OBA High Range	94.01	93.20	94.80	0.15	Pass
OBA Normal Range	94.01	93.91	94.11	0.15	Pass

-- **End of measurement results**--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	6.35	9.00	Pass
C-weight Noise Floor	12.13	15.00	Pass
Z-weight Noise Floor	22.31	25.00	Pass

-- **End of measurement results**--

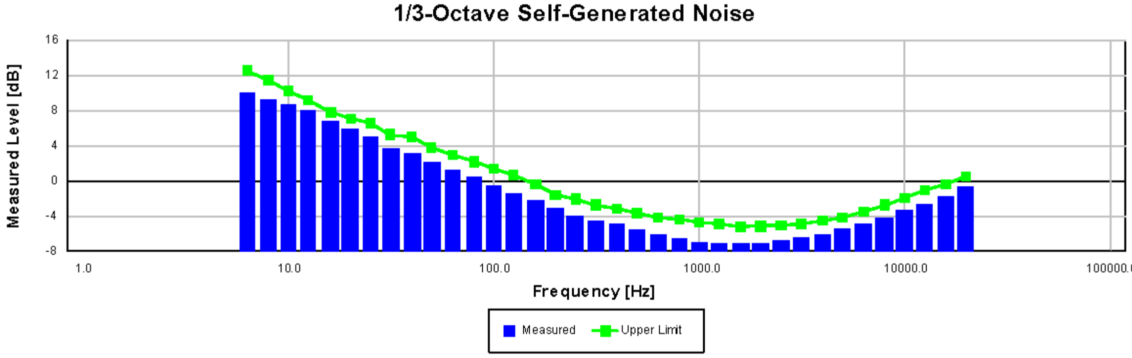
Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	137.56	137.20	138.80	0.15	Pass
THD	-81.90		-60.00	1.30 ‡	Pass
THD+N	-80.18		-60.00	1.30 ‡	Pass

-- **End of measurement results**--

Certificate Number 2023007816



The SLM is set to normal range and 20 dB gain.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	10.04	12.60	Pass
8.00	9.30	11.50	Pass
10.00	8.68	10.20	Pass
12.50	8.00	9.20	Pass
16.00	6.79	7.90	Pass
20.00	5.96	7.20	Pass
25.00	4.98	6.60	Pass
31.50	3.69	5.30	Pass
40.00	3.11	5.00	Pass
50.00	2.10	3.80	Pass
63.00	1.21	3.00	Pass
80.00	0.47	2.20	Pass
100.00	-0.58	1.40	Pass
125.00	-1.38	0.70	Pass
160.00	-2.24	-0.40	Pass
200.00	-3.09	-1.50	Pass
250.00	-3.91	-2.00	Pass
315.00	-4.42	-2.70	Pass
400.00	-4.92	-3.10	Pass
500.00	-5.64	-3.70	Pass
630.00	-6.11	-4.10	Pass
800.00	-6.56	-4.30	Pass
1,000.00	-6.91	-4.70	Pass
1,250.00	-7.05	-4.80	Pass
1,600.00	-7.12	-5.20	Pass
2,000.00	-7.06	-5.10	Pass
2,500.00	-6.84	-5.00	Pass
3,150.00	-6.50	-4.80	Pass
4,000.00	-6.00	-4.50	Pass
5,000.00	-5.45	-4.10	Pass
6,300.00	-4.83	-3.40	Pass
8,000.00	-4.12	-2.70	Pass
10,000.00	-3.35	-1.90	Pass
12,500.00	-2.53	-1.10	Pass
16,000.00	-1.65	-0.30	Pass
20,000.00	-0.73	0.60	Pass

-- End of measurement results--

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716-684-0001

Certificate Number 2023007816

-- **End of Report**--

Signatory: *Eric Olson*

~ Certificate of Calibration and Compliance ~

Model : 377B02 **Manufacturer :** PCB

Serial : 347522 **Description :** 1/2" Free-Field Microphone

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Reference Equipment

Manufacturer	Model #	Serial #	Control #	Cal Date	Due Date
National Instruments	PCIe-6351	01896F08	CA1918	04/20/2023	04/20/2024
Larson Davis	PRM915	0143	CA2000	02/07/2023	02/07/2024
Larson Davis	PRM902	4701	CA1450	12/07/2022	12/07/2023
Larson Davis	PRM916	129	CA1084	06/23/2022	06/23/2023
Larson Davis	CAL250	5569	CA2284	10/07/2022	10/06/2023
Larson Davis	2201	146	CA1686	12/20/2022	12/20/2023
Larson Davis	GPRM902	4163	CA1089	08/23/2022	08/23/2023
Larson Davis	PRM915	147	CA2179	08/15/2022	08/15/2023
Larson Davis	PRA951-4	0241	CA1449	06/23/2022	06/23/2023
Bruel & Kjaer	4192	3259547	CA3214	01/23/2023	01/23/2024
Newport	iTHX-SD/N	1080002	CA1511	02/07/2023	02/07/2024
PCB	68510-02	N/A	CA2672	02/08/2023	02/08/2024

Frequency sweep performed with B&K UA0033 electrostatic actuator.

Condition of Unit

As Found : n/a

As Left : New Unit, In Tolerance

Notes

1. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 10012-1, ANSI/NCSL Z540.3 and ISO 17025.
4. Measurement results relate only to the items tested. Refer to Manufacturer's Specification Sheet for performance details.
5. Open Circuit Sensitivity is measured using the voltage insertion method following procedure AT603-5.
6. Measurement uncertainty (95% confidence level with coverage factor of 2) for sensitivity is +/-0.20 dB.
7. Unit calibrated per ACS-20.
8. Product is compliant with specification if measured value is within or equal to the specification tolerance. Product is not compliant with specification if measured value falls outside of the specification tolerance.

Technician: Leonard Lukasik Date: 05/30/2023

ilac-MRA ACCREDITED CALIBRATION CERT#: 1862.01

PCB PIEZOTRONICS
AN AMPHENOL COMPANY
3425 WALDEN AVENUE - DEPEW, NY 14043
TEL: +1 (888) 684-0013 - FAX: +1 (716) 685-3886 - www.pcb.com

PAGE 1 of 2

ID: CAL112-3768292140.600+0

~ *Calibration Report* ~

Model : 377B02 **Manufacturer :** PCB

Serial : 347522 **Description :** 1/2" Free-Field Microphone

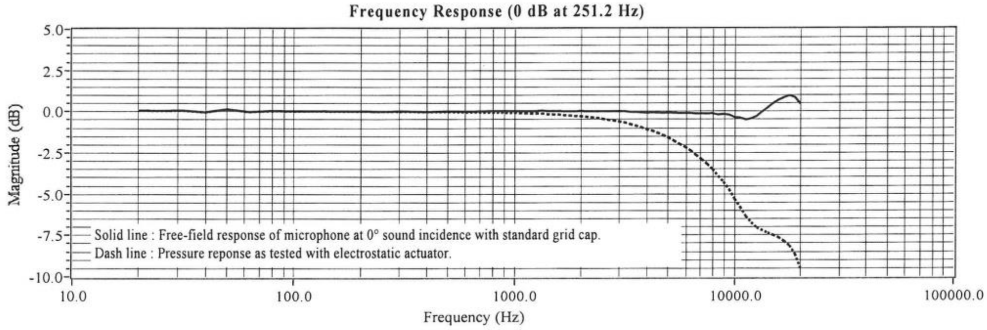
Calibration Data

Open Circuit Sensitivity at 251.2 Hz : 50.08 mV/Pa
-26.01 dB re 1 V/Pa

Polarization Voltage, External : 0 V
Capacitance : 13.52 pF

Temperature: 68 °F (20 °C) Ambient Pressure: 992 mbar Relative Humidity: 41 %

Frequency Response (0 dB at 251.2 Hz)



Frequency (Hz)	Pressure (dB)	Free-Field (dB)	Frequency (Hz)	Pressure (dB)	Free-Field (dB)	Frequency (Hz)	Pressure (dB)	Free-Field (dB)
20.00	0.07	0.07	1584.90	-0.19	0.02	6683.40	-2.65	-0.13
25.10	0.06	0.06	1678.80	-0.21	0.02	7079.50	-2.92	-0.14
31.60	0.07	0.07	1778.30	-0.23	0.02	7498.90	-3.20	-0.13
39.80	-0.03	-0.03	1883.60	-0.26	0.02	7943.30	-3.51	-0.12
50.10	0.15	0.15	1995.30	-0.28	0.03	8414.00	-3.92	-0.19
63.10	-0.01	-0.01	2113.50	-0.32	0.02	8912.50	-4.28	-0.17
79.40	0.04	0.04	2238.70	-0.36	0.01	9440.60	-4.73	-0.21
100.00	0.03	0.03	2371.40	-0.40	0.01	10000.00	-5.31	-0.36
125.90	0.03	0.03	2511.90	-0.45	0.01	10592.50	-5.78	-0.38
158.50	0.02	0.02	2660.70	-0.50	0.01	11220.20	-6.35	-0.49
199.50	0.01	0.01	2818.40	-0.55	0.01	11885.00	-6.73	-0.41
251.20	0.00	0.00	2985.40	-0.61	0.01	12589.30	-7.04	-0.27
316.20	0.00	0.01	3162.30	-0.67	0.01	13335.20	-7.20	-0.01
398.10	-0.01	-0.01	3349.70	-0.77	-0.03	14125.40	-7.36	0.23
501.20	-0.02	0.02	3548.10	-0.85	-0.03	14962.40	-7.49	0.48
631.00	-0.04	0.00	3758.40	-0.96	-0.06	15848.90	-7.64	0.71
794.30	-0.06	0.03	3981.10	-1.08	-0.08	16788.00	-7.86	0.86
1000.00	-0.08	0.04	4217.00	-1.17	-0.06	17782.80	-8.14	0.97
1059.30	-0.09	0.04	4466.80	-1.30	-0.07	18836.50	-8.66	0.85
1122.00	-0.10	0.04	4731.50	-1.46	-0.09	19952.60	-9.48	0.45
1188.50	-0.11	0.04	5011.90	-1.60	-0.07			
1258.90	-0.13	0.03	5308.80	-1.79	-0.09			
1333.50	-0.13	0.05	5623.40	-1.98	-0.10			
1412.50	-0.16	0.03	5956.60	-2.17	-0.10			
1496.20	-0.17	0.03	6309.60	-2.39	-0.10			

Technician: Leonard Lukasik Date: 05/30/2023

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PAGE 2 of 2 ID: CAL112-3768292140.600+0

Calibration Certificate

Certificate Number 2023007543
Customer:
STANTEC CONSULTING LTD
2728 Alvord Lane
Redondo Beach,CA 90278,United States

Model Number	PRM831	***Procedure Number***	D0001.8383		
Serial Number	077465	***Technician***	Mayra Quintana		
Test Results	**Pass**	***Calibration Date***	15 Jun 2023		
Initial Condition	As Manufactured	***Calibration Due***			
		Temperature	23.66	°C	± 0.01 °C
Description	Larson Davis 1/2" Preamplifier for Model 831 Type 1	***Humidity***	49.1	%RH	± 0.5 %RH
		Static Pressure	85.91	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 17025:2017.
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 9001:2015.

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. Tests are considered to pass when the measured value is within the acceptance limits, which are derived from industry standards.

Simple acceptance criteria is used with an expanded uncertainty not to exceed 0.20 dB for all measurements below 100 kHz and 0.50 dB for measurements above 100 kHz.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	03/06/2023	03/06/2024	003003
Hart Scientific 2626-S Humidity/Temperature Sensor	02/20/2023	08/20/2024	006946
Agilent 34401A DMM	06/24/2022	06/24/2023	007165
SRS DS360 Ultra Low Distortion Generator	09/02/2022	09/02/2023	007167

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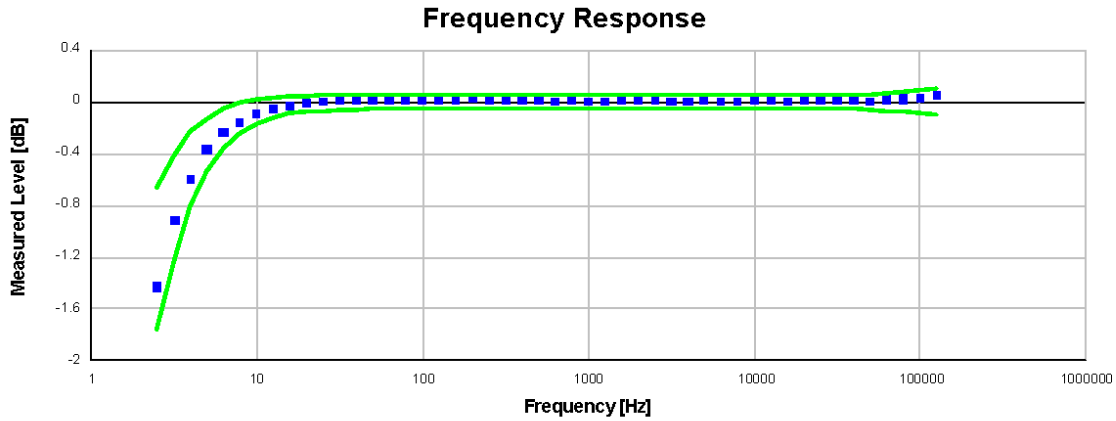

Frequency response electrically tested at 120.0 dB re 1 µV

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
2.50	-1.43	-1.76	-0.66	0.12	Pass
3.20	-0.92	-1.20	-0.40	0.12	Pass
4.00	-0.60	-0.81	-0.23	0.12	Pass
5.00	-0.37	-0.53	-0.13	0.10	Pass
6.30	-0.23	-0.36	-0.05	0.07	Pass
7.90	-0.16	-0.24	-0.01	0.07	Pass
10.00	-0.09	-0.17	0.03	0.07	Pass
12.60	-0.06	-0.13	0.04	0.04	Pass
15.80	-0.03	-0.09	0.04	0.04	Pass
20.00	-0.01	-0.08	0.05	0.04	Pass
25.10	0.00	-0.07	0.05	0.04	Pass
31.60	0.01	-0.07	0.05	0.04	Pass
39.80	0.01	-0.06	0.05	0.04	Pass
50.10	0.01	-0.06	0.05	0.04	Pass
63.10	0.02	-0.05	0.05	0.04	Pass
79.40	0.01	-0.05	0.05	0.04	Pass
100.00	0.01	-0.05	0.05	0.04	Pass
125.90	0.02	-0.05	0.05	0.04	Pass
158.50	0.02	-0.05	0.05	0.04	Pass
199.50	0.03	-0.05	0.05	0.04	Pass
251.20	0.02	-0.05	0.05	0.04	Pass
316.20	0.02	-0.05	0.05	0.04	Pass
398.10	0.02	-0.05	0.05	0.04	Pass
501.20	0.01	-0.05	0.05	0.04	Pass
631.00	0.00	-0.05	0.05	0.04	Pass
794.30	0.01	-0.05	0.05	0.04	Pass
1,000.00	0.00	-0.05	0.05	0.04	Pass
1,258.90	0.00	-0.05	0.05	0.04	Pass
1,584.90	0.02	-0.05	0.05	0.04	Pass
1,995.30	0.01	-0.05	0.05	0.04	Pass
2,511.90	0.02	-0.05	0.05	0.04	Pass
3,162.30	0.00	-0.05	0.05	0.04	Pass

Certificate Number 2023007543

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,981.10	0.00	-0.05	0.05	0.04	Pass
5,011.90	0.01	-0.05	0.05	0.04	Pass
6,309.60	0.00	-0.05	0.05	0.04	Pass
7,943.30	0.00	-0.05	0.05	0.04	Pass
10,000.00	0.01	-0.05	0.05	0.04	Pass
12,589.30	0.01	-0.05	0.05	0.04	Pass
15,848.90	0.00	-0.05	0.05	0.04	Pass
19,952.60	0.01	-0.05	0.05	0.04	Pass
25,118.90	0.01	-0.05	0.05	0.05	Pass
31,622.80	0.01	-0.05	0.05	0.05	Pass
39,810.70	0.01	-0.05	0.05	0.05	Pass
50,118.70	0.00	-0.06	0.06	0.09	Pass
63,095.70	0.02	-0.07	0.07	0.09	Pass
79,432.80	0.02	-0.08	0.08	0.09	Pass
100,000.00	0.03	-0.09	0.09	0.09	Pass
125,892.50	0.05	-0.10	0.10	0.45	Pass

Gain Measurement

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Output Gain @ 1 kHz	-0.16	-0.45	-0.03	0.04	Pass

-- End of measurement results--

DC Bias Measurement

Measurement	Test Result [V]	Lower limit [V]	Upper limit [V]	Expanded Uncertainty [V]	Result
DC Voltage	18.20	15.50	19.50	0.04	Pass

-- End of measurement results--

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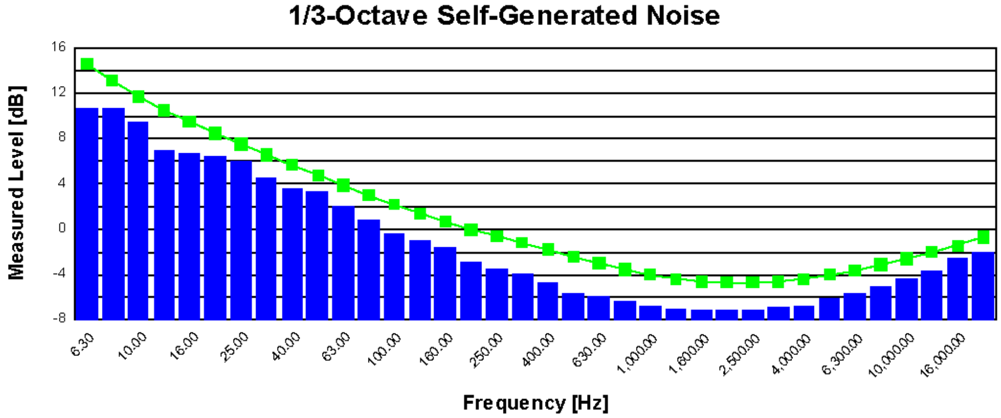

Frequency [Hz]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
6.30	10.60	14.60	Pass
8.00	10.60	13.10	Pass
10.00	9.40	11.70	Pass
12.50	7.00	10.50	Pass
16.00	6.70	9.50	Pass
20.00	6.50	8.50	Pass
25.00	6.10	7.50	Pass
31.50	4.50	6.60	Pass
40.00	3.60	5.70	Pass
50.00	3.40	4.80	Pass
63.00	2.00	3.90	Pass
80.00	0.80	3.00	Pass
100.00	-0.40	2.20	Pass
125.00	-0.90	1.40	Pass
160.00	-1.60	0.70	Pass
200.00	-2.90	0.00	Pass
250.00	-3.50	-0.60	Pass
315.00	-3.90	-1.20	Pass
400.00	-4.70	-1.80	Pass
500.00	-5.70	-2.40	Pass
630.00	-6.00	-3.00	Pass
800.00	-6.30	-3.50	Pass
1,000.00	-6.80	-4.00	Pass
1,250.00	-7.00	-4.40	Pass
1,600.00	-7.20	-4.60	Pass
2,000.00	-7.20	-4.70	Pass
2,500.00	-7.10	-4.70	Pass
3,150.00	-6.90	-4.60	Pass
4,000.00	-6.70	-4.40	Pass
5,000.00	-6.10	-4.00	Pass
6,300.00	-5.70	-3.60	Pass
8,000.00	-5.00	-3.10	Pass
10,000.00	-4.30	-2.60	Pass
12,500.00	-3.60	-2.00	Pass
16,000.00	-2.60	-1.40	Pass
20,000.00	-2.00	-0.70	Pass

-- End of measurement results--

Certificate Number 2023007543

Self-generated Noise

Bandwidth	Test Result [µV]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
Broadband (1 Hz - 20 kHz)	4.84	13.70	15.50	Pass
A-weighted (1 Hz - 20 kHz)	2.00	6.00	8.00	Pass

-- End of measurement results--

Signatory: *Mayra Quintana*

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APPENDIX B

Point of Interest Noise Measurement Photos

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NOISE MEASUREMENT PHOTOS

PHOTOS OF MEASUREMENT SITES AT RUSH CREEK POWERHOUSE

Tailrace

Southeast of Tailrace

Northeast of Tailrace

Northeast of Tailrace Near Electrical Switching Station

PHOTOS OF MEASUREMENT SITES NEAR RUSH CREEK POWERHOUSE UNITS

Outside Powerhouse Gate

Along State Route 158

Along State Route 158 Adjacent Nearby Residence

PHOTOS OF MEASUREMENT SITES IN NEIGHBORHOOD NEAR RUSH CREEK POWERHOUSE UNITS

Washington St

Washinton St

Isabel Driveway off of Nevada St

Photos of Measurement Sites Near June Lake Ski Area Parking Lot

June Lake Ski Area Parking Lot

Access Road / Trail north of June Lake Ski Area

Access Road / Trail north of June Lake Ski Area

PHOTOS OF MEASUREMENT SITES NEAR HELICOPTER PATH / HAUL ROUTES

Eastern End of Palisades Dr

Silver Lake Recreation Area

Silver Lake Shore Adjacent to State Route 158

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APPENDIX C

Additional Software Modeling Details and Methodology

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C-1 HELICOPTER

This noise study uses the DoD Noisemap suite of computer programs for aircraft noise modeling and analysis including the Advanced Acoustic Model (AAM) (U.S. Department of Transportation 2020). AAM is capable of presenting the time history of a noise event at a single observer position, the noise footprint on the ground at a given time, or the noise contours for many different noise metrics, including accounting for the acoustic impacts of extreme natural terrain, such as that found in the Grand Canyon (Miller 2003). This includes propagating sound over terrain with varying elevation and ground impedance conditions. Many of the propagation algorithms in AAM [Plotkin *et al.,* 2001; Page, 2002; Plotkin, 2006; Plotkin, Lee, and Downing, 1995] have been based on the same analytical techniques contained in the NASA Aircraft Noise Prediction Program (ANOPP) [Zorumski, 1982; Zorumski and Weir, 1986]. Since the early 1980s, ANOPP has served as the primary noise model NASA uses in its aero-acoustic research. The algorithms in ANOPP, and in turn AAM, have been validated through many years of testing. Additionally, the RNM (predecessor of AAM), whose genesis was from NMSim, has been applied and compared with 1994 NATO experimental measurements of an F-16 simulated runway departure and flight over mountainous terrain in Narvik, Norway [Plotkin *et al.,* 2001]. NMSim was developed and validated from those flight tests. Sound spheres for that propagation test were created based on the same 1991 USAF reference noise measurement data used in NMSim. Time history predictions using RNM at various measurement locations agree well with measured data [Lee *et al.,* 1996; Page, 2002], as did predictions via NMSim [Page and Plotkin, 2004].

Testing of the software's sound modeling algorithms, as implemented in NMSim and later in Noisemap and AAM, includes a study at Grand Canyon National Park [Miller *et al.,* 2003]. That study compared the measured levels of aircraft flights through the Grand Canyon to software predicted values across four noise models with a focus on audibility (the threshold at which the aircraft noise would transition to ambient levels), which occurs at relatively long distances and represents conditions involving more variability when compared to locations at shorter distances under flight paths. The hourly L_{eq} results of all flights in that study analyzed at individual measurement points represented the studied condition most similar to the proposed helicopter flights in this analysis, which found that NMSIM provided the lowest overall error of 6 dB at those much longer propagation distance. The calculation and aircraft type capabilities of AAM are a superset of those in RNM and NMSim.

In 2021 the U.S. Department of the Navy (Navy) completed a study that measured real-time sound levels of jet aircraft at Naval Air Station (NAS) Whidbey Island and NAS Lemoore over the previous year and compared the resulting measured data with modeled noise data from Noisemap (the fixed-wing portion of the analysis tools with Baseops and a predecessor to AAM). Overall, the Navy determined that the DoD-approved noise models operate as intended and provide an accurate prediction of noise exposure levels from aircraft operations for use in impact assessments and that there are two main variables that contribute to accurate noise modeling: a functioning model and accurate input data. That study found that the largest source of error was flight modeling input data (i.e. runway and flight track utilization, altitudes at various points in the flight track, and engine power settings among other parameters) and that the software predicted noise levels were found to be greater than the real-time noise levels at nine of the ten studied points of interest (DoN 2021).

C-1.2 Construction Noise and Truck Hauling

The Roadway Construction Noise Model (RCNM) is the Federal Highway Administration's (FHWA) national model for the prediction of construction noise. Much of the noise data originates from The Central Artery/Tunnel (CA/T) project in Boston, Massachusetts, which began in the early 1990s, is the largest urban construction project ever conducted in the United States. Its noise control program developed the Construction Noise Control Specification 721.560, the most comprehensive noise specification ever developed in the United States. Because the CA/T prediction tool benefited other state and local governments, the FHWA developed the RCNM, which is based on the noise prediction calculations and the equipment database used in the CA/T prediction spreadsheet (FHWA 2006).

The RCNM provides a construction noise tool to predict noise levels at user-entered distances from various types of construction equipment or trucks for sound propagation paths over relatively flat ground, providing outputs for L_{max} and L_{eq} metrics.

C-2 HELICOPTER MODELING DETAILS FOR TERRAIN ELEVATION, GROUND IMPEDANCE, AND FLIGHT PROFILES

This study utilized U.S. Geological Survey (USGS) National Elevation Dataset (NED) 30m (1 arc-second data) to develop the ground elevation datafile. Typical model elevation files use 500 feet grid spacing in both north and south direction for most studies. However, due to the steeper mountainous terrain in the June Lake area and concerns from the public this analysis sampled the elevation data at a finer 250 foot grid spacing in both north and south directions to provide the most accurate noise level predictions.

AAM's other ground related input describes local ground impedance conditions in a ground impedance file. First, this study utilized USGS hydrography data to identify all bodies of water within the study area to model each with the "hardest ground" flow resistivity of 1,000,000 kPa-s/m^2.[1] For non-water areas the study then considered the North American Land Change Monitoring System (NALCMS) 30-meter Land Cover Data, as presented in Map 2-2. The NALCMS Land Cover data depicts most areas within a mile on either side of the proposed helicopter flight paths and the majority of the study area as either Temperate / Sub-polar Needleleaf Forest or Temperate / sub-polar shrubland, both of which would correspond to modeled flow resistivities of less than 225 kPa-s/m^2 (US DoT 2020). For reference, numerically lower values absorb sound propagation more than higher flow resistivities that allow easier sound transmission at greater sound levels. The land cover data layer in Map LAND C-1 also identifies smaller areas as Barren Lands, which primarily occur at mountain peaks representing bare rock. Based upon concerns from the public and with the goal of presenting a conservative analysis of noise from proposed helicopter flights, this study subsequently reviewed aerial

[1] Kilopascal (kPa) is a unit of pressure measurement. kPa-s/m^2 is a measure of air flow resistivity.

imagery to identify all areas visually appearing to contain bare rock from mountain faces, which expanded the areas classified as exposed rock with a flow resistivity of 6,000 kPa-s/m^2 (US DoT 2020). Map LAND C-2 presents the resulting modeled ground impedance layers with water bodies (1,000,000 kPa-s/m^2), an expanded area modeled as exposed rock (6,000 kPa-s/m^2), and remaining areas as softer ground cover (225 kPa-s/m^2).

For ambient temperature, humidity, and pressure, each month was assigned a temperature, relative humidity, and barometric pressure from data available for that month for the years 2018 through 2022. AAM determined April as the month with the weather values that produced the median results in terms of noise propagation effect.

The helicopter flight profiles include flight parameters such as altitude (in either feet above ground level or feet above sea level), airspeed in knots, and angle of attack and roll angles. The software automatically accounts for engine power and rotor blade pitch by selecting the noise sphere with the most similar flight trajectory as the user-entered profile. In this case, each helicopter types was modeled to maintain 500 feet of clearance from the ground level below based upon input from the operators, as well as including time to hover over the June Lake Mountain Parking Lot for pilots to stabilize the load while taking off or landing. Noise levels are computed in the time domain and with a variety of integrated metrics, including Lmax, sound exposure level (SEL), and Leq at receiver positions at specific POIs.

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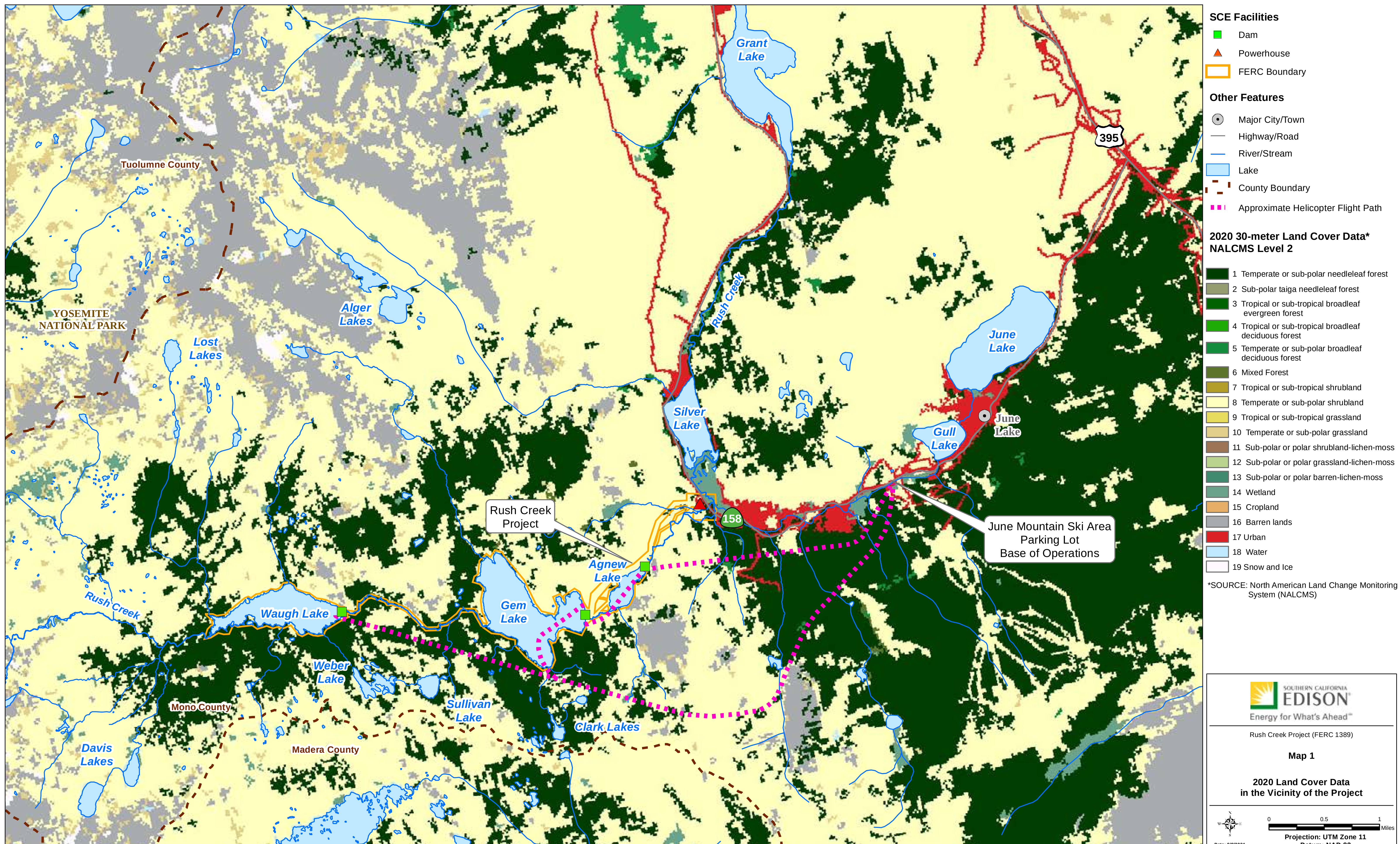

Grant Lake
Rush Creek
June Lake
Silver Lake
Gull Lake
June Lake
395
158
Alger Lakes
Lost Lakes
YOSEMITE NATIONAL PARK
Tuolumne County
Rush Creek Project
June Mountain Ski Area Parking Lot Base of Operations
Agnew Lake
Gem Lake
Waugh Lake
Rush Creek
Weber Lake
Sullivan Lake
Clark Lakes
Mono County
Madera County
Davis Lakes
Thousand Island Lake
SCE Facilities
Dam
Powerhouse
FERC Boundary
Other Features
Major City/Town
Highway/Road
River/Stream
Lake
County Boundary
Approximate Helicopter Flight Path
2020 30-meter Land Cover Data* NALCMS Level 2
1 Temperate or sub-polar needleleaf forest
2 Sub-polar taiga needleleaf forest
3 Tropical or sub-tropical broadleaf evergreen forest
4 Tropical or sub-tropical broadleaf deciduous forest
5 Temperate or sub-polar broadleaf deciduous forest
6 Mixed Forest
7 Tropical or sub-tropical shrubland
8 Temperate or sub-polar shrubland
9 Tropical or sub-tropical grassland
10 Temperate or sub-polar grassland
11 Sub-polar or polar shrubland-lichen-moss
12 Sub-polar or polar grassland-lichen-moss
13 Sub-polar or polar barren-lichen-moss
14 Wetland
15 Cropland
16 Barren lands
17 Urban
18 Water
19 Snow and Ice
*SOURCE: North American Land Change Monitoring System (NALCMS)
Rush Creek Project (FERC 1389)
Map 1
2020 Land Cover Data in the Vicinity of the Project
0 0.5 1 Miles
Projection: UTM Zone 11
Datum: NAD 83
Date: 8/8/2024

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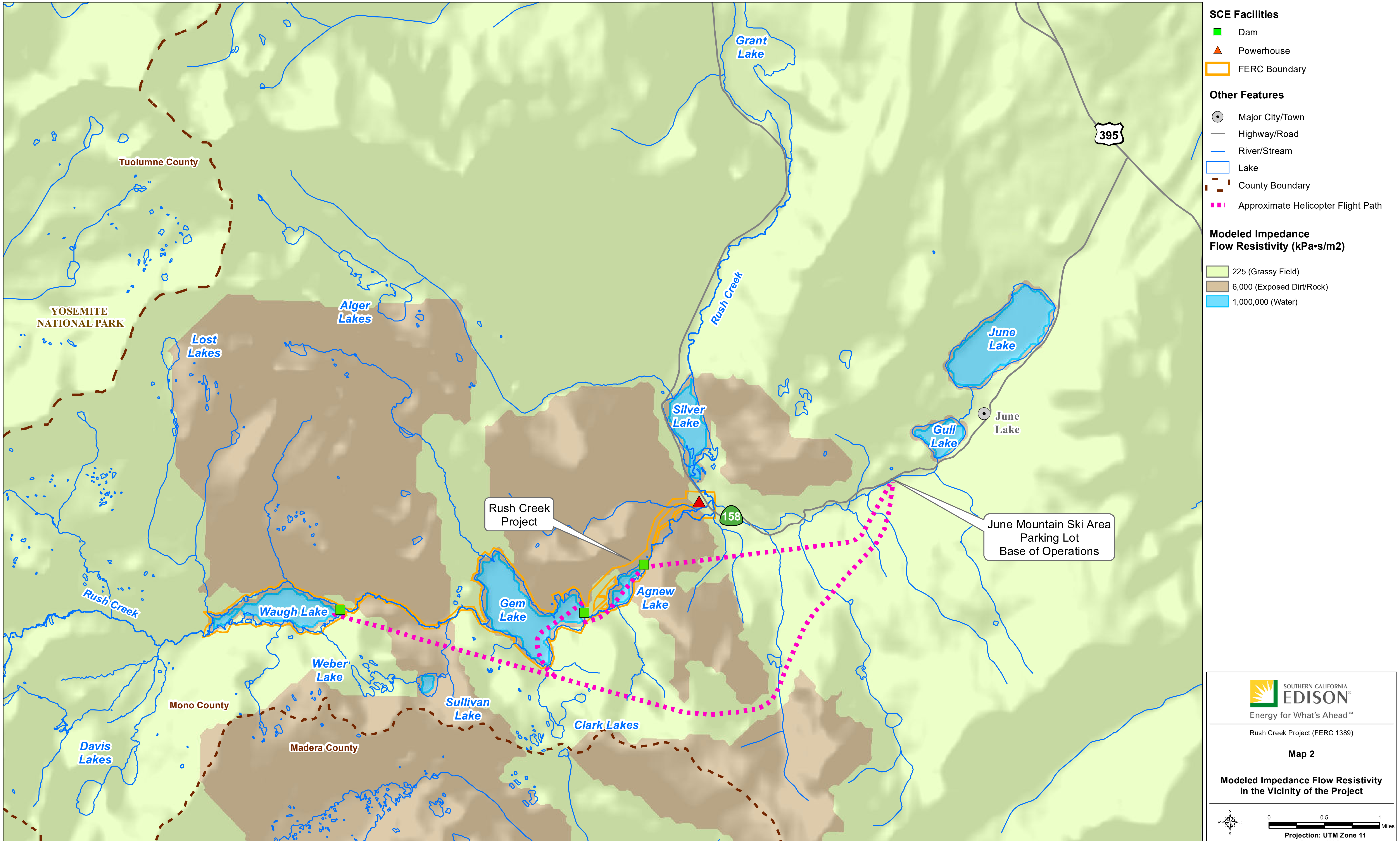

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Rush Creek Project (FERC 1389)

Map 2

Modeled Impedance Flow Resistivity in the Vicinity of the Project

Projection: UTM Zone 11
Datum: NAD 83

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