Topock Project Executive Abstract

Document Title: Topock Compressor Station Summer Roosting Bat Surveys and Potential Project Impacts, Final Report Final Document? ☒ Yes ☐ No	Date of Document: November 5, 2015 Who Created this Document?: (i.e. PG&E, DTSC, DOI, Other) PG&E
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What does this information pertain to? ☐ Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)/Preliminary Assessment (PA) ☐ RCRA Facility Investigation (RFI)/Remedial Investigation (RI) (including Risk Assessment) ☐ Corrective Measures Study (CMS)/Feasibility Study (FS) ☐ Corrective Measures Implementation (CMI)/Remedial Action ☐ California Environmental Quality Act (CEQA)/Environmental Impact Report (EIR) ☐ Interim Measures ☒ Other / Explain: Biological Reports	Is this a Regulatory Requirement? ☐ Yes ☒ No If no, why is the document needed? In support of the upcoming Groundwater Remedy EIR and future Groundwater Remedy construction
What is the consequence of NOT doing this item? What is the consequence of DOING this item? This report supports upcoming work associated with the Final Groundwater Remedy. Not performing the survey and preparing this report would impede efforts to better understand and avoid potential impacts to roosting bats.	Other Justification/s: ☐ Permit ☒ Other / Explain: Supports upcoming Final Groundwater Remedy activities.

Brief Summary of attached document:

The goal of the current survey was to build upon the knowledge on bat roosting and foraging habitat in the Final Groundwater Remedy area that was gained from previous surveys conducted in the winter (Brown 2015) and spring (Brown and Rainey, 2015). The main purpose of the current study was to identify actual bat roost locations and to support future appropriate mitigation measures to avoid or minimize potential impacts that would be associated with upcoming Final Groundwater Remedy activities. It also provides an assessment of potential noise impacts from well drilling and sampling equipment. The summer surveys were conducted in the latter portion of the bat roosting season on five nights during a period from July 20 through 28, 2015 and on the night of September 25, 2015. The summer bat surveying activities included mist-netting surveys and radiotracking bats to roost locations, as well as visual and acoustic surveys of bat roost habitats. The assessment of potential impacts to bats from drilling and sampling activities was conducted using acoustic monitoring and a high frequency noise analysis. Mist-netting from July 20 through 28, 2015 captured 6 pallid bats, 10 California myotis, and 38 Yuma myotis. Two post-lactating female pallid bats were radio-tagged and tracked to their roosts, which were identified to the south of the project area in Bat Cave Wash. Visual surveys found additional roosts within Bat Cave Wash and beneath the western end of the BNSF bridge. Acoustical monitoring revealed a cave myotis roost within a brick culvert in Bat Cave Wash beneath the National Trails Highway. The acoustic analysis provides noise attenuation data based on distance from drilling rigs and generators without shielding.

Written by: PG&E

Recommendations:

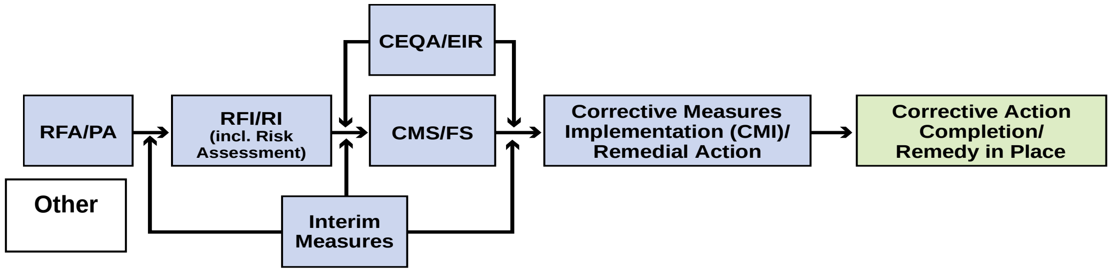
This report is for information only.

How is this information related to the Final Remedy or Regulatory Requirements:

The survey and this report provides information to support the upcoming Final Groundwater Remedy activities.

Other requirements of this information?
None.

Related Reports and Documents:
Click any boxes in the Regulatory Road Map (below) to be linked to the Documents Library on the DTSC Topock Web Site (www.dtsc-topock.com).



Legend
RFA/PA – RCRA Facility Assessment/Preliminary Assessment
RFI/RI – RCRA Facility Investigation/CERCLA Remedial Investigation (including Risk Assessment)
CMS/FS – RCRA Corrective Measure Study/CERCLA Feasibility Study
CEQA/EIR – California Environmental Quality Act/Environmental Impact Report

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Topock Compressor Station
Summer Roosting Bat Surveys and Potential Project Impacts
Final Report

Project #3740-01

Prepared for:

Pacific Gas and Electric Company

Prepared by:

H. T. Harvey & Associates

November 5, 2015

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Section 1. Introduction

Pacific Gas and Electric Company's (PG&E's) Topock Compressor Station and adjacent lands (referred to hereafter as the Project site) is a natural gas compressor site located south of Needles, California (Figure 1) near the Interstate 40 crossing of the Colorado River. PG&E is planning to implement a remediation project to address chromium groundwater contamination that may have resulted from past disposal activities at the Project site.

Initial surveys for special-status bats conducted at the Project site by Drs. Patricia Brown and William Rainey last winter (Brown 2015) and spring (Brown and Rainey, 2015) detected four special-status species, Townsend's big-eared bats (*Corynorhinus townsendii*), pallid bats (*Antrozous pallidus*), cave myotis (*Myotis velifer*) and California mastiff bats (*Eumops perotis*) that could potentially establish maternity roosts on the Project site.

As a follow-up to the winter and spring 2015 surveys and as requested by PG&E and CH2M HILL, H. T. Harvey & Associates conducted focused surveys to identify the locations of maternity roosts of special-status bats on the Project site. In addition to the special-status species identified in these reports, we expected that the western red bat (*Lasiurus blossevillii*) could also be present on the Project site based on their range and potential on-site habitat.

The main purpose of the current bat surveys was to develop appropriate mitigation measures to avoid or minimize potential impacts of upcoming groundwater remediation work on bat maternity roosts on the Project site and in the immediate vicinity. The subsequent avoidance and minimization measures from this report would then supersede previous minimization measures that were designed prior to identifying maternity roosts on the Project site. As part of this investigation, H. T. Harvey & Associates ecologists conducted mist-netting, radiotracking, short-term acoustic monitoring, and visual observations at areas supporting potential roosting habitat. This report will summarize our findings for the summer bat roost surveys and potential impacts to bats based on our observations. It also summarizes an assessment of potential impacts to bats from noise generated by well boring and sampling equipment. Following this report, we will provide an additional report that will summarize avoidance and minimization measures for on-site bats.

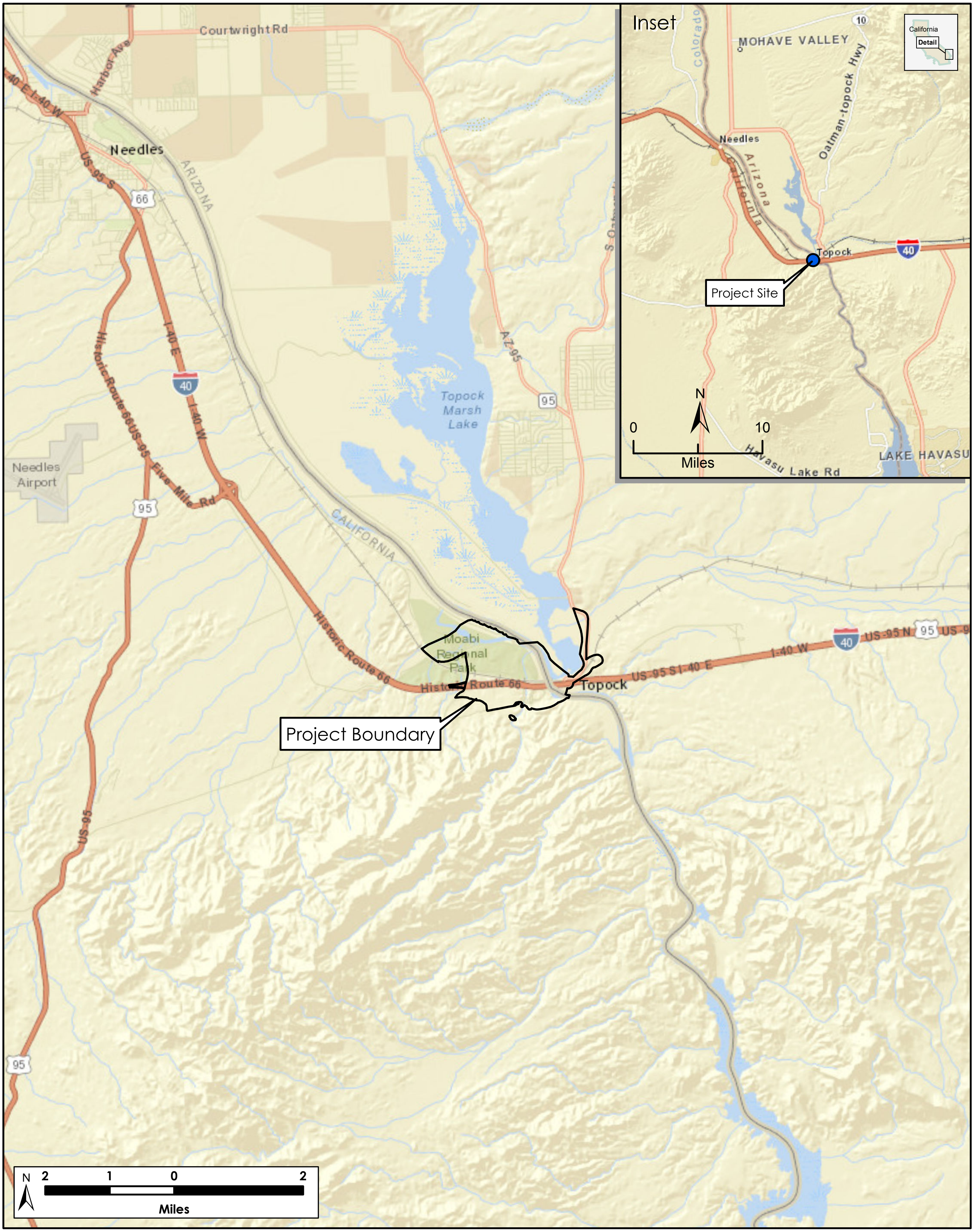

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Figure 1. Vicinity Map

Topock Compressor Station Summer Roosting Bat Surveys (3740-01)

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Section 2. Methods

2.1 Mist-Netting and Radiotelemetry

During the maternity season (March 15th through August 31st), females of some bat species group together in a single roost or cluster of associated roosts to form larger maternity colonies, where they raise their young. These colonies often represent significant populations on a local or regional scale, and some species are particularly susceptible to disturbance while raising their young. To document the locations of maternity roosts on the Project site, we conducted mist-net surveys with the intention of catching lactating females and tracking them back to their maternity colonies. Although our primary aim was to locate maternity roosts for species of special concern (Townsend's big-eared bat, pallid bat, western red bat, and cave bat), we also were interested in assessing the species, sex, and reproductive status of other bats on the Project site.

We conducted mist-netting during the evenings of July 20, 21, 23, 26, and 28, 2015, and during the morning of July 28, 2015. We placed mist nets that ranged from 6 to 12 meters wide and from 2.6 to 5.2 meters tall across natural flyways on the Project site. The 5.2-meter-tall net was operated with a pulley system (Johnston 2001). When mist-netting in the evening, we opened nets at approximately 7:45 p.m. and closed them at approximately 10:00 p.m. When mist-netting in the morning, we set mist nets up before dawn, at approximately 4:45 a.m., and closed them at approximately 6:00 a.m. After nets were opened, we checked them in intervals of 15 minutes or less. We placed each captured bat in a paper or cloth bag, processed it on site, and released it unharmed after data collection. For each individual, we assessed and recorded species, age (adult or sub-adult), forearm length (in millimeters), mass (in grams), and reproductive status (lactating, postlactating, testes descended, or nonreproductive).

To radio track bats, we carefully clipped the fur in the interscapular region of the bat's back and attached Holohil BD-2 radio transmitters (Holohil Systems, Ltd., Carp, Ontario, Canada) using eyelash glue. Each radio tag accounted for less than 5% of an individual's weight. After the radio tag was securely attached we released the bat. The day after capture, we went to the site of release and checked for a signal using radio receivers (R-1000, Communication Specialists, Orange, California), and three-element and five-element Yagi antennas. If we could not detect a signal, we drove or walked to opportunistic areas of high elevation within a 5-mile radius and attempted to locate the signal. After locating the signal, we attempted to locate the roost by systematically determining the direction in which it was strongest and following it in that direction.

2.2 Visual Surveys of Roost Habitat

To locate bat roosts on the Project site, we used both systematic searches and radiotelemetry. We conducted systematic searches by initially searching for suitable roosting habitat during a reconnaissance-level survey in June 2015, and later by also using aerial images in Google Earth. We subsequently visited all suitable locations to conduct in-person evaluations of the sites. We conducted visual observations at known roost sites, as determined by radiotelemetry, and in areas supporting suitable roost habitat, from approximately half an hour before sunset to an hour after sunset. At each location, we watched for emerging bats and kept a tally of how many bats flew out from an emergence spot and how many bats flew back into the same roost opening. To arrive at an approximate total number of bats for each roost, we subtracted the number of bats flying into the roost from the number of bats recorded flying out of the roost.

Based on new project information we received on September 25, 2015, we evaluated one additional section of the railroad and a set of three culverts that had potential to support roosting bats. Both sites are located in the westernmost section of the groundwater remedy project area, west of the Moabi Regional Park. On September 30, 2015, Gabe Reyes, with assistance from Curt Russell of PG&E, visually inspected the westernmost railroad crossing and culverts for signs of roosting bats. Following this inspection, Mr. Reyes and Mr. Russell remained at the sites to watch for bats exiting these features after sunset. Mr. Reyes observed the railroad crossing and Mr. Russell observed the culverts, utilizing night vision goggles.

2.3 Acoustic Monitoring and Analysis

Bats use echolocation calls to detect prey and obstacles as they navigate across landscapes. Although a given species may demonstrate some degree of plasticity in its calls, acoustic parameters, such as call shape, duration, and minimum frequencies, may be used to identify species (Fenton et al. 1995). Therefore, acoustic surveys can be used to help determine many species of bats (Parsons et al. 2000). Two primary technologies exist for recording and analyzing bat calls: zero-crossing and full spectrum. The technology for viewing zero-crossing recordings is well developed; it is easy to quickly view and place species labels on thousands of calls at a time. However, full-spectrum technology provides more detail about specific call characteristics, which can sometimes be critical for distinguishing species with similar call parameters (Fenton 2000). Therefore, to assess bat activity in different areas of the Project site, we used Song Meters (Song Meter SM2 BAT recorders) (Wildlife Acoustics, Concord, Massachusetts, United States), which record compressed files that can be converted to either zero-crossing or full spectrum files.

To determine which bat species were present on the Project site, we deployed eight Song Meters on the Project site from July 20 through July 30, 2015. We programmed the Song Meters according to the default settings provided in the instruction manual, and we manually set the Universal Transverse Mercator coordinates for each detector. We then scheduled the units to record from sunset to sunrise. We attached microphones to microphone cables and secured them approximately 3 feet off the ground to T-posts positioned at a slight angle. We deployed Song Meters throughout the site, concentrating on areas with tamarisk groves, bridges, and rocky outcrops that could provide suitable habitat for maternity roosts and special-status bats.

When we identified possible roost locations but did not conduct visual emergence counts, we deployed detectors for two consecutive nights. When we deployed Song Meters in possible roost locations while conducting simultaneous visual emergence counts, we left detectors out for only the duration of the emergence count.

We analyzed the first hour after and first hour before sunset from all detectors. We analyzed Song Meter data as both full spectrum .wav files in callViewer, v.18.0 (Skowronski and Fenton 2008), and as zero-crossing files in AnaLook, v.3.9c (Titley Electronics, Ballina, New South Wales, Australia). This approach allowed us to move quickly through easily identifiable calls in AnaLook and mark other files for a second analysis in full spectrum.

Whenever possible, we identified bats to species based on the acoustic parameters of shape, minimum frequency, duration, and/or critical frequency. Of the species that use the Project site, several have call characteristics that often overlap with those of other local species (Humboldt State University Bat Lab 2011). Therefore, some bat calls were identified to a group rather than to a species (e.g., Yuma myotis and California myotis). Calls that we could not identify to species were classified as unknown.

Although bat calls cannot be used to identify individuals, the number of calls is commonly used as an index of overall activity at a site (Kunz et al. 1996). We quantified bat activity separately for each species classification by presence/absence within 1-minute periods per night. This method provides more accurate assessments of bat activity than traditional methods of counting individual passes (Miller 2001). We then examined the data for temporal patterns to determine whether there was evidence of an emergence event (e.g., a high number of calls from one species recorded around sunset).

2.4 High Frequency Noise Analysis

One of the main components of assessing how the Project activities may affect roosting bats was by assessing how much ultrasonic noise will be generated by the equipment to be used for these activities. It is our understanding that the two main sources of noise will come from the use of portable generators and borehole drilling, and a third potential source is from construction vehicles including backhoes, cranes, and graders. Drilling rigs and other well maintenance rigs will be used during initial construction, during decommissioning (at the end of Remedy life), and during the intervening O&M period. Most of the other construction equipment will be used during the initial construction and decommissioning phases. The portable generators were specifically included because they are the primary noise-inducing device that will be used routinely throughout the O&M period (for groundwater sampling) that will occur several times each year.

To assess whether or not high frequency noise made by generators will disturb bats, we recorded the ultrasonic noise produced by an operating small generator (Honda EU 2000) simultaneously at three distances (10, 20, and 30 meters) with Song Meter (Song Meter SM2 BAT) bat detectors for one minute. The goal of this assessment was to determine the frequencies produced by the generator and at what distance the sound attenuates to a point where it is not expected to disturb a maternity colony.

Because borehole drilling can potentially encounter larger rocks causing auger bits to “skip” along the surface of the substrate, we predicted that the borehole drilling on the Project site could also potentially generate high frequency sounds as metal scrapes rocks. To duplicate these potential drilling sounds, we recorded ultrasonic sounds at a similar situation. Our H. T. Harvey & Associates field staff positioned three high frequency Song

Meter bat detectors at a borehole drilling site in San Jose, California on September 28, 2015. In addition to recording high frequency sounds from the borehole drilling, we recorded sounds generated by a calibration instrument (Wildlife Acoustics) that emitted 48 decibels (dB) (±4 dB) at the 40 kHz frequency. Due to site constraints, the measurements were taken along a path alongside the rig, which likely provided some acoustical shielding; however, any shielding that dampened the sound was accounted for, and actual dB levels were then estimated by modelling based on attenuation data. H. T. Harvey & Associates hired sound analysis specialists Illingworth and Rodkin, Inc. (Petaluma, California) to analyze the strength of high frequencies generated from this borehole drilling in San Jose and to compensate for any possible shielding effects. The memo from Illingworth and Rodkin, Inc. is included as Appendix B.

Construction vehicles, including backhoes, cranes, and graders, that are required to implement the planned groundwater remedy activities, likely also produce ultrasonic noises that could potentially impact roosting bats. We have not measured the amount of high frequency sound generated by each of the pieces of equipment needed to construct the final remedy. Instead, we rely on published accounts of the amount of low frequency noise these construction vehicles generate to estimate their potential high-frequency output.

Section 3. Results

3.1 Mist-Netting and Radiotelemetry

We conducted five nights and one morning of mist-netting in five locations: two areas in southern Bat Cave Wash and three areas in northern Bat Cave Wash: north and south sides of the Interstate 40 culverts and north side of the Burlington Northern Santa Fe Railway culvert (Figure 2). In total, we captured 54 bats representing three species (Table 1 and Appendix A).

Table 1. Number of Bats Captured by Date, Site, and Species

Date	Site	Pallid bat	California Myotis	Yuma Myotis
July 20, 2015	Bat Cave Wash	3	0	1
July 21, 2015	Bat Cave Wash culverts	2	2	7
July 23, 2015	Bat Cave Wash	1	0	0
July 26, 2015	Railroad culvert	0	5	1
July 28, 2015[1]	Railroad culvert	0	0	2
July 28, 2015	Bat Cave Wash culverts/ railroad culvert	0	3	27

[1]Mist net was deployed in the morning before dawn.

We radio-tagged two postlactating pallid bats and successfully located the first bat's roost along Bat Cave Wash south of the Project site (Figure 2). We observed this first radio-tagged bat emerge from the roost two nights after capture. The second radio-tagged bat flew towards the first bat's roost location. However, the next day after the second bat was radio-tagged, neither bats were located at this pallid bat roost, and we were unable to locate the signals of these bats thereafter.

3.2 Visual Surveys of Roost Habitat

We located seven roosts through visual surveys at 19 locations (Figure 3). We observed approximately five bats emerging from the western bluff of southern Bat Cave Wash and 64 bats emerging from five locations in the railroad bridge (Figure 3). Most of the bridge-roosting bats were observed emerging from the bridge near the western shoreline and the westernmost pier over the Colorado River. We did not identify the exact crevice(s) where the five bats emerged from the western bluff; however, the general location is illustrated on Figure 3.

During mist-net surveys we located a large roost of Yuma myotis in a vertical tube in the easternmost culvert under Interstate 40 at the northern end of Bat Cave Wash (Figure 3). We estimated there were approximately 30 individuals present inside the vertical tube. However, the colony is possibly larger, as we captured 27 Yuma myotis individuals while mist-netting outside the culvert before detecting this roost.

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Figure 2. Locations of Mist-nets and Roosts Found Through Telemetry
Topock Compressor Station Summer Roosting Bat Surveys (3740-01)
November 2015

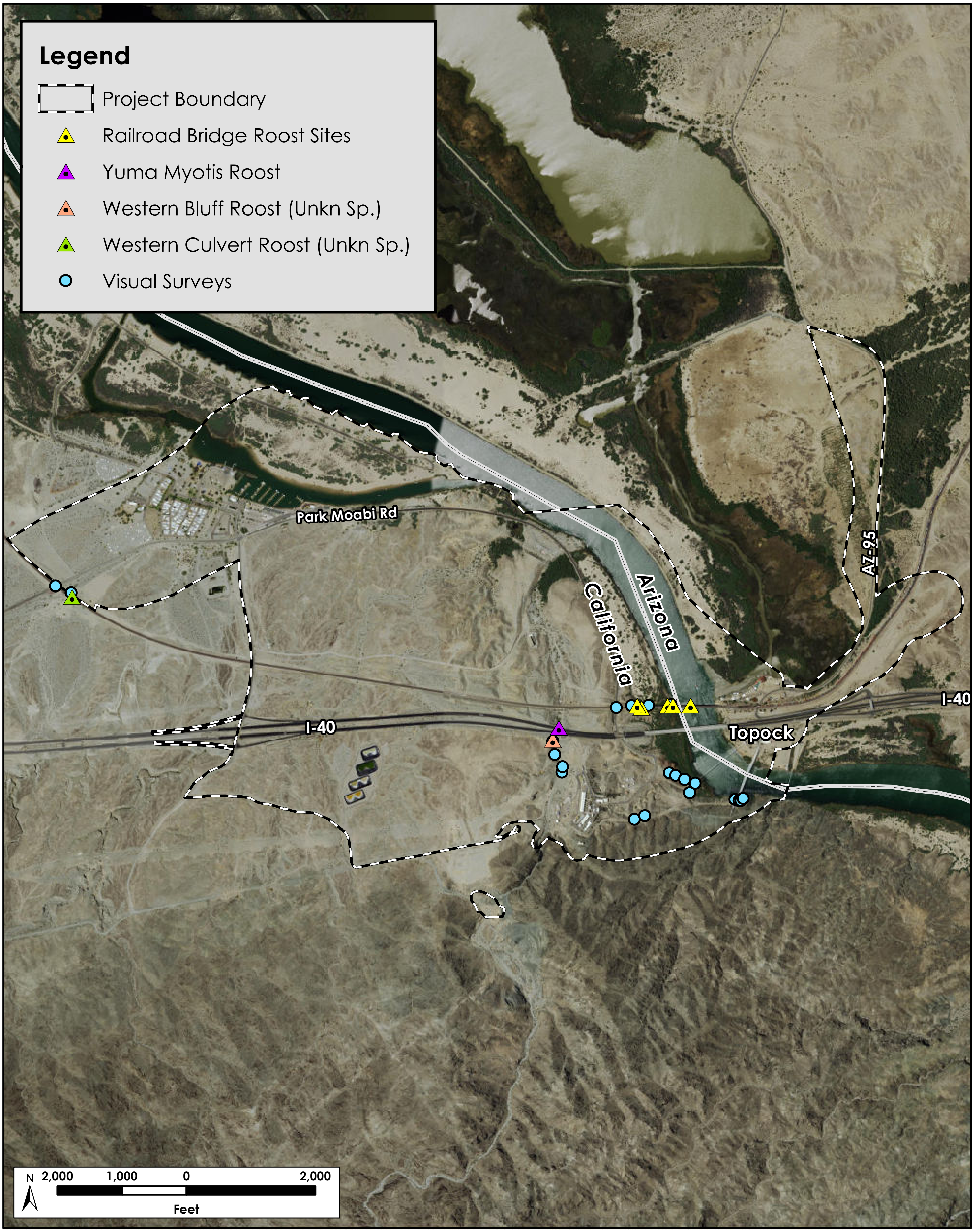

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Figure 3. Locations of Visual Surveys and Roosts Found
Topock Compressor Station Summer Roosting Bat Surveys (3740-01)
November 2015

On September 30th, no bats or bat sign were observed during a daytime inspection under the railroad crossing over the western section of National Trails Highway during the initial inspection or during the subsequent exit count. However, suitable roost habitat is present in this structure. No bats were observed during a daytime inspection of the three culverts immediately east of the National Trail Highway railroad crossing; however, approximately 60 guano pellets were observed underneath an area where overlapping sections of the culverts left a gap in the southernmost culvert (Figure 3). We visually surveyed for emerging bats that evening and conducted an acoustic survey at the same time. No bats were observed visually or through the use of bat detectors during the expected emergence time. However, this site is considered to support roosting bats due to the presence of guano and suitable habitat in the culvert. Based on the roost type and the size of the guano pellets, these bats were either crevice-roosting myotis or canyon bats.

3.3 Acoustic Monitoring

In total we conducted short-term acoustic surveys at 15 locations on the Project site, and covered a variety of potential foliage roosting habitat and crevice or cavity roosting habitats (Figure 4). Using acoustics, we detected seven distinct species of bats at the Project site: big brown bat (*Eptesicus fuscus*), California mastiff bat (*Eumops perotis*), canyon bat (*Parastrellus hesperus*), cave myotis (*Myotis velifer*), Mexican free-tailed bat (*Tadarida brasiliensis*), pallid bat, Townsend's big-eared bat, and one grouped species category, California myotis/Yuma myotis totaling nine species.

3.3.1 Foliage Roosting Habitat

We did not detect western red bats at any of the detectors placed in tamarisk groves in either Arizona or California. There was no on-site roosting habitat for two other foliage roosting bats, the western yellow bat (*Lasiurus xanthinus*) or the silver-haired bat (*Lasionycteris noctivagans*). Hoary bats (*Laisurus cinereus*), a widespread and common foliage roosting species, may roost rarely in the tamarisk grove although we did not detect any bats that were specifically hoary bats (most of this species' calls are difficult to separate from Mexican free-tailed bats). Further, there was no roosting habitat for crevice roosting bats although we did detect crevice-roosting bats that were foraging among these tamarisk trees.

3.3.2 Crevice and Cavity Roosting Habitat

We did not detect any temporal patterns indicative of a maternity colony along Bat Cave Wash or in the red rocks area. Although we detected cave myotis in low numbers at most detectors, we detected a high number of cave myotis passes in the first hour after sunset (8:00 p.m.) at the brick culvert along National Trails Highway (Figure 5). This pattern of high activity, not recorded elsewhere on the Project site for this species, suggests that a maternity colony is close by, possibly inside the brick culvert (Figure 6).

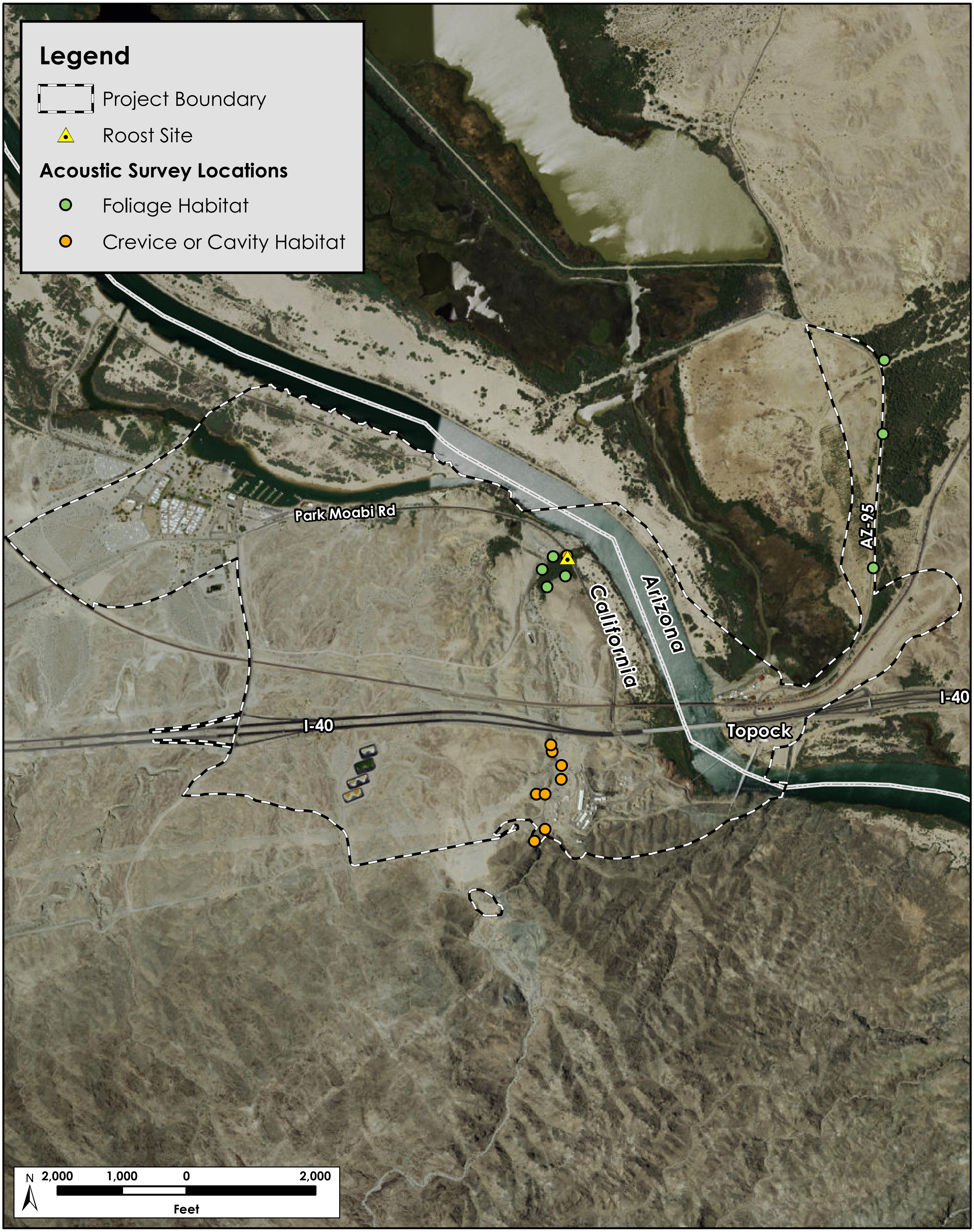

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Figure 4. Locations of Acoustic Surveys and Roosts Found
Topock Compressor Station Summer Roosting Bat Surveys (3740-01)
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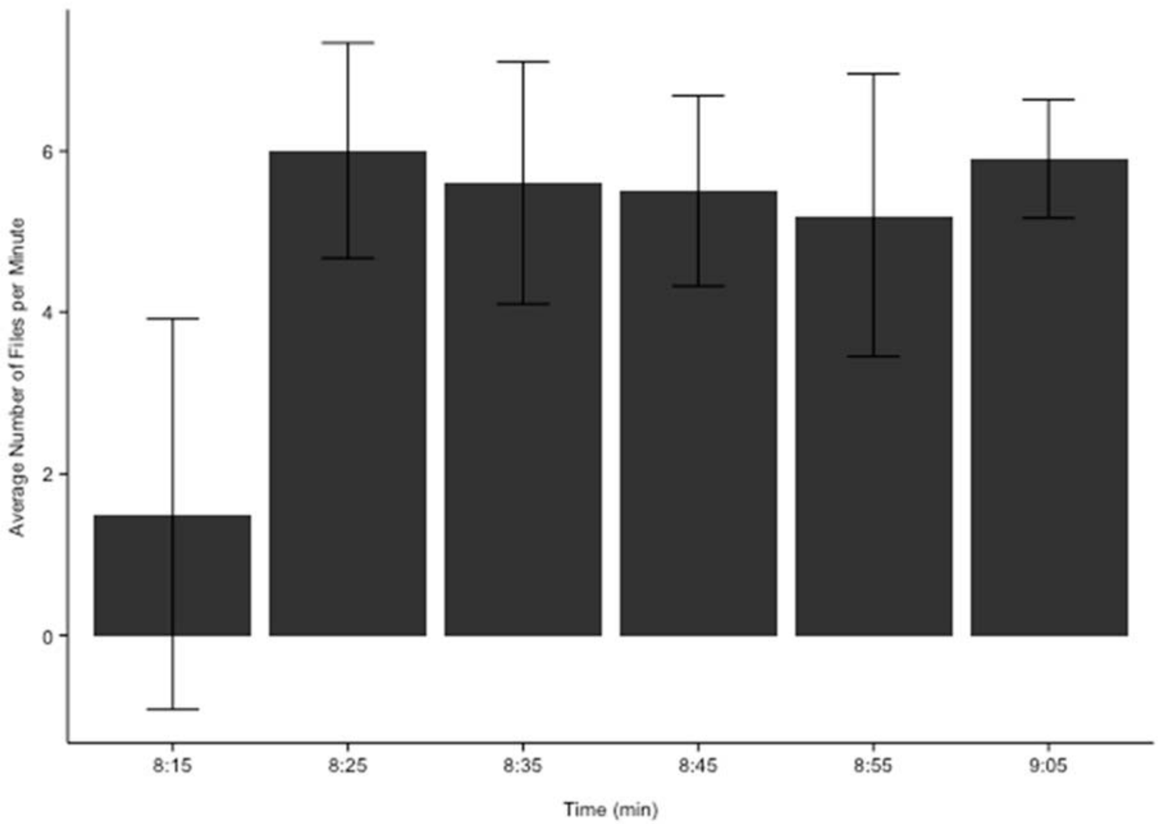
Figure 5. Average Cave Myotis Activity Recorded in Ten-Minute Intervals during First Hour after Sunset



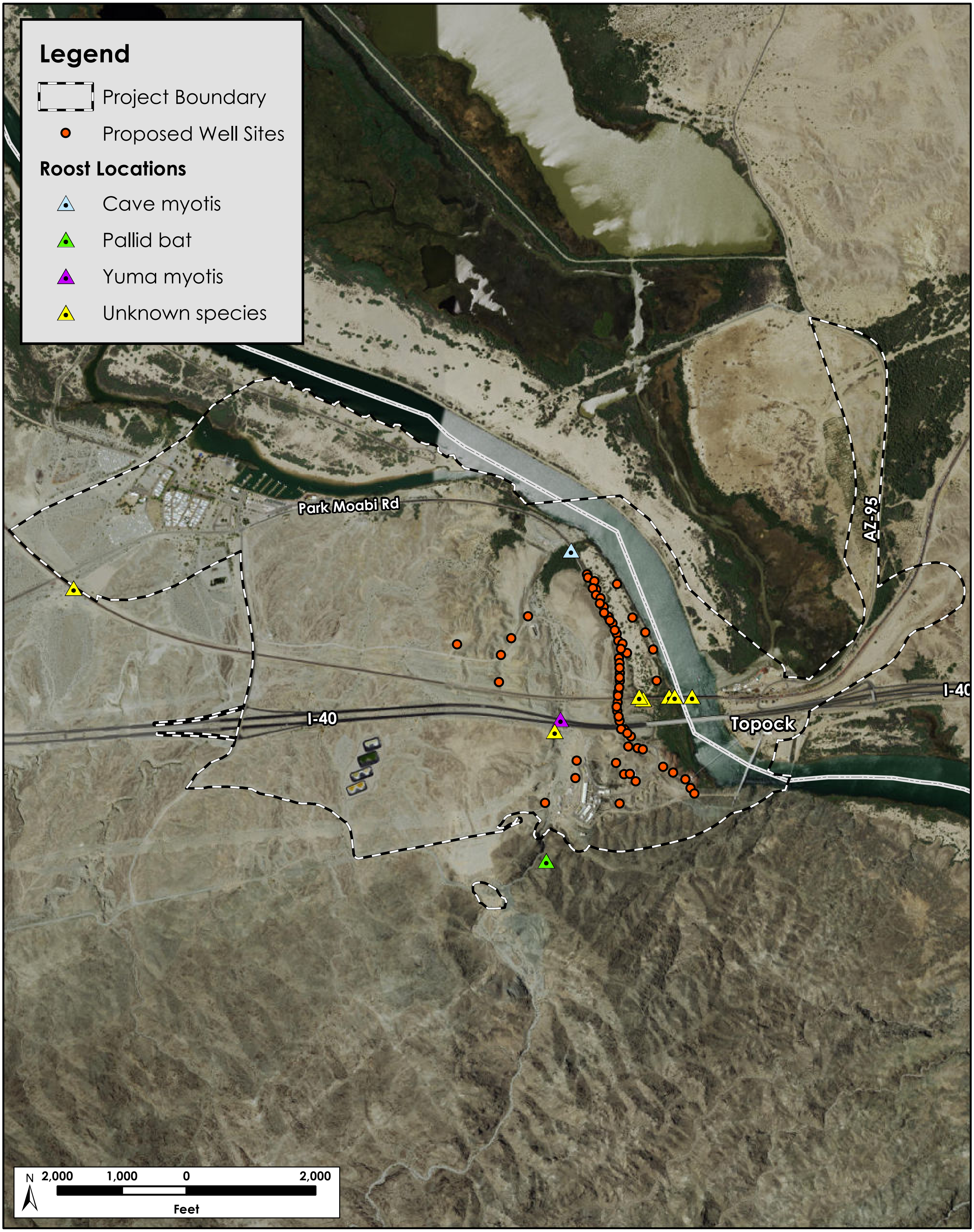


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Figure 6. Locations of All Roosts Found and Proposed Well Sites

Topock Compressor Station Summer Roosting Bat Surveys (3740-01)

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3.4 High Frequency Noise Analysis

3.4.1 Small Generator Ultrasonic Noise

The small generator emits a significant amount of high frequency noise at close range; however, high frequency sounds attenuate very quickly. Figure 2 shows the sonograms of the generator noise at 10, 20, and 30 meter distances away from the recorders. The sonogram at 10 meters shows quite a bit of noise whereas the recordings at 20 and 30 meters away are minimal. At 30 meters the bat flying noise near the bat detector is louder than the noises made by the generator. (In the sonogram the generator noise is fairly faint, and mostly at about 10 kHz.)

3.4.2 Borehole Drilling Ultrasonic Noise

As indicated in the memo (Appendix B), the highest noise levels were measured in the human audible range (up to 10 kHz) with the second highest dB level at about 20 kHz. At the 60-foot distance drill noise was indistinguishable from ambient conditions at frequencies of 40 kHz and higher, but ambient noise likely influenced the levels at frequencies at and above about 30 kHz (see Table 1 in Appendix B). At a distance of 90 feet, drill noise was indistinguishable from ambient conditions at frequencies of 30 kHz and up, and ambient noise likely influenced the levels at frequencies above about 15 kHz.

Because of site constraints, the measurements were taken along a path around the rig, which likely provided some acoustical shielding at some of these locations. The measured levels at the 10- and 30-foot distances are consistent with the Federal Highway Administration's Roadway Construction Noise Model (RCNM). In addition, the drop off rate over distance, which should be about 6 dB per doubling of distance for the overall dB level, is consistent between the 10- and 30-foot distances. Additional attenuation can be seen in the 60- and 90-foot distance data, where shielding provided about 5 dB of additional attenuation at the 60-foot position and about 14 dB of additional attenuation at the 90-foot position.

Ultrasonic sounds attenuate at a much higher rate than lower frequency sounds. Based on the results at the 10- and 30-foot positions, noise levels drop off by about 7 dB per doubling of distance at 30 kHz and by about 10 dB per doubling at the 40 kHz level (Appendix B, Figures 1 and 2). Using these drop off rates, the sum of the frequencies between 30 and 40 kHz would be below 35 dB at a distance of about 150 feet from the drill.

While not specifically addressed in the noise analysis, other types of construction activities and equipment are expected to have similar potential impacts to roosting and foraging bats.

3.4.3 Backhoe Trenching, Operating Cranes, and Grading

We made no measurements of high frequency noises from backhoe trenching, operating cranes, or grading by tractors. However, these construction activities and likely other construction activities are expected to generate high frequency sounds and could potentially impact roosting and/or foraging bats. Based on the United States Environmental Protection Agency (1971) the maximum noise level (of low frequency sounds) at 50 feet for backhoes is 80 dB, for portable cranes it is 78 dB, and for graders it is 80 dB. Whereas we cannot make inferences specific to various noise levels at different frequencies, there is a reasonable chance that these construction vehicles generate high frequency sounds that will need mitigation to minimize and mitigate for potential impacts to bats.

Section 4. Potential Impacts

High Frequency Noise. Ultrasonic sounds can disturb roosting as well as foraging bats. The operating of small gasoline generators and the drilling of boreholes for wells produce high frequency noises that could potentially affect roosting and foraging bats. Additionally, operating backhoes, cranes, graders, trucks and other construction equipment are expected to make high frequency sounds that could disturb bats that are not normally acclimated to such sounds.

Increase in Light Levels at Night. Whereas a few species of bats benefit from foraging around lights that attract nocturnal insects, many bat species show an aversion to areas with anthropogenic lights. An increase in light values near roosts can potentially increase predation on bats and possibly cause bats to abandon a roost.

Vibration. Construction activities planned to implement the final groundwater remedy, such as grading, truck driving, borehole drilling, and the operation of a crane and backhoe could potentially impact roosting bats.

Increased Human Activities. People tend to be curious about bat roosts and enjoy investigating them, especially during the maternity season. However, such activities can result in disturbing the bats, often leading to mothers abandoning a roost. While most species take their young with them, some species of bats (e.g., Townsend's big-eared bats) abandon the young when they leave the roost.

Pipeline Construction. Because the pipelines will be buried, the noise associated with digging trenches could pose a significant noise disturbance to both the colony of cave myotis along the river and the colony of Yuma myotis under Interstate Highway 40 (Figure 6). These colonies are both in close proximity to proposed pipeline routes.

Building Construction. Several new structures will be constructed on the project site including various water storage units, a water conditioning building, new maintenance facility, new storage building, and several new carbon amendment buildings. These new structures are being built immediately adjacent to the existing structures and no impacts on bats or bat roosts are anticipated.

Soil Processing/Storage Areas. Two areas on the north side of the railroad at National Trails Highway on the northwest portion of the Project area will be set aside for construction-generated soil processing and storage. This work will involve frequent noise disturbance from various equipment (soil screening unit, soil loaders, dump trucks/trailers), and air quality degradation from idling trucks in two associated truck waiting areas. Noise from soil moving and processing equipment could impact the bat roost located in the western culverts adjacent to the soil processing areas, especially during the maternity season. Likewise, diesel from idling trucks in the Truck Waiting Areas, even for as little as 15 minutes at a time, could cause roosting bats to abandon this site.

Temporary Construction Laydown Area & Long Term Remedy Support Areas. A temporary construction storage area will be used and several long term remedy support structures will be constructed west of the mobile home park at Moabi Regional Park. We do not anticipate any potential impact on roosting bats associated with these Project features.

Air Quality Degradation. Idling motor vehicles and generators produce exhaust that can greatly impact roosting bats to the extent that bats will abandon their roost. This is especially true during the maternity season when bats tend to be more sensitive and are more easily disturbed.

Foraging Quality Degradation. We do not anticipate any grading of soils or other activities such as vegetation removal that would lead to significant levels of foraging quality degradation. Through the use of acoustic surveys and mist-netting we were able to identify nine species of bats on the Project site, including three species of special concern. Although we did not detect western red bats in the Project site's tamarisk trees, we believe this species could day roost on the site during other times of the year, especially during spring and fall months. Western red bats have been recorded in various locations along the Colorado River, although they are more typically found roosting in Fremont cottonwood (*Populus fremontii*) (Diamond et al. 2013). Because we observed no western red bat calls from bat detectors, we do not expect this species to raise young (form maternity roosts) on the project site.

Section 5. Conclusions

We located ten bat roosts comprising at least 3 species (cave myotis, Yuma myotis, and pallid bat) on or near the Project site through the use of visual surveys, radio telemetry, and acoustic surveys (Figure 6). Identifying the locations of these summer roosts is critical in determining potential impacts and for developing a minimization and mitigation plan that addresses potential impacts to maternity colonies. Bat colonies, including pallid bat maternity colonies, typically have more than one roost and change their roost site locations over the course of the spring – summer period (Lewis 1995). Therefore, summer roost sites described herein may not necessarily be occupied throughout the maternity season and some colonies are likely to be located at different sites during the earlier spring period. Additionally, there may be some year-to-year variation of roost sites based on the differences in weather from year to year. Of the potential impacts to maternity colonies, we believe the impacts due to high frequency noise from boring wells, monitoring wells with an operating generator, idling diesel vehicles, and the pipeline construction have the greatest potential to impact roosting bats.

Section 6. References

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Appendix A. Bat Capture Data

Appendix A. Bat Capture Data

Date	Site	Capture Time	Species	Mass (g)	Forearm (mm)	Sex	Age	Reproductive Status
7/20/2015	Bat Cave Wash	20:30	Pallid bat	11.5	52.05	Female	Adult	Post-lactating
7/20/2015	Bat Cave Wash	20:45	Pallid bat	10.4	49.94	Female	Sub-Adult	Non-reproductive
7/20/2015	Bat Cave Wash	21:10	Pallid bat	12.9	52.1	Female	Adult	Non-reproductive
7/20/2015	Bat Cave Wash	21:38	Yuma myotis	5.6	34	Female	Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	20:20	Yuma myotis	5.2	35.4	Female	Adult	Post-lactating
7/21/2015	Bat Cave Wash Culverts	20:20	Yuma myotis	5.2	35.4	Female	Adult	Post-lactating
7/21/2015	Bat Cave Wash Culverts	20:20	Yuma myotis	5.2	34.35	Female	Sub-Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	20:20	California myotis	3.6	32.3	Female	Adult	Post-lactating
7/21/2015	Bat Cave Wash Culverts	20:20	Yuma myotis	4.3	34	Male	Sub-Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	20:20	Yuma myotis	4.9	34.3	Male	Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	20:20	California myotis	2.9	29	Male	Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	20:55	Pallid bat	12.7	51.2	Male	Adult	Reproductive
7/21/2015	Bat Cave Wash Culverts	20:45	Yuma myotis	3.9	33.3	Female	Sub-Adult	Non-reproductive
7/21/2015	Bat Cave Wash Culverts	21:00	Yuma myotis	5.3	35.15	Female	Adult	Post-lactating
7/21/2015	Bat Cave Wash Culverts	21:25	Pallid bat	15	52.7	Female	Adult	Post-lactating
7/23/2015	Bat Cave Wash	21:00	Pallid bat	14.2	50	Female	Adult	Post-lactating
7/26/2015	RR Culvert	20:25	Yuma myotis	5.2	34.1	Female	Adult	Post-lactating
7/26/2015	RR Culvert	20:30	California myotis	3.4	31.4	Male	Adult	Non-reproductive
7/26/2015	RR Culvert	20:30	California myotis	3.4	31.4	Female	Adult	Post-lactating
7/26/2015	RR Culvert	20:39	California myotis	3.8	31.4	Female	Adult	Non-reproductive
7/26/2015	RR Culvert	20:48	California myotis	2.9	30.6	Male	Adult	Non-reproductive
7/26/2015	RR Culvert	20:55	California myotis	4.2	31.4	Female	Adult	Post-lactating

Appendix A. Bat Capture Data

7/28/2015	RR Culvert	5:10	Yuma myotis	7.3	35.9	Female	Adult	Post-lactating
7/28/2015	RR Culvert	5:10	Yuma myotis	5.3	32.1	Female	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	19:50	Yuma myotis	5.7	35.2	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	19:50	Yuma myotis	4.8	33.3	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	19:50	Yuma myotis	6.1	34.4	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	19:50	Yuma myotis	6	35.2	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	19:50	Yuma myotis	5.3	34	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	19:55	Yuma myotis	4.8	33.2	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	19:55	Yuma myotis	5.8	33.9	Female	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:05	Yuma myotis	5.7	34.2	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:00	Yuma myotis	5.8	34.1	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:09	Yuma myotis	4.4	34	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:16	Yuma myotis	5.5	35.6	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	20:25	Yuma myotis	4.9	34.4	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	20:20	Yuma myotis	4.7	33.4	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:20	Yuma myotis	5.2	34.2	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:27	Yuma myotis	5.6	34	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	20:35	California myotis	3.4	31.2	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	20:40	California myotis	3.2	31.7	Male	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:55	Yuma myotis	6.3	34.9	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	20:55	California myotis	3.2	30.7	Male	Sub-Adult	Non-reproductive

Appendix A. Bat Capture Data

7/28/2015	RR/Bat Cave Wash Culverts	21:10	Yuma myotis	5.5	34.4	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	21:10	Yuma myotis	5.6	34.6	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	21:20	Yuma myotis	5.4	33.9	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	21:20	Yuma myotis	6	33.5	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	21:35	Yuma myotis	6.9	35.5	Female	Adult	Lactating
7/28/2015	RR/Bat Cave Wash Culverts	21:20	Yuma myotis	6.2	36.6	Male	Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	22:00	Yuma myotis	5.7	35	Female	Adult	Post-lactating
7/28/2015	RR/Bat Cave Wash Culverts	22:00	Yuma myotis	5.5	36	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	22:15	Yuma myotis	6.9	35.1	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	22:15	Yuma myotis	6.7	35.2	Female	Sub-Adult	Non-reproductive
7/28/2015	RR/Bat Cave Wash Culverts	22:20	Yuma myotis	7.6	34.7	Female	Adult	Post-lactating

Appendix B. Frequency Analysis of Drill Rig Measurements

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September 24, 2015

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VIA E-MAIL: djohnston@harveyecology.com

SUBJECT: Frequency Analysis of Drill Rig Measurements

Dear Dave:

This letter presents the results of our noise analysis of the acoustical samples provided to us at distances of 10, 30, 60, and 90 feet from the drill impact location of a CME-95 drill rig. The surface soil was made up of slightly damp dense gravel and sandy soil. We understand that these recordings were made at a sample rate of 192,000 samples per second. Noise levels were calibrated using the provided recording of a 48 dB tone (+/- 4 dB) at 40 kHz. Data were developed with a band width of 750 Hz and were based on representative selections from the provided recordings that were typically 1 to 2 seconds in length. Figures 1 and 2, and Table 1 present the results of this analysis.

Table 1: Measured Noise Level at 10, 30, 60, and 90 feet from CME-95 Drill

	Measured Noise Level, dB				
	Ambient	10 ft	30 ft	60 ft	90 ft
Overall Level	47	88	78	67	55
Sum 30-40 kHz	33	67	54	35	33
30 kHz	20	58	47	26	21
40 kHz	22	53	37	23	22

As indicated by Figure 1, the highest noise levels were measured in the audible range (up to 10 kHz) with a second peak occurring around 20 kHz. At the 60 foot distance, drill noise was indistinguishable from ambient conditions at frequencies of 40 kHz and up and ambient noise likely influenced the levels at frequencies above about 30 kHz. At a distance of 90 feet, drill noise was indistinguishable from ambient conditions at frequencies of 30 kHz and up and ambient noise likely influenced the levels at frequencies above about 15 kHz.

It is our understanding that due to site constraints, the measurements were taken along a path around the rig, which likely provided some acoustical shielding at some of these locations. The measured levels at the 10 and 30 foot distances are consistent with the Federal Highway Administration's Roadway Construction Noise Model (RCNM). In addition, the drop off rate over distance, which would be expected to be about 6 dB per doubling of distance for the overall level, is consistent between the 10 and 30 foot distances. Additional attenuation can be seen in the 60 and 90 foot distance data, where shielding provided about 5 dB of additional attenuation at the 60 foot position and about 14 dB of additional attenuation at the 90 foot position.

Due to air absorption, high frequency sounds drop off at a higher rate than those in the audible range. Based on the results at the 10 and 30 foot positions, noise levels drop off by about 7 dB per doubling of distance at 30 kHz and by about 10 dB per doubling at 40 kHz. Using these drop off rates, it is anticipated that the sum of the frequencies between 30 and 40 kHz would be below 35 dB at a distance of about 150 feet from the drill with no additional shielding.

◆ ◆ ◆

This concludes our analysis. If you have any questions or comments, please do not hesitate to call.

Sincerely,

Dana M. Lodico, PE, INCE Bd. Cert.
Senior Consultant
ILLINGWORTH & RODKIN, INC.

(I&R #15-205)

Figure 1: Drill Rig Noise Levels at Various Distances, 0 to 70 kHz

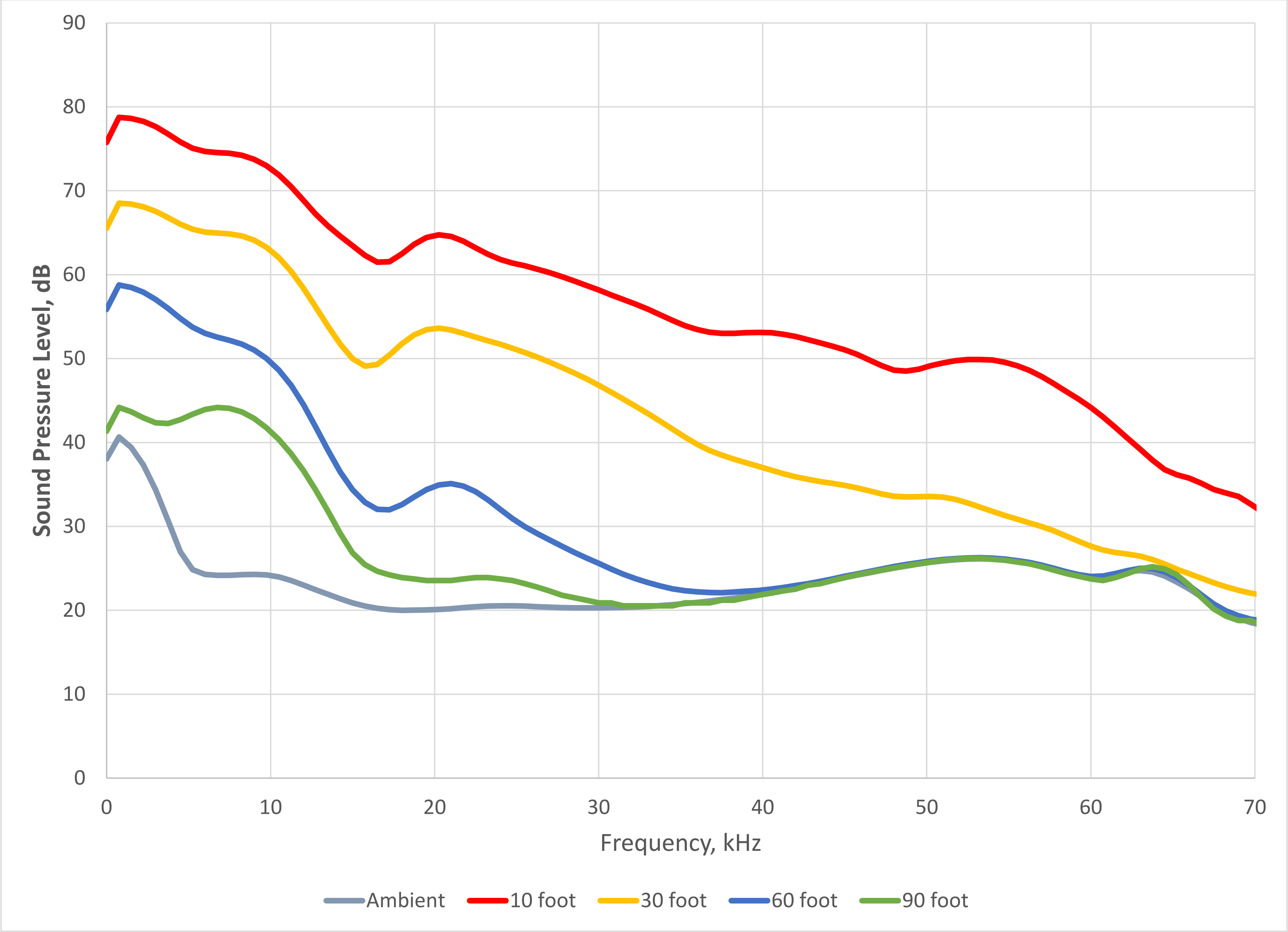

Figure 2: Drill Rig Noise Levels at Various Distances, 20 to 50 kHz