

Acoustical Bat Survey

Santa Susana Field Laboratory,
Ventura County, California

Soil & Groundwater Remediation Sites & Southern Undeveloped Land Borrow Sites

Prepared by:

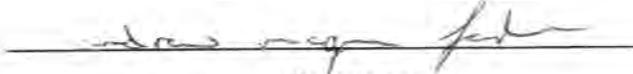


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This report is a true and accurate statement regarding the methodology and results of acoustical bat surveys conducted by Andrew McGinn Forde of Forde Biological Consultants at Boeing held portions of the Santa Susana Field Laboratory, Ventura County, California between April 9 and August 8, 2014. The biologist holds a Scientific Collectors Permit and a Memorandum of Understanding that authorizes the capture of all bats occurring in California.



Signature



Date

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SUMMARY

Forde Biological Consultants (FBC) conducted acoustical bat surveys at the property commonly known as the Santa Susana Field Laboratory (SSFL), Ventura County, California between April 9, 2014 and August 8, 2014. The surveys were conducted at proposed soil and groundwater remediation sites within Area I and Area III and at borrow sites within the part of the property known as Southern Undeveloped Land. Species detected during the surveys included *Myotis yumanensis* (Yuma myotis), *M. californicus* (California myotis), *M. ciliolabrum* (western small-footed myotis), *Lasionycteris noctivagans* (silver-haired bat), *Parastrellus hesperus* (canyon bat), *Eptesicus fuscus* (big brown bat), *Lasiurus blossevillii* (western red bat), *Lasiurus cinereus* (hoary bat), *Corynorhinus townsendii* (Townsend's big-eared bat), *Antrozous pallidus* (pallid bat), *Tadarida brasiliensis* (Mexican free-tailed bat), and *Eumops perotis* (greater bonneted bat). The California Department of Fish and Wildlife (CDFW) consider *L. blossevillii*, *A. pallidus*, *C. townsendii* and *E. perotis* to be Species of Special Concern. *C. townsendii* is currently proposed for listing as an endangered species under the state's Endangered Species Act. As a candidate for listing, *C. townsendii* is currently protected.

SCOPE of WORK

The scope of work included 2 days of habitat assessment, 6 nights of active acoustical surveys, data analysis, and provision of a report documenting the results of the surveys. FBC conducted 5 days of habitat assessment, 6 nights of active acoustical surveys, and collected data almost continuously between April 19, 2014 and August 8, 2014. The additional data was collected and analyzed, on a voluntary basis.

PURPOSE

The SSFL is a former rocket and nuclear reactor research, test, and development facility that is no longer operational and is in the process of decommissioning. Past chemical use at the site has resulted in areas of the soil, surface water, groundwater, and vadose zone bedrock with contaminant concentrations in excess of regulatory thresholds. The potential remediation activities are to be performed in accordance with the 2007 Consent Order for Corrective Action as directed by the California Department of Toxic Substances Control on Boeing-owned parcels referred to as Area I, Area III, the Southern Undeveloped Land, and in adjacent northeast offsite areas where contaminants have migrated.

The proposed project includes soil and groundwater remediation, which will affect up to 154-acres of land within Area I and Area III, and in adjacent off-site areas and up to a ¼ acre of land within the Southern Undeveloped Land. The project may also use soil from "borrow sites" that could affect up to 21-acres of land within the Southern Undeveloped Land. The purpose of the acoustical surveys was to identify species of bats that occur at the SSFL and to determine if there are any significant roost sites or potential roost sites that could be affected by the proposed activities.

SURVEY LOCATION

The SSFL is a 2,850-acre property located in Simi Valley, Ventura County, California. Bell Canyon is to the south, the Santa Monica Mountains Conservancy's Sage Ranch Park and the Brandeis-Bardin Institute to the north, ranches and mobile home parks to the east, and Meier and Runkle Canyons to the west. The location of the property is depicted in Exhibit A. The SSFL is divided into four administrative areas, Area I, Area II, Area III, and Area IV, and an area to the north is known as Northern Undeveloped Land and an area to the south is known as Southern Undeveloped Land. The survey area included the proposed soil and groundwater remediation sites in Area I and Area III, remediation and borrow sites in the Southern Undeveloped Land, and those located in off-site areas. A map depicting the proposed remediation and borrow sites is depicted in Exhibit B.

SITE CHARACTERISTICS

The SSFL is underlain by the Chatsworth formation, a deep-sea turbidite deposit that consists primarily of sandstone, interbedded with lesser amounts of shale, siltstone, and conglomerate. The formation where it occurs on the property is exposed and includes numerous caves and cliffs with features that could be used by bats including crevices, overhangs, vugs, and drill holes. Chaparral, coastal sage scrub, riparian woodland, riparian scrub, oak woodland, annual grassland, perennial grassland, and ephemeral streambeds dominate the SSFL. Old growth trees associated with the oak woodland and riparian habitats and others scattered throughout the SSFL contain numerous basal hollows, cavities, cracks, exfoliating bark, and foliage that could provide numerous potential roost, maternal, hibernation sites, and winter hibernacula for bats. An open body of water at SSFL, Silvernale Pond, is available to them. The pond is approximately 500 feet long and about 150 feet wide. It occasionally dries by summers end and fills during the rain season. The approximate extent of the water surface during the surveys measured about 250 feet long by about 100 feet wide. There are other smaller ponds at SSFL and a number of ephemeral/intermittent streams. The proposed remediation and borrows sites are mostly located within previously developed areas of the property with little to no vegetation or areas that have recently been restored. Based on topography, the majority of the previously developed areas were presumably blasted and flattened during development of the space program and for the most part lack significant rock outcrop. Photographs depicting parts of the SSFL are included in Exhibit C.

METHODOLOGY

Andrew McGinn Forde conducted a habitat assessment on April 9, April 22, April 24, April 27, and April 28, and May 1 2014. The assessment included searching for features suitable for use by bats, mapping them, and searching them for presence of bats or evidence including insectivorous bat fecal material (guano), nectar bat fecal material (splatter), urine and body oil stains, audible vocalizations, carcasses, and discarded prey remains, indicating use. The assessment included areas within the soil remediation sites, groundwater remediation sites, and the borrow sites and extended approximately 100 feet beyond the areas that would be affected by the proposed remediation activities. The survey was extended to 200 feet beyond the remediation sites at a former test area in Area I named Canyon. Due to the high volume of features that could be potentially used by bats,

non-specific polygons were created in an effort to map the most significant features. The map is included as Exhibit D. The biologist conducted additional assessments on August 6 and August 8, 2014, that focused on a number of cave complexes near Silvernale Pond in Area III.

FBC conducted active acoustical surveys on April 14, May 14, June 17, June 25, July 29, August 6, 2014 using EM3 bat detectors. The active surveys included a period where the biologist observed significant potential roost features to determine if bats emerged. Once it was too dark to see, the biologists moved around each sample site tracking bats as they flew past. The active surveys began approximately 30 minutes before sunset and lasted approximately 4 hours each evening. FBC also deployed an SM2Bat+ bat detector at 12 different sample sites between April 9, 2014 and August 8, 2014. The SM2Bat+ was programmed to run from approximately 30 minutes before sunset for 6 hours and about 2 hours before sunrise for 2.5 hours. The active and passive surveys were conducted at the same sites. The 12 sampling sites are depicted in Exhibit D.

A bat detector is a device that is used to detect ultrasonic calls of bats, record them as electronic files, and convert them to a frequency audible to humans; however, detection distances are extremely variable. It is affected by atmospheric attenuation (which varies with humidity, temperature, air pressure and most of all with frequency), the frequency of the bat call, vegetation, obstacles, wind, frequency and amplitude of the bat, the loudness of the bat, and the directionality of the bat call itself. Higher frequencies are also absorbed more readily than lower frequencies such that the detection distance is quite different for *C. townsendii* and *M. yumanensis*. Wildlife Acoustics, Inc. estimates that most bat species can be detected well over 30m, with a likely maximum of about 100m using the SM2Bat+ and EM3 bat detectors, for *C. townsendii* it is much less. With practice, it is possible to identify species based upon the detectors audible output. Bat detectors utilize two main technologies, Zero Crossing and Full Spectrum. The information recorded using Full Spectrum is far richer and has more content than Zero Crossing. Utilizing Full Spectrum allows more confident species identifications. FBC utilized Full Spectrum during the survey using a single omni-directional ultrasonic microphone at a sampling rate of 360 kHz. The ultrasonic microphones were set approximately 4 meters from the ground using an extension pole. The files recorded by the bat detectors can also be used in conjunction with analytical software to generate audible sounds, sonographs, and sonograms.

SonoBat 3 is a comprehensive tool for analyzing and comparing high-resolution full-spectrum sonograms of bat echolocation calls. It uses a decision engine based on the quantitative analysis of approximately 11,000 species-known recordings from across North America. The software automatically recognizes and sorts calls, then processes them to extract five-dozen parameters, which describe the time-frequency and time-amplitude trends of calls. While derived from a robust data set acquired from a variety of environments and conditions, the data set nevertheless encompasses a finite set of calls from each species covered and can not fully represent the repertoire of bat vocalizations that likely occur in nature. The substantial overlap in the echolocation call characteristics of many species often means that only a small portion of some species' repertoires will have a

tendency toward discriminating characteristics, even with perfectly recorded call sequences. This renders acoustic classification of bats a probabilistic process and relatively inexact. For some species, confident classification can only be achieved on a subset of call types within its repertoire that falls outside of data space shared with another species. As a result many recordings have ambiguous species classification.

Andrew McGinn Forde transferred the data from the bat detectors to a MAC (Version 10.6.8), used SonoBat Batch Scrubber (Version 5.1) to scrub noise files, and SonoBat 3 (Version 3.2) to automatically and manually analyze calls. Scrubbing removes files containing poor quality calls and noise files before analysis. SonoBat Batch Scrubber has three settings, 1) Tolerant (accepts files with shorter, less strong calls, but more noise), 2), Medium (accepts all files but those with poor quality calls; and accepts some noise with tonal content, and 3) High Grade (accepts only files with strong clear calls, and rejects more noise). FBC scrubbed files using the High Grade setting. After scrubbing, the files containing high quality calls were automatically analyzed by SonoBat 3 using the SonoBatch method with settings at 0.80 for acceptable call quality and 0.90 for the discriminant probability threshold. The files that SonoBat 3 identified to species were then analyzed manually by quantifying characteristic frequency, (the frequency of the call at its lowest slope toward the end of the call, or the lowest frequency for consistent FM sweeps), the highest apparent frequency (can vary depending upon distance of detector to bat), the lowest apparent frequency, the frequency with the greatest power, call duration from the beginning to the end of the call, the slope of the upper portion or onset of the call from the high frequency to the knee, the slope of the lower portion or body of the call from the knee to the characteristic frequency, and frequency modulation (the change in frequency with time). FBC also manually compared call a number of call sequences to compiled call repertoire references included in SonoBat.

RESULTS

With exception to Canyon and two areas in the Southern Undeveloped Land, the majority of the significant features that bats could use as roost, maternal, hibernation site, and wintering hibernacula are located beyond the limits of the remediation and borrow sites. The biologist searched a number of the mapped features for evidence indicating use by bats; however, the majority of them were not accessible due to topography consisting of steep rock outcrops and cliffs. The biologist also searched a number of caves near Silvernale Pond that focused on discovery of *C. townsendii*. The biologists did not observe any evidence suggesting use of any of the accessible features by this species. Photographs depicting various features at or within 100 feet of the remediation and borrow sites are included in Exhibit E.

Species detected during the acoustical survey included *M. yumanensis*, *M. californicus*, *M. ciliolabrum*, *L. noctivagans*, *P. hesperus*, *E. fuscus*, *L. blossenillii*, *L. cinereus*, *C. townsendii*, *A. pallidus*, *T. brasiliensis*, and *E. perotis*. The highest number of call sequences recorded was at Silvernale Pond. On August 6, 2014, three hundred sixty-four files containing at least on call sequences were recorded between 8:00pm and 9:00pm at this pond. Survey dates, survey type, sample site, names of surveyors, and species detected at each sample site are included in Table 1.

Table 1 - Survey Dates, Survey Type, Site, Surveyor, & Species Detected

Survey Dates	Survey Type	Site	Surveyor	Species Detected
April 9 - April 10	Passive	1		<i>Myotis ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i>
April 14	Active	1	A. Forde	<i>Myotis ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Lasiurus blossevillii</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i>
April 22 - April 24	Passive	2		<i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i>
April 30 - May 7	Passive	3		<i>Myotis ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Corynorhinus townsendii</i> , <i>Lasiurus cinereus</i> , <i>Tadarida brasiliensis</i> , & <i>Eumops perotis</i> .
May 14	Active	4	A. Forde, Z. Abbey K. Gilliland	<i>Myotis ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i> .
May 14 - May 24	Passive	4		<i>Myotis ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Corynorhinus townsendii</i> , <i>Lasiurus blossevillii</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i> .
May 24 - May 31	Passive	5		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Corynorhinus townsendii</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i> .
May 31 - June 3	Passive	6		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , <i>Tadarida brasiliensis</i> , & <i>Eumops perotis</i> .
June 7 - June 17	Passive	7		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i>
June 17	Active	8	A. Forde	<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i> .
June 17 - June 25	Passive	8		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i> .
June 25	Active	9/10	C. Villasenor A. Plesetz	<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i>
June 25 - July 8*	Passive	9		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i>
July 8 - July 22*	Passive	10		<i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i>
July 22 - July 30	Passive	11		<i>Myotis yumanensis</i> , <i>M. californicus</i> , <i>M. ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i>
July 30	Active	12	C. Villasenor	<i>Myotis yumanensis</i> , <i>M. ciliolabrum</i> , <i>M. californicus</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , <i>Antrozous pallidus</i> , & <i>Tadarida brasiliensis</i> .
July 30 - August 6	Passive	12		<i>Myotis yumanensis</i> , <i>M. ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i> .
August 6	Active	10	A. Forde	<i>Myotis yumanensis</i> , <i>M. ciliolabrum</i> , <i>Lasionycteris noctivagans</i> , <i>Parastrellus hesperus</i> , <i>Eptesicus fuscus</i> , & <i>Tadarida brasiliensis</i> .

* Some data lost due to a corrupt SDHC.

M. yumanensis, *M. californicus*, *M. ciliolabrum*, *L. noctivagans*, *P. hesperus*, *E. fuscus*, *A. pallidus*, and *T. brasiliensis* were detected during all months of the survey; April, May, June, July, and August. *L. blossevillii* was detected April and May, *L. cinereus* was detected May, *C. townsendii* was detected May and July, and *E. perotis* was detected May and June. Table 2 includes species detected, the months they were detected, and the method of identification.

Table 2 - Species Detected, Months Detected, and Method of Identification

<i>Scientific Name</i>	April	May	June	July	August	Method of Identification ¹
<i>Myotis yumanensis</i>	X	X	X	X	X	Visually & Acoustically Identified
<i>Myotis californicus</i>	X	X	X	X	X	Acoustically Identified
<i>Myotis ciliolabrum</i>	X	X	X	X	X	Acoustically Identified
<i>Lasionycteris noctivagans</i>	X	X	X	X	X	Visually & Acoustically Identified
<i>Parastrellus hesperus</i>	X	X	X	X	X	Visually & Acoustically Identified
<i>Eptesicus fuscus</i>	X	X	X	X	X	Acoustically Identified
<i>Lasiurus blossevillii</i>	X	X				Acoustically Identified
<i>Lasiurus cinereus</i>		X				Acoustically Identified
<i>Corynorhinus townsendii</i>		X		X		Acoustically Identified
<i>Antrozous pallidus</i>	X	X	X	X	X	Visually & Acoustically Identified
<i>Tadarida brasiliensis</i>	X	X	X	X	X	Visually & Acoustically Identified (and by ear)
<i>Eumops perotis</i>		X	X			Acoustically Identified

SonoBat 3 also classified a few call sequences as *Myotis lucifugus* (Little brown bat) and a few as *Myotis evotis* (Long-eared myotis). FBC rejected the classifications of *M. lucifugus* mainly due to the quality of the call sequences; echoes, noise, out of range calls sequences, incomplete bandwidth, etc, etc. Furthermore, the range of the species is not known to include the SSFL. FBC also rejected the classifications of *M. evotis*. The calls in the sequences appeared too high, too long, and there were not enough fully formed pulses to get a good idea of entire bandwidth.

The most significant features at SSFL that could be used by bats are located beyond the remediation and borrow sites. The majority of the significant features occurring within the remediation and borrow sites are at Canyon in Area I (See Exhibit C, Photograph 4). On May 14, 2014, Andrew McGinn Forde, Zack Abbey, and Ken Gilliland conducted an emergence survey within this area (Sample Site 4). *P. hesperus* was observed emerging from three of the mapped features, beyond the area to be affected by the proposed activities, south of Canyon Road. The majority of bats however, were observed emerging from areas well beyond the mapped areas. The borrow sites lack significant potential roosting features. There are no rock outcrops associated with the borrow sites and there are only a handful of trees, which for the most part lack suitable roosting features.

¹ Visual Identification = Species observed on at least one occasion during active surveys

DISCUSSION

With exception to Canyon in Area I and two areas in the Southern Undeveloped Land, the majority of the significant features that bats could use as roost, maternal, hibernation, and winter sites are located beyond the limits of the remediation and borrow sites. Given historical use of the property, the lack of significant potential features within the remediation and borrow sites is not surprising. Significant potential features occurring within the remediation and borrow sites were searched for evidence indicating use by bats. Due to safety and cultural concerns caves were not fully entered by the biologist; the search was limited to looking for evidence around the entrances of the caves and areas within them that the biologist could see from outside the entrance. Although the biologist did not observe evidence of use at any of the accessible features bats could still use them; however, due to lack of evidence, use of these features is not expected to be significant. The biologist also searched a number of caves near Silvernale Pond that focused on discovery of *C. townsendii*. The biologists did not observe any evidence suggesting use of any of the accessible caves.

The four most commonly recorded call sequences at the SSFL, in relative order, were those of *T. brasiliensis*, *P. hesperus*, *M. ciliolabrum*, and *E. fuscus*. Call sequences of these species were recorded at all sample sites and were recorded during all months of the survey. Although not recorded at all sample sites, *M. yumanensis*, *M. californicus*, *L. noctivagans*, and *A. pallidus* were recorded during all months of the survey. Call sequences of *L. noctivagans* were detected at a number of sites; however, the majority of call sequences were recorded at the oak woodland in the Southern Undeveloped Land (Sample Site 12). These species undoubtedly roost at SSFL, and are likely to have maternity roosts, hibernation sites, and/or winter sites. *L. blossevillii*, *L. cinereus*, *C. townsendii*, and *E. perotis* were detected occasionally. *L. blossevillii* was detected during April at Sample Site 1 and early May at Sample Site 4. *L. cinereus* was detected early May at Sample Site 3. The lack of detection of these species after May indicates that they migrate through the area; however, it is not necessarily the case that they were absent during the other months and there is potential that they could use the SSFL during winter. The most significant potential features that could be used by these two species at SSFL are within the oak woodland in the Southern Undeveloped Land, and there are suitable features for these species within the groundwater remediation sites in that area. *C. townsendii* was detected at Sample Site 1, 3, 5, and 12. Given that numerous caves occur at SSFL and ample suitable foraging habitat, it is highly likely that this species occur throughout the year and has roost and maternal sites at SSFL. The numerous caves may also provide suitable winter hibernacula. Biologist Andrew McGinn Forde searched a number of caves within and adjacent the remediation sites for evidence of use by bats with a focus on *C. townsendii*. A number of the caves did not appear suitable; however, there are a few that do appear suitable for this species. No evidence indicating use of any of the accessible features was observed by the biologist. *E. perotis* was detected early May and early June at Sample Site 3 and 6. Given the numerous cliffs at SSFL and the significant potential roost features that dominate them and ample suitable foraging habitat, it is highly likely that this species occurs throughout the year and has roost and maternal sites at SSFL.

A. pallidus, *L. blossevillii*, *C. townsendii*, and *E. perotis* are recognized by the CDFW as species of special concern. *C. townsendii* is a candidate for listing as an endangered species by the State of California and is currently protected. FBC relies on the “Fully Protected Animals” list, the “State and Federally Endangered and Threatened Animals of California” list, and the “Special Animal’s” list for these determinations. These lists are produced and maintained by the CDFW.² The following discussion is focused upon these special-status species and includes notes taken from the species accounts contained in the California Wildlife Habitat Relationships System, which is maintained by CDFW California Interagency Wildlife Task Group.³

Antrozous pallidus

A. pallidus occurs throughout California except for the high Sierra Nevada from Shasta County south to Kern County and the northwestern corner of the state from Del Norte County and western Siskiyou County to northern Mendocino County. It is a yearlong resident in most of its range. A wide variety of habitats are occupied, including grasslands, shrublands, woodlands, and forests but it prefers habitats dominated by rock outcrops and cliffs and open habitats. Day roosts include caves, crevices, mines, and occasionally hollow trees and buildings. Night roosts may be in more open sites. Maternity colonies form in early April, and may have a dozen to 100 individuals. Males may roost separately or in the nursery colony. Few hibernation sites are known. *A. pallidus* mates from late October through February. Fertilization is delayed until spring with gestation taking between 53 and 71 days. The pups are born between April and July but most are born between May and June. The average litter is 2 but females reproducing for the first time usually only have 1. Litter size is 1 to 3. The pups are weaned in about 7 weeks and are typically observed flying in July and August.

A. pallidus was recorded at the SSFL during all months of the survey, April, May, June, July, and August. Given that rock outcrop dominates the SSFL, the numerous significant potential roost, maternal, and hibernation sites, the large tracts of suitable foraging habitat, and the species life history, it is highly likely that this species occurs throughout the year, and that they roost, form maternity colonies, and hibernate at SSFL.

Lasiurus blossevillii

L. blossevillii occurs throughout California with exception to the state’s northeast corner. They migrate between summer and winter ranges. Its winter range includes western lowlands and coastal regions south of San Francisco Bay. It prefers edges or habitat mosaics with trees for roosting and open areas for foraging. It roosts primarily in tree foliage, typically along edge habitats. They are known to roost in orchards. Preferred roost sites are protected from above and open below. Mating occurs between August and September. After delayed fertilization there is an 80 to 90 day gestation period. Most females bear 2 or 3 pups, though the single litter may have between 1 and 5. The pups are born late May through early July, are capable of flight between 3 to 6 weeks of age, and are weaned by about 4 to 6 weeks.

² CAL. Fish & Wildlife, Fully Protected Animals, May 2003. CAL. Fish & Wildlife, Special Animals, January 2011. CAL. Fish & Wildlife, State & Federally Endangered & Threatened Species of California, March 2014.

³ California Wildlife Habitat Relationships System, California Department of Fish and Wildlife, California Interagency Wildlife Task Group. Located at <http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife>. Originally published in: Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Department of Fish and Game, Sacramento, California.

The results of the acoustical survey indicate that *L. blossevillii* utilize the SSFL during spring migration; however, some individuals could persist at the SSFL throughout the summer in small numbers. The most significant potential roosting sites for this species is the foliage associated with the oak woodland and riparian habitats within Southern Undeveloped Land and Area III. It is likely that *L. blossevillii* will also utilize the SSFL during fall migration, and they could potentially use the foliage of the oak woodland and riparian habitats for hibernation.

Corynorhinus townsendii

C. townsendii occurs throughout California, but details of its distribution are not well known. It occurs in all but subalpine and alpine habitats, and may be found at any season throughout its range in a variety of habitats, including desert scrub, sagebrush, chaparral, and deciduous and coniferous forests, where it feeds primarily on moths.⁴ Distribution of this species is strongly correlated with the availability of roosting habitat such as caves or cave-like structures including mines, tunnels, abandoned buildings, and bridges with population centers occurring in areas dominated by exposed, cavity forming rock and/or historic mining districts. *C. townsendii* requires these features for roosting, for giving birth, and for winter hibernacula. One of the most important characteristics of suitable hibernacula is that it be free of human disturbance. There are only a handful of known roost sites in southern California, none of which occur in Ventura County. Unlike many species, which take refuge in crevices, *C. townsendii* only roosts in the open, hanging from walls and ceilings, where it is relatively easily detected and particularly vulnerable to disturbance. It is also known to roost in basal hollows of very large trees. Mating typically occurs in fall. Sperm is stored until ovulation occurs in spring. Gestation lasts between 56 and 100 days. A single litter of 1 is produced annually. Pups are born between May and June, peaking in late May, fly at about 2 ½ to 3 weeks old, and are weaned in about 6 weeks. It is a colonial species. Females aggregate in the spring at nursery sites and give birth to one young in late spring or early summer. These nursery colonies, comprised of adult females and their young, remain intact until the young are independent in late summer or early fall.⁵ The maternity period is April through mid-September. The maternity group begins to break up in August. Banding studies have shown that these groups are stable, with individuals showing fidelity to both their group and chosen roost sites.⁶ During the summer months, adult males are generally found roosting alone. The species is typically found at its winter hibernacula from November through February. Individuals occurring in southern California do not enter true hibernation, but rather a state of torpor.

The results of the acoustical survey indicate that *C. townsendii* occur at the SSFL. Given that rock outcrop dominates the SSFL, the numerous significant potential roost and maternal sites including caves, the large tracts of suitable foraging habitat, and the species life history, it is highly likely that this species occurs throughout the year, and that they roost, form maternity colonies, and winter at SSFL. Andrew McGinn Forde searched a

⁴ Barbour, R.W.; Davis, W.H. 1969. Bats of America. Lexington, KY: University of Kentucky Press

⁵ Pierson, E.D.; Rainey, W.E. 1998. Distribution, status, and management of Townsend's big-eared bat (*Corynorhinus townsendii*) in California. Tech. Rept. 96-7. Sacramento, CA: Bird and Mammal Conservation Program, California Department of Fish and Game

⁶ Pearson, O.P., Koford, M. R., and A.K. Pearson. 1952. Reproduction of the lump-nosed bat (*Corynorhinus rafinesquei*) in California. J. Mamm., 33: 273-320.

number of caves near Silvernale Pond that focused on discovery of *C. townsendii*. The biologists did not observe any evidence suggesting use of any of the accessible caves; however, a few of these caves appeared to have characteristics suitable for the occurrence of this species.

Eumops perotis

E. perotis is an uncommon resident in southeastern San Joaquin Valley and the Coastal Ranges from Monterey County southward through southern California from the coast eastward to the Colorado Desert. It occurs in many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, palm oases, chaparral, desert scrub, and urban areas. *E. perotis* is primarily a crevice dwelling species. Distribution is likely correlated with the availability of suitable roosting habitat.⁷ Suitable habitat consists of extensive open areas with abundant roost locations provided by crevices in rock outcrops and buildings. Natural roosts are generally on cliff faces and can be in exfoliating granite, sandstone, or columnar basalt. Roosts are generally high above the ground, usually allowing a clear vertical drop of at least 3 meters below the entrance for flight.⁸ Mating occurs most frequently in early spring. Length of gestation is unknown. In California, pups are born from early April through August sometimes September.⁹ Apparently 1 young produced per female each year. It does not hibernate but it generally goes into daily torpor from December through February, but usually resumes activity each night to feed.

The results of the acoustical survey indicate that *E. perotis* occurs at the SSFL. Given that rock outcrop (& cliffs) dominates the SSFL, the numerous significant potential roost and maternal sites, the large tracts of suitable foraging habitat, and the species life history, it is highly likely that this species occurs throughout the year, and that they roost, form maternity colonies, and winter at SSFL.

Sonographs and sonograms depicting the call sequences of these 4 species are included in Exhibit F.

IMPACT ANALYSIS

The majorities of the significant potential roost features that can be potentially used by bats and those being used by bats at the SSFL are located beyond the remediation and borrow sites. This is not surprising given the historical use of the site. That said there are potential roost sites within the remediation and borrow sites that could be affected by the proposed activities; however, given the number of significant potential roost features surrounding the remediation and borrow sites and the high number of bats observed emerging from these features during the surveys, effects on common bats are not expected to be significant. The proposed project includes soil and groundwater remediation; it does not include removal of significant rock outcrop or a substantial number of trees.

⁷ Pierson, E.D.; Rainey, W.E. 1998. Distribution, Habitat Associations, Status, and Survey Methodologies for Three Molossid Bat Species (*Eumops perotis*, *Nyctinomops femorosaccus*, *Nyctinomops macrootis*) and the Vesperilionid (*Euderma maculatum*)

⁸ Barbour, R.W. and W.H. Davis. 1969. Bats of America. University of Kentucky Press, Louisville. 285 pp.

⁹ Barbour, R. W., and W. H. Davis. 1969. Bats of America. Univ. of Kentucky Press, Lexington. 286pp.

The proposed activities are not expected to have a direct effect on species that utilize the oak woodland and riparian habitats including *L. blossevillii*. This also holds true for *A. pallidus*, *C. townsendii*, and *E. perotis*, which also occasionally uses tree hollows. *C. townsendii* will occasionally roost in basal hollows of very large trees; however, caves and cave like structures are preferred. It is highly unlikely that *C. townsendii* would utilize trees at the SSFL for roosting, the vast majority of the trees do not appear big enough and there are numerous caves nearby, which are preferred by this species. There are some caves immediately adjacent the remediation sites; however, given historical use of the remediation sites, and the species sensitivity to human disturbance, it is unlikely that they use them. Studies indicate that they have high fidelity to their roost sites.

The project has potential to affect all species indirectly through noise, vibration, and human presence; however, given the historical use of the SSFL specifically at the remediation sites, this potential impact is not expected to be significant. As stated, the majorities of the features that can be potentially used by bats at the SSFL are located beyond the soil remediation, groundwater remediation, and borrow sites. The following recommendations are aimed at avoiding impacts to significant potential roost sites and reducing potential impacts upon all bats occurring at SSFL.

RECOMMENDATIONS

- 1) A biologist familiar with bats should identify all significant potential roost sites within the limits of disturbance so that they can be avoided during the proposed activities. A 10-foot buffer should be established for each significant potential roost site or group of potential roost sites. These buffers should be clearly marked in the field with wooden stakes with signs attached to them stating that the area is an Environmentally Sensitive Habitat Area (ESHA).
- 2) It is the understanding of FBC that the location of equipment used for groundwater remediation activities (e.g., monitoring or extraction wells) can be adjusted slightly where necessary to protect sensitive biological resources. That being the case, all equipment should be located outside the ESHA buffers to the practicable extent feasible.
- 3) If remediation activities must occur within an ESHA buffer, the biologist should determine if the activity might affect significant potential roost sites. If the biologist determines that the activity will not affect significant potential roost sites, the activity can proceed. If the biologist determines that the activity may affect significant potential roost sites, they will determine if bats are present or absent. If bats are absent, the activity can proceed. If bats are present, the biologist will devise a strategy with CDFW, Boeing management, and the site supervisor, that complements the life history of the species using the feature.
- 4) If significant potential roost sites must be removed, the biologist should determine if bats are present or absent. If absent, the feature and its associated ESHA buffer can be removed. If present, the biologist should

determine if the feature is being used as a maternal roost site. Bat pups are dependent on their mothers for their immediate survival, and the time between birth and them being able to fly is called the non-volant period (generally May through July but can be as early as April and continue through August and sometimes into the beginning of September). Features that are being used as maternal roost sites will not be removed until after the biologist determines that the pups are no longer dependent on their mothers or are no longer using it. Upon this determination, removal can begin but should be completed before entering the non-volant period of the following year. If removal has not been completed before entering the following year's non-volant period, the biologist should determine if the feature has become occupied again as a maternal roost. If the feature has become a maternal roost again, similar timing constraints would then apply, possibly from April to September.

If the biologist determines that bats are not using the feature as a maternal roost site, impacts to roosting bats should be minimized through careful planning of the removal activities. The biologist should devise a strategy with CDFW, Boeing management, and the site supervisor, that complements the life history of the species using the feature. That is, the feature will be removed after the bats have vacated the roost site. Roost sites of *A. pallidus*, *L. blossevillii*, *C. townsendii*, or *E. perotis* will not be removed due to these species' special status unless specific authorization has been granted by CDFW.

OPINION

California has the fourth highest diversity of bat species in the United States, following Arizona, New Mexico, and Texas, with 25 species. Fourteen species are known to occur within Death Valley National Park, with one other species being cited as possibly present, which encompasses approximately 3,373,062 acres of land. Eleven species are known to occur at Joshua Tree National Park, with two others species being cited as possibly present, which encompasses about 789,745 acres of land.¹⁰ Eleven species are known to occur at Camp Pendleton Marine Corp Base, which encompasses more than 125,000 acres of land.¹¹ Seven species are known to occur at Griffith Park in Los Angeles County, which covers just over 4,000 acres.¹²

The SSFL consists of 2,850 acres of land and is located within the range of 18, maybe 19 species of bats. Twelve species were recorded at the SSFL between April 9 and August 8, 2014. Ten of these species are expected to occur at the SSFL throughout the year. Rock outcrop is the single most dominant feature at the SSFL and it is characterized by a plethora of potential roost, maternal, hibernation sites, and winter hibernacula including caves, crevices, cavities, overhangs, and vugs. The oak woodlands, riparian habitats, and other habitats associated with the SSFL form a mosaic that provides ample foraging habitat and travel corridors. The trees scattered throughout the site and those associated with the oak woodlands and riparian habitats also provide a plethora of potential roost, maternal, hibernation sites, and winter hibernacula. The acoustical surveys were conducted within areas to be effected by the proposed remediation activities. The amount of area

¹⁰ Drost, Charles A., and Hart, Jan, 2008, Mammal inventory of the Mojave Network parks; Death Valley and Joshua Tree National Parks, Lake Mead National Recreation Area, Manzanar National Historic Site, and Mojave National Preserve: U.S. Geological Survey Open-File Report 2008-1167, 74 p.

¹¹ Cited by Drew Stokes, March 2014 Presentation - Bat Research and Management Ideas for San Diego County Reserve Lands

¹² Remington, Stephanie & Daniel Cooper, February 2009. Bat Survey of Griffith Park, Los Angeles, California

surveyed is actually less than 10% of the entire SSFL property and the majorities of the significant potential roost features lie beyond the remediation and borrow sites. Given these facts there are likely to be additional species at the SSFL. In fact, given the habitat and the significant roost site features all 18 species with ranges that include the SSFL, likely occur at the SSFL. Based on the number of species detected at the SSFL and its relative size in comparison to the National Parks and other locations discussed above, the SSFL may very well be one of the most important locations for bats in southern California.

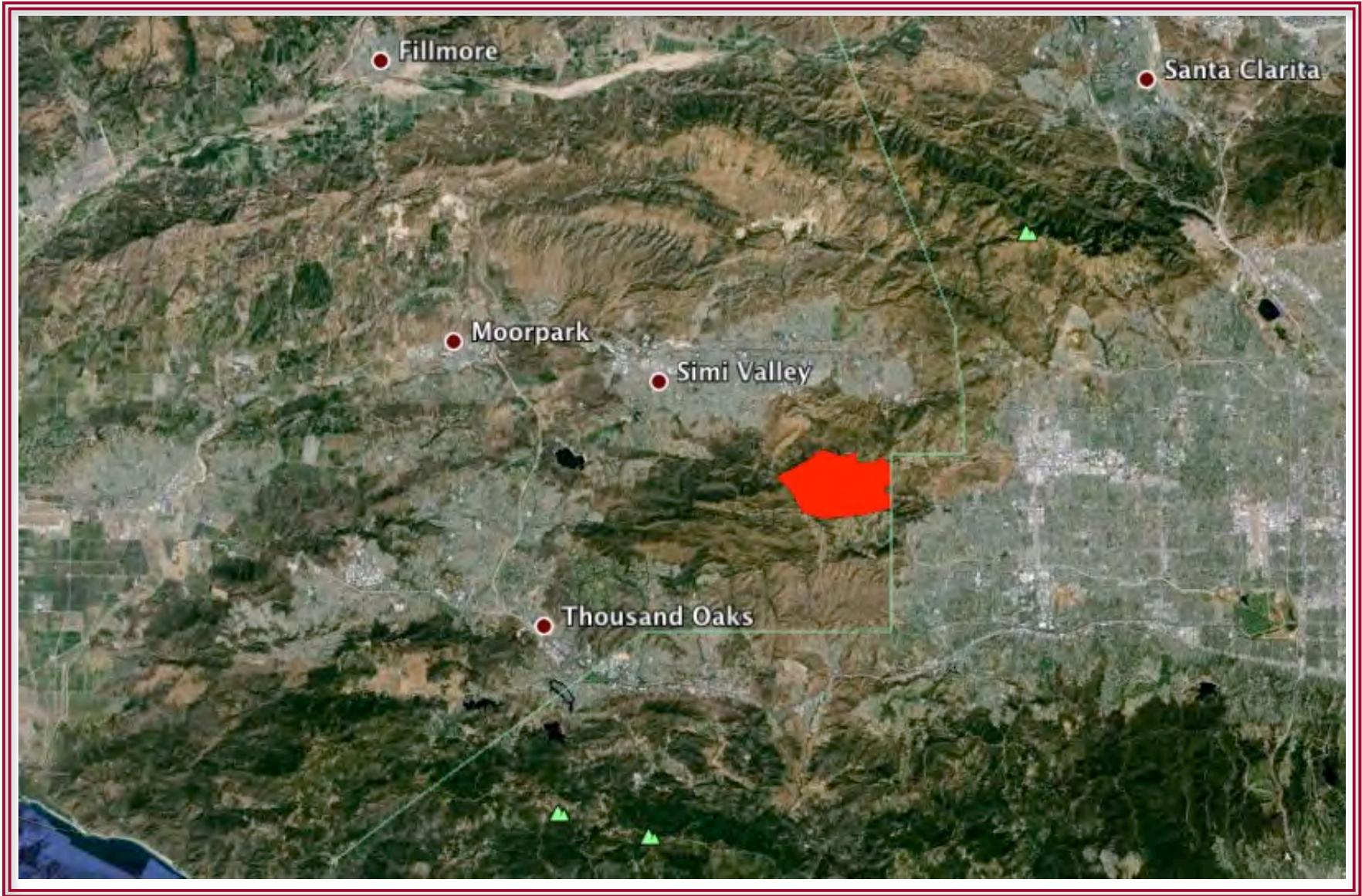


Exhibit A - Location of Santa Susana Field Laboratory

*Acoustical Bat Survey
 Santa Susana Field Laboratory
 Ventura County, California*

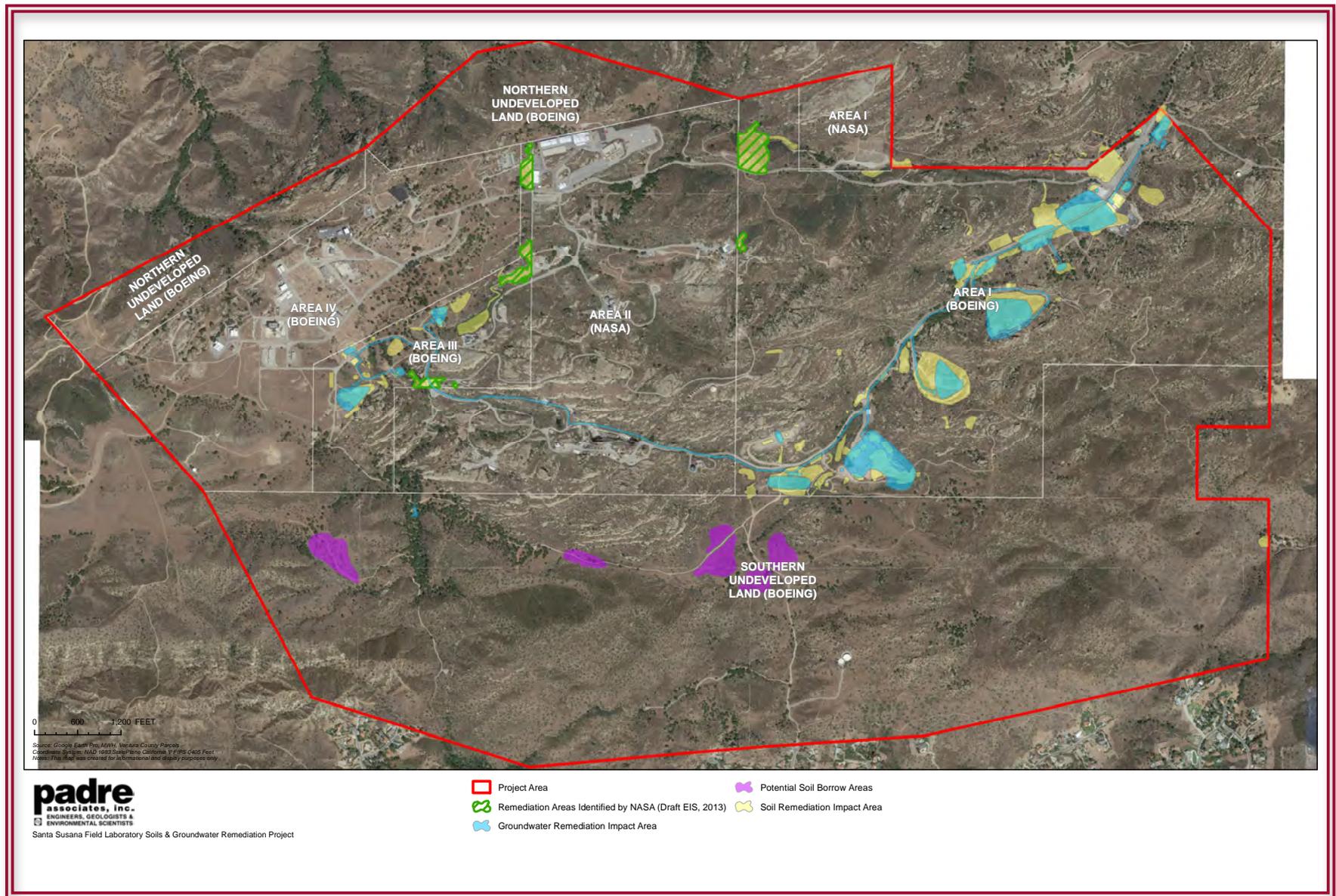


Exhibit B - Soil Remediation Areas, Groundwater Remediation Areas, and Borrow Sites

Photograph 1

Description: Caves and Crevices in Rock Outcrop in Area I. Taken from near Area I Road and Canyon Road intersection. A remediation site is located within the flat area in the foreground.



Photograph 2

Description: Caves and Crevices in Rock Outcrop in Area 1. Unpaved road east of Research Road.



Photograph 3

Description: Caves and Crevices in Rock Outcrop in Area 1. Unpaved road east of Research Road.



Photograph 4

Description: Rock Outcrop in Area I, Canyon. Taken from Canyon Road south across Canyon



Photograph 5

Description: Rock Outcrop and Oak Woodland and
Grassland in Area III



Photograph 6

Description: Rock Outcrop and Oak Woodland
Southern Undeveloped Land.



*Acoustical Bat Survey
 Santa Susana Field Laboratory
 Ventura County, California*

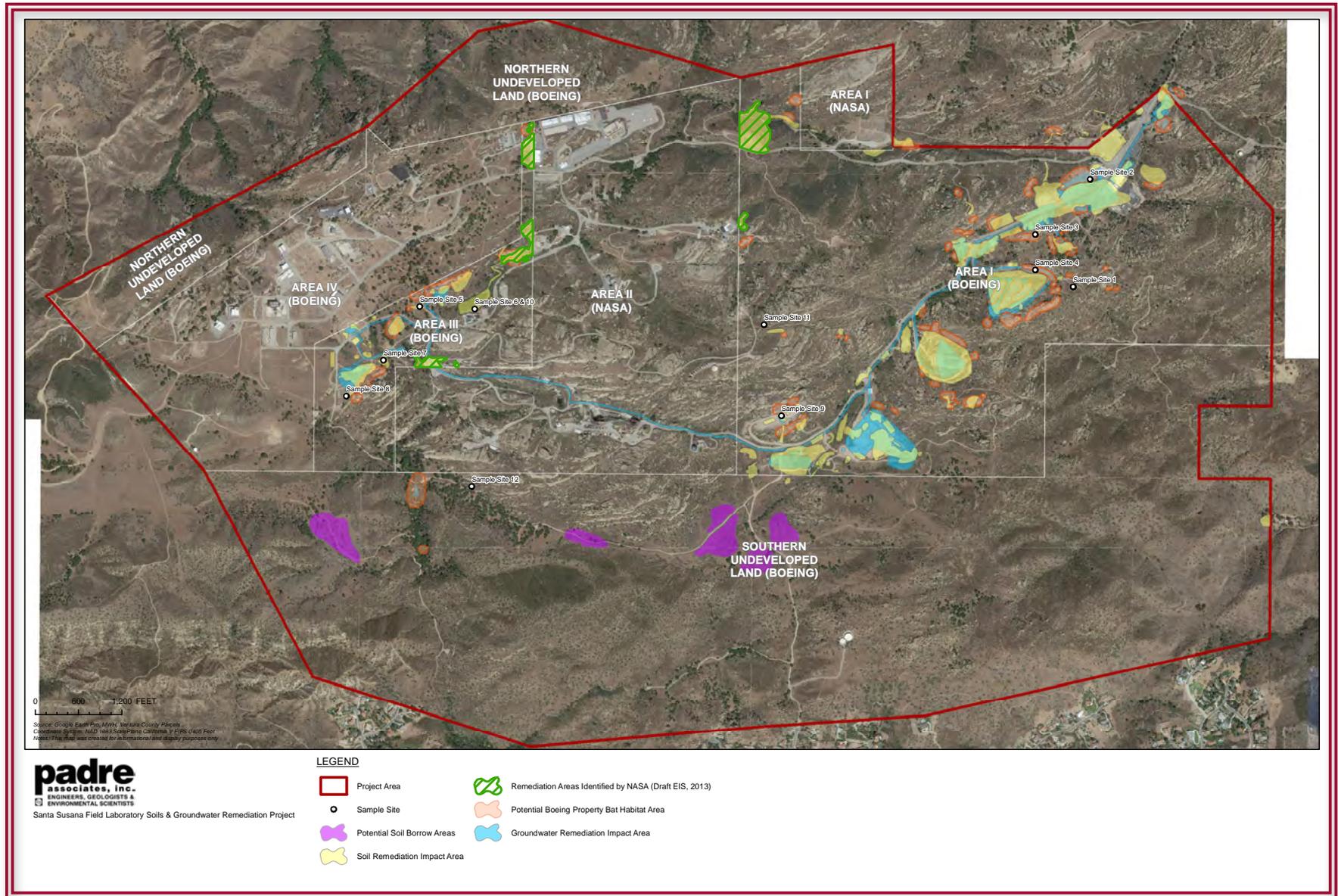


Exhibit D - Significant Potential Roost Site Features

Photograph 1

Description: Caves and Crevices in Rock Outcrop in Area 1

View: West of Sample Site 1



Photograph 2

Description: Caves and Crevices in Rock Outcrop in Area I

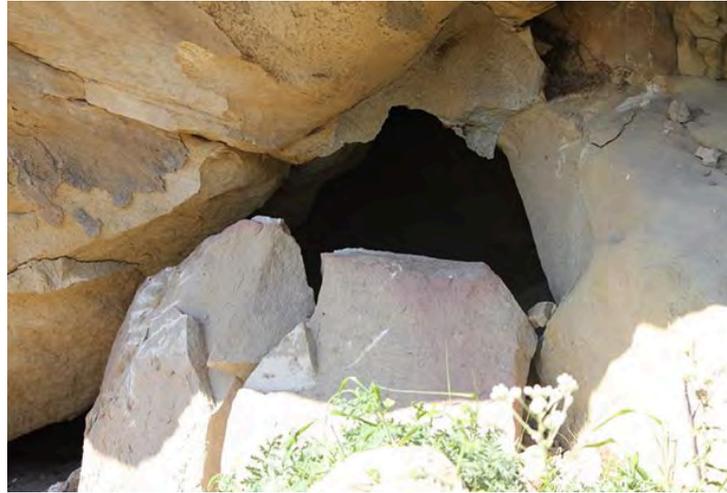
View: North of Sample Site 2



Photograph 3

Description: Cave in Rock Outcrop in Area I.

View: West of Sample Site 3



Photograph 4

Description: Cave in Rock Outcrop in Area III.

View: West of Sample Site 3

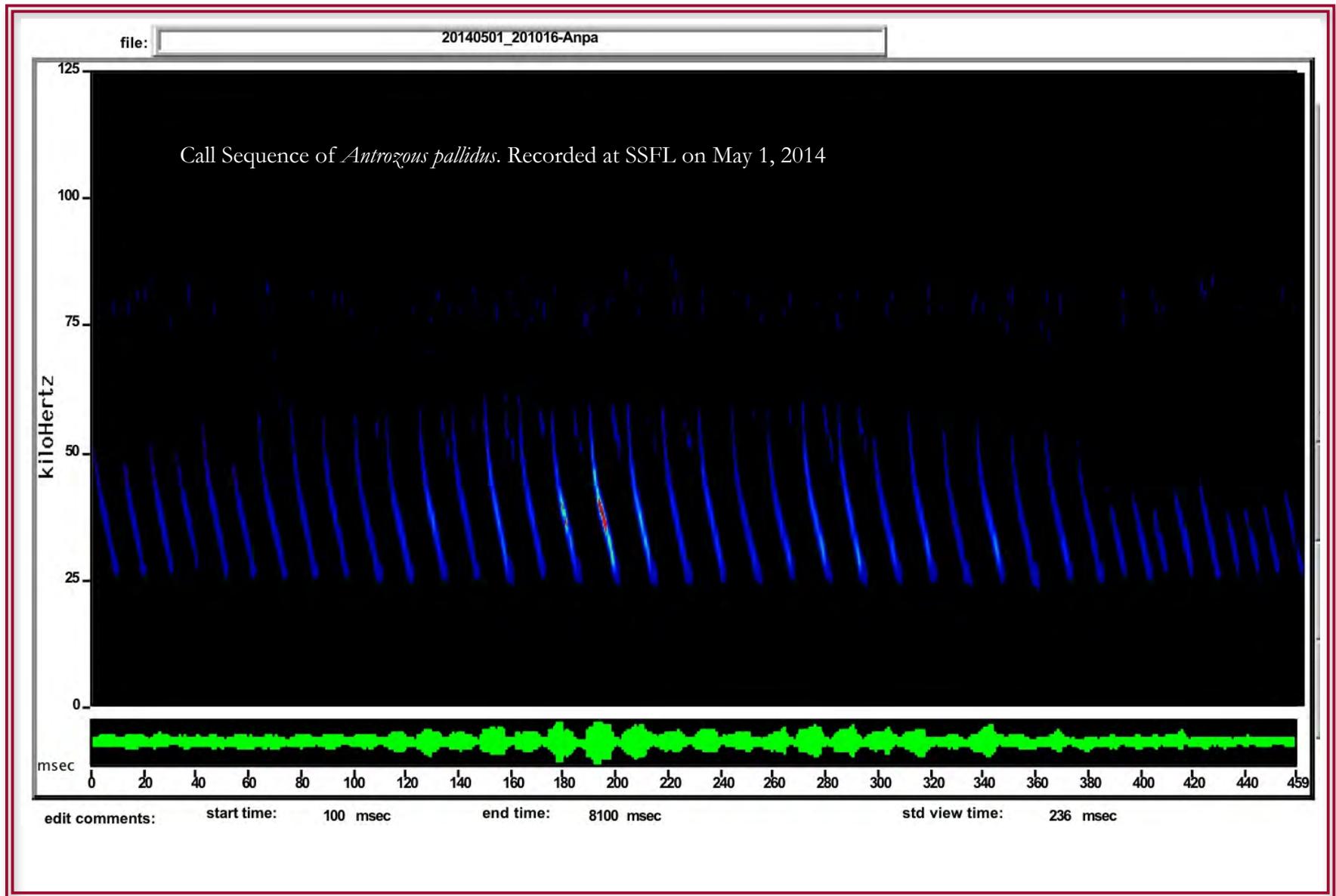


Photograph 5

Description: Caves, Crevices, Overhangs, and
Vugs in Rock Outcrop in Area III

View: West from near Sample Site 7





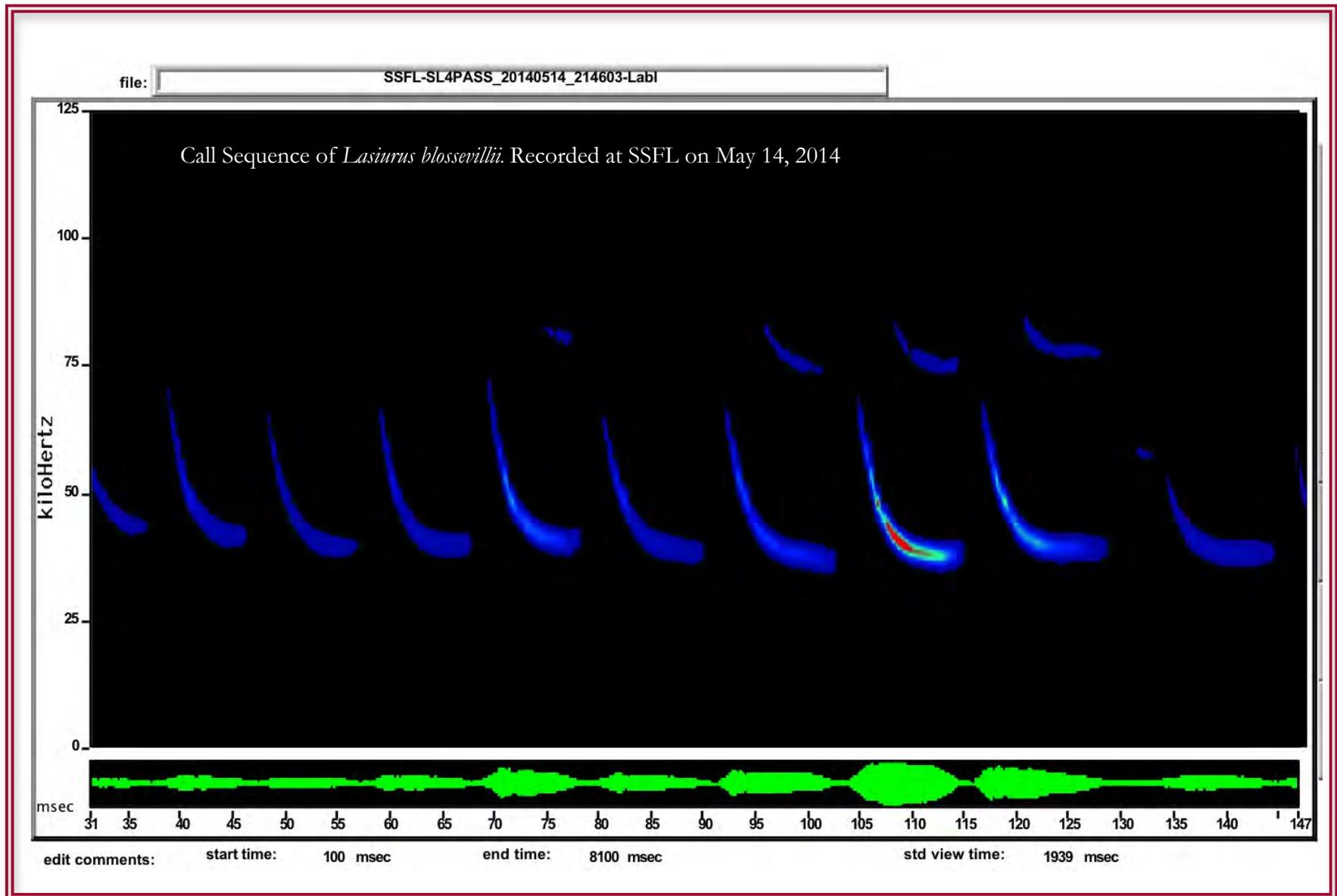


Exhibit F - Call Sequences of Special-Status Bats Occurring at SSFL

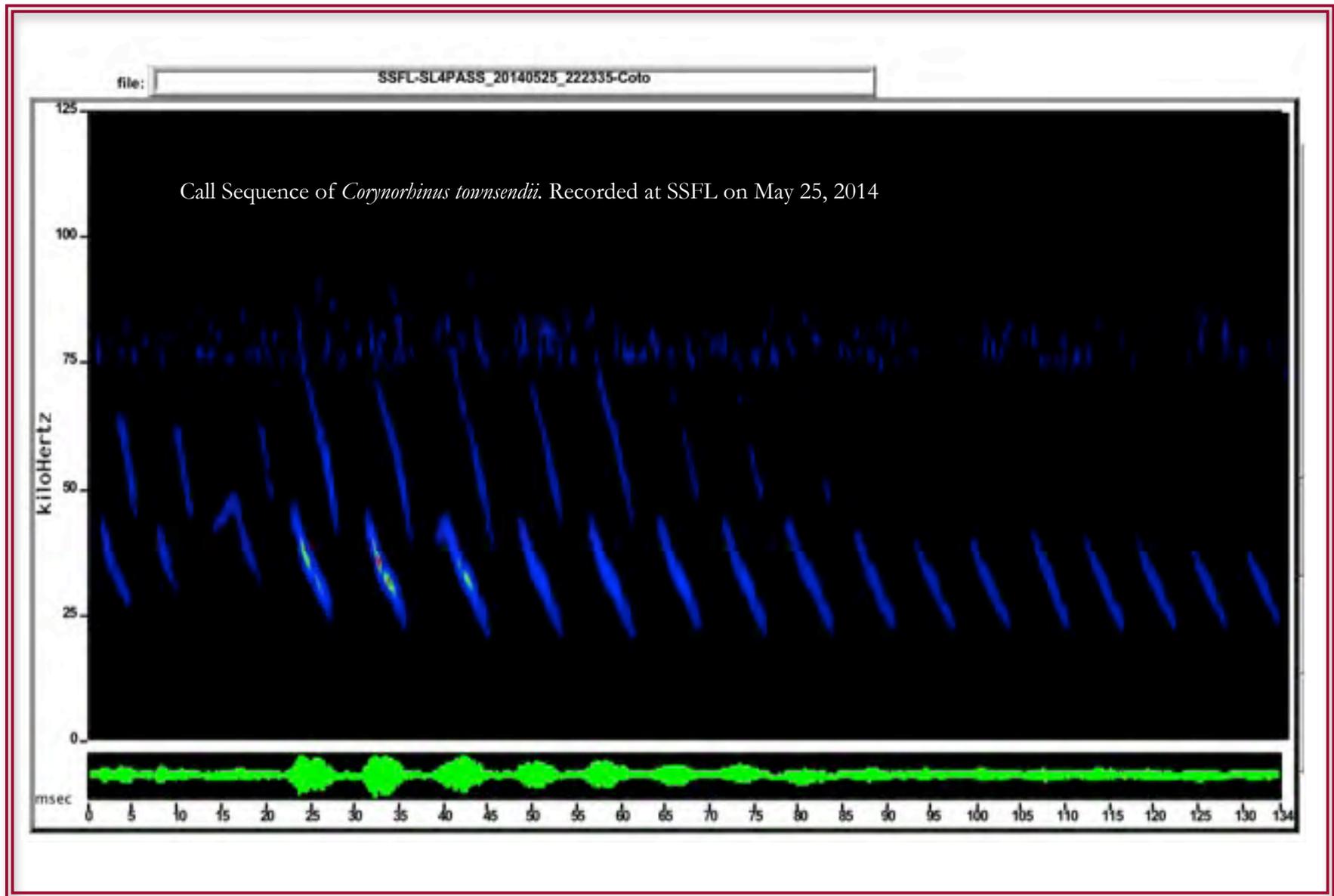


Exhibit F - Call Sequences of Special-Status Bats Occurring at SSFL

