



# Alameda-Tesla Property 2023 Bat Survey Report



Prepared for:  
**California Department of Parks & Recreation**  
**Off-Highway Motor Vehicle Recreation Division**  
**1725 23<sup>rd</sup> Street, Suite 200**  
**Sacramento, CA 95816**

Prepared by:  
**MIG, Inc.**

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**PLANNING | DESIGN | COMMUNICATIONS | MANAGEMENT | SCIENCE | TECHNOLOGY**

2055 Junction Avenue, Suite 205 • San Jose, CA 95131 • USA • 650-327-0429 • [www.migcom.com](http://www.migcom.com)

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## Introduction

In the late 1990's, the California Department of Parks & Recreation (Department) acquired the Alameda-Tesla property (Property). The Department is currently in the process of classifying the Property, which involves conducting assessments of existing conditions for the purpose of determining the range of conservation, recreation, and management activities that are appropriate for the site. As part of this classification process, the Department requires information on the status of sensitive biological resources on the Property. In support of this process, MIG has completed focused surveys for bats on the Property. As requested by the Department, the focus of this effort was that of special-status bats in the Tesla Mine area of the Property, including what species occupy the mine and, if present, how they are using the mine. As part of this effort, a combination of evening exit count surveys and acoustic monitoring surveys were conducted on the Property in 2023. This report presents the results of those surveys, as well as recommendations for additional surveys, habitat conservation, and opportunities for future investigations.

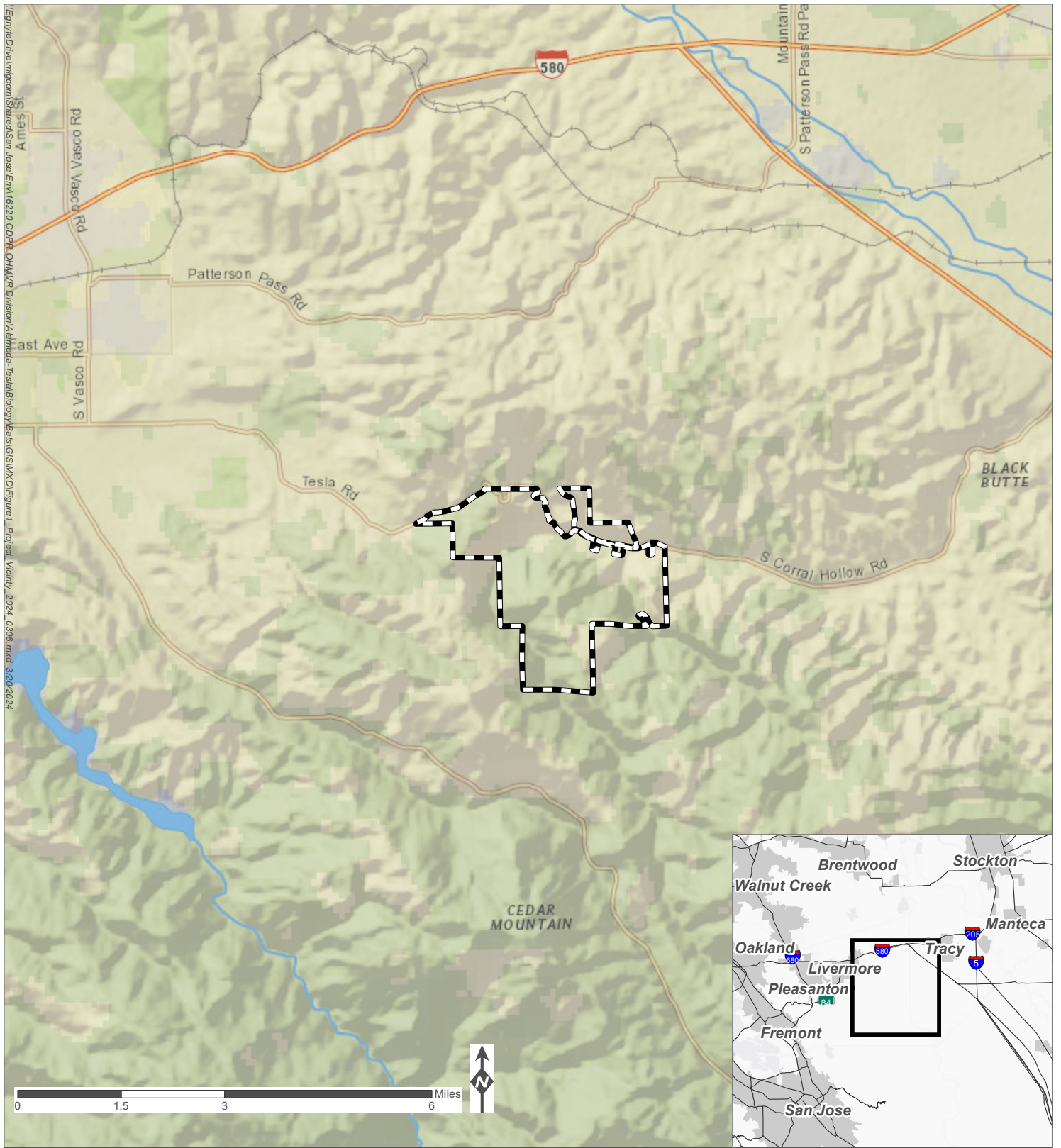
### Property Description

The Alameda-Tesla Property is located in eastern Alameda County within the *Altamont*, *Cedar Mtn*, and *Midway* U.S. Geological Survey (USGS) 7.5-minute quadrangles. The Property is situated in a rural area, approximately 15 miles east of Livermore and 6 miles south of Tracy (Figure 1). Surrounding land use is primarily open space ranchland used for cattle grazing as well as the 7,000-acre Lawrence Livermore National Laboratory Experimental Test Site to the north, which is mostly open space. Carnegie State Vehicular Recreation Area (SVRA) is situated directly east of the Property.

General habitats present on the Property include grassland, scrub, and oak woodland habitats, as well as small to large rock outcrops. Roost habitat for bats is present in the abandoned Tesla Mine, rock outcrops, and likely some trees on the Property. There are several aquatic features present on the Property including Corral Hollow Creek, Arroyo Seco Creek, and their associated riparian corridors, and several cattle stock ponds. When water is present in these features, they provide drinking sites and foraging habitat for a variety of bat species.

### Potentially-Occurring Bat Species

Abandoned mines are attractive to bats that roost in caves or cave-like habitats because they provide analogous physical and abiotic features such open roosting areas that provide a permanent or nearly permanent roost, stable temperatures and humidity, and a variety of microclimates to support seasonal roost requirements (e.g., hibernation, maternity roosting). Within mines, bats will roost in the open areas of the mine or in crevices within the space. Bat species that roost in mines and are known to occur in the region include two California species of special concern, Townsend's big-eared bat (*Corynorhinus townsendii*) and pallid bat (*Antrozous pallidus*), and several non-special-status bat species including the Mexican free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), and several myotis species (*Myotis*



Source: ESRI 2024

 Alameda-Tesla Property Boundary

**Figure 1** Alameda-Tesla Property Vicinity

*Alameda-Tesla Property 2023 Bat Survey Report*

spp.) (Table 1) (Altenbach and Pierson 1995, Watkins 2002, , CNDDDB 2024). Additionally, Table 1 lists other bat species that do not generally roost in mines but potentially occur within the Property. Of all the potentially-occurring bat species, only the Townsend’s big-eared bat is dependent on cave-like habitats such as mines to support all of their roosting requirements. The other species may roost in the open or in crevices in mines but will also roost in crevices and cavities in rocky outcrop habitats, trees, and anthropogenic structures.

**Previous Bat Surveys and Occurrences in the Region**

Surveys were conducted for special-status bats at Carnegie SVRA, including the Alameda-Tesla Property in 2014 and 2016 (The Wildlife Project 2014, 2016). Those surveys are described below.

The 2014 surveys involved visual encounter surveys at the Tesla Mine<sup>1</sup> and Lime Kiln Cave, and acoustic surveys at various locations (Lime Kiln Cave, Tesla Mine, Hidden Pond, Mitchell Ravine Pond, Tyson’s Pond, Tara’s Trough) on the SVRA. During the 2014 surveys a Townsend’s big-eared bat was visually observed in the Tesla Mine Adit (referred to in this report as Mine Entrance 1), and signs of bats (e.g., guano and large insect parts) were observed at the Lime Kiln Cave. Acoustic surveys detected the pallid bat at Lime Kiln Cave and Tyson’s Pond.

The 2016 surveys involved visual encounter surveys at undescribed locations but are presumed to be at the same locations as the 2014 surveys (Tesla mine adit and Lime Kiln Cave), and acoustic surveys at the Tesla mine, Lime Kiln cave, Hidden Pond, and Tyson’s pond. The 2016 surveys did not result in visual detections of bats; however, guano and/or urine staining was observed during acoustic surveys<sup>2</sup>. Additionally, it was noted that SVRA biologists frequently incidentally observed pallid bats night-roosting on a covered wall of a concrete composting toilet in Carnegie SVRA. Special-status species that were acoustically detected over the course of the 2016 surveys include the pallid bat, western red bat (*Lasiurus frantzii*), and western mastiff bat (*Eumops perotis californicus*).

**Table 1. Potentially-Occurring Bat Species at the Alameda-Tesla Property, Conservation Status, and Tendency for Mine Use.**

Species	Conservation Status	Mine Use*
Townsend's big-eared bat ( <i>Corynorhinus townsendii</i> )	Species of Special Concern	1
Pallid bat ( <i>Antrozous pallidus</i> )	Species of Special Concern	2
California mastiff bat ( <i>Eumops perotis californicus</i> )	Species of Special Concern	4
Western red bat ( <i>Lasiurus frantzii</i> )	Species of Special Concern	4
Hoary bat ( <i>Lasiurus cinereus</i> )	No status	4

<sup>1</sup> The surveys describe the Tesla Mine, it is presumed that the survey was conducted at the mine adit.

<sup>2</sup> The locations of guano and/urine staining observations were not noted in the report.

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Species	Conservation Status	Mine Use*
Silver-haired bat ( <i>Lasiurus noctivagans</i> )	No status	4
Mexican free-tailed bat ( <i>Tadarida brasiliensis mexicanus</i> )	No status	2
Canyon bat ( <i>Parastrellus Hesperus</i> )	No status	3
Big brown bat ( <i>Eptesicus fuscus</i> )	No status	2
Fringed myotis ( <i>Myotis thysanodes</i> )	No status	2
California myotis ( <i>Myotis californicus</i> )	No status	3
Yuma myotis ( <i>Myotis yumanensis</i> )	No status	2
Long-eared myotis ( <i>Myotis evotis</i> )	No status	3
Long-legged myotis ( <i>Myotis volans</i> )	No status	3

\* Codes are as follows: 1 = Mine/cave-like habitat dependent, 2 = Frequently used, 3 = Occasionally used, and 4 = Rarely or never used.

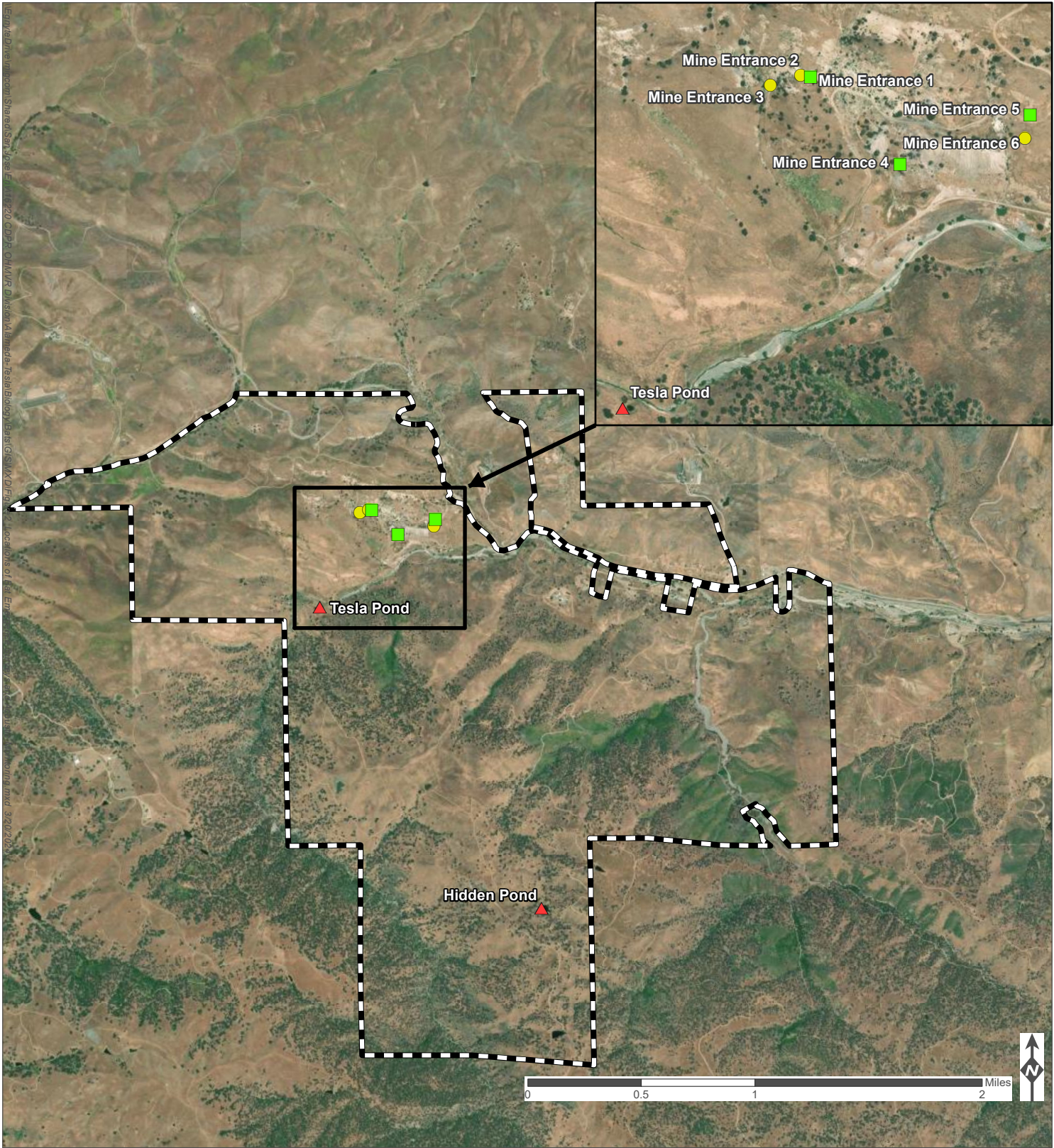
## 1 Methods

### Exit Count Surveys

MIG biologists Kim Briones, David Gallagher, and Alex Broskoff conducted exit count surveys at six mine entrance locations (Figure 2) in mid- summer to early fall 2023. These surveys were conducted on July 13 (Entrances 1 - 3), July 14 (Entrance 4), and August 10 (Entrances 5 and 6). A repeat exit count survey was conducted on September 18, 2023, at Entrance 1. The surveys were conducted from 30 minutes prior to sunset (between 6:30 and 8:00 p.m.) until one hour after sunset (between 8:00 and 9:30 p.m.). During the exit count surveys, each observer was stationed in front of a mine opening to watch for emerging bats. Surveyors used two tally counters, one to count bats exiting the mine and the other to count bats entering the mine<sup>3</sup>. At the end of the survey the number of bats re-entering the mine was subtracted from the total number of bats leaving the mine to obtain a total count for the survey. Additionally, each observer used a handheld active bat detector (Anabat Walkabout bat detector or Bat Recorder software with Pettersson M500-384 microphone) to listen for bats as an aid in bat detection. A Songmeter SM4BAT FS bat detector (Wildlife Acoustics, Maynard, MA) was also deployed at each survey location to record bats for identification purposes. Passive bat detector microphones were mounted on an approximately 10-foot-tall pole. During the follow-up survey of Mine Entrance 1, Ruggedized night vision goggles (AB Night Vision Inc., Bristol, VA) were utilized to aid in the visualization of emerging bats. Following the exit count surveys, acoustic files were viewed and identified using Sonobat 4.4.5 Bat Call Analysis Software.

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<sup>3</sup> During dusk emergence bats will occasionally re-enter the roost before leaving for evening foraging.



Source: ESRI 2024; State Parks 2023

- ▲ Acoustic Monitoring
- Exit Count Survey
- Exit Count Survey and Acoustic Monitoring
- Alameda-Tesla Property Boundary

**Figure 2** Locations of Bat Exit Count Surveys and Acoustic Monitoring  
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Each mine entrance that was surveyed is described below, and locations are mapped in Figure 2. Photos of each of the sites are attached in Appendix B Photos.

*Mine Entrance 1* (Photos 1 and 2). Mine Entrance 1 (Tesla Mine adit) is located on the northwest end of the Tesla Mine area. This entrance is approximately 6 feet wide and 5 feet tall and supports a metal bat-friendly gate with horizontal angle-iron bars with approximately 6-inch spacing between the bars. This mine entrance has been subject to soil erosion, which has partially covered the framed entrance. The frame roof has also partially collapsed from soil debris.

*Mine Entrance 2* (Photo 3). Mine Entrance 2 is located on the northwest end of the Tesla Mine area. This mine entrance appears to be a horizontal mine shaft that has been fitted with a 2 to 2.5-foot diameter corrugated metal pipe vent with horizontal angle-iron bars. The gate currently supports two linear openings that are approximately 1.5 inches and 3 inches wide. Heavy erosion is occurring above the entrance such that it is partially buried by talus debris.

*Mine Entrance 3* (Photos 4 and 5). Mine Entrance 3 is located on the northwest end of the Tesla Mine area. This mine entrance is a vertical shaft with a 5.5 to 6-foot diameter corrugated metal pipe vent that has been fitted inside the shaft. A series of horizontal round bars spaced approximately 4 inches apart are fitted across the culvert to prevent human entry.

*Mine Entrance 4* (Photo 6). Mine Entrance 4 is located on the southern portion of the Tesla Mine area. This entrance is a horizontal mine shaft that has been fitted with two side-by-side 2.5-foot diameter corrugated metal pipe vents with a series of horizontal round bars to prevent human entry. The spacing between each of the bars is approximately 5 inches. Dense grass was growing in front of the mine entrance openings at the time of the survey.

*Mine Entrance 5* (Photos 7 and 8). Mine Entrance 5 is located on the eastern portion of the Tesla Mine area. This mine entrance is a vertical shaft that has been fitted with a vertical 2 to 2.5-foot diameter corrugated metal pipe vent and a series of horizontal round bars to prevent human entry (Photo 8). The spacing between each of the bars is approximately 3 inches. At the time of the survey, dense grass was growing around the mine entrance opening.

*Mine Entrance 6* (Photos 9 and 10). Mine Entrance 6 is located on the eastern portion of the Tesla Mine area south of the main access road. This mine entrance is a vertical mine shaft that has been fitted with a 4-foot diameter corrugated metal pipe and a series of horizontal round bars to prevent human entry. The bars are oriented perpendicular to the ground surface and are spaced approximately 3.5 inches apart. At the time of the survey, dense grass was growing around the mine entrance opening.

## **Acoustic Surveys**

Department Environmental Scientist Nicole Kleponis, with initial deployment and programming assistance from MIG biologist Kim Briones, deployed bat acoustic detectors near select mine

entrances and at Hidden Pond and Tesla Pond in the Tesla Mine area. Locations and deployment dates are provided in Table 2 below and illustrated in Figure 1.

**Table 2. Bat Acoustic Survey Deployment Dates on the Alameda-Tesla Property.**

Location	Recording Period
Tesla Pond	March 16 - April 4, 2023
Hidden Pond	March 16 - April 5, 2023
Tesla Mine Entrance 5	March 2 - March 16, 2023
Tesla Mine Entrance 5	June 21 - July 6, 2023
Tesla Mine Entrance 4	June 21 - July 6, 2023
Tesla Mine Entrance 1	Aug 29 - October 16, 2023

Acoustic surveys were conducted with Pettersson D500X ultrasound bat detectors (Pettersson Elektronik, Uppsala, Sweden). Detectors were placed with microphones mounted on approximately 10-foot tall, galvanized steel poles that supported a microphone approximately 10 feet above the ground surface. Detectors were set to record from one hour before sunset and continue until one hour after sunrise. Data were analyzed using Sonobat 4.4.5. First, data were run through a noise scrubber (batch file scrubber) in the Sonobat Data Wizard as an initial round to remove non-bat recordings (e.g., insects) and poor-quality call files. Note that the scrubbing process removes some, but not all, non-bat sound files. Next, call files were processed through the Sonobat batch auto-classifier using the Southwest California Regional Classifier pack. All unclassified calls and calls of species with overlapping call characteristics that cannot be auto-classified to the species level were manually vetted and classified.

## 2 Results

### Exit Count Surveys

During the exit count surveys, bats were observed emerging from two of the six mine entrances: Mine entrances 1 and 4. On July 13, 53 bats were observed exiting from Mine entrance 1, and on July 14, two bats were observed exiting from Mine entrance 4. After reviewing the bat acoustic data that was recorded concurrently with the exit count survey, a total of 103 sound files were recorded during the exit count survey. Of the 103 sound files, 54 Townsend's big-eared bat call files and one canyon bat call file were recorded (see representative calls in Appendix C) at Mine entrance 1. The remaining recorded files were composed of ultrasonic noise, poor-quality call files, or social-call call files that could not be identified to species.

On July 14, 2023, two bats were observed exiting from Mine entrance 4. After reviewing the bat acoustic data that was recorded concurrently with the exit count survey, a total of 65 sound files were recorded at Mine Entrance 4. Of the 65 sound files, one Townsend's big-eared bat and one unidentified bat call file were recorded (see representative calls in Appendix C). These files were recorded concurrently when the two bats were observed exiting the mine entrance; thus,

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at least one of these bats is presumed to be a Townsend's big-eared bat. The remaining call files were determined to be ultrasonic noise files.

No bats were observed exiting from Mine entrances 2, 3, 5, or 6 during the exit count surveys.

During the follow-up exit count survey on September 18, 2023, at Mine Entrance 1, 52 bats were observed exiting from the mine. After reviewing the bat acoustic data that was recorded concurrently with the exit count survey, a total of 220 sound files were recorded. Of the 220 sound files, 36 Townsend's big-eared bat, two California myotis, and one canyon bat call files were recorded (see representative calls in Appendix C). The canyon bat call was detected towards the end of the survey well after sunset and was probably a flyover, as this species typically emerges early in the evening before sunset. The remaining recorded files were composed of ultrasonic noise, poor-quality call files, or social-call call files that could not be identified to species.

### Acoustic Monitoring Surveys

A total of 13,127 sound files were recorded at all the monitoring sites during the acoustic monitoring surveys. However, due to technical and weather-related difficulties (nightly high winds), a majority of these recordings contained ultrasonic noise, and only 13 files contained bat call files (Table 3). Bat calls were recorded at Tesla Mine Entrance 4 (one possible pallid bat call file), Tesla Pond (one California myotis call file), and Hidden Pond (11 canyon bat call files). The possible pallid bat call file was composed of four call pulses that were of low quality. However, based on the characteristic frequency (frequency of call at its lowest slope) and simple shape of the call compared to library reference calls for this species, this call is likely from a pallid bat. Although no identifiable call files were recorded at Mine Entrance 1, hundreds of social call files and poor-quality call files, which are not suitable for species identification, were recorded and indicated that there was bat activity at this site. See Appendix C for representative call files.

**Table 3. Bat Acoustic Survey Results on the Alameda-Tesla Property.**

Survey Location	# Sound Files Recorded	Species Detected/# Call Files
Tesla Pond	412	California myotis/1 call file
Hidden Pond	721	Canyon bat/11 call files
Tesla Mine Entrance 5 (March)	5,627	No identifiable bat call files
Tesla Mine Entrance 5 (June – July)	1,620	No identifiable bat call files
Tesla Mine Entrance 4	3,173	Possible pallid bat/1 call file
Tesla Mine Entrance 1	1,574	No identifiable bat call files, hundreds of social call files

### 3 Discussion

#### Exit Count Surveys

Based on the results of the exit count surveys, Townsend's big-eared bats occupy the Tesla mine adit, and the mine likely supports a maternity colony based on the large number of bats that were observed exiting Mine Entrance 1 in the mid-summer and early fall (Pearson 1952, Pierson and Rainey 1998). Thus, this portion of the mine is apparently an important resource for this species. Mine entrance 4 was also used by bats, one of which was likely a Townsend's big-eared bat, but only in smaller numbers.

Several physical characteristics at the entrances may explain the low numbers/absence of bats at most of the mine entrance sites. For example, spacing between the gate bars that cover the openings is likely too narrow for Townsend's big-eared bats to navigate through. While Townsend's big-eared bats are able to navigate bat gates, many studies have shown that this species requires a minimum of about 5 to 5.5 inches of spacing between horizontal bars (Tobin et al. 2018, Tuttle and Taylor 1998). The spaces between the round and angle-iron bars at Mine Entrances 3 and 4 are about 4 and 5 inches, respectively; and 3 – 3.5 inches at Mine Entrances 2, 5, and 6. Thus, the narrow spacing between bars on most of these entrances may preclude use by Townsend's big-eared bats and potentially other species. While the spacing may be wide enough on Entrance 4 (5 inches), tall grass covered most of the entrance at the time of the survey, probably making this entrance difficult to enter/exit. Additionally, the orientation of the bars on Mine Entrance 6 is vertical, which can be problematic for many bat species, as most species fly into a roost portal horizontally, not vertically (Tobin and Chambers 2017, Elliot 2017). Lastly, the small size of most of the mine entrances may contribute to the absence of Townsend's big-eared bats, as they tend to prefer large portal areas (>2 square meters) for predator avoidance (Tobin et al. 2018). Based on the existing conditions at most of the mine entrances, the results of the exit count surveys are not surprising.

The shape of the corrugations in metal culverts, such as those in Mine Entrances 2 – 6, have been shown to confuse big brown bats, due to the complex patterns of echoes reflecting off of the corrugations (Simmons et al. 2020). This confusion may result in abandonment of roosts by or exclusion of this species and potentially other mine-roosting species known to occur in the region (Simmons et al. 2020, HTH 2019). However, Townsends big-eared bats are generally not challenged by metal culvert entrances (Tobin et al. 2018). Thus, the low numbers or absence of other species of bats at Mine Entrances 2 – 6 may also be related to this mine feature. Other potentially occurring species that do not tolerate bat gates include Mexican free-tailed bats; however, little is known about how other potentially-occurring bat species are affected by corrugated culverts.

As described previously, other bat species that were detected during the exit count surveys (canyon bat and California myotis), occasionally roost in mines. Based on the small number of call files of these species that were recorded during the exit count surveys, either individual/non-

reproductive bats occupy the mine, or these individuals were flying across the Property during the survey.

### **Acoustic Monitoring Surveys**

Although acoustic monitoring surveys failed to document substantial bat activity due to technical issues, the survey likely detected one additional special-status bat species, pallid bat, which was not detected during exit count surveys. That said, additional acoustic monitoring would be needed to confidently ascertain a more complete list of species and their activity levels on the Property.

## **4 Recommendations and Conservation Considerations**

### **Annual Monitoring**

It has been 7 years since the Tesla Mine was last surveyed for bats. Based on the presence of a special-status species colony (Townsend's big-eared bat), which is likely a maternity colony, we recommend that the Department incorporate annual monitoring (acoustic surveys and exit count surveys) at the mines and ponds on the Alameda-Tesla Property as part of future wildlife management of the Property to be able to detect changes in Townsend's population size, and populations of other species that might occupy the mine. Regular monitoring may also provide baseline population data to support White Nose Syndrome (WNS)<sup>4</sup> surveillance efforts in the state. Townsend's big-eared bats are not known to present diagnostic symptoms of WNS (e.g., muzzle fungus, wing lesions), but the fungus that causes WNS has been detected on this species (White Nose Syndrome Response Team 2024). Several non-special-status species that occur in the Property region (e.g., big brown bat, fringed myotis, and long-legged bat) that do present the diagnostic symptoms of WNS may occasionally occupy the mine. Thus, regular monitoring including annual exit counts (summer/fall) and acoustic monitoring (summer/winter) to assess any obvious changes to the colony size and uncharacteristic winter activity, which is common in WNS-affected individuals, would be an important conservation effort and should be considered.

### **Baseline Acoustic Monitoring**

Due to technical issues during acoustic monitoring in 2023, it is recommended that another round of surveys are conducted at the mine area and at select pond sites on the Property to ascertain the species assemblage and activity levels of each species on the property.

### **Mine Entrance Repair and Retrofitting**

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<sup>4</sup> White nose syndrome is caused by a cold-loving fungus (*Pseudogymnoascus destructans*) that affects hibernating bats. Based on preliminary data, low levels of the fungus have been detected in California in Shasta, Plumas, Inyo, and San Bernardino Counties in California (White-nose Syndrome Response Team 2024).

Mine entrances 1 and 2 have been partially filled due to soil erosion above the entrances. To ensure that adequate ingress/egress for bats is maintained, we recommend that the Department conduct maintenance and stabilization of these mine entrances. Additionally, weed management/suppression around Mine Entrances 4 – 6 would be necessary to maintain uncluttered ingress/egress at these locations. Finally, mine entrances 2, 3, 5 and 6 are not currently bat-compatible either due to the narrow spacing between the bars or the vertical orientation of the bars (Mine Entrance 6). Thus, the Department should consider retrofitting these entrances so that they are more bat compatible. Corrugated culverts at mine entrances 3 – 5 are not known to affect Townsend's big-eared bats, but it is unknown how other special-status species, such as the pallid bat, respond to these types of features. To manage this species, the Department may also consider the feasibility of replacing/retrofitting the culverts on one or more of the entrances so that they are bat-compatible to improve habitat quality at these sites.

**Conduct Additional Surveys on the Property.**

Other roosting habitat that may support special-status species is present on the Property in the form of rock outcrops and trees. Rock outcrops in particular have potential to support roosting pallid bat and western mastiff bat (if those outcrops are sufficiently tall). Thus, the Department may consider surveying these other habitat features through exit count surveys in the future to assess use by special-status bats.

## 5 References

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## **Appendix A. Mine Entrance Photos**





Photo 1. Mine entrance 1 exterior at the Tesla Mine area.



Photo 2. Close-up view mine entrance 1 at the Tesla Mine area.



Photo 3. Mine entrance 2 at the Tesla Mine area.



Photo 4. Mine entrance 3 at the Tesla Mine area.



Photo 5. Close-up view of Mine entrance 3 at the Tesla Mine area.



Photo 6. Mine entrance 4 at the Tesla Mine area.



Photo 7. Mine entrance 5 at the Tesla Mine area.



Photo 8. Close-up view of Mine entrance 5 at the Tesla Mine area.

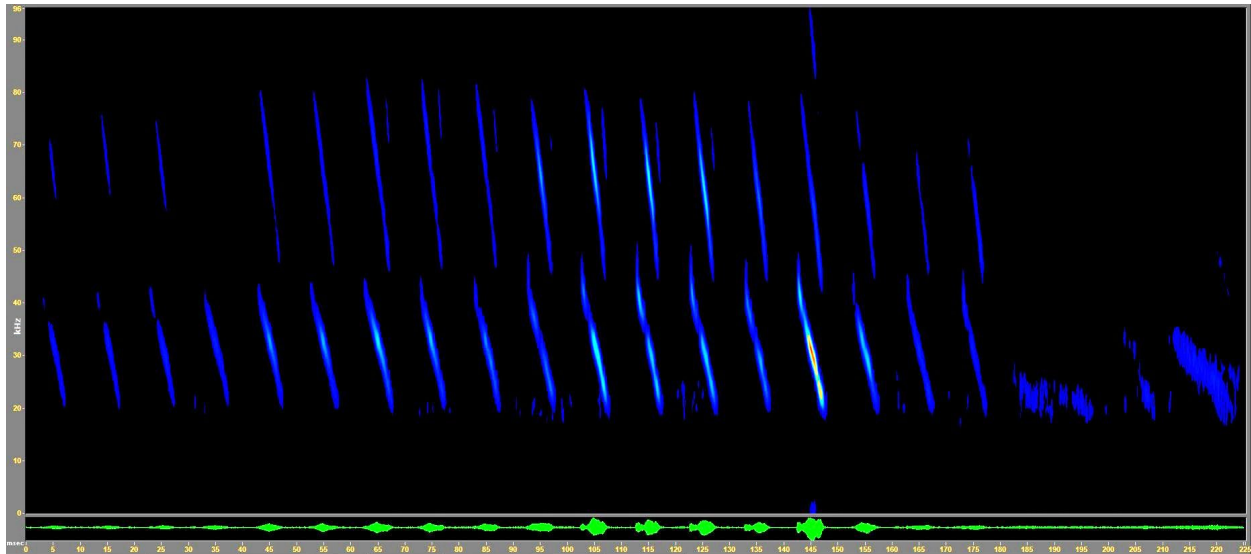


Photo 9. Mine entrance 6 at the Tesla Mine area.

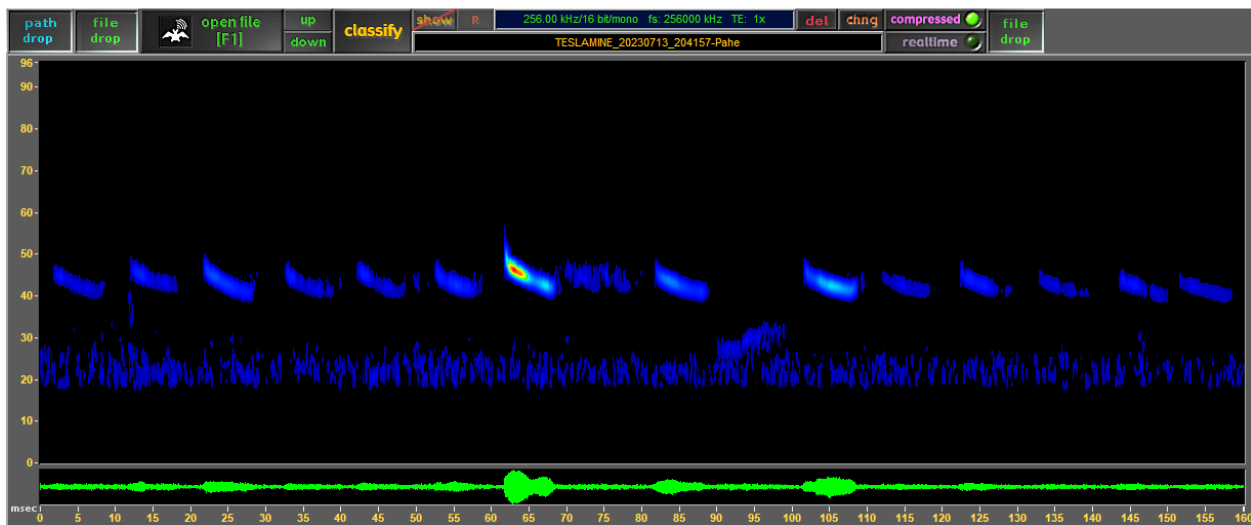


Photo 10. Close-up view of mine entrance 6 at the Tesla Mine area.

## Appendix B. Representative Bat Call Files

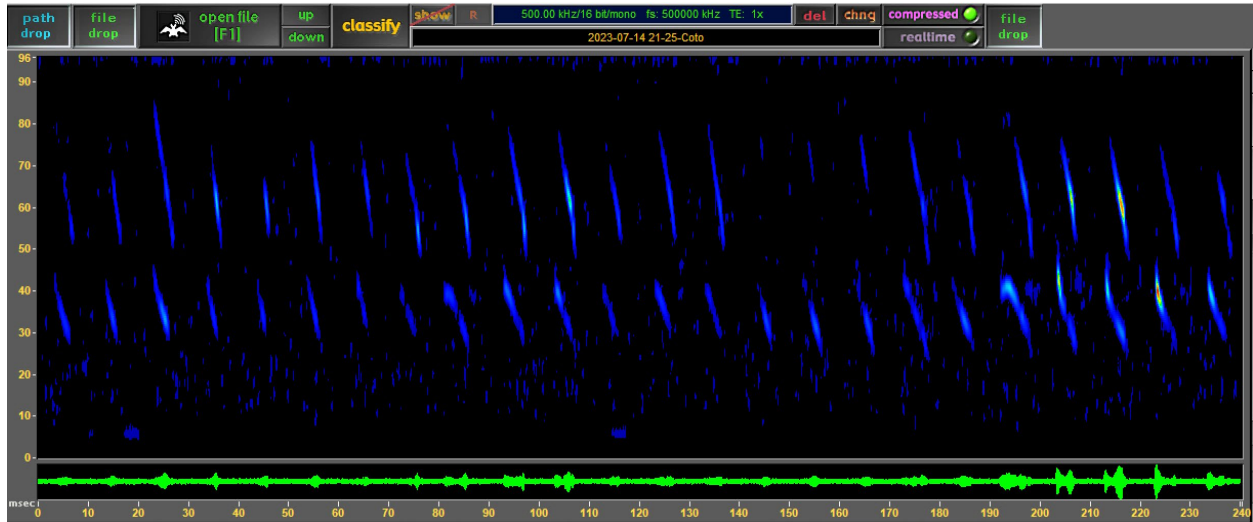


Representative Townsend's big-eared bat search phase calls recorded on July 13, 2023, during an exit count survey at Tesla Mine Entrance 1.

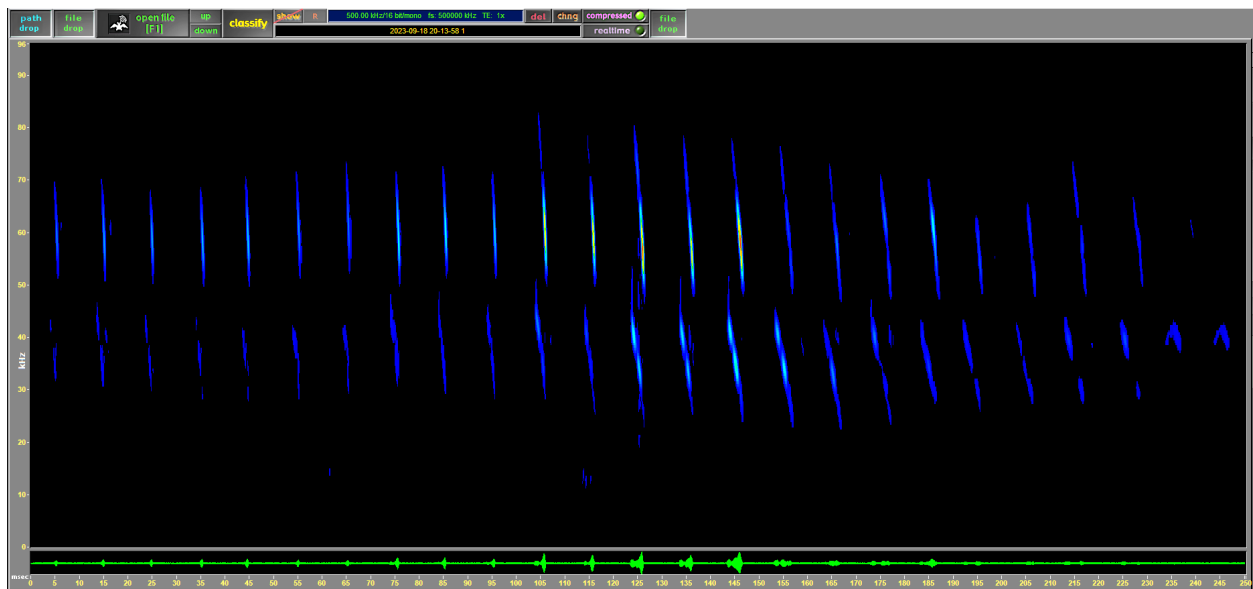


Representative canyon bat search phase calls recorded on July 13, 2023, during an exit count survey at Tesla Mine Entrance 1.

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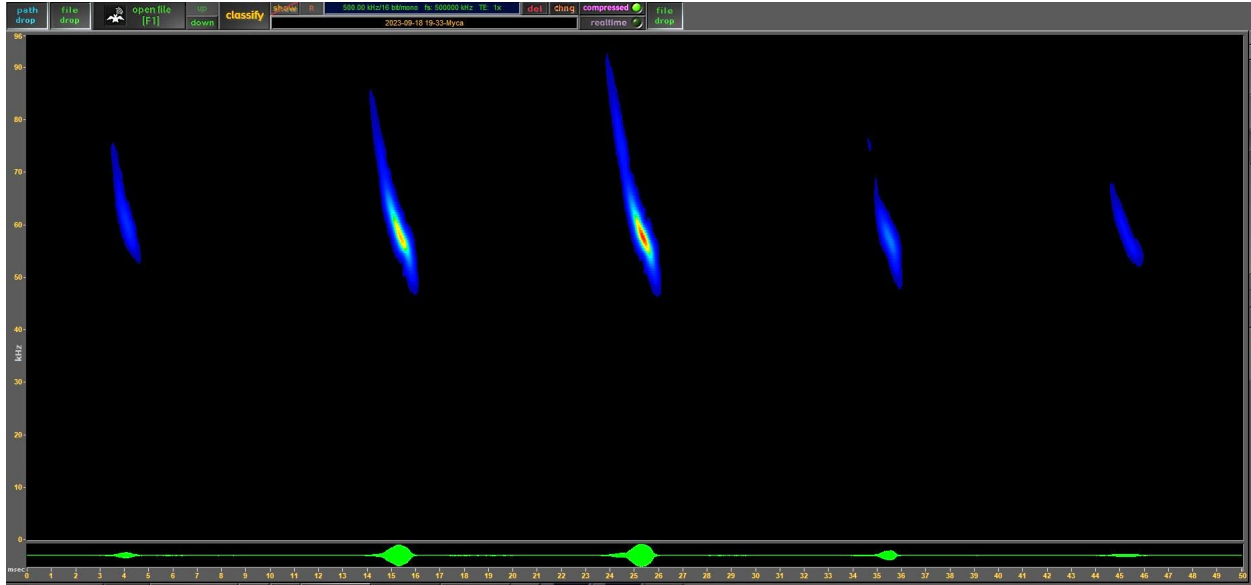


Representative Townsend's big-eared bat search phase calls recorded on July 14, 2023, during an exit count survey at Tesla Mine Entrance 4.

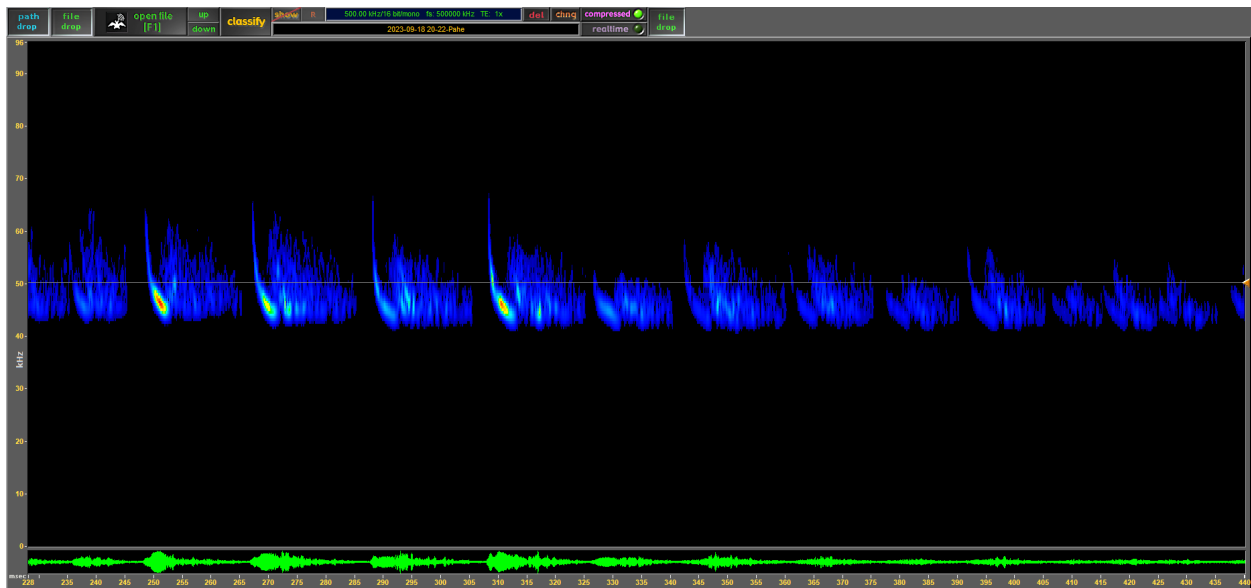


Representative Townsend's big-eared bat search phase calls recorded on September 18, 2023, during an exit count survey at Tesla Mine Entrance 1.

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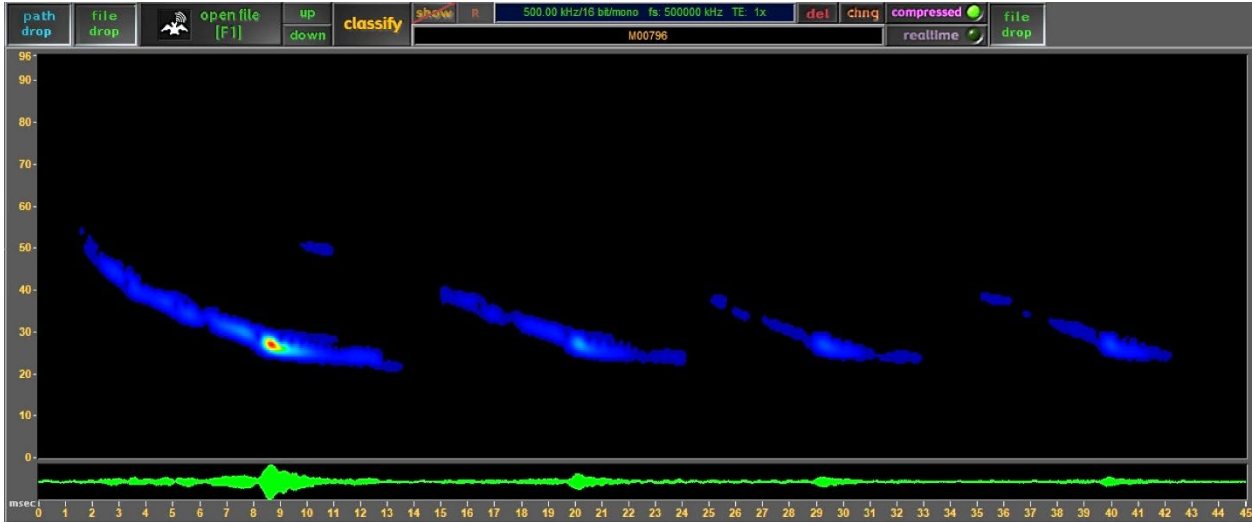
Representative California myotis search phase calls recorded on September 18, 2023, during an exit count survey at Tesla Mine Entrance 1.



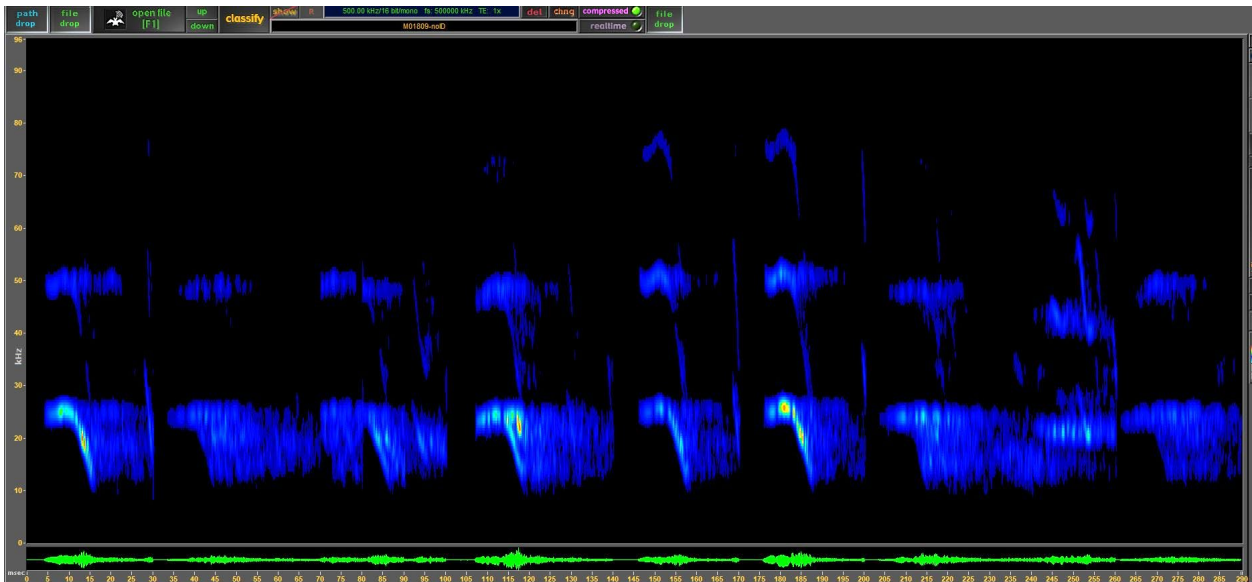
Representative canyon bat search phase calls recorded on September 18, 2023, during an exit count survey at Tesla Mine Entrance 1.



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Possible pallid bat search phase calls recorded June 20, 2023, during acoustic monitoring at Tesla Mine Entrance 4.



Social calls recorded between September 13 and October 16, 2023, during acoustic monitoring at Tesla Mine Entrance 1.