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REPORT

Willow Rock Energy Storage Center (21-AFC-02)
CEC Data Request Set 4 Responses

Biological Resources: DR157, DR158, and DR159

Noise and Vibration: DR160, DR161, DR162, DR163, DR164, and DR165

Submitted to:

CALIFORNIA ENERGY COMMISSION

Submitted by:

GEM A-CAES LLC

Prepared with technical assistance from:

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March 29, 2023



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Acronyms and Abbreviations

| | |
|-------|--|
| AFC | Application for Certification |
| CDFW | California Department of Fish and Wildlife |
| CEC | California Energy Commission |
| CNDDB | California natural Diversity Database |
| dBA | A-weighted decibels |
| dB | Decibels |
| DR | Data Request |
| MGS | Mohave ground squirrel |
| MOU | Memorandum of understanding |
| USFWS | United States Fish and Wildlife |
| WRESC | Willow Rock Energy Storage Center |

1.0 INTRODUCTION

GEM A-CAES LLC's (the "Applicant") is responding to the California Energy Commission (CEC) Staff Data Requests Set 4, numbers:

Biological Resources: DR157, DR158, and DR159

Noise and Vibration: DR160, DR161, DR162, DR163, DR164, and DR165

The responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as presented by CEC Staff and are keyed to the Data Request (DR) numbers (DR#). New or revised graphics, tables, or attachments are provided as attachments and are numbered in reference to the Data Request number. For a hypothetical example, the first attachment used in response to Data Request DR10 would be numbered Attachment DR10-1. Each page in this response document is sequentially page-numbered consistently with the remainder of the document, although some attachments may also have their own internal page numbering system.

2.0 BIOLOGICAL RESOURCES

2.1 Mohave Ground Squirrel (DR157, 158, and 159)

2.1.1 Data Request DR157

DR157: Please conduct MGS protocol surveys following the CDFG 2003, 2010 Mohave Ground Squirrel Survey Guidelines, in the areas identified as suitable habitat (per the MGS Habitat Assessment TN 248931) for MGS and provide the results of the surveys. (DR44)

Response: Mohave Ground Squirrel (MGS) protocol surveys are expected to commence on or about April 1, 2023. We anticipate completing the surveys no later than July 15, 2023 and will be providing results to California Department of Fish and Wildlife (CDFW) and the California Energy Commission (CEC) within approximately 45 days of completion of the field work.

2.1.2 Data Request DR158

DR158: If surveys will be conducted, please provide CDFW and CEC with a hybrid (camera/live trapping) survey methodology for review and approval prior to conducting surveys for concurrence of survey methods. (DR 45)

Response: Protocol surveys will include a hybrid (camera/live trapping) survey methodology as discussed with CDFW. A draft protocol was submitted to CDFW on March 17, 2023, for review and comment. A protocol incorporating any CDFW comments will be provided to CDFW and CEC staff.

2.1.3 Data Request DR159

DR159: Please provide valid MGS handling authorization from CDFW for any surveyor retained by the applicant to perform surveys.

Response: The most current authorizations available for designated MGS handlers are included in Attachment DR159-1 and were submitted to CDFW. An email documenting CDFW approval of these authorizations will be sent to the CEC upon receiving it. Like many biologists in the state of California, applications for renewal of all

valid authorizations for MGS handling were submitted prior to permit expiration. The Scientific Collection Permit and Memorandum of Understanding (MOU) Renewal have not been released by CDFW. The last renewal update that was posted, identified the permit process would be completed by the summer of 2023. Each collection permit and MOU includes standard language administratively extending the authorization provided the permit holder has submitted a valid renewal request. Therefore, the permit holders are authorized to handle MGS during the pendency of the renewal process.

3.0 NOISE

3.1 Noise and Vibration (DR160, 161, 162, 163, 164, and 165)

3.1.1 Data Request DR160

DR160: Please describe what the expected vibration level would be on the surface of the shaft and its dB level. Please provide all decibel level values in dBA.

Response: At the opening of the shaft the audible decibel level from the detonation of explosives at the bottom of the shaft is estimated to be 78 dBA at ground level. At the opening of the shaft the air-overpressure is estimated to be 124 linear decibels (dBL). These estimates are expected to be conservative and are based on the assumptions outlined in Attachment 2-1 Controlled Detonation of Explosive Information Summary (TN 247494). As noted in forementioned summary:

“During this 2-year period, twice-daily (at most) underground controlled detonation of explosives of a few second durations each would occur at the beginning of each shift as described below. Controlled detonation is NOT continuous throughout the day”.

Note: dBA is not a measure of vibration, but a measure of audible sound (noise), air-overpressure is a measure of vibration through the atmosphere from overall (linear) sound pressure levels.

3.1.2 Data Request DR161

DR161: Please explain what the vibration level is expected to be at an approximate distance of 3 feet below ground at the fence line on all sides of the project site.

Response: Vibration traveling through the ground will be less than 1.00 in/sec at the closest fence line locations and in the range of 0.10 in/sec at the furthest fence line locations. Supporting detonation vibration estimates are provided in Attachment DR161-1.

3.1.3 Data Request DR162

DR162: Please define the threshold value used to determine whether a significant impact has occurred to special-status wildlife species.

Response: The standard threshold for noise impacts to wildlife/biological resources is 60 dBA averaged over a one-hour period. As an example, any noise level that occurs above 60 dBA for an entire hour would be considered significant. If a 60 dBA noise only occurs for 30-minutes, it is not considered significant because the average noise level over an hour period of time would be less than 60 dBA. A noise level at 120 dBA sustained for 30 minutes would be considered significant when averaged over the one-hour time period. Typically, there are some common wildlife species that may be affected by different noise levels, but this noise level has been

consistently utilized in analysing noise impacts to threatened and endangered bird species, specifically during the nesting season. As noted in Attachment 2-1 Controlled Detonation of Explosive Information Summary (TN 247494) the average duration of a detonation event is on the order of a few seconds, and these events are expected to occur up to twice daily. Given the very short duration of the expected sound impact levels, no significant impact is expected to occur to wildlife.

3.1.4 Data Request DR163

DR163: Please provide the decibel value for 20 mile per hour wind.

Response: The referenced pressure of 20 miles per hour wind was presented in Attachment 2-1 Controlled Detonation of Explosive Information Summary (TN 247494) to compare to the air-overpressure of 120 dBL. The comparison was to illustrate the pressure created from a sound wave at 120 dBL and is not a reference to audible wind driven noise.

3.1.5 Data Request DR164

DR164: Please explain what the expected noise attenuation level of the 2,000-foot shaft would be at the ground surface of the shaft and at the fence line on all sides of the project.

Response: According to the inverse square law, it can be shown that for each doubling of distance from a point source, the sound pressure level decreases by approximately 6 dB(A). For a shaft, it can be assumed that the attenuation would doubly decrease (decrease by approximately 12 dB(A) per doubling of distance). For this study, the attenuation affects from the shaft were not considered in order to be conservative.

Based on the inverse square law, the following Table illustrates the estimated noise and air-overpressure levels for the Project:

| Location | Distance from Detonation (Feet) | Sound Level (dBA) | Air-overpressure (dBL) |
|--------------------|---------------------------------|-------------------|------------------------|
| Shaft Entrance | 2,000 | 78 | 124 |
| Closest Residence | 3,300 | 74 | 120 |
| Fence line – East | 2,500 | 76 | 122 |
| Fence line – South | 2,520 | 76 | 122 |
| Fence line – North | 2,760 | 75 | 122 |
| Fence line - West | 3,500 | 73 | 120 |

Note: based on assumptions in Attachment 2-1 Controlled Detonation of Explosive Information Summary (TN 247494)

3.1.6 Data Request DR165

DR165: Please explain which receptor is the closest above ground receptor and what it is closest to. Is it closest to the loudest expected construction noise or closest to the boundary of the project site?

Response: The closest receptor to the shaft is the residence located east of the Project site along Hamilton Road and can be found at the below UTM coordinates:

Zone: 11N
Easting: 382944.78 m
Northing: 3861811.35 m

It is not the closest receptor to construction or operations, but closest to the expected location of the shaft and therefore closest and most likely impacted receptor.

Attachment DR159-1 MGS Handling Authorizations



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EDUCATION

- CALIFORNIA POLYTECHNIC STATE UNIVERSITY, SAN LUIS OBISPO 2005–09
 - ❖ Bachelor of Science – Animal Science

AUTHORIZATIONS & PERMITS

- CDFW LEVEL II BLUNT-NOSED LEOPARD LIZARD (*GAMBELIA SILA*) PROTOCOL SURVEYOR
- CDFW RARE, THREATENED, AND ENDANGERED PLANT VOUCHER COLLECTING PERMIT 2081(A)-14-077-V
- USFWS AUTHORIZED COACHELLA VALLEY FRINGE-TOED LIZARD (*UMA INORNATA*) BIOLOGIST
- USFWS ENDANGERED SPECIES ACT 10(A)(1)(A) RECOVERY PERMIT TE-95006A
 - California Tiger Salamander (*Ambystoma californiense*) California Red-legged Frog (*Rana draytonii*)
 - San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*) Stephens' Kangaroo Rat (*Dipodomys stephensi*)
 - Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*) Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)
 - Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*) Giant Kangaroo Rat (*Dipodomys ingens*)
 - Delhi Sands Flower-loving Fly (*Rhaphiomidas terminatus abdominalis*) Quino Checkerspot Butterfly (*Euphydryas editha quino*)
- CDFW SCIENTIFIC COLLECTING PERMIT SC-012551/MEMORANDUM OF UNDERSTANDING/LETTER OF CONCURRENCE
 - Flat-tailed Horned Lizard (*Phrynosoma mcallii*)
 - Mohave Ground Squirrel (*Xerospermophilus mohavensis*) Palm Springs Pocket Mouse (*Perognathus longimembris bangsi*)
 - Los Angeles Pocket Mouse (*Perognathus longimembris brevinasus*) Salinas Pocket Mouse (*Perognathus inornatus psammophilus*)
 - Jacumba Pocket Mouse (*Perognathus longimembris internationalis*) Tehachapi Pocket Mouse (*Perognathus alticolus inexpectatus*)
 - White-eared Pocket Mouse (*Perognathus alticolus alticolus*) Dulzura Pocket Mouse (*Chaetodipus californicus femoralis*)
 - Northwestern San Diego Pocket Mouse (*Chaetodipus fallax fallax*) Pallid San Diego Pocket Mouse (*Chaetodipus fallax pallidus*)
 - Short-nosed Kangaroo Rat (*Dipodomys nitratoides brevinasus*) Big-eared Kangaroo Rat (*Dipodomys venustus elephantinus*)
 - Marysville California Kangaroo Rat (*Dipodomys californicus eximius*) Tulare Grasshopper Mouse (*Onychomys torridus tularensis*)
 - Southern Grasshopper Mouse (*Onychomys torridus ramona*) Yuma Hispid Cotton Rat (*Sigmodon hispidus plenus*)
 - Colorado River Cotton Rat (*Sigmodon arizonae eremicus*) San Diego Desert Woodrat (*Neotoma bryanti intermedia*)
 - Monterey Dusky-footed Woodrat (*Neotoma macrotis luciana*)
- CERTIFIED INSPECTOR OF SEDIMENT AND EROSION CONTROL (CISEC) #1621
- QUALIFIED SWPPP PRACTITIONER (QSP) #25523

PROFESSIONAL EXPERIENCE

- SoCALGAS ETS 42984 L7200 MP 1.77 RECOAT AND ANODE INSTALL (Bakersfield, CA) 2020
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat in support of anode installation activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- SoCALGAS ETS 35517 AIRPORT AND GAS COMPANY ROAD INSTALL 6" MAIN (Taft, CA) 2020
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat in support of new pipeline installation. Set and baited Sherman Live Traps and extracted and processed individuals.
- PIPELINE SAFETY ENHANCEMENT PLAN SL36-9-09-P1B-SECTION 15 (San Luis Obispo, CA) 2020
 - ❖ Monitored construction activities for biological resources, specifically California Red-legged Frog, in support of pipeline maintenance activities to pressure test pipes, and upgrade, replace or retrofit mainline valves.
- CONTROL-SILVER PEAK TRANSMISSION LINE RATING REMEDIATION PROJECT (Bishop, CA) 2020
 - ❖ Completed weekly SWPPP inspections of construction in support of remediating the existing transmission line. Coordinated variance and environmental requests on behalf of construction to Southern California Edison.
- SoCALGAS MORENO COMPRESSOR STATION UPGRADE (Moreno Valley, CA) 2018-20
 - ❖ Completed habitat assessment for sensitive species. Protocol presence/absence trapping for Stephens' Kangaroo Rat in support of compressor station upgrade activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- SOUTHERN CALIFORNIA EDISON: TD1682748 DEATH VALLEY NATIONAL PARK (Death Valley National Park, CA) 2020
 - ❖ Completed pre-construction survey for biological resources, specifically Desert Tortoise, and nesting bird survey in support of slab box replacement.
- SOUTHERN CALIFORNIA EDISON: TD1549395 DISTRICT 77 (Perris, CA) 2020
 - ❖ Completed pre-construction survey for biological resources, specifically Stephens' kangaroo rats, and nesting bird survey in support of pole replacement for multiple deteriorated poles.
- SOUTHERN CALIFORNIA EDISON: TD1204978/TD1527177/TD1587143 DISTRICT 34 (Chino, CA) 2020

- ❖ Completed pre-construction survey for biological resources, specifically Burrowing owls, and nesting bird survey in support of pole replacement for multiple deteriorated poles.
- **STATE ROUTE 210 MIXED FLOW LANE ADDITION PROJECT (San Bernardino, CA)** **2020**
 - ❖ Completed nocturnal trapping and relocation for San Bernardino Kangaroo Rats in support of widening of the existing segment of State Route 210. Set and baited Sherman Live Traps, and processed individuals.
- **SOUTHERN CALIFORNIA EDISON: TD1359407 DISTRICT 73 (Lucerne Valley, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources, specifically Desert Tortoise, and nesting bird survey in support of pole replacement for a deteriorated pole.
- **SOUTHERN CALIFORNIA EDISON: TD1652119 DISTRICT 31 (Oak Glen, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources and nesting bird survey in support of pole replacement for a deteriorated pole.
- **SOUTHERN CALIFORNIA EDISON: TD1550352 DISTRICT 31 (Redlands, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources and nesting bird survey in support of pole replacement for multiple deteriorated poles.
- **SOUTHERN CALIFORNIA EDISON: TD1625798 DISTRICT 79 (Cathedral City, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources and nesting bird survey in support of operations and maintenance activities for an underground vault.
- **SOUTHERN CALIFORNIA EDISON: TD1621107 SBNF (Forest Falls, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources, specifically Southern Rubber boa and bats, support of pole replacement for a deteriorated pole.
- **SOUTHERN CALIFORNIA EDISON: TD1470217 SBNF (Crestline, CA)** **2020**
 - ❖ Completed pre-construction survey for biological resources, specifically Andrew's Flying Marble Butterfly, San Bernardino Flying Squirrel, Southern Rubber boa, support of pole replacement for a deteriorated pole.
- **SOUTHERN CALIFORNIA EDISON: SAP801678206 SBKR HABITAT ASSESSMENT (San Bernardino, CA)** **2020**
 - ❖ Completed habitat assessment for biological resources, specifically San Bernardino Kangaroo Rat, in support of transmission line rating remediation on the Arrowhead-DVLS Canyon 115 kV.
- **PRESIDENTIAL SUBSTATION PROJECT (Ventura County, CA)** **2019–20**
 - ❖ Completed nesting bird surveys and monitored construction activities for biological resources, specifically Coastal California Gnatcatcher, in support of constructing a new substation and subtransmission line.
- **SOUTHERN CALIFORNIA EDISON: TD1492344/TD1492348 DISTRICT 31 (Muscoy, CA)** **2020**
 - ❖ Monitored construction activities for biological resources, specifically San Bernardino Kangaroo Rat and Arroyo Toad, in support of pole replacement for a deteriorated pole.
- **SoCALGAS ETS 39961 SL 36-9-10 BRUSH CLEARING (Morro Strand, CA)** **2019**
 - ❖ Monitored construction activities for biological resources, specifically California Red-legged Frog, Morro Shoulderband Snail, Tidewater Goby, in support of brush clearing to facility access to the pipeline for leak detection surveys.
- **SoCALGAS ETS 43686.01 L2000 ROW GRADING (Moreno Valley, CA)** **2019**
 - ❖ Completed a habitat assessment and pre-construction survey for biological resources, specially Stephens' Kangaroo, Burrowing Owl, in support of ROW grading and brush clearing activities.
- **DEVERS-COLORADO RIVER SUBSTATION NO. 1 500 KV TRANSMISSION LINE RATING REMEDIATION PROJECT (Riverside County, CA)** **2018–19**
 - ❖ Executed pre-construction surveys for Coachella Valley Fringe-toed Lizard, Coachella Valley Milk-vetch and Desert Tortoise. Monitored construction activities for biological resources in support of remediating the existing transmission line.
- **SOUTHERN CALIFORNIA EDISON: TD1148919 DISTRICT 79 (Desert Hot Springs, CA)** **2019**
 - ❖ Completed pre-construction survey for biological resources, specifically Triple-ribbed Milk-vetch, Desert Tortoise, Le Conte's Thrasher, Desert Bighorn Sheep, Palm Springs Pocket Mouse, in support of pole replacement activities for a deteriorated pole.
- **BAILEY-PASTORIA 220KV TRANSMISSION LINE RATING REMEDIATION PROJECT (Kern County, CA)** **2019**
 - ❖ Completed pre-construction survey for biological resources, specifically Tehachapi Pocket Mouse, Tehachapi Slender Salamander, California Condor, Blunt-nosed Leopard Lizard, in support of remediating the existing transmission line.
- **BAILEY-PARDEE 220KV TRANSMISSION LINE RATING REMEDIATION PROJECT (Angeles National Forest, CA)** **2019**
 - ❖ Completed pre-construction survey for biological resources, specifically Tehachapi Pocket Mouse, Tehachapi Slender Salamander, California Condor, in support of remediating the existing transmission line.
- **SOUTHERN CALIFORNIA EDISON: TD1493522/TD1496827 (Lytle Creek, CA)** **2019**
 - ❖ Protocol presence/absence trapping surveys for San Bernardino Kangaroo Rat in support of distribution pole maintenance and operation activities. Set and baited Sherman Live Traps, and processed individuals.
- **FALCON RIDGE CONSTRUCTION YARD PROJECT (Fontana, CA)** **2019**
 - ❖ Completed nesting bird surveys and pre-construction surveys for Burrowing Owls in support of upgrading an existing construction yard. Documented all sensitive biological resources encountered.
- **NASA JET PROPULSION LABORATORY GOLDSTONE SUBSTATION (Fort Irwin, CA)** **2019**
 - ❖ Completed nesting bird surveys and pre-construction surveys for Mohave Ground Squirrel and Desert Tortoise in support of upgrading an existing substation. Documented all biological resources encountered.
- **SOUTHERN CALIFORNIA EDISON: TD1478302 DISTRICT 73 (Wrightwood, CA)** **2019**
 - ❖ Completed pre-construction and nesting bird survey in support of pole replacement activities for a deteriorated pole. Documented all biological resources encountered.
- **SOUTHERN CALIFORNIA EDISON: TD1474237 DISTRICT 73 (Pinon Hills, CA)** **2019**

- ❖ Completed pre-construction and nesting bird survey in support of pole replacement activities for a deteriorated pole. Documented all biological resources encountered.
- **SOUTHERN CALIFORNIA EDISON: TD1301472 DISTRICT 31 (San Jacinto Wildlife Refuge, CA)** **2019**
 - ❖ Completed pre-construction surveys and monitored pole replacement activities for sensitive species, including Stephens' Kangaroo Rat, Northwestern San Diego Pocket Mouse, Coastal Horned Lizard, and Parry's Spineflower.
- **SOUTHERN CALIFORNIA EDISON: TD902683386 DISTRICT 88 (Lake Matthews, CA)** **2019**
 - ❖ Completed pre-construction surveys and monitored vegetation clearing and road grading activities for sensitive species, including Stephens' Kangaroo Rat, in support of distribution pole maintenance and operation activities.
- **CALIFORNIA DEPARTMENT OF WATER RESOURCES SJFD SUBSIDENCE INSTRUMENTATION (San Joaquin Valley, CA)** **2019**
 - ❖ Protocol presence/absence surveys for Tipton Kangaroo Rat, San Joaquin Kit Fox, Blunt-nosed Leopard, San Joaquin Antelope Squirrel in support of subsidence instrumentation activities on the California Aqueduct.
- **PIPELINE SAFETY ENHANCEMENT PLAN L1010 VALVE AUTOMATION MLV 2, 1010-3.61-0 (Gaviota, CA)** **2019**
 - ❖ Monitored construction activities for biological resources, specifically California Red-legged Frog, in support of pipeline maintenance activities to pressure test pipes, and upgrade, replace or retrofit mainline valves.
- **WESTERN AREA POWER ADMINISTRATION PATH 15 OPERATIONS & MAINTENANCE (Fresno County, CA)** **2017-19**
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat in support of transmission tower operation and maintenance activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS L1005 EMERGENCY REPAIR (Montecito, CA)** **2019**
 - ❖ Monitored construction activities for biological resources, specifically California Red-legged Frog, in support of emergency pipeline repairs in Hot Springs Creek. Documented and evaluated SWPPP conditions.
- **PANAMA LANE GROUNDWATER RECHARGE PROJECT (Bakersfield, CA)** **2019**
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat in support of water recharge basin construction. Set and baited Sherman Live Traps, and processed individuals.
- **EVALUATION OF MOHAVE GROUND SQUIRREL POPULATIONS AND THEIR VIABILITY (Mojave Desert, CA)** **2014-19**
 - ❖ Diurnal focused-trapping for the Mohave Ground Squirrel to determine status of the population and presence of hybridization with Round-tailed Ground Squirrel (*Xerospermophilus tereticaudus*). Set Sherman Live Traps and extracted and processed the individuals.
- **SANITATION DISTRICTS OF LOS ANGELES COUNTY: LANCASTER FARM (Lancaster, CA)** **2019**
 - ❖ Protocol presence/absence trapping for Mohave Ground Squirrel in support of Sanitation Districts of Los Angeles County. Set Sherman Live Traps and extracted and processed the individuals.
- **SOUTHERN CALIFORNIA EDISON: TD1406935 DISTRICT 79 (Whitewater, CA)** **2019**
 - ❖ Completed pre-construction surveys for sensitive species, including Coachella Valley Milk-vetch, on deteriorated pole scheduled for replacement, prior to construction activities.
- **SOUTHERN CALIFORNIA EDISON: TD1406772 DISTRICT 79 (North Palm Springs, CA)** **2019**
 - ❖ Completed pre-construction surveys for sensitive species, including Coachella Valley Fringe-toed Lizard and Coachella Valley Milk-vetch, on multiple deteriorated poles scheduled for replacement.
- **SOUTHERN CALIFORNIA EDISON: TD1194425 MISSION SPRINGS WATER DISTRICT (North Palm Springs, CA)** **2018**
 - ❖ Completed pre-construction surveys for sensitive species, including Coachella Valley Fringe-toed Lizard and Burrowing Owl, to interconnect a 992-kilowatt solar generation facility to the grid.
- **SOUTHERN CALIFORNIA EDISON: TD1410054 DISTRICT 79 (Cathedral City, CA)** **2018**
 - ❖ Completed pre-construction surveys for sensitive species, including Coachella Valley Fringe-toed Lizard and Coachella Valley Milk-vetch, on multiple deteriorated poles scheduled for replacement.
- **SOUTHERN CALIFORNIA EDISON: TD1406917 DISTRICT 79 (NORTH Palm Springs, CA)** **2018**
 - ❖ Completed pre-construction surveys for sensitive species, including Coachella Valley Fringe-toed Lizard and Burrowing Owl, on multiple deteriorated poles scheduled for replacement.
- **WEST OF DEVERS UPGRADE PROJECT (Inland Empire, CA)** **2014-18**
 - ❖ Completed species habitat assessments and monitored construction activities for sensitive species, including the Coachella Valley Fringe-toed Lizard, Stephens' Kangaroo Rat and Los Angeles Pocket Mouse, in support of transmission line construction.
- **SoCALGAS L85 PIPELINE EXPOSURES AND SPAN END EROSION MITIGATION 0.00 TO 2.00 (Avenal, CA)** **2018**
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat in support of pipeline and right-of-way maintenance activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS L103 MP 0.52 RELOCATE PIPE SPAN ON BRIDGE (Tupman, CA)** **2018**
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat and Giant Kangaroo Rat in support of pipeline relocation activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **NORTH OF MAGUNDEN REDUNDANT BCT UPGRADE (San Joaquin Valley, CA)** **2017-18**
 - ❖ Monitored construction activities for biological resources, specifically San Joaquin Kit Fox, Blunt-nosed Leopard Lizard and nesting birds, in support transmission tower upgrades and construction and reconductoring activities.
- **CALTRANS UPPER SR-111 BRIDGE REPAIR #08-OQ8904 (Snow Creek, CA)** **2018**
 - ❖ Monitored construction activities for Coachella Valley Fringe-toed Lizards in support of bridge rehabilitation activities. Captured and relocated individuals outside of the project area and out of harm's way.
- **PIPELINE SAFETY ENHANCEMENT PLAN SUPPLY LINE 103 DE-RATE (Valley Acres, CA)** **2018**
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat in support of pipeline maintenance activities to pressure test pipes, and upgrade, replace or retrofit mainline valves. Set and baited Sherman Live Traps and extracted and processed individuals.
- **PIPELINE SAFETY ENHANCEMENT PLAN SUPPLY LINE 38-960-PHASE 1B (Wheeler Ridge, CA)** **2018**

- ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat in support of pipeline maintenance activities to pressure test pipes, and upgrade, replace or retrofit mainline valves. Set and baited Sherman Live Traps and extracted and processed individuals.
- **BLACKWELLS CORNER MITIGATION BANK (Blackwells Corner, CA)** **2017–18**
 - ❖ Completed surveys and protocol trapping for special-status species, including Giant Kangaroo Rat, San Joaquin Antelope Squirrel, San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, and Burrowing Owl, in support of the creation of a proposed mitigation bank.
- **PANOCH VALLEY SOLAR PROJECT (Panoche Valley, CA)** **2015–18**
 - ❖ Executed pre-construction surveys, relocations, excavations, telemetry, and monitoring for Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Fairy Shrimp, San Joaquin Kit Fox, Nelson’s Antelope Squirrel, California Tiger Salamander, and Burrowing Owl.
- **STOCKDALE EAST GROUNDWATER RECHARGE PROJECT – ROSEDALE – RIO BRAVO WATER STORAGE DISTRICT (Bakersfield, CA)** **2018**
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat in support of water recharge basin construction. Set and baited Sherman Live Traps, and processed individuals.
- **SDG&E CLEVELAND NATIONAL FOREST POWER LINE REPLACEMENT PROJECT, TRANSMISSION LINE 682 (Lake Henshaw, CA)** **2017**
 - ❖ Completed pre-construction survey and biological monitoring for Stephens’ Kangaroo Rat in support of transmission line activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **CALIFORNIA HIGH-SPEED RAIL, CONSTRUCTION PACKAGES 2-3 (San Joaquin Valley, CA)** **2015–17**
 - ❖ Executed pre-construction and protocol surveys, and monitoring for Blunt-nosed Leopard Lizard, Fairy Shrimp, Swainson’s Hawk, Tipton Kangaroo Rat, Fresno Kangaroo Rat, San Joaquin Kit Fox, Nelson’s Antelope Squirrel, and Buena Vista Lake Ornate Shrew.
- **CALIFORNIA HIGH-SPEED RAIL, CONSTRUCTION PACKAGE 1 (San Joaquin Valley, CA)** **2016–17**
 - ❖ Executed pre-construction surveys, excavations and compliance monitoring for Fairy Shrimp, Swainson’s Hawk, San Joaquin Kit Fox, Valley Elderberry Longhorn Beetle, Chinook Salmon, Hairy Orcutt Grass, and California Tiger Salamander.
- **AQUEOUS FILM FORMING FOAM SAMPLING PROJECT (Travis Air Force Base, CA)** **2017**
 - ❖ Completed pre-construction survey for biological resources, specifically California Tiger Salamander, Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp, in support of sampling activities. Identified work location and access routes to avoid sensitive resources.
- **SoCALGAS WHITEWATER STATION UPGRADE (Palm Springs, CA)** **2017**
 - ❖ Completed habitat assessment and biological survey for the Coachella Valley Fringe-toed Lizard, Flat-tailed Horned Lizard and other special status species in support of upgrading a gas valve station.
- **SoCALGAS LINE 85 ROW GRADING (Taft, CA)** **2017**
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat and Giant Kangaroo Rat in support of pipeline operation and maintenance activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS TAFT HIGHWAY AND GARDNER FIELD ROAD PIPELINE INSTALLATION (Taft, CA)** **2017**
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat in support of pipeline operation and maintenance activities. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS LINE 7200, NEW 500 FT CATHODIC PROTECTION DEEP WELL ANODE (Bakersfield, CA)** **2016–17**
 - ❖ Protocol presence/absence trapping and monitoring for Tipton Kangaroo Rat in support of pipeline operations and maintenance activities to install new 500 ft cathodic protection deep well anode. Set and baited Sherman Live Traps, and processed individuals.
- **KERN RIVER BIKE PATH (Kern County, CA)** **2017**
 - ❖ Protocol presence/absence trapping for Giant Kangaroo Rat and Tipton Kangaroo Rat in support of the construction of a public bike path in the Kern Water Bank adjacent to the Kern River. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS LINE 4002 MP 76.6, FONTANA STATION LEAK REPAIR (Fontana, CA)** **2017**
 - ❖ Completed habitat assessment and pre-construction survey for San Bernardino Kangaroo Rats. Monitored ground-disturbing and backfilling activities for San Bernardino Kangaroo Rats in support of pipeline operations and maintenance to repair a gas leak.
- **SoCALGAS LINE 8107, INTERNAL INSPECTION – VAULT INSPECTION MP 8.15 (New Cuyama, CA)** **2017**
 - ❖ Completed habitat assessment for Giant Kangaroo Rats. Monitored ground-disturbing and backfilling activities for Giant Kangaroo Rats in support of pipeline operations and maintenance to replace the existing wooden vault with a metal one.
- **PIPELINE SAFETY ENHANCEMENT PLAN TAFT VALVE BUNDLE - BUTTONWILLOW (Buttonwillow, CA)** **2017**
 - ❖ Protocol presence/absence trapping for Tipton Kangaroo Rat in support of pipeline maintenance activities to pressure test pipes, and upgrade, replace or retrofit mainline valves. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SoCALGAS LINE 247, POST ILI ANOMALY DIGS (Gaviota, CA)** **2016**
 - ❖ Pre-construction survey for the presence of California Red-legged Frog, any other sensitive species and nesting birds. Monitored ground-disturbing for biological resources in support of pipeline excavation, inspection and repair activities.
- **SoCALGAS LINE 2001, INTERNAL INSPECTION – CACTUS STATION TO MORENO STATION (Riverside County, CA)** **2016**
 - ❖ Escorted and monitored construction vehicles during internal pipeline inspection activities to avoid project impacts to sensitive habitat and species, specifically Desert Tortoise, Coachella Valley Fringe-toed Lizard and Flat-tailed Horned Lizard.
- **GOLDEN HILLS WIND ENERGY FACILITY REPOWERING PROJECT (Altamont Pass, CA)** **2015**
 - ❖ Completed pre-construction and pitfall/drift fence surveys, and relocation for sensitive species, mainly California Red-legged Frog, San Joaquin Kit Fox, and California Tiger Salamander. Monitored ground-disturbing activities for biological resources.
- **SoCALGAS LINE 36-9-01, BRUSH TRIMMING (Cañada de la Gaviota, CA)** **2015**
 - ❖ Monitored brush trimming and vegetation clearing activities to allow vehicular access to the pipeline ROW. The project area was cleared for biological resources and monitored for California Red-legged Frog and nesting birds.
- **SOUTHERN CALIFORNIA EDISON: PATH 42 – 1,500 MW UPGRADES (Coachella Valley, CA)** **2014–15**
 - ❖ Executed pre-construction clearance surveys for Coachella Valley Fringe-toed Lizard, Coachella Valley Milk-vetch and Palm Springs Pocket Mouse, and nesting bird surveys. Monitored ground-disturbing activities for biological resources.
- **SOUTHERN CALIFORNIA EDISON CONSULTANT’S WORK ASSIGNMENT 663 (Barstow, CA)** **2014**

- ❖ Monitored ground-disturbing, distribution pole replacement activities for Mojave Fringe-toed Lizard (*Uma scoparia*). Access road and disturbance area were surveyed and raked for the species to place connecting plastic mats.
- **VALLECITOS OIL FIELD AND GAS WELLS PROJECT (Vallecitos Canyon, CA)** 2014
 - ❖ Completed burrow and habitat assessment for Giant Kangaroo Rat. Identified and mapped all burrows and burrow complexes within the existing and proposed access roads and several sites as well as the buffer.
- **IMPERIAL IRRIGATION DISTRICT: PATH 42 TRANSMISSION UPGRADES PROJECT (Coachella Valley, CA)** 2013–14
 - ❖ Executed nesting bird and pre-construction surveys for Coachella Valley Fringe-toed Lizard, Mojave Desert Tortoise, Desert Kit Fox, and Flat-tailed Horned lizard. Monitored ground-disturbing activities for biological resources.
- **DEVERS–PALO VERDE 500 KV TRANSMISSION LINE #2 (Riverside County, CA)** 2012–14
 - ❖ Conducted trapping for Stephens’ Kangaroo Rat and pre-construction surveys for sensitive species, chiefly Coachella Valley Fringe-toed Lizard, California Gnatcatcher and Mojave Desert Tortoise. Monitored ground-disturbing activities for biological resources.
- **RED BLUFF SUBSTATION/DESERT SUNLIGHT SOLAR FARM (Desert Center, CA)** 2012–14
 - ❖ Conducted pre-construction, clearance surveys and exclusion fence checks for sensitive species, mainly Mojave Desert Tortoise and Desert Kit Fox, prior to ground-disturbing activities. Monitored ground-disturbing activities for biological resources.
- **CUYAMA RUSSELL RANCH 3D SEISMIC SURVEY (New Cuyama, CA)** 2011
 - ❖ Conducted pre-construction, clearance surveys and monitoring for Nelson’s Antelope Squirrel, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Burrowing Owl, and San Joaquin Kit Fox. Monitored ground-disturbing activities for biological resources.
- **ANTELOPE VALLEY 3D SEISMIC SURVEY (Lost Hills, CA)** 2011
 - ❖ Conducted pre-construction, clearance surveys and monitoring for Nelson’s Antelope Squirrel, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Burrowing Owl, and San Joaquin Kit Fox. Monitored ground-disturbing activities for biological resources.
- **APEX 3D SEISMIC SURVEY (North Belridge, CA)** 2011
 - ❖ Conducted pre-construction, clearance surveys and monitoring for Nelson’s Antelope Squirrel, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Burrowing Owl, and San Joaquin Kit Fox. Monitored ground-disturbing activities for biological resources.
- **VINTAGE PETROLEUM, INC. DEVIL’S DEN, BANDIT, OUTLAW 1-X, OUTLAW X, AND OUTLAW 2-X OIL WELL PROJECTS (Kern County, CA)** 2011
 - ❖ Surveyed for the presence of the Blunt-nosed Leopard Lizard on multiple proposed oil wells following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed.
- **INNEX ENERGY KMD 17-18 OIL WELL PROJECT (Kings County, CA)** 2011
 - ❖ Surveyed for the presence of the Blunt-nosed Leopard Lizard on proposed oil well location following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed.
- **VENOCO, INC. BEATTIE 1-33, BLACK STONE 1-31, BLM 1-198, BONDUX 1-26, BOSTICK 3-30, LEE 2-30, ROBBINS 1-29, SOCAL 1-28, HABERKERN 1-25, STONE 1-17, STONE 1-18, STONE 1-19, AND STONE 3-18 OIL WELL PROJECTS (Kern County, CA)** 2011
 - ❖ Surveyed for the presence of the Blunt-nosed Leopard Lizard on multiple proposed oil wells following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed.
- **CYMRIC 3D SEISMIC SURVEY (McKittrick, CA)** 2011
 - ❖ Conducted pre-construction, clearance surveys and monitoring for Nelson’s Antelope Squirrel, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Burrowing Owl, and San Joaquin Kit Fox. Monitored ground-disturbing activities for biological resources.
- **CALIFORNIA VALLEY SOLAR RANCH (California Valley, CA)** 2011
 - ❖ Surveyed for the presence of the Blunt-nosed Leopard Lizard on a proposed solar project by using the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed.
- **VCA SOUTH COUNTY ANIMAL HOSPITAL (Arroyo Grande, CA)** 2007–09
 - ❖ Performed venipuncture, fluid therapies, IV catheters, x-rays, laboratory analysis, and sedations to determine the health and status of domestic and wild animals. Safely handled and secured animals for procedures. Monitored and assisted during and post-surgeries.

RELATED EXPERIENCE

- **CALIFORNIA TIGER SALAMANDER (SANTA ROSA DPS) POPULATION ECOLOGY (Santa Rosa, CA)** 2016–18
 - ❖ Protocol dipnet surveys and drift fence/pitfall traps for larval and terrestrial California Tiger Salamander (Santa Rosa DPS) on multiple vernal pools to monitor the species’ population status and health. Individuals captured were processed and recorded.
- **WESTERN RIVERSIDE COUNTY MSHCP VERNAL POOL MONITORING (Western Riverside County, CA)** 2014–17
 - ❖ Presence/absence protocol dipnet surveys for the Vernal Pool Fairy Shrimp, Santa Rosa Plateau Fairy Shrimp, Riverside Fairy Shrimp, and Western Spadefoot. Voucher specimens of invertebrate species encountered were collected for identification.
- **LOKERN PRESERVE SMALL MAMMAL MONITORING (Lokern Preserve, CA)** 2013–16
 - ❖ Nocturnal protocol trapping for small mammals, mainly the Giant and Short-nosed Kangaroo Rat, to monitor the population and evaluate management strategies. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **SEMITROPIC RIDGE PRESERVE SMALL MAMMAL MONITORING (Semitropic Ridge Preserve, CA)** 2013–16
 - ❖ Nocturnal protocol trapping for small mammals, mainly the Tipton Kangaroo Rat, to monitor the population and evaluate management strategies. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **SWAINSON’S HAWK POPULATION STATUS IN CALIFORNIA (San Joaquin Valley, CA)** 2016
 - ❖ Protocol nesting surveys for Swainson’s Hawk as part of a two-year statewide survey project to understand their population status in California. Surveyed randomly selected blocks to locate any nesting individuals and monitored their development.
- **MONITORING MOHAVE GROUND SQUIRREL POPULATIONS IN COSO REGION (Coso Range, CA)** 2016
 - ❖ Diurnal focused-trapping for Mohave ground squirrel to determine population trends from natural environmental influences outside of significant human impacts. Set Sherman and Pymatuning Live Traps and extracted and processed the individuals.
- **MATHER FIELD & PRAIRIE CITY FAIRY SHRIMP MONITORING (Rancho Cordova, CA)** 2016

- ❖ Dipnet surveys for the Vernal Pool Fairy Shrimp, California Fairy Shrimp (*Linderiella occidentalis*) and Vernal Pool Tadpole Shrimp to determine population status and distribution of the species. All invertebrates were identified and documented.
- **SUNNYSLOPE CREEK NATIVE FISH SURVEY AND EXOTIC SPECIES REMOVAL (Sunnyslope Creek, CA)** **2015**
 - ❖ Aquatic dipnet, seine net and electrofish surveys for Santa Ana Sucker and Arroyo Chub. Individuals captured were recorded and released. Exotic aquatic species encountered were permanently removed from the habitat.
- **GOLDEN HILLS CALIFORNIA TIGER SALAMANDER HYBRID SAMPLING (Altamont Pass, CA)** **2015**
 - ❖ Aquatic dipnet and seine net sampling of California Tiger Salamander to determine the presence/absence of hybrids and/or the Barred Tiger Salamander (*Ambystoma mavortium*). Individuals were measured and genetic samples collected.
- **WESTERN RIVERSIDE COUNTY MSHCP SMALL MAMMAL MONITORING (Western Riverside County, CA)** **2013–15**
 - ❖ Nocturnal protocol trapping for Western Riverside County MSHCP-covered small mammals, including Federally and State listed kangaroo rat species, and State sensitive species. Set and baited Sherman Live Traps and extracted and processed individuals.
- **WESTERN RIVERSIDE COUNTY MSHCP QUINO CHECKERSPOT SURVEY (Western Riverside County, CA)** **2015**
 - ❖ Monitoring of and protocol surveys for the Quino Checkerspot Butterfly to determine presence and absence of larvae and/or adults, assess relative abundance, and evaluate species-specific resources. Documented all host plant encountered and their densities.
- **ABUNDANCE AND MICROHABITAT USE OF CALIFORNIA RED-LEGGED FROGS & BULLFROGS (Carmel, CA)** **2014–15**
 - ❖ Protocol diurnal and nocturnal surveys for California Red-legged Frog and American Bullfrog (*Lithobates catesbeianus*) to determine if the former modify their population size and/or behavior in the presence of a larger predator. Adults were captured and released.
- **COLORADO RIVER AND YUMA HISPID COTTON RAT DISTRIBUTION & HABITAT (Lower Colorado River)** **2014–15**
 - ❖ Nocturnal focused-trapping for Colorado River and Yuma Hispid Cotton Rats to assess distribution and population structure along the Lower Colorado River. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **VASCO CAVES FAIRY SHRIMP SURVEY (Vasco Caves Regional Preserve, CA)** **2015**
 - ❖ Practice of appropriate field techniques for USFWS protocol-level sampling of the Longhorn Fairy Shrimp and Vernal Pool Fairy Shrimp. Introduction on the species' life history in rock pools, field techniques and field identification.
- **CARRIZO PLAIN FAIRY SHRIMP SURVEY (Carrizo Plain National Monument, CA)** **2015**
 - ❖ Presence/absence protocol dipnet surveys for the Longhorn Fairy Shrimp, Vernal Pool Fairy Shrimp, and the Western Spadefoot. Individuals captured were identified to species in the field and released.
- **WESTERN RIVERSIDE COUNTY MSHCP DELHI SANDS FLOWER-LOVING FLY SURVEY (Jurupa Hills, CA)** **2013–14**
 - ❖ Protocol surveys for the Delhi Sands Flower-loving Fly to estimate the population density of adults, document successful reproduction (tenerals and/or exuviae), quantify resource selection, and estimate detection probabilities.
- **DON EDWARDS SF BAY NWR RED-BELLIED HARVEST MOUSE SURVEY (Don Edwards SF Bay NWR, CA)** **2014**
 - ❖ Nocturnal protocol trapping for the Red-bellied Harvest Mouse to monitor the population status and evaluate management strategies. Set and baited Sherman Live Traps and extracted and processed individuals.
- **SAN PABLO BAY NWR SALT MARSH HARVEST MOUSE SURVEY (San Pablo Bay NWR, CA)** **2014**
 - ❖ Nocturnal protocol trapping for the Salt Marsh Harvest Mouse to monitor the population status and evaluate management strategies. Set and baited Sherman Live Traps and extracted and processed individuals.
- **STEPHENS' KANGAROO RAT MONITORING AND MANAGEMENT (Motte Rimrock Reserve, CA)** **2013–14**
 - ❖ Nocturnal protocol trapping for Stephens' Kangaroo Rats to satisfy the Western Riverside County MSHCP requirements and management strategies. Set and baited Sherman Live Traps, and extracted and processed the individuals, including ear tagging.
- **GREATER SANDHILL CRANE ROOST SURVEY (Pixley NWR, CA)** **2014**
 - ❖ Roost fly-in-and-out surveys for the Greater Sandhill Crane (*Gus Canadensis tabida*) to monitor the population and assess management strategies. Counted the number of individuals flying in during dusk and flying out during dawn.
- **TIPTON KANGAROO RAT RECONNAISSANCE TRAPPING (Pixley NWR, CA)** **2013**
 - ❖ Nocturnal, reconnaissance focused-trapping for the Tipton Kangaroo Rats to determine presence so follow-up research can be conducted to manage the species. Set Sherman Live Traps and extracted and processed the individuals.
- **THE DESERT KIT FOX PROJECT (Eastern Riverside County, CA)** **2013**
 - ❖ Nocturnal trapping for small mammals to assess Desert Kit baseline requirements. Conducted aerial, spotlight and terrestrial remote-camera monitoring for individuals, and surveyed for active, potential and natal dens.
- **LONG TERM POPULATION STUDY OF GIANT KANGAROO RATS (North Lokern, CA)** **2013**
 - ❖ Nocturnal protocol trapping for the Giant Kangaroo Rat as part of a long-term monitoring study to determine population trends. Set and baited Sherman Live Traps, and extracted and processed the individuals, including scanning for PIT tags.
- **LONG TERM MONITORING AND MANAGEMENT OF THE STEPHENS' KANGAROO RAT (Camp Pendleton, CA)** **2012**
 - ❖ Nocturnal protocol trapping for the Dulzura (*Dipodomys simulans*) and Stephens' Kangaroo Rats to monitor the population and assess the management strategies. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **COACHELLA VALLEY MSHCP COACHELLA VALLEY FRINGE-TOED LIZARD SURVEY (Coachella Valley, CA)** **2012**
 - ❖ Focused-surveys for the Coachella Valley Fringe-toed Lizard, while documenting all terrestrial species encountered. Flat-tailed Horned Lizards were captured for measurement, sexing and health assessment to check population status.
- **GIANT KANGAROO RAT DISTRIBUTION MONITORING AND MODELING (Carrizo Plain National Monument, CA)** **2012**
 - ❖ Mark-recapture protocol surveys for the Giant Kangaroo Rat to understand annual range fluctuations based on resource abundance. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **STEPHENS' KANGAROO RAT TRANSLOCATION (Southwestern Riverside Multi-Species Reserve, CA)** **2011**
 - ❖ Nocturnal protocol trapping for translocated Stephens' Kangaroo Rats to determine translocation success and efficacy of different management strategies. Set and baited Sherman Live Traps and extracted and processed the individuals.
- **GUADALUPE-NIPOMO DUNES NWR MAMMAL TRAPPING (Guadalupe-Nipomo Dunes NWR, CA)** **2009**

- ❖ Nocturnal trapping for small mammals, specifically the Lompoc Kangaroo Rat (*Dipodomys heermanni arenae*) as part of demographic and host-parasite study. Set and baited Sherman Live Traps and extracted and processed individuals.

- **WIDER CARIBBEAN SEA TURTLE CONSERVATION NETWORK (Cahuita, Costa Rica)** **2008**
 - ❖ Float-line fishnet trapping and open-water transects for the Green Sea Turtle (*Chelonia mydas*) and the Hawksbill Sea Turtle (*Eretmochelys imbricata*). Individuals were captured for processing and tagging. Monitored nests and processed hatchlings.

TRAININGS & WORKSHOPS

- **AUTHORIZED DESERT TORTOISE BIOLOGIST TRAINING** **2017**
Provided knowledge and experience to fulfill the qualifications of an Authorized Biologist as defined by the USFWS. Handled and processed multiple captive and wild tortoises. Excavated burrows to locate individuals and nests and constructed artificial burrows.
- **SALT MARSH HARVEST MOUSE WORKSHOP** **2017**
Identification, natural history, taxonomy, distribution, habitat, genetics, threats, and conservation of the Salt Marsh Harvest Mouse. In-field observations on survey protocols and methods for processing trapping, handling and processing individuals.
- **BUENA VISTA LAKE ORNATE SHREW WORKSHOP** **2017**
Introduction on the biology and habitat requirements of the Buena Vista Lake Ornate Shrew. Lecture on current knowledge of their ecology, and effective techniques for detection. Discussion of regulatory requirements for mitigating and monitoring the species.
- **CALIFORNIA CENTRAL COAST AQUATIC AND SEMI-AQUATIC HERP WORKSHOP** **2016**
Introduction on locally common and sensitive herps on the Central Coast. Practiced decontamination protocols. Conducted spotlighting, and night and daytime survey protocol techniques for California Red-legged Frogs and Western Pond Turtles.
- **WESTERN POND TURTLE WORKSHOP: ECOLOGY AND CONSERVATION** **2015**
Background on conservation issues, recent research findings, and practical understanding of field methods. Lectures on how to identify the species, their life history, habitat requirements, taxonomy, survey techniques and management.
- **CALIFORNIA TIGER SALAMANDER TERRESTRIAL ECOLOGY WORKSHOP** **2015**
Lecture on the upland habitat use and migratory patterns, design of pitfall and drift trap arrays, upland survey protocols, and implementing land use management practices. Hands-on construction of pitfall trap and fence array.
- **ACOE WETLAND DELINEATION, WATERS OF THE US AND REGIONAL SUPPLEMENT TRAINING** **2015**
Technical guidelines for wetland delineations, field indicators of hydrophytic vegetation, hydric soils and wetland hydrology, methods for making jurisdictional determinations, and methods to apply in atypical situations.
- **BALD AND GOLDEN EAGLE IN CALIFORNIA AND NEVADA WORKSHOP** **2015**
The natural history, species' needs in California, threats, regulatory protections, survey techniques, and the new permitting requirements for the Bald Eagle (*Haliaeetus leucocephalus*) and the Golden Eagle (*Aquila chrysaetos*).
- **AMPHIBIANS OF THE SAN FRANCISCO BAY SURVEY TECHNIQUES** **2014**
Overview of the life history, ecology and conservation of frogs, toads, and salamanders that occur in the Bay Area. Information on sixteen species including identification, range, habitat requirements, survey methods, and behavior.
- **SAN JOAQUIN KIT FOX ECOLOGY, CONSERVATION, AND SURVEY TECHNIQUES** **2014**
Instructions on behavior, identifying sign, monitoring dens and the standard survey techniques. Field training on setting camera traps, lure traps, spotlighting, and differentiating from juvenile coyotes and other potential canids.
- **ARROYO TOAD WORKSHOP** **2014**
Natural history, habitat types, conservation challenges, and nocturnal and diurnal protocol survey methods of the Arroyo Toad. Field training on evening protocol surveys to identify adult individuals visually and by sound.
- **TOOLS AND MANAGEMENT APPLICATIONS WORKSHOP FOR MANAGING GREATER SAGE-GROUSE** **2013**
Conservation planning tools for managing the Greater Sage-Grouse habitat and populations, including presentation on Pinyon-Juniper treatment assessment tools, fire and mowing in the sagebrush ecosystem, and the life history.
- **BURROWING OWL WORKSHOP** **2013**
Natural history, habitat requirements, basic biology, and effective preservation of Burrowing Owl. Field practicum to identify individual, key characteristics of breeding and wintering habitats, and benefits/drawbacks of various methods.
- **BLUNT-NOSED LEOPARD LIZARD IDENTIFICATION WORKSHOP** **2013**
Biology, conservation, identification and survey methods for the Blunt-nosed Leopard Lizard. Field training to practice field survey techniques for observing lizards, diagnostic signs, their habitat requirements, and identifying habitat.
- **UINTA BASIN RARE PLANT ORIENTATION WORKSHOP** **2013**
Identification of sensitive plants in the Uinta Basin, and an understanding of their habitats to ensure consistency and quality of surveys, and data reporting for consultation and regulatory compliance based on the FWS protocol.
- **THE ANOSTRACA AND NOTOSTRACA OF OREGON, WASHINGTON AND CALIFORNIA WITH EMPHASIS ON THE FEDERALLY LISTED SPECIES** **2013**
Lecture on protected Anostraca and Notostraca, and their biology, ecology, zoogeography, conservation, and morphology. Practice on the identification of each species with emphasis on their key morphological characters.
- **SENSITIVE SMALL MAMMALS OF THE SAN JOAQUIN VALLEY WORKSHOP** **2012**
Presentations on the ecology and conservation needs of species status small mammal species. Training on various research and conservation goals for small mammal trapping. Field exercise with trapping and handling individuals.
- **INTRODUCTORY RAPTOR FIELD TECHNIQUES WORKSHOP** **2012**
Lectures on raptor ecology, biology, migration patterns, and identification, including long-range identification. Hands-on field training on raptor trapping (mist nets, bow nets and Dho-Ghazas), banding and safe handling techniques.
- **BIGHORN SHEEP NATURAL HISTORY WORKSHOP** **2012**
AZGFD course on the natural history, management, conservation, and historical significance of the Desert Bighorn Sheep (*Ovis canadensis nelsoni*). Observed individuals and their behavior in their natural environment.

- **BIOMONITOR TRAINING – FLAT-TAILED HORNED LIZARD**

Lesson on preparation of Flat-tailed Horned Lizard mitigation and non-invasive research monitoring. Instructions on safe capture techniques and identifying diagnostic signs, including tracks and scat, and habitat requirements.

2012
- **YELLOW-BILLED CUCKOO SURVEY WORKSHOP AND TRAINING SESSION**

Overview of the current call-playback survey protocol. In-depth discussion of the species, identification behavior, habitat use, and management strategies. Identified individuals in the field and observed examples of typical habitat.

2012
- **CALIFORNIA TIGER SALAMANDER WORKSHOP**

Training on species identification, survey methods, sampling techniques and habitat requirements of California Tiger Salamander. Lecture on the biology and conservation management for the species. Aquatic surveys for larvae.

2012
- **WILLOW FLYCATCHER WORKSHOP AND TRAINING SESSION**

Overview of the current call-playback survey protocol. In-depth discussion of the species, identification behavior, habitat use, and management strategies. Identified individuals in the field and observed examples of typical habitat.

2012
- **RARE POND SPECIES SURVEY TECHNIQUES WORKSHOP**

Practical hands-on training on aquatic and terrestrial survey techniques for California Tiger Salamander, California Red-legged Frog and Western Pond Turtle. Lecture on the biology, behavior and habitat needs for each of the species.

2012
- **WORKSHOP ON THE BIOLOGY & MANAGEMENT OF THE CALIFORNIA RED-LEGGED FROG**

Training on the species identification, field sampling and survey techniques, and habitat requirements. Provided foundational knowledge for monitoring and surveying where the species may be affected. Survey for adult and larvae.

2012
- **NATIONAL ENVIRONMENTAL POLICY ACT (NEPA): WRITING THE PERFECT EA/FONSI, OR EIS**

Training course for preparing an EA/FONSI or EIS and all the required content as well as the practical skills for safely leaving out unnecessary content and how to make the findings required by law.

2012
- **INTRODUCTION TO DESERT TORTOISE SURVEYING, MONITORING, AND HANDLING TECHNIQUES WORKSHOP**

Information on handling, monitoring and surveying methods for Mojave Desert Tortoise. Authorized egg handling techniques, survey methods, and burrow construction demonstrations. Lecture on species' ecology and biology.

2011
- **INTRODUCCIÓN AL ESTUDIO DE LOS ANFIBIOS NEOTROPICALES**

Course on the recognition of morphological characteristics in Neotropical amphibians' families. Training on the procedures for collection, preservation and cataloguing of specimens, and field survey techniques and methods.

2010



State of California - Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Wildlife Branch
P.O. Box 944209
Sacramento, CA 94244-2090
<http://www.wildlife.ca.gov>

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



February 19, 2020

Steven C. Chen
1382 Oceanaire Dr.
San Luis Obispo, CA 93405

Dear Mr. Chen,

In response to your written request, the Department of Fish and Wildlife (Department) hereby authorizes you to take California Endangered Species Act (CESA)-listed threatened Mohave ground squirrel (*Xerospermophilus mohavensis*) for scientific research purposes related to conservation and recovery of the species.

The authorization is in the form of a Memorandum of Understanding (MOU) between you and the Department. The MOU is a special permit prepared pursuant to CESA. For the purpose of this agreement, we consider you both the executive signatory and the principal investigator.

Enclosed are two originals of the MOU, including a List of Authorized Individuals (LAI). If you concur with the terms of the MOU, please sign and date both MOU documents in the appropriate space on page seven. Retain the LAI and one fully signed MOU for your records and as a master for making copies for your field personnel to ensure compliance with all terms and conditions. Please return the other signed MOU to the address in the letterhead, with attention to Esther Burkett.

Should you have any questions about the MOU, please contact Dr. Scott Osborn, Senior Environmental Scientist (Specialist), by e-mail at Scott.Osborn@wildlife.ca.gov or by telephone at (707) 499-0566.

Sincerely,

Erin Chappell, Environmental Program Manager
Wildlife Branch, Nongame Wildlife Program

cc: Scott Osborn, Esther Burkett
Wildlife Branch, Nongame Wildlife Program

Crawford, Scott

From: Garcia, Justin@Wildlife <Justin.Garcia@wildlife.ca.gov>
Sent: Tuesday, March 7, 2023 8:31 AM
To: Steven Chen
Cc: Hirano, Chad@Wildlife; Osborn, Scott@Wildlife
Subject: RE: Steven Chen MGS MOU and SCP Renewal

Hi Steven,

We have reviewed the information submitted for Corey and Dalton.

We have decided to approve Dalton as an Independent Researcher, but based on the information provided, Corey needs more experience under the supervision of a permitted MGS researcher. If there is additional information that outlines his experience with desert ground squirrels, or a strong letter of recommendation, then we could consider that as well and possibly designate Corey as an Independent Researcher. Otherwise, we can designate Corey as a Field Assistant until additional experience is obtained.

Thank you,
Justin

Justin D. Garcia (he/him)
Senior Environmental Scientist (Specialist)
[CESA Wildlife Permitting](#) Coordinator
CDFW Wildlife Branch, Wildlife Diversity Program
West Sacramento, CA
Justin.Garcia@wildlife.ca.gov
(916) 207-4957

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From: Steven Chen <stvnenator@gmail.com>
Sent: Tuesday, February 28, 2023 12:08 PM
To: Garcia, Justin@Wildlife <Justin.Garcia@wildlife.ca.gov>
Cc: Dalton Stanfield <daltonstanfield@gmail.com>; Hirano, Chad@Wildlife <Chad.Hirano@Wildlife.ca.gov>; Osborn, Scott@Wildlife <Scott.Osborn@wildlife.ca.gov>; Corey Chan <corey.davin@gmail.com>
Subject: Re: MGS MOU and SCP Renewal



State of California - Natural Resources Agency
 DEPARTMENT OF FISH AND WILDLIFE
 Wildlife Branch
 P.O. Box 944209
 Sacramento, CA 94244-2090
<http://www.wildlife.ca.gov>

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



Amended Date: March 20, 2023
Expiration Date: December 31, 2023

Attachment 2
LIST OF AUTHORIZED INDIVIDUALS

Steven C. Chen (SC-012551)
Principal Investigator

Research on Mohave Ground Squirrel in California

1. Individuals authorized to conduct activities pursuant to this California Endangered Species Act (CESA) Memorandum of Understanding (MOU) for scientific research on Mohave ground squirrel (*Xerospermophilus mohavensis*):

Principal Investigator: Steven C. Chen

Independent Researchers: Corey Chan, Dalton Stanfield, Kyle Tabor

Field Assistants: None listed at this time.

2. Independent Researchers may conduct activities pursuant to this MOU without the direct supervision of the Principal Investigator, and as authorized by the appropriate federal permit(s), when applicable.
3. When approved by the Department, Field Assistants must work under the direct, on-site supervision of the Principal Investigator or an Independent Researcher, and may assist on survey and capture efforts, until such time as the Principal Investigator can certify in writing to the Department, and the Department concurs in writing, that the individual may work independently. Field Assistants should have sufficient training or experience with small mammal trapping in general prior to conducting any activities under this MOU.
4. This List of Authorized Individuals supersedes the list dated on February 19, 2020.

March 20, 2023

 Date

 Justin D. Garcia
 Senior Environmental Scientist (Specialist)

This List of Authorized Individuals is valid only if dated on or after the issuance date of the MOU.

Subject: Resume for CDFW and USFWS approval for project surveys and monitoring

Kyle Tabor – Aardvark Biological Services LLC

Education

A.S. in Life Science, Westside Community College, Taft, CA 2011

B.S. in Biology, California State University, Bakersfield, CA 2018

Trainings/Workshops

Ringtail Cat Workshop presented by David Wyatt in the Sutter Buttes, CA. 2016

Workshop presented live-trapping, morphometrics, and radio telemetry of the ringtail (*Bassariscus astutus*).

Western Pond Turtle Workshop presented by The San Francisco Bay Area Chapter of The Wildlife Society, 2015

Workshop presented Ecology and Conservation of the Western pond turtle (*Actinemys marmorata*).

Basic Tracking and Awareness Workshop 2014

Training on mammal tracks and sign identification.

CALIFORNIA TIGER SALAMANDER WORKSHOP 2012

Training on species identification, survey methods, sampling techniques and habitat requirements of California tiger salamander (*Ambystoma californiense*). Lecture on the biology and conservation management for the species.

INTRODUCTION TO DESERT TORTOISE SURVEYING, MONITORING, AND HANDLING TECHNIQUES WORKSHOP 2011

Information on handling, monitoring and surveying methods for Mojave Desert Tortoise (*Gopherus agassizii*). that included authorized egg handling techniques and burrow construction demonstrations. Lecture on species ecology and biology.

Certifications

- **CDFW DESIGNATED BIOLOGIST for Giant Kangaroo Rat for Panoche Valley Solar Project.**
- **CDFW DESIGNATED BIOLOGIST for San Joaquin kit fox, Tipton kangaroo rat and San Joaquin antelope squirrel for the California High Speed Rail project (Construction Package 2 and 3).**
- **CDFW LEVEL II protocol surveyor for blunt-nosed leopard lizards (*Gambelia sila*).**
- **USFWS ENDANGERED SPECIES ACT 10(A)(1)(A) RECOVERY PERMIT (TE-95006A)** Tipton kangaroo rat (*Dipodomys nitratooides nitratooides*), Fresno kangaroo rat (*Dipodomys nitratooides exilis*) and Giant kangaroo rat (*Dipodomys ingens*).
- **CDFW SCIENTIFIC COLLECTING PERMIT SC-13532/MEMORANDUM OF UNDERSTANDING /LETTER OF CONCURRENCE**

Selected Wildlife Experience

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Project: HIGH SPEED RAIL CONSTRUCTION PACKAGES 2-3 (FRESNO-BAKERSFIELD)

Location: San Joaquin Valley, CA

Completed: In progress

Permit #: ITP # 2081-20015-024-04

Lead Biologist: (Current) - Eric Hanson, ehanson@dudek.com

Work Description: Performed preconstruction surveys for SJKF. Monitored potential SJKF dens with game cameras and tracking medium. Excavated and supervised excavation of potential SJKF dens. Monitored construction in SJKF habitat.

Estimated Survey Hours: 723

Estimated Monitoring Hours: 1003

Adults Observed: 0

Juveniles Observed: 0

Potential Dens Excavated: Over 400

Project: San Joaquin Kit Fox Mangle Study

Location: San Joaquin Valley, CA

Completed: 2016

Lead Biologist: Brian Cypher (661) 381-0048, bcypher@esrp.csustan.edu, and Jaime Rudd, (916) 201-2699, jlrudd@ucdavis.edu

Work Description: Assisted with sarcoptic mange study in urban San Joaquin kit fox. Responsibilities include: setting, baiting, and checking traps, trap maintenance, and radio telemetry. Data collection included: recording weight, ocular swab, nasal swab, fecal swab, skin scrape, collection of blood, radio collaring, ear tagging, applying topical solution for treatment of ectoparasites, overall health and dental assessment. Additional duties included transport to and from animal health care facility and release near capture site.

Estimated Survey Hours: 500

Adults Observed: 50

Juveniles Observed: 10

Potential Dens Observed: 100

Adults Handled: 25

Project Name: Victor Dry Farm Solar Site (2014)

Location: San Bernardino County

Completed: November 2014

Work description: Conducted monitoring and excavations of desert kit fox dens at the development site. Monitoring consisted of using wildlife camera stations to record use of the dens prior to excavations. Dens were excavated using hand tools only as the site was within the range of the desert tortoise.

Estimated Survey Hours: 84

Adults Observed: 0

Dens Observed: 4 known pupping dens with numerous entrances

Project Name: Great Valley Solar Project

Location: Southern Tulare County

Completed: September 2011

Work description: Conducted baseline biological surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Tipton Rat, Burrowing Owl and special status plant species. Provided biological surveys for listed and special-status plants and wildlife, conducted small mammal trapping, mapped vegetation and habitat types, conducted scent station surveys and nighttime spotlight surveys for nocturnal carnivores and other wildlife.

Estimated Survey Hours: 500

Project Name: Buena Vista 3D Geophysical

Location: Elk Hills, Kern County, CA

Completed: 2009 - 2010.

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 2600
Adults Observed: 2
Dens Observed: 100 potential, 25 known.

Project Name: PANOCHE VALLEY SOLAR

Location: Mendota, CA

Completed: September 2013

Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards. Other sensitive species encountered include Burrowing Owl, Giant Kangaroo Rat, and San Joaquin Kit Fox.

Estimated Survey Hours: 300

Adults Observed: 7

Dens Observed: 1 Active and 7 Potential

Project Name: ANTELOPE VALLEY 3D SEISMIC SURVEY

Location: Lost Hills

Completed: November 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 400

Adults Observed: 1

Dens Observed: 2 Potential

Project Name: APEX 3D SEISMIC SURVEY

Location: North Belridge

Completed: July 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: 12

Dens Observed: 7 Active and 17 Potential

Project Name: CYMRIC 3D SEISMIC SURVEY

Location: McKittrick

Completed: May 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: 0

Dens Observed: 20 potential, 5 active.

Burrowing Owl (*Athene cunicularia*)

Project Name: ANTELOPE VALLEY 3D SEISMIC SURVEY

Location: Lost Hills

Completed: November 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 400
Adults Observed: 8
Burrows Observed: 5 Active

Project Name: APEX 3D SEISMIC SURVEY

Location: North Belridge

Completed: July 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: 21

Burrows Observed: 15 Active

Project Name: Buena Vista 3D Geophysical

Location: Elk Hills, Kern County, CA

Completed: 2009 - 2010.

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 2600

Adults Observed: 10

Burrows Observed: 20

Giant and Tipton Kangaroo Rats

(Dipodomys ingens and D. nitratoides nitratoides)

Project Name: LOKERN PRESERVE SMALL MAMMAL MONITORING

Location: Lokern Preserve

Completed: September 2012, September 2013, September 2014

Work description: Nocturnal protocol trapping for small mammals, mainly for giant and short-nosed kangaroo rats (*Dipodomys nitratoides brevinasus*) to evaluate success of management strategies. Set Sherman Traps, and extracted and processed individuals.

Estimated Survey Hours: 75

Adults Handled: 40 Giant Kangaroo Rats (*Dipodomys ingens*)

All captures were handled under supervision of permitted biologist.

Burrows Observed: Multiple

Project Name: SEMITROPIC RIDGE PRESERVE SMALL MAMMAL MONITORING

Location: Semitropic Ridge Preserve

Completed: August 2012, August 2013, August 2014, August 2015

Work description: Nocturnal protocol trapping for small mammals, mainly Tipton kangaroo rats, to evaluate success of management strategies. Set Sherman Traps, extracted and processed individuals.

Estimated Survey Hours: 65

Adults Handled: 34 Tipton Kangaroo Rats (*Dipodomys nitratoides nitratoides*)

All captures were handled under supervision of permitted biologist.

Burrows Observed: Multiple

Project Name: PANOCH VALLEY SOLAR

Location: Mendota, CA

Completed: September 2013

Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards. Other sensitive species encountered include Burrowing Owl, Giant Kangaroo Rat and San Joaquin Kit Fox. Surveys for giant kangaroo rats

included looking for recent evidence of use (i.e. fresh scat, tracks, tail drags, mowing, haystacks, etc.). Scat, tracks, and burrows were measured and compared to literature published.

Estimated Survey Hours: 300

Adults Observed: Multiple

Project Name: ANTELOPE VALLEY 3D SEISMIC SURVEY

Location: Lost Hills

Completed: November 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 400

Adults Observed: Multiple

Burrows Observed: Multiple

Project Name: APEX 3D SEISMIC SURVEY

Location: North Belridge

Completed: July 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: Multiple

Burrows Observed: Multiple

Project Name: Buena Vista 3D Geophysical

Location: Elk Hills, Kern County, CA

Completed: 2009 -2010.

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 2600

Adults Observed: Multiple

Dens Observed: Multiple

Blunt-nosed Leopard Lizard

(Gambelia sila)

Project Name: OXY BNLL SURVEYS 2012

Location: Elk Hills

Completed: 2012

Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards and other sensitive species.

Estimated Survey Days: 137

Adults Observed: 200 (see attached CNDDDB form).

Hatchlings: 50

Level II Contact: Ignacio Maldonado

Stantec Consulting

Ignacio.Maldonado@stantec.com

(661) 302-3669

Project Name: BACON HILLS

Location: Belridge, CA

Completed: 2015

Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards and other sensitive species.

Estimated Survey Days: 26
Adults Observed: 27
Level II Contact: Steve Tabor BEASPT@aol.com (970) 481-8386

Project Name: KETTLEMAN HILLS
Location: Avenal, CA
Completed: 2014
Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards and other sensitive species.
Estimated Survey Days: 83
Adults Observed: 0
Level II Contact: Chris Bronny chrisbronny@gmail.com (925) 330-7202

Project Name: PANOCHE VALLEY SOLAR
Location: Mendota, CA
Completed: 2013
Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards. Other sensitive species encountered include Burrowing Owl, Giant Kangaroo Rat and San Joaquin Kit Fox.
Estimated Survey Days: 64
Adults Observed: 5
Hatchlings Observed: 3
Level II Contact: Steve Tabor BEASPT@aol.com (970) 481-8386

Project Name: CMO PIPELINE
Location: Belridge Oilfield
Completed: September 2013
Work description: Surveyed for the presence of the Blunt-nosed Leopard Lizard on multiple proposed oil wells following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed
Estimated Survey Days: 24
Adults Observed: 4
Level II Contact: Steve Tabor BEASPT@aol.com (970) 481-8386

Project Name: ANTELOPE VALLEY 3D SEISMIC SURVEY
Location: Lost Hills
Completed: November 2011
Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.
Estimated Survey Days: 33
Adults Observed: 2

Project Name: VENOCO, INC. OIL WELLS PROJECT
Location: Kern County
Completed: July 2011
Work description: Surveyed for the presence of the Blunt-nosed Leopard Lizard on multiple proposed oil well sites following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed.
Estimated Survey Days: 50
Adults Observed: 1

Project Name: APEX 3D SEISMIC SURVEY
Location: North Belridge
Completed: July 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Days: 30

Adults Observed: 12

Project Name: Buena Vista 3D Geophysical

Location: Elk Hills, Kern County, CA

Completed: 2009 -2010.

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Days: 100

Adults Observed: 50 – 60

Hatchlings: 12

San Joaquin Antelope Squirrel (SJAS)

(Ammospermophilus nelsoni)

Project Name: BACON HILLS

Location: Belridge, CA

Completed: 2015

Work description: Conducted protocol surveys for Blunt-nosed Leopard Lizards and other sensitive species.

Estimated Survey Hours: 208

Adults Observed: 25

Project Name: CMO PIPELINE

Location: Belridge

Completed: September 2013

Work description: Surveyed for the presence of the Blunt-nosed Leopard Lizard on multiple proposed oil wells following the CDFW 2004 Survey Protocol. Documented all sensitive flora and fauna encountered and observed

Estimated Survey Hours: 100

Adults Observed: 10

Project Name: ANTELOPE VALLEY 3D SEISMIC SURVEY

Location: Lost Hills

Completed: November 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 400

Adults Observed: 1

Project Name: APEX 3D SEISMIC SURVEY

Location: North Belridge

Completed: July 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: Numerous

Project Name: CYMRIC 3D SEISMIC SURVEY

Location: McKittrick

Completed: May 2011

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 1200

Adults Observed: 25

Project Name: Buena Vista 3D Geophysical

Location: Elk Hills, Kern County, CA

Completed: 2009 -2010.

Work description: Conducted preconstruction clearance surveys for sensitive species, notably San Joaquin Kit Fox, Blunt-nosed Leopard Lizard, Giant Kangaroo Rat, Nelson's Antelope Squirrel, and Burrowing Owl. Monitored ground-disturbing activities for biological resources.

Estimated Survey Hours: 2600

Adults Observed: 60

Project Name: LOKERN PRESERVE SMALL MAMMAL MONITORING

Location: Lokern Preserve

Completed: September 2012, September 2013, September 2014

Work description: Nocturnal protocol trapping for small mammals, mainly Giant and Short-nosed Kangaroo Rats, to evaluate success of management strategies. Set Sherman Traps, and extracted and processed individuals.

Estimated Survey Hours: 75

Adults Handled: 3

Mohave Ground Squirrel

(Xerospermophilus mohavensis)

Project Name: Endangered Species Recovery Program MGS Study

Location: Mojave Desert, CA

Completed: 2015 – 2016

Lead Biologist: - Philip Leitner, pleitner@pacbell.net

Work description: Protocol trapping for Mohave ground squirrel (*Xerospermophilus mohavensis*), to evaluate presence/absence. In addition to deployment of wildlife cameras, Sherman and Pymatuning traps were set in accordance with the protocol survey guidelines. Mohave ground squirrels were processed and evaluated each morning. Incidental captures included antelope ground squirrel ground squirrels (*Ammospermophilus leucurus*).

Estimated Survey Hours: 1200

Adults Handled: 5 Mohave ground squirrels (*Xerospermophilus mohavensis*) and 17 antelope ground squirrels (*Ammospermophilus leucurus*).

Project Name: COSO MGS Study

Location: Naval Air Weapons Station, China Lake

Completed: 2021

Lead Biologist: - Philip Leitner, pleitner@pacbell.net

Work description: Protocol trapping for Mohave ground squirrel (*Xerospermophilus mohavensis*), to evaluate presence/absence. Sherman and Pymatuning traps were set in accordance with the protocol survey guidelines. Mohave ground squirrels were processed and evaluated each morning. Incidental captures included antelope ground squirrels (*Ammospermophilus leucurus*).

Estimated Survey Hours: 36

Adults Handled: 5 Mohave ground squirrels (*Xerospermophilus mohavensis*) and 8 antelope ground squirrels (*Ammospermophilus leucurus*).

Attachment DR161-1 Detonation Vibration Estimates

Attachment DR161-1

Detonation vibration estimate

1) Formula - USBM

$$V = K (d/w^{1/2})^\beta$$

- où
- V: Peak particle velocity (in./sec or mm/s)
 - w: Max. explosive charge per delay (lbs or kg)
 - d: Distance from blast to structure (ft. or m)
 - K: Detonation constant
 - β : Ground attenuation constant

2) Cavern excavation

2.1 Top heading

Drilling parameters

Borehole size : 2.0 in. (50 mm)

Advance per round: 20 ft. (6.1 m)

Detonation parameters

Collar length: 1.5 ft. (0,45 m)

Loaded length: 18.5 ft. (5.65 m)

Explosive used: Bulk emulsion at 1.25 g/cc density

Charge per hole: 31.5 lbs (14.2 kg)

Electronic detonators

Nb of holes initiated per delay: 1 hole

Explosive charge per delay: 31.5 lbs (14.2 kg)

| Parameters | Imperial | Metric |
|----------------------|---------------------|--------------------|
| β | -1.6 | -1.6 |
| K | 908 | 6500 |
| Distance | 2 000 ft. | 610 m |
| W (charge per delay) | 31.5 lbs | 14.2 kg |
| PPV | 0.08 in./sec | 1.90 mm/sec |

2.2 Bench excavation

Drilling parameters

Borehole size : 3.5 in. (90 mm)

Bench height: 33 ft. (10.0 m)

Sub drilling: 2 ft. (0.6 m)

Drill length: 35 ft. (10.6 m)

Detonation parameters

Collar length: 6 ft. (1,8 m)

Loaded length: 29.0 ft. (8.8 m)

Explosive used: Bulk emulsion at 1.25 g/cc density

Charge per hole: 151.0 lbs (68.3 kg)

Electronic detonators

Nb of holes initiated per delay: 1 hole

Explosive charge per delay: 151.0 lbs (68.3 kg)

| Parameters | Imperial | Metric |
|----------------------|---------------------|--------------------|
| β | -1.6 | -1.6 |
| K | 240 | 1725 |
| Distance | 2 000 ft. | 610 m |
| W (charge per delay) | 151.0 lbs | 68.3 kg |
| PPV | 0.07 in./sec | 1.77 mm/sec |

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wsp.com