Appendix F-2
Segment 2 Inventory

DRAFT PALEONTOLOGICAL TECHNICAL STUDY

LUGO-VICTORVILLE REMEDIAL ACTION SCHEME PROJECT

Southern California Edison Company

Prepared for: **BLM Barstow Field Office**

BLM Needles Field Office

BLM Southern Nevada District

NPS Mojave National Preserve

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TABLE OF CONTENTS

1.0 Executive Summary 5

2.0 Introduction 7
2.1 Project Description 7

3.0 Definition and Significance of Paleontological Resources 11

4.0 Laws, Ordinances, Regulations, and Standards 12
4.1 Federal Regulatory Setting 12
4.1.1 National Environmental Policy Act of 1969 (NEPA) 12
4.1.2 Antiquities Act of 1906 12
4.1.3 Federal Land Management and Policy Act (FLMPA) (43 USC 1701) 13
4.1.4 Paleontological Resources Preservation Act (PRPA) 13
4.2 State Regulatory Setting 13
4.2.1 California Environmental Quality Act (CEQA) 13
4.2.2 State of California Public Resources Code 14
4.3 Local Regulatory Setting 14
4.3.1 San Bernardino County 14
4.4 Permits 14

5.0 Methods 14
5.1 Paleontological Analysis 15
5.2 Criteria For Evaluating Paleontological Potential 15

6.0 Analysis of Existing Data 17
6.1 Literature Search 17
6.1.1 Igneous and Metamorphic Rocks – Precambrian and Paleozoic (pCg, m) 17
6.1.2 Monte Cristo Limestone – Carboniferous (Lower Mississippian) (Mmc) 18
6.1.3 Bird Spring Formation – Early Permian (Pbs) 18
6.1.4 Igneous and Metamorphic Rocks – Mesozoic (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m) 19
6.1.5 Igneous Rocks – Tertiary and Quaternary (Tah, Ta, Qb) 20
6.1.6 Unnamed Sedimentary Deposits – Paleogene and Early Neogene (Taf, Tt, Tsf, Tss, Tvf) 20
6.1.7 Older Quaternary Deposits – Pleistocene (Qf, Qc, Qoa) 21
6.1.8 Younger Quaternary Deposits – Holocene (Qa, Qal, Qrs, Qf) 21
6.2 Paleontological Record Search Results 21

7.0 Field Survey 22
7.1 Geology 22
7.2 Paleontology 23

8.0 Impacts to Paleontological Resources 38

9.0 Recommendations 38

References 40

Appendix A. Geologic Maps 42

Appendix B. BLM Permits and Fieldwork Authorizations 43

Appendix C. Location (PLSS) 44

Appendix D. Record Search Results 45

Appendix E. Mapped Geology by Construction Area 46

TABLES

Table 1. SCE LVRAS Project Summary 7
Table 2. Potential Fossil Yield Classification (BLM, 2016) 15

FIGURES

Figure 1. Project Location and Surface Management Map. 10
Figure 2. View along ROW from Qa fan looking toward hills. View to northeast. 24
Figure 3. View of Qa valley with hills in foreground and background composed of mixed igneous and metamorphic rock. View to north 25
Figure 4. Overview photo taken from M109-T4 showing terrain of alluvial fans, washes, and moderate to high relief hills. View to southwest. 25
Figure 5. Shallow wash in Qal. View to south. 26
Figure 6. 5-10' high Qoa lobe dissected by wash. View to west. 26
Figure 7. Qal fan exposed by gravelly wash. View to west. 27
Figure 8. Moderate relief hills composed of igneous plutonic and volcanic rock above Tss exposures. View to west. 27
Figure 9. High relief cliffs of Bird Spring Formation limestone rising above Qal valley. View to north. 28
Figure 10. Qal wash with indurated banks. View to east. 28
Figure 11. Disturbed surface Qa at Daggett Storage Yard. View to south. 29
Figure 12. Lobe of coarse Qoa above wash. View to southwest. 29
Figure 13. Greenish Tertiary tuff breccia exposed in hillside under Quaternary alluvium. View to northwest. 30
Figure 14. Tertiary andesitic fanglomerate exposure. View to south. 30
Figure 15. Tss exposure beside wash. View down. 31
Figure 16. Planar laminations and cross-bedding observed in Tss outcrop. View to north. 31
Figure 17. Tss outcrop within hillside. View to west. 32
Figure 18. Bird Spring Formation limestone outcrop. View to north. 32
Figure 19. Bird Spring Formation limestone cliffs and hills above wash. View to south. 33
Figure 20. Tertiary sediments and flows (Tsf) hill. View to east. 33
Figure 21. Outcrop of Tsf with Qal valley below. View to west. 34
Figure 22. Outcrop of pre-Cambrian granite and gneiss adjacent to access road. View to southwest. 34
Figure 23. Outcrop of pre-Cambrian granite and gneiss. View to west. 35
Figure 24. Exposure of pre-Cambrian granite and gneiss adjacent to ROW access road. View to west. 35
Figure 25. Bedrock boulder exposure of Cretaceous Teutonia quartz monzonite surrounded by eroding flats of same quartz monzonite. View to southwest. 36
Figure 26. Mounds of popcorn weathered fine sediments at previously documented horse limb fossil locality. View to west. 36
Figure 27. Shallow, sandy wash topography surrounding previously documented fossil localities. View to east. 37
Figure 28. Bar of cross-bedded, well sorted sand within shallow wash within vicinity of previously documented tooth fragment locality. View to north. 37

1.0 EXECUTIVE SUMMARY

This report presents the results of the paleontological technical study conducted by Paleo Solutions, Inc. (Paleo Solutions) in support of the Southern California Edison Company (SCE) Lugo-Victorville Remedial Action Scheme Project (LVRAS Project) located in San Bernardino County, California and Clark County, Nevada. The LVRAS Project is located on land managed by the Bureau of Land Management (BLM) Barstow and Needles Field Offices and Southern Nevada District (~1235 acres); National Park Service (NPS) Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres) (see Figure 1). All paleontological work was conducted under California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization (FA) CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017 (see Appendix B). Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017. All work was conducted in compliance with federal, state, and local regulations.

The paleontological potential of the Project area was evaluated based on an analysis of existing paleontological data and a Phase 1 field survey. The three components of the analysis of existing data included a geologic map review, a literature search, and institutional record searches. The analysis of existing data was supplemented with a pedestrian field survey. Geologic mapping indicates that the Project and vicinity is underlain by Precambrian to Paleozoic igneous and metamorphic rocks (pCg, m); Carboniferous Monte Cristo Limestone (Mmc); Permian Bird Spring Formation (Pbs); Mesozoic igneous and metamorphic rocks (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m); Tertiary and Quaternary igneous rocks (Tah, Ta, Qb); Tertiary unnamed sedimentary rocks (Taf, Tt, Tsf, Tss, Tvf); older Quaternary (Pleistocene) alluvial deposits (Qf, Qc, Qoa); and younger Quaternary (Holocene) deposits (Qa, Qal, Qrs, Qf) (Dibblee, 1967, 2008a-b; Hewett, 1956; Jennings et al., 1962). The field survey confirmed the presence of younger Quaternary deposits (Qa/Qal), older Quaternary deposits (Qoa), Tertiary sandstone (Tss), Tertiary tuff breccia (Tt), Tertiary andesitic fanglomerate (Taf), Tertiary volcanic fanglomerate sediments (Tvf), Permian Bird Spring Formation (Pbs), and igneous and metamorphic units, including Tertiary flow deposits (Tsf). Monte Cristo Limestone bedrock (Mmc) was not observed during the survey, although it may underlie alluvial units at depth. No fossils were observed or collected.

Paleontological record searches were requested from the San Bernardino County Museum (SBCM) and the Las Vegas Natural History Museum (LVNHM). SBCM reported that they have one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius. The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. LVNHM reported that they did not have any fossil localities within the Project boundaries or one-mile radius. The NPS National Preserve also reported that they had two Pleistocene vertebrate localities located approximately a mile south of the LVRAS Project. Literature and database reviews identified numerous invertebrate fossils (e.g., coral, bryozoans, trilobites, gastropods, and bivalves) from the Monte Cristo Limestone and Bird Springs Formation, and vertebrate fossils (e.g., camel, mammoth, horse, sloth, rodents, and tortoise) from older Quaternary alluvium. Therefore these geologic units are assigned a moderate paleontological potential (Potential Fossil Yield Classification [PFYC] 3). Tertiary unnamed deposits have not been assigned to a specific formation, therefore the paleontologic content of these units is unknown, though sedimentary deposits often have the potential to contain fossils. Therefore, the Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf) are assigned an unknown potential (PFYC U). The Tsf sediments in the Project area were confirmed on

the survey to consist of very low paleontological potential (PFYC 1) flow deposits. Holocene young alluvial deposits are estimated to be less than 10,000 years old, and have low paleontological potential (PFYC 2), because they are too young to contain in-situ fossils. However, these younger deposits often overlie older geologic units with higher paleontological potential which may be impacted at depth. Due to the high heat and pressure under which they form, igneous and metamorphic rock units generally have very low potential to produce scientifically important paleontological resources (PFYC 1).

Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources during excavation within older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate (Tvf); Permian Bird Spring Formation (Pbs); and Lower Mississippian Monte Cristo Limestone (Mmc). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units, including the Tsf flow deposits, will not require monitoring or spot checking.

Prior to construction, a paleontological resources monitoring and mitigation plan (PRMMP) should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

A Project summary is provided in Table 1.

2.0 INTRODUCTION

This report presents the results of the paleontological technical study conducted by Paleo Solutions in support of the SCE Lugo-Victorville Remedial Action Scheme Project located in San Bernardino County, California and Clark County, Nevada. The LVRAS Project is located on land managed by the California BLM Barstow and Needles Field Offices and the Southern Nevada District (~1235 acres); NPS Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres) (Figure 1).

2.1 PROJECT DESCRIPTION

SCE is proposing to install a new 84 mile telecommunication path consisting of Optical Ground Wire (OPGW) between Nipton Road in Clark County, Nevada (near Eldorado Substation) and Interstate 40 near Ludlow, California (Pisgah Substation) on the existing Eldorado-Lugo 500 kilovolt (kV) Transmission Line. The project includes bucket truck work on disturbed areas at approximately 408 transmission tower locations, installation of guard poles at 14 locations, 72 helicopter landing zones, and pulling/tensioning activities at 27 locations. In addition, the Project includes several laydown yards.

Table 1. SCE LVRAS Project Summary

Project Name	SCE Lugo-Victorville Remedial Action Plan Scheme Project			
Project Description	Install a new 84 mile telecommunication path consisting of OPGW between Nipton Road in Clark County, Nevada (near Eldorado Substation) and Interstate 40 near Ludlow, California (Pisgah Substation) on the existing Eldorado-Lugo 500 kV Transmission Line			
Project Area	The Project is located north of Interstate 40 and east of Interstate 15 in the Mojave Desert spanning from Daggett, San Bernardino County, California into Clark County, Nevada.			
Total Acreage	84 linear miles			
Location (PLSS)	**Quarter-Quarter**	**Section**	**Township**	**Range**
	See Appendix C			
Land Owner/Managing Agency	California BLM Barstow and Needles Field Offices and Southern Nevada District (~1235 acres); NPS Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres)			
Geologic Map(s)	Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California (Dibblee, 1967); Geologic Map of the Barstow & Daggett 15 Minute Quadrangles, San Bernardino County, CA (Dibblee, 2008a); Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California (Dibblee, 2008b); Geology and Mineral Resources of the Ivanpah Quadrangle, California and Nevada (Hewett, 1956); Geologic map of California: Trona Sheet (Jennings et al., 1962)			
Geologic Formation(s) and Age(s)	**Formation**	**Map Symbol**	**Age**	**Paleontological Potential (PFYC)**
	Quaternary alluvium	Qa/Qal	Holocene	Low (2)
	Quaternary fanglomerate	Qf	Holocene	Low (2)
	Quaternary Mojave River channel sand	Qrs	Pleistocene to Holocene	Low (2)
	Quaternary colluvium	Qc	Pleistocene	Moderate (3)

	Quaternary fanglomerate	Qf	Pleistocene	Moderate (3)
	Quaternary older alluvium	Qoa	Pleistocene	Moderate (3)
	Quaternary basalt	Qb/Qtb/ QTb	Pleistocene	Very Low (1)
	Tertiary andesitic fanglomerate	Taf	Miocene or Pliocene	Unknown (U)
	Tertiary tuff breccia	Tt	Oligocene or Miocene	Unknown (U)
	Tertiary sediments and flows*	Tsf	Tertiary	Very Low (1)
	Tertiary sandstone	Tss	Oligocene or Miocene	Unknown (U)
	Tertiary volcanic fanglomerate	Tvf	Late Miocene or Early Quaternary	Unknown (U)
	Andesite	Ta	Oligocene or Miocene	Very Low (1)
	Altered Andesite Porphyry	Tah	Oligocene or Miocene	Very Low (1)
	Quartz Diorite Porphyry	qdp	Mesozoic or older	Very Low (1)
	Biotite Quartz Diorite	bqd	Mesozoic or older	Very Low (1)
	Gneiss	gn	Mesozoic or older	Very Low (1)
	Granite	gr	Mesozoic	Very Low (1)
	Hornblende Diorite-Gabbro	hd	Mesozoic	Very Low (1)
	Granite or Quartz Monzonite	gqm	Mesozoic	Very Low (1)
	Dacite Flow Breccia	Jfb	Jurassic	Very Low (1)
	Sands Granite	Js	Jurassic	Very Low (1)
	Teutonia Quartz Monzonite	TKq	Cretaceous or Tertiary	Very Low (1)
	Granite or Metamorphic Rocks	gr-m	Pre-Cretaceous	Very Low (1)
	Bird Spring Formation	Pbs	Permian	Moderate (3)
	Monte Cristo Limestone	Mmc	Lower Mississippian	Moderate (3)
	Marble	m	Paleozoic	Very Low (1)
	Gneiss or Granite	pCg	Precambrian	Very Low (1)
Surveyors(s)	Geraldine L. Aron, M.S., Cecilio D. Garcia, B.A., Joseph T. Raum, B.S, Madeline M. Weigner, M.S.			
Dates(s) Surveyed	July 12-14, 2017, July 19-22, 2017, and July 27-29, 2017			
Formations Surveyed	Younger Quaternary alluvium (Qa/Qal), older Quaternary alluvium (Qoa), Tertiary			

	andesitic fanglomerate (Taf), Tertiary volcanic fanglomerate (Tvf), Tertiary sediments and flows (Tsf), Tertiary tuff breccia (Tt), Tertiary sandstone (Tss), Permian Bird Spring Formation (Pbs).
Permits	California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017. Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017.
Previously Documented Fossil Localities in Project Area	SBCM reported that they have one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius. The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. LVNHM reported that they did not have any fossil localities within the Project boundaries or one-mile radius. The NPS National Preserve reported that they had two Pleistocene vertebrate localities located approximately a mile south of the LVRAS Project.
Paleontological Results	No fossils were observed or collected during the survey.
Disposition of Fossils and Data	Not applicable; no fossils observed or collected.
Recommendation(s)	Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources within older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate (Tvf); Permian Bird Spring Formation (Pbs); and Lower Mississippian Monte Cristo Limestone (Mmc). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units, including the Tsf flow deposits, will not require monitoring or spot checking. Prior to construction, a PRMMP should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

*Only the Tsf volcanic flow deposits were observed during the field survey

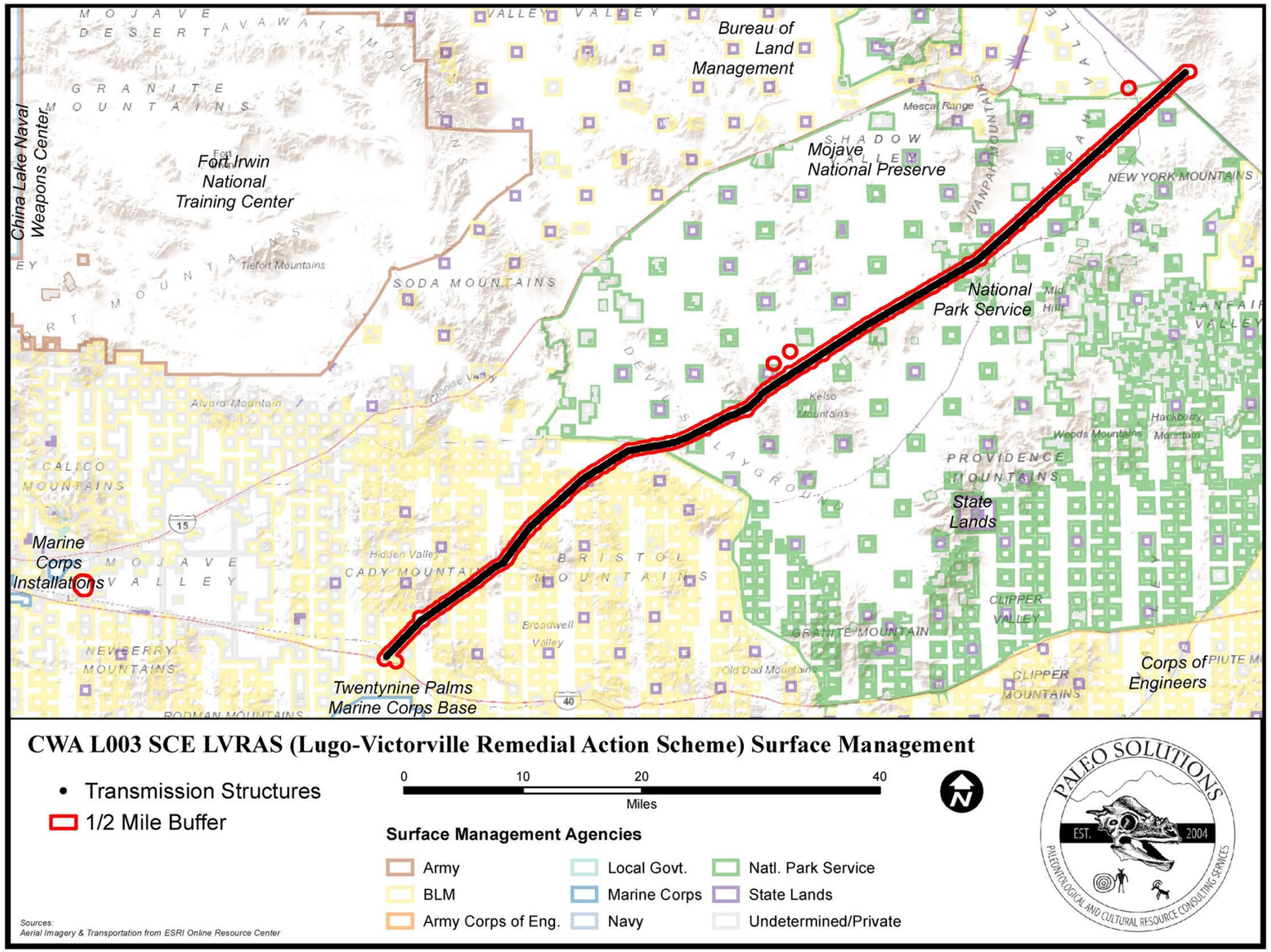

Figure 1. Project Location and Surface Management Map.

3.0 DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

As defined by Murphey and Daitch (2007): "Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates."

Fossil resources vary widely in their relative abundance and distribution and not all are regarded as significant. According to BLM Instructional Memorandum (IM) 2009-011, a "Significant Paleontological Resource" is defined as:

> "Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be of scientific interest if it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has an identified educational or recreational value. Paleontological resources that may be considered not to have scientific significance include those that lack provenience or context, lack physical integrity due to decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate

> coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities" (BLM, 2008).

Vertebrate fossils, whether preserved remains or track ways, are classified as significant by most state and federal agencies and professional groups (and are specifically protected under the California Public Resources Code). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments.

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected fossils. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental and taphonomic conditions.

4.0 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section of the report presents the regulatory requirements pertaining to paleontological resources that apply to this Project.

4.1 FEDERAL REGULATORY SETTING

If any federal funding is used to wholly or partially finance a project, it is sited on federal lands, involves a federal permit, and/or includes a perceived federal impact, federal laws and standards apply, and an evaluation of potential impacts on paleontological resources may be appropriate and/or required. The management and preservation of paleontological resources on public and federal lands are prescribed under various laws, regulations, and guidelines.

4.1.1 National Environmental Policy Act of 1969 (NEPA)

The National Environmental Policy Act of 1969, [NEPA] as amended (Public Law [Pub. L.] 91-190, 42 United States Code [USC] 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258 § 4(b), Sept. 13, 1982) recognizes the continuing responsibility of the Federal Government to "preserve important historic, cultural, and natural aspects of our national heritage . . ." (Sec. 101 [42 USC § 4321]) (#382). With the passage of the Paleontological Resources Preservation Act (PRPA) (2009), paleontological resources are considered to be a significant resource and it is therefore now standard practice to include paleontological resources in NEPA studies in all instances where there is a possible impact.

4.1.2 Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431-433) states, in part:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR 3]), the term "objects of antiquity" has been interpreted to include fossils by the NPS, the BLM, the Forest Service (FS), and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this act. However, due to the large gray areas left open to interpretation due to the imprecision of the wording, agencies are hesitant to interpret this act as governing paleontological resources.

4.1.3 Federal Land Management and Policy Act (FLMPA) (43 USC 1701)

Federal law including the Federal Land Management and Policy Act (FLMPA) of 1976 (43 USC 1701) includes objectives such as the evaluation, management, protection and location of fossils on BLM-managed lands, defines fossils, and lays out penalties for the destruction of significant fossils. Also, NEPA requires the preservation of "historic, cultural, and natural aspects of our national heritage." Most recently, the Omnibus Public Lands Act refines NEPA and FLMPA guidelines and strictures, as well as outlines minimum punishments for removal or destruction of fossils from federal/public lands (see below).

4.1.4 Paleontological Resources Preservation Act (PRPA)

Paleontological Resources Preservation, Title VI, Subtitle D in the Omnibus Public Lands Act of 2009, Pub. L. 111-011 Purpose: The Secretary (Interior and Agriculture) shall manage and protect paleontological resources on federal land using scientific principles and expertise. With the passage of the PRPA, Congress officially recognizes the importance of paleontological resources on federal lands (U.S. Department of the Interior, US Department of Agriculture) by declaring that fossils from federal lands are federal property that must be preserved and protected using scientific principles and expertise. The PRPA provides:

- Uniform definitions for "paleontological resources" and "casual collecting";
- Uniform minimum requirements for paleontological resource use permit issuance (terms, conditions, and qualifications of applicants);
- Uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from Federal lands; and
- Uniform requirements for curation of federal fossils in approved repositories.

4.2 STATE REGULATORY SETTING

4.2.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with the California Environmental Quality Act (CEQA) are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations) and further amended January 4th, 2013. One of the questions listed in the CEQA Environmental Checklist is: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (State CEQA Guidelines Section 15064.5 and Appendix G, Section V, Part C).

4.2.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological "sites" or "features" from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, "state lands" refers to lands owned by, or under the jurisdiction of, the state or any state agency. "Public lands" is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

4.3 LOCAL REGULATORY SETTING

4.3.1 San Bernardino County

The Conservation Element of the San Bernardino County General Plan (2007) contains one goal (CO 3) and one map (Paleontologic Resources Overlay Map, noted in the General Plan as "not available yet"), as well as three programs regarding paleontological resources within the County. Goal CO 3 requires that the County will preserve and promote its historic and prehistoric cultural heritage. Three programs within the General Plan delineate the required County actions regarding paleontological resources. In areas of potential but unknown sensitivity, field surveys prior to grading will be required to establish the need for paleontologic monitoring. Projects requiring grading plans that are located in areas of known fossil occurrences, or demonstrated in a field survey to have fossils present, will have all rough grading (cuts greater than 3 feet) monitored by trained paleontologic crews working under the direction of a qualified professional, so that fossils exposed during grading can be recovered and preserved. Fossils include large and small vertebrate fossils; the latter recovered by screen washing of bulk samples.

Finally, a report of findings with an itemized accession inventory will be prepared as evidence that monitoring has been successfully completed. A preliminary report will be submitted and approved prior to granting of building permits, and a final report will be submitted and approved prior to granting of occupancy permits. The adequacy of paleontologic reports will be determined in consultation with the Curator of Earth Science, San Bernardino County Museum.

4.4 PERMITS

All paleontological work was conducted under California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization (FA) CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017 (Appendix B). Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017. Geraldine Aron, Principal Investigator, oversaw all work as the permit holder and administrator.

5.0 METHODS

This paleontological analysis of existing data included a geologic map review, a literature search, two institutional record searches, and a record search conducted by the NPS Mojave National Preserve.

The analysis of existing data was supplemented with a Phase 1 field survey. The goal of this paleontological study is to evaluate the paleontological potential of the Project. Kate Zubin-Stathopoulos, M.S. and Nathan Dickey, M.S. performed the background research and co-authored this report with Courtney Richards, M.S and Cecilio Garcia, B.A. Geraldine Aron, M.S. oversaw all aspects of the Project as the Paleontological Principal Investigator. GIS maps were prepared by Nathan Dickey, M.S.

Copies of this report will be submitted to the BLM, NPS, and other appropriate federal and state agencies. Paleo Solutions will retain an archival copy of all Project information.

5.1 PALEONTOLOGICAL ANALYSIS

Paleo Solutions reviewed geologic maps of the Project area published by T.W. Dibblee Jr. (1967, 2008a-b), D.F. Hewett (1956), and C.W. Jennings et al. (1962). The literature reviewed included published and unpublished scientific papers. Paleontological record searches were requested from the San Bernardino County Museum (SBCM) and the Las Vegas Natural History Museum (LVNHM). The museum record search results are attached as Appendix D. An additional record search was provided by the NPS Mojave National Preserve and searches of online databases were completed by Paleo Solutions staff.

The Phase 1 field survey was conducted by Paleo Solutions staff members Geraldine L. Aron, M.S., Cecilio D. Garcia, B.A., Joseph T. Raum, B.S, Madeline M. Weigner, M.S., on the following dates: July 12-14, 2017, July 19-22, 2017, and July 27-29, 2017. The paleontological survey was performed in order to determine the paleontological sensitivity of the geologic deposits underlying the survey areas. The survey was conducted after a review of aerial photographs indicated the Project area included areas of undisturbed native sediment. The pedestrian survey included inspection of the Project area with the majority of focus occurring in areas with native sediment exposures. This included close inspection of sediment and bedrock outcrops. Rock exposures as well as the surrounding areas were photographed and documented. Reference points were acquired using a Trimble GPS unit. Sediment and bedrock lithologies were recorded and analyzed and used to better interpret the Project's paleontological sensitivity, and thus better understand the Project's potential impact.

5.2 CRITERIA FOR EVALUATING PALEONTOLOGICAL POTENTIAL

The PFYC system was developed by the BLM (BLM, 2016). Because of its demonstrated usefulness as a resource management tool, the PFYC has been utilized for many years for projects across the country, regardless of land ownership. It is a predictive resource management tool that classifies geologic units on their likelihood to contain paleontological resources on a scale of 1 (very low potential) to 5 (very high potential). This system is intended to aid in predicting, assessing, and mitigating paleontological resources. The PFYC ranking system is summarized in Table 2.

Table 2. Potential Fossil Yield Classification (BLM, 2016)

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low	Geologic units are not likely to contain paleontological resources.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
	Field surveys have verified that significant paleontological resources are not present or are very rare.
	Units are generally younger than 10,000 years before present.
	Recent 16eolian deposits
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	Significant paleontological resources have been documented but may vary in occurrence and predictability.
	Surface-disturbing activities may adversely affect paleontological resources.
	Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
	Illegal collecting activities may impact some areas.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	Significant paleontological resources have been documented and occur consistently
	Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities.
	Unit is frequently the focus of illegal collecting activities.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
U = Unknown	Geologic units that cannot receive an informed PFYC assignment
	Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is unknown.
	Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
	Scientific literature does not exist or does not reveal the nature of paleontological resources.
	Reports of paleontological resources are anecdotal or have not been verified.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
	Area or geologic unit is poorly or under-studied.
	BLM staff has not yet been able to assess the nature of the geologic unit.
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

6.0 ANALYSIS OF EXISTING DATA

6.1 LITERATURE SEARCH

Geologic mapping by indicates that the Project is underlain by Precambrian to Paleozoic igneous and metamorphic rocks (pCg, m); Carboniferous Monte Cristo Limestone (Mmc); Permian Bird Spring Formation (Pbs); Mesozoic igneous and metamorphic rocks (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m); Tertiary and Quaternary igneous rocks (Tah, Ta, Qb); Tertiary unnamed sedimentary rocks (Taf, Tt, Tsf, Tss, Tvf); older Quaternary (Pleistocene) alluvial deposits (Qf, Qc, Qoa); and younger Quaternary (Holocene) deposits (Qa, Qal, Qrs, Qf) (Dibblee, 1967, 2008a-b; Hewett, 1956; Jennings et al., 1962). The geographic distributions of the geologic units in the Project area, as mapped by Dibblee (1967, 2008a-b), Hewett (1956), and Jennings et al. (1962) are provided in Appendix A; and a list of mapped geologic units by construction area is provided in Appendix E.

6.1.1 Igneous and Metamorphic Rocks – Precambrian and Paleozoic (pCg, m)

The Project area is underlain by two Precambrian to Paleozoic igneous and metamorphic rock units (pCg, m), both of which have very low potential to produce scientifically important paleontological resources (PFYC 1).

Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava or magma. Intrusive (plutonic) igneous rocks form below the earth's surface, and extrusive (volcanic) rocks form on the earth's surface. Lava and magma are formed by the melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition. Extreme temperatures in the environments in which intrusive igneous rocks form prevent the preservation of fossils. The formation of extrusive igneous rocks as a result of volcanic processes is associated with extremely high temperatures that also generally prevents the preservation of fossils.

Metamorphic rocks result from the transformation of other rocks due to high temperature and high pressure. The parent rock can be igneous, sedimentary, or a pre-existing metamorphic rock. Metamorphic rocks comprise a large portion of the earth's crust and are classified on the basis of their chemistry and mineralogy. Most do not preserve fossils due to the conditions under which they were formed. However, metasedimentary rocks are formed from common sedimentary rock types such as limestone, shale, mudstone, siltstone, sandstone, and conglomerate. These types of metamorphic rocks do sometimes preserve fossils, but rarely fossils of scientific importance. Examples of fossils in metasedimentary rock include mollusks preserved in marble and echinoderms and graptolites preserved in slate.

The following Precambrian to Paleozoic igneous and metamorphic rocks are present within the Project area (Dibblee, 1967; Hewett, 1956):

- Gneiss or Granite (pCg) – Precambrian: In some areas this may include small bodies of late Mesozoic intrusive rocks; and
- Marble (m) – Paleozoic: White to gray-white, coarsely crystalline, thickly bedded marble composed of calcite and some dolomite; adjacent to granitic contacts locally silicate to garnet, epidote and diopside.

6.1.2 Monte Cristo Limestone – Carboniferous (Lower Mississippian) (Mmc)

The Monte Cristo Limestone, also called Monte Cristo Group, is an Early Mississippian unit originally documented by Hewett (1931). He named it after an exposure near the Monte Cristo mine in the Goodsprings Quadrangle in Clark County, Nevada (Hewett, 1931; Reade, 1962). It unconformably overlies the Sultan Limestone, unconformably underlies the Bird Spring Formation and is equivalent in age to the Tin Mountain Limestone. The Monte Cristo has been documented in Nevada, California, and Arizona and contains five members, which include from oldest to youngest, the Dawn Limestone, Anchor Limestone, Bullion Dolomite, Arrowhead Limestone, and the Yellowpine Limestone members (Hewett, 1931, 1956; Reade, 1962). The Monte Cristo Limestone is generally composed of limestone, altered dolomite, and occasional thin shale beds. The Dawn Limestone Member is composed of blue gray to dark gray limestone with localized dolomite alterations. The Anchor Limestone Member is mostly light bluish gray limestone with chert nodules and locally altered dolomite. The Bullion Dolomite Member is composed of light gray to white with coarse crystallization and vugs. The Arrowhead Limestone Member is composed of alternating layers of limestone and thin shale beds. The Yellowpine Limestone Member is composed of dark gray to black limestone and altered dolomite (Hewett, 1956; Reade, 1962). The thickness of the Monte Cristo Limestone varies from locality to locality, ranging anywhere from 350 feet to 1133 feet. Not all members are present throughout the distribution of the Monte Cristo Limestone (Hewett, 1931, 1956; Reade, 1962). It was deposited in a warm, shallow-water marine environment.

The fossil assemblage found in the Monte Cristo are not found uniformly throughout this unit, but are found within "fossil horizons" that represent short periods of warm shallow water at the time of deposition (Reade, 1962). Hewett (1956) documented fossils, identified by George H. Girty in 1928, which was then supplemented by Reade (1962). The most abundant and well-preserved fossils occur in the Anchor Limestone Member. These fossils included corals (*Syringopora* sp., *Lithostrotionella* sp., *Caninophyllum incrassatum*, *Neozaphrentis* sp., *Triplophyllites* sp., *Homalophyllites* sp., *Zaphrentis* sp., and *Pleurodictyum* sp.), brachiopods (*Spirifer* sp., *Rhipidomella* sp., *Camarotoechia* sp., *Rhytiophora gallatinensis*, *Avonia* sp., *Dictyoclostus* sp., *Echinoconchus* sp., *Linoproductus* sp., and *Syringothyris* sp.), bryozoans (*Fenestrellina* sp.), crinoids (*Displodocrinus* sp., *Dilatocrinus* sp., *Tarantocrinus* sp., *Agaricocrinus* sp., and *Ancalocrinus* sp.), bivalves (*Cypricardinia* sp. and *Schizodus* sp.), gastropods (*Pleurotomaria* sp., *Straparolus* sp.), cephalopods (*Orthoceras* sp.), trilobite fragments, and an ostracod (*Bairdia* sp.) (Hewett, 1931, 1956; Reade, 1962; Webster and Lane, 1987). While not abundant, many of the fossils found in the Monte Cristo Limestone are considered to fill in gaps in the paleontologic and biostratigraphic record for the Lower Mississippian, and constrain the age of the Monte Cristo to the Kinderhookian to Upper Osagean stages of the Lower Mississippian Period (Webster and Lane, 1987). The Monte Cristo Limestone has been assigned moderate paleontological potential (PFYC 3).

6.1.3 Bird Spring Formation – Early Permian (Pbs)

The Bird Spring Formation is a 1,200 to 2,500 foot thick series of limestone, sandstone, and shale beds named by Hewett (1931) after its significant exposure in the Bird Spring Range (Hewett, 1956). It was originally thought to be Pennsylvanian in age, but later determined to be Early Permian (299 to 280 million years ago) (Wilson, 1991). It mostly consists of beds of limestone less than 20 feet thick alternating with thinner beds of shale, sandstone, and dolomite. Small quantities of chert are

present throughout the formation, but are most abundant near the base. In the Spring Mountains, it is mostly pure blue-grey limestone, but grades westward into mostly brown-weathering sandy limestone (Hewett, 1956). It is overlain by the Permian Kaibab Limestone and Supai Formation, and at its base is a local unconformity where it overlies the Mississippian Monte Cristo Limestone. While the Bird Spring Formation is only locally continuous through the Bird Springs Range in Nevada, it may be equivalent to other fossiliferous Early Permian limestone units throughout Nevada and eastern California (Hewett, 1956). It was deposited in a shallow marine environment.

The Bird Spring Formation contains a vast multitude of marine invertebrate micro- and mega-fossils including many species of annelids, brachiopods, bryozoa, corals, crustaceans, echinoderms, gastropods, pelecypods, and protozoa. These fossils are most common in the lower part of the formation and are abundant in some beds 100 to 300 feet above the base (Hewett, 1931). This formation has proven to be a highly productive source of material for paleontological study for many investigators (Clapham and Bottjer, 2007; Webster and Lane, 2007; Wilson, 1991; Wilson and Langenheim, 1993; etc.). Recently discovered taxa include a feather star (*Poteriocrinites permicus*), crinoids (*Ekteinocrinus battleshipensis*), and the first evidence of a Permian age actinocrinitid in North America (Webster and Lane, 2007). Exposures of the formation near the mouth of Battleship Wash, Clark County, Nevada, "has yielded the largest Early Permian crinoid fauna known in North America" (Webster and Lane, 2007), and fusilinid-based regional strata correlations have resulted in a significantly improved understanding of the tectonic history of North America (Stevens and Stone, 2007). Due to the abundance, diversity, and excellent preservation of scientifically significant marine invertebrates, the Bird Spring Formation is considered to have moderate paleontological potential (PFYC 3).

6.1.4 Igneous and Metamorphic Rocks – Mesozoic (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m)

The Project area is underlain by 10 Mesozoic igneous and metamorphic rock units (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m), all of which have very low potential to produce scientifically important paleontological resources (PFYC 1). See Igneous and Metamorphic Rocks – Precambrian to Paleozoic for a full discussion on these types of rocks.

The following Mesozoic igneous and metamorphic rocks are present within the Project area (Dibblee, 2008b, 1967; Hewett, 1956; Jennings et al., 1962):

- Quartz Diorite Porphyry (qdp) – Mesozoic or older: Gray, massive to gneissoid, porphyritic, medium to coarse grained granitic rock composed of quartz, potassic feldspar and plagioclase;
- Biotite Quartz Diorite (bqd) – Mesozoic or older: Dark gray, medium to fine grained, massive to gneissoid or weakly foliated dioritic rock;
- Gneiss (gn) – Mesozoic or older: Gray banded gneiss;
- Granite (gr) – Mesozoic: Includes Teutonia and Atolia quartz monzonites, granite, diorite, granodiorite, hornblende diorite, pegmatite, alpite, granophyre and gneissic granite;
- Hornblende Diorite-Gabbro (hd) – Mesozoic: Dark gray to black, medium to coarse grained, massive dioritic rock composed mostly of hornblende or biotite and calcic plagioclase;
- Granite or Quartz Monzonite (gqm) – Mesozoic: Light gray, hard, massive, medium to coarse grained quartz monzonite;

- Dacite Flow Breccia (Jfb) – Jurassic: Specific lithology descriptions of this unit are not available;
- Sands Granite (Js) – Jurassic: Specific lithology descriptions of this unit are not available;
- Teutonia Quartz Monzonite (TKq) – Cretaceous or Tertiary: Specific lithology descriptions of this unit are not available; and
- Granite or Metamorphic Rocks (gr-m) – Pre-Cretaceous: Undifferentiated quartzite, marble, talc schist, and meta-igneous rocks.

6.1.5 Igneous Rocks – Tertiary and Quaternary (Tah, Ta, Qb)

The Project area is underlain by three unnamed Tertiary igneous rock units (Tah, Ta, Qb), all of which have very low potential to produce scientifically important paleontological resources (PFYC 1). See Igneous and Metamorphic Rocks – Precambrian to Paleozoic for a full discussion on these types of rocks.

The following Tertiary intrusive and extrusive igneous rocks are present within the Project area (Dibblee, 2008b, 1967):

- Andesite (Ta) – Oligocene or Miocene: Greenish-gray, brown and dark reddish-brown, massive and aphanitic to porphyritic, composed mostly of plagioclase and gradational into andesite breccia unit;
- Basalt Flow of Pisgah Crater (Qb) – Pleistocene: Black, vesicular, microcrystalline and porous with small vugs between grains and forms at least one ropy flow on surficial deposits. Erupted from Pisgah Crater; and
- Altered Andesite Porphyry (Tah) – Oligocene or Miocene: Hydrothermally leached to light buff, softer rock with feldspars partly altered to kaolinite with iron leached out.

6.1.6 Unnamed Sedimentary Deposits – Paleogene and Early Neogene (Taf, Tt, Tsf, Tss, Tvf)

There are several unnamed sedimentary deposits mapped within the Project area. These consist of andesitic fanglomerate (Taf), tuff breccia (Tt), fanglomerate and sediments and flows (Tsf), sandstone (Tss), and volcanic fanglomerate (Tvf) (Dibblee, 1967, 2008b; Hewett, 1956). Since these units have not been assigned to a specific formation, the general geology and paleontologic content of these units is unknown, though sedimentary deposits, especially sandstone, often have the potential to contain fossils. For example, Pliocene alluvial deposits in San Bernardino County have produced numerous well preserved mammalian fossils including fish, salamanders, frogs, toads, giant tortoise, snakes, birds, rodents, rabbits, camels, and cats, among other taxa (Wagner and Prothero, 2001). These fossils were preserved in an undetermined alluvial deposit in a layer that contains calcareous concretionary sandstone and pebbly conglomerate located on Gypsum Ridge in Twentynine Palms, San Bernardino County.

There were no fossils identified form these deposits during the survey, however, with the exception of Tsf, the observed sediments appear conducive to the preservation of fossils and are considered to have unknown paleontological potential (PFYC U) within the Project area (see Section 7). Only the very low paleontological potential (PFYC 1) flow deposits of Tsf were observed within the Project area.

6.1.7 Older Quaternary Deposits – Pleistocene (Qf, Qc, Qoa)

Several unnamed older Quaternary deposits (middle to late Pleistocene; 780,000 to 11,000 years old) are exposed throughout the Project area and consist of fanglomerate (Qf) and older alluvium (Qc, Qoa) (Dibblee, 2008b, 1967; Hewett, 1956; Jennings et al., 1962). Fanglomerate is composed of weekly consolidated, massive to poorly bedded, gray, coarse gravel derived from nearby highlands. Older alluvium is composed of cobble, gravel, and sand that is poorly bedded to massive (Dibblee, 2008b, 1967).

Ice Age taxa have been recovered from Pleistocene age deposits of San Bernardino County, including specimens of rodents (*Peromyscus* sp., *Dipodomys ordii*, *Neotoma* sp., *Thomomys* sp., among others) rabbits (*Lepus* sp.), horse (*Equus conversidens*), badger (*Taxidea taxus*), cats (*Smilodon* sp., *Puma concolor*), mammoth (*Mammuthus* sp.) camel (*Camelops* sp., *Hemiauchenia* sp.), sloth (*Nothrotheriops* sp., *Megalonyx* sp.), tortoise (*Opherus agassizi*) as well as bison, antelope, and many other taxa of mammals (Jefferson, 1991; Reynolds, 1991; Brattstrom, 1961). There are numerous Pleistocene-aged localities throughout San Bernardino County and the Mojave Desert, some of which are accumulations of material by woodrats for nests (woodrat middens) in caves, and many of which are deposits from along the shorelines of Pleistocene lakes (Stegner, 2015; Grayson, 2011). While the depositional environment of the cave deposits and lake deposits differs from that of the Project area, there is the potential for a similar fauna to be recovered during Project excavations.

Some Pleistocene-age alluvial deposits are composed of coarse-grained material, which is not typically conducive to the preservation of fossils. For example, coarse-grained surficial Quaternary deposits derived from the local plutonic igneous rocks have a low probability to contain fossils; however, older, finer grained alluvial sediments may contain significant paleontological resources. Based on the results of the field survey (see Section 7), older Quaternary deposits within the Project area are assigned a moderate paleontological potential (PFYC 3).

6.1.8 Younger Quaternary Deposits – Holocene (Qa, Qal, Qrs, Qf)

Younger Quaternary deposits typically consist of variable compositions of unconsolidated clay, silt, sand, gravel, and larger clasts. Holocene sediments within the Project area consist of alluvium (Qa, Qal), fanglomerate (Qf), and Mojave River channel sand (Qrs) (Dibblee, 2008a, 2008b, 1967; Hewett, 1956; Jennings et al., 1962). Holocene age (less than 11,000 years old) sediments are typically too young to contain fossilized material (Society of Vertebrate Paleontology [SVP] 2010), but they may overlie sensitive older (e.g., Pliocene and Pleistocene age) deposits at variable depth. Younger Quaternary deposits are assigned low paleontological potential (PFYC 2) at the surface using BLM (2016) guidelines. However, they have an unknown paleontological potential in the subsurface since there is potential for these deposits to be conformably underlain by older, paleontologically sensitive geologic units.

6.2 PALEONTOLOGICAL RECORD SEARCH RESULTS

Paleontological records searches were requested from SBCM and LVNHM in order to identify if there are any known fossils within the Project boundaries. On September 14, 2017, SBCM reported that they had one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius (Gilbert, 2017; Appendix D). The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. Recovered fossils include specimens of large mammals such as camel (*Camelops* sp.), horse (*Equus* sp.; cf. *Equus occidentalis*), mammoth (*Mammuthus* sp.), and sloth (Megalonychidae), as well as a variety of smaller taxa such as turtles, lizards, snakes, amphibians, birds, rabbits, and rodents. SBCM also noted that

abundant fusulinid, coral, and other marine fossils have been recovered from the Bird Spring Formation in the Mojave Desert; and that there is also the potential for younger (Pleistocene/Holocene) cave and/or midden deposits to have formed in the Bird Spring Formation (Gilbert, 2017). However, no cave or midden deposits were observed during the survey and are thus not expected to be impacted by the Project.

LVNHM responded on August 29, 2017 that they do not have any localities recorded from within the Project boundaries, and that the closest locality is a ground sloth recovered from Devil's Hole (Bonde, 2017; Appendix D), which is located north of the Project area in Nye County, Nevada.

The NPS Mojave National Preserve also report that they had discovered fossils of Pleistocene horse, camel, rodent, and fish fossils approximately a mile south of the LVRAS Project (David Burdette, Pers. Comm., 6/6/2017).

7.0 FIELD SURVEY

The survey area is located in southeastern California and southwestern Nevada with the Project right of way (ROW) spanning approximately 84 miles between Ludlow, San Bernardino County, California to an unnamed area in Clark County, Nevada adjacent to Joshua Tree Highway 164 as well as an additional storage yard in Daggett, California. The ROW is accessible via a graded access road which traverses a series of low to high relief alluvial fans, valleys, and several hill ranges. Segments of this access road, labeled on maps as Powerline Road, were paved with asphalt some years ago, but due to minimal maintenance the pavement has since been heavily eroded or obscured by drifting sediment making access to certain ROW segments a challenge. Existing ground disturbances include the aforementioned graded and paved access road, transmission line facilities (substations), a railroad, three transmission distribution lines with associated graded pads and spur roads, roads and berms constructed from local sediment, fences, and litter debris. Surface sediments are exposed along the entirety of the ROW with the exception of areas with graded roads or natural vegetation.

7.1 GEOLOGY

Younger Quaternary alluvial deposits (Qa/Qal) are mapped throughout a vast majority of the Project ROW from the southwestern yard in Daggett, California to the northeastern ROW terminus in Clark County, Nevada. These younger sediments were exposed within numerous washes and outcrops atop the many low to moderate relief alluvial fans and valleys along the alignment. Sediments observed are light brown, light brown pink, tan, medium gray, gray green, poorly to moderately consolidated, moderately to poorly sorted, clay, silt, rounded to angular fine to very coarse sand, with subrounded to angular clasts of pebble to cobble sized metamorphic and igneous rock. These Qa/Qal sediments were observed to have some bedding structures as evidenced by clast sorted beds exposed within washes up to several feet high (Figures 2, 3, 4, 5, 7, 9, 10). Washes with banks were observed in the northeast end of the ROW by Nipton, California. These banks contained moderately to well concreted sediments of poorly sorted, rounded to angular fine to coarse sands, pebbles, cobbles (Figure 10).

The Daggett training and storage yard located in Daggett, California is mapped within an area of younger Quaternary alluvium (Qa/Qal) however recent grading and the presence of artificial gravel and temporary structures such as post fencing and trailers indicate that the (Qa/Qal) within the yard is very likely disturbed (Figure 11). Similarly, the Nipton, California yard is also mapped within (Qa/Qal) and has also been disturbed by similar grading and temporary infrastructure.

Older Quaternary alluvium sediments (Qoa) are mapped in several locations along the ROW typically adjacent or near to moderate relief hills composed of igneous or metamorphic rock. These older sediments form alluvial fans or lobes raised above the lower elevation (Qa/Qal). Sediments observed are tan, light brown, pink brown, light gray, poorly consolidated, poorly sorted, very fine to coarse sands, with subrounded to angular clasts of pebble, cobble, and boulder sized igneous, sedimentary, metamorphic rock (Figures 6, 12).

Tertiary (Oligocene- to Miocene-aged) tuff breccia sediments (Tt) are mapped in the vicinities of towers M72-T2 to M73-T2. These tuffaceous sediments ranging from clastic to uniform ashfall are exposed within wash exposures and hillsides typically underlying surficial deposits of Quaternary alluvium. Sediments observed are mint green, grayish green, moderately to well lithified, very poorly to well sorted, ash and very fine to coarse sands, with subrounded to angular clasts of gravel to pebble sized volcanic tephra (Figure 13).

Tertiary andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf) are mapped in the vicinities of M71-T5 to M73-T3 and M79-T3. These sediments are exposed surficially within alluvial lobes and low to moderate relief hill slopes. Sediments observed are light brown, grayish brown, poorly to moderately compacted, poorly to moderately sorted, silty, very fine to coarse sands, with rounded to subangular clasts of pebble to boulder sized igneous volcanic rock (Figure 14).

Tertiary (Oligocene- to Miocene-aged) sandstone (Tss) is mapped within the vicinity of towers M77-T3 to M78-T3. These sediment outcroppings are exposed between moderate relief hills of igneous plutonic and igneous bedrock either adjacent to bedrock or directly below shallow colluvium eroding from said hills. Sediments observed are pale pink red, brick red, well to very well lithified, medium to very coarse sands with subrounded to subangular clasts of igneous plutonic minerals, with laminated and cross bedded structures (Figures 15, 16, 17). Compaction and mineralization of this unit give it an almost granitic crystalline appearance.

Permian-aged Bird Spring Formation limestone (Pbs) is mapped in the vicinities of towers M104-T2 to M106-T1. Outcroppings of this limestone form massive, moderate to high relief hills rising above surrounding low relief alluvial washes and valleys. In addition, Pbs bedrock makes contact with adjacent pre-Cambrian igneous and metamorphic bedrock. Sediments observed are light to dark gray weathering to light to medium gray, microcrystalline, well lithified, well sorted grains (Figures 9, 18, 19). Late Mississippian-aged Monte Cristo Limestone (Mmc) is mapped adjacent to Pbs, but exposures of Mmc were not observed during the survey.

An unnamed unit noted as Tertiary sediments and flows (Tsf) is mapped south of towers M148-T3 and M149-T1 on the northeast end of the alignment. Topographically, the outcrop forms a moderate relief hill sitting above low relief Qal slopes and washes. Observation of this Tsf outcrop revealed an igneous volcanic rock formation purplish black in color weathering to reddish black, very well indurated, with an aphanitic crystalline groundmass (Figures 20, 21).

Paleozoic- to Cenozoic-aged igneous and metamorphic rocks were encountered across the Project area in varying degrees of exposure from small outcroppings to broad slopes to high relief hills. Several segments of the ROW cross through areas where structures and access roads are built directly into these igneous and metamorphic units (Figures 8, 20-25).

7.2 PALEONTOLOGY

No paleontological resources were observed during the survey. However, sediments conducive to fossil preservation were observed within the older Quaternary alluvium (Qoa); Tertiary sandstone

(Tss), tuff breccia (Tt), andesitic fanglomerate (Taf), and volcanic fanglomerate sediments (Tvf); and Permian Bird Spring Formation (Pbs). As part of the survey, previously documented NPS Mojave National Preserve localities outside of the assigned survey buffer, but close to the Project ROW were investigated to determine the sedimentary composition around the localities. Sediments observed were analogous to the previously encountered Qa/Qal sediments observed through the survey; light tan brown to light grayish brown, poorly to moderately compacted, poorly to moderately sorted, clay-sized grains to medium sands with rounded to subangular clasts of igneous and metamorphic rock present as surface float, with cross-bedded and popcorn weathering-like structures (Figures 26-28). The fossils previously discovered at these localities were not present and no new fossil resources were observed or collected.

Figure 2. View along ROW from Qa fan looking toward hills. View to northeast.

Figure 3. View of Qa valley with hills in foreground and background composed of mixed igneous and metamorphic rock. View to north.

Figure 4. Overview photo taken from M109-T4 showing terrain of alluvial fans, washes, and moderate to high relief hills. View to southwest.

Figure 5. Shallow wash in Qal. View to south.

Figure 6. 5-10' high Qoa lobe dissected by wash. View to west.

Figure 7. Qal fan exposed by gravelly wash. View to west.

Figure 8. Moderate relief hills composed of igneous plutonic and volcanic rock above Tss exposures. View to west.

Figure 9. High relief cliffs of Bird Spring Formation limestone rising above Qal valley. View to north.

Figure 10. Qal wash with indurated banks. View to east.

Figure 11. Disturbed surface Qa at Daggett Storage Yard. View to south.

Figure 12. Lobe of coarse Qoa above wash. View to southwest.

Figure 13. Greenish Tertiary tuff breccia exposed in hillside under Quaternary alluvium. View to northwest.

Figure 14. Tertiary andesitic fanglomerate exposure. View to south.

Figure 15. Tss exposure beside wash. View down.

Figure 16. Planar laminations and cross-bedding observed in Tss outcrop. View to north.

Figure 17. Tss outcrop within hillside. View to west.

Figure 18. Bird Spring Formation limestone outcrop. View to north.

Figure 19. Bird Spring Formation limestone cliffs and hills above wash. View to south.

Figure 20. Tertiary sediments and flows (Tsf) hill. View to east.

Figure 21. Outcrop of Tsf with Qal valley below. View to west.

Figure 22. Outcrop of pre-Cambrian granite and gneiss adjacent to access road. View to southwest.

Figure 23. Outcrop of pre-Cambrian granite and gneiss. View to west.

Figure 24. Exposure of pre-Cambrian granite and gneiss adjacent to ROW access road. View to west.

Figure 25. Bedrock boulder exposure of Cretaceous Teutonia quartz monzonite surrounded by eroding flats of same quartz monzonite. View to southwest.

Figure 26. Mounds of popcorn weathered fine sediments at previously documented horse limb fossil locality. View to west.

Figure 27. Shallow, sandy wash topography surrounding previously documented fossil localities. View to east.

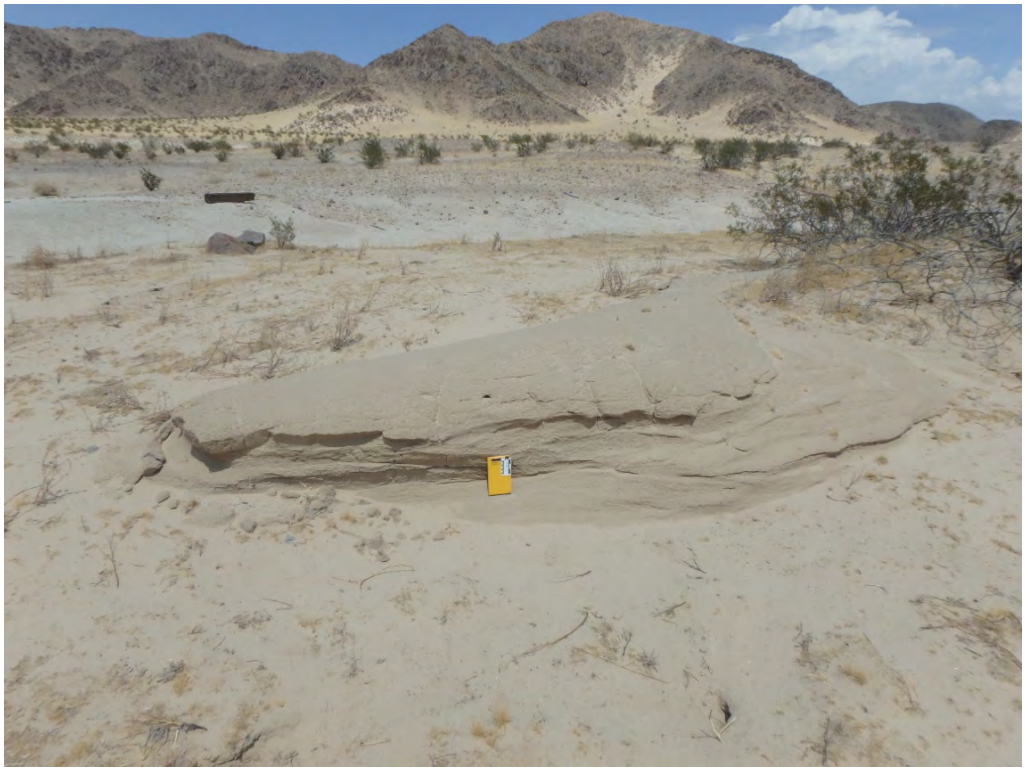

Figure 28. Bar of cross-bedded, well sorted sand within shallow wash within vicinity of previously documented tooth fragment locality. View to north.

8.0 IMPACTS TO PALEONTOLOGICAL RESOURCES

Impacts on paleontological resources can generally be classified as either direct, indirect or cumulative. Direct adverse impacts on surface or subsurface paleontological resources are the result of destruction by breakage and crushing as the result of surface disturbing actions including construction excavations. In areas that contain paleontologically sensitive geologic units, ground disturbance has the potential to adversely impact surface and subsurface paleontological resources of scientific importance. Without mitigation, these fossils and the paleontological data they could provide if properly recovered and documented, could be adversely impacted (damaged or destroyed), rendering them permanently unavailable to science and society.

Indirect impacts typically include those effects which result from the continuing implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of the construction of new roads and trails in areas that were previously less accessible. This increases public access and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. Human activities that increase erosion also cause indirect impacts to surface and subsurface fossils as the result of exposure, transport, weathering, and reburial.

Cumulative impacts can result from incrementally minor but collectively significant actions taking place over a period of time. The incremental loss of paleontological resources over time as a result construction-related surface disturbance or vandalism and unlawful collection would represent a significant cumulative adverse impact because it would result in the destruction of non-renewable paleontological resources and the associated irretrievable loss of scientific information.

Excavations into areas containing native older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf); Permian Bird Spring Formation (Pbs), and Lower Mississippian Monte Cristo Limestone (Mmc) may result in significant impacts to paleontological resources. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) are unlikely to uncover significant fossil remains. However, older deposits are likely present below immediately below Holocene soils or alluvium. Excavations entirely within previously disturbed sediments or artificial fill are unlikely to uncover significant fossil remains; furthermore, any recovered resources will lack stratigraphic context. However, these deposits may shallowly overlie older in-situ sedimentary deposits. Therefore, grading and other earthmoving activities may potentially result in significant adverse impacts to paleontological resources throughout areas of the Project containing sedimentary units. Excavations into Proterozoic- to Cenozoic-aged igneous and metamorphic rock units, including the Tsf flow deposits, are unlikely to yield significant recognizable fossil remains.

9.0 RECOMMENDATIONS

Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources within older Quaternary deposits (Qoa) (PFYC 3); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf), and volcanic fanglomerate sediments (Tvf) (PFYC U); Permian Bird Spring Formation (Pbs) (PFCY 3); and Lower Mississippian Monte Cristo Limestone (Mmc) (PFYC 3). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level.

Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments (PFYC 2) are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units (PFYC 1), including the Tsf flow deposits, will not require monitoring or spot checking.

Prior to construction, a PRMMP should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

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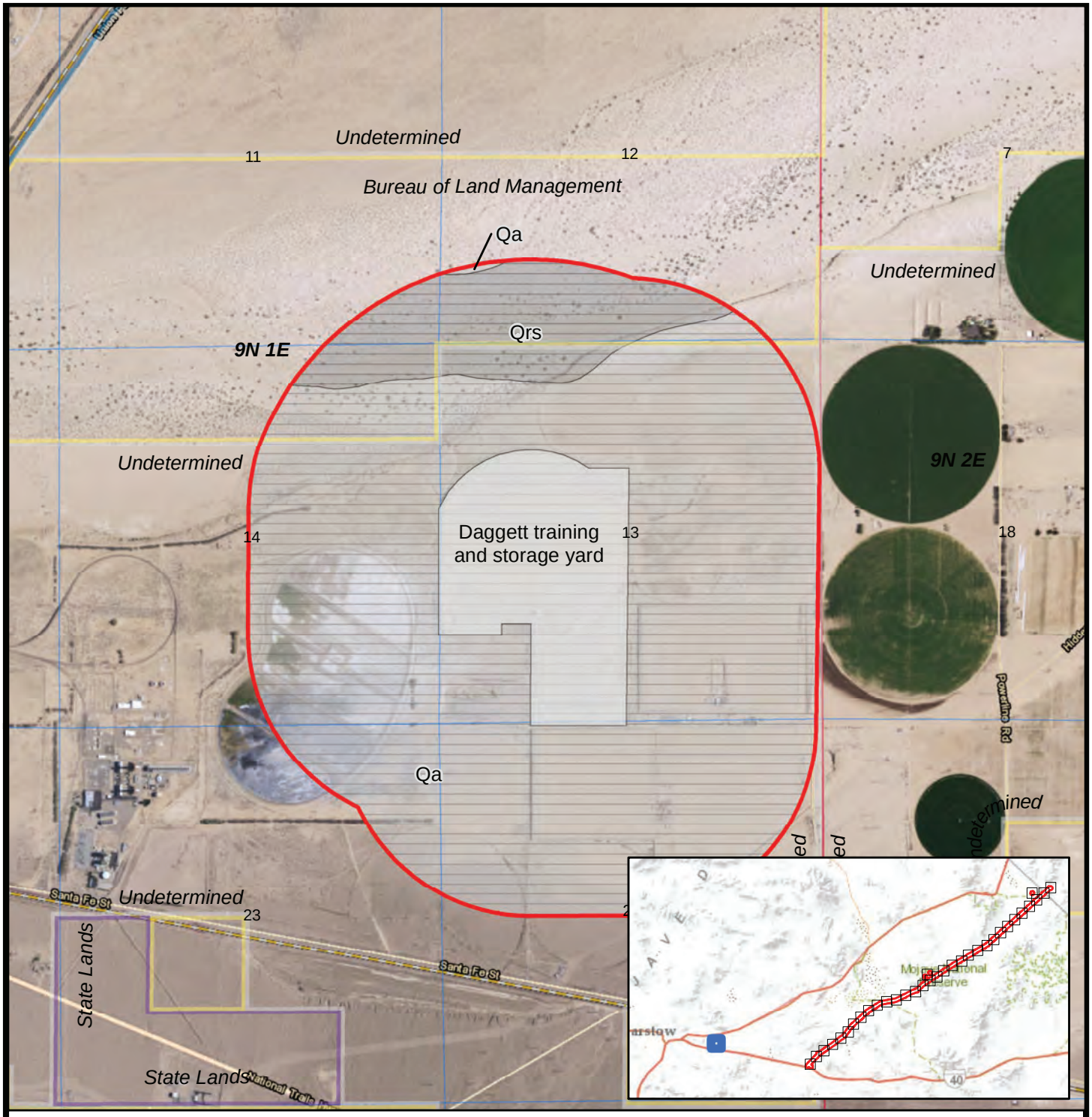
APPENDIX A. GEOLOGIC MAPS



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 1

- Material Laydown Yard
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qrs: Mojave River Channel Sand (Holocene)

Paleosensitivity

- 2 - Low

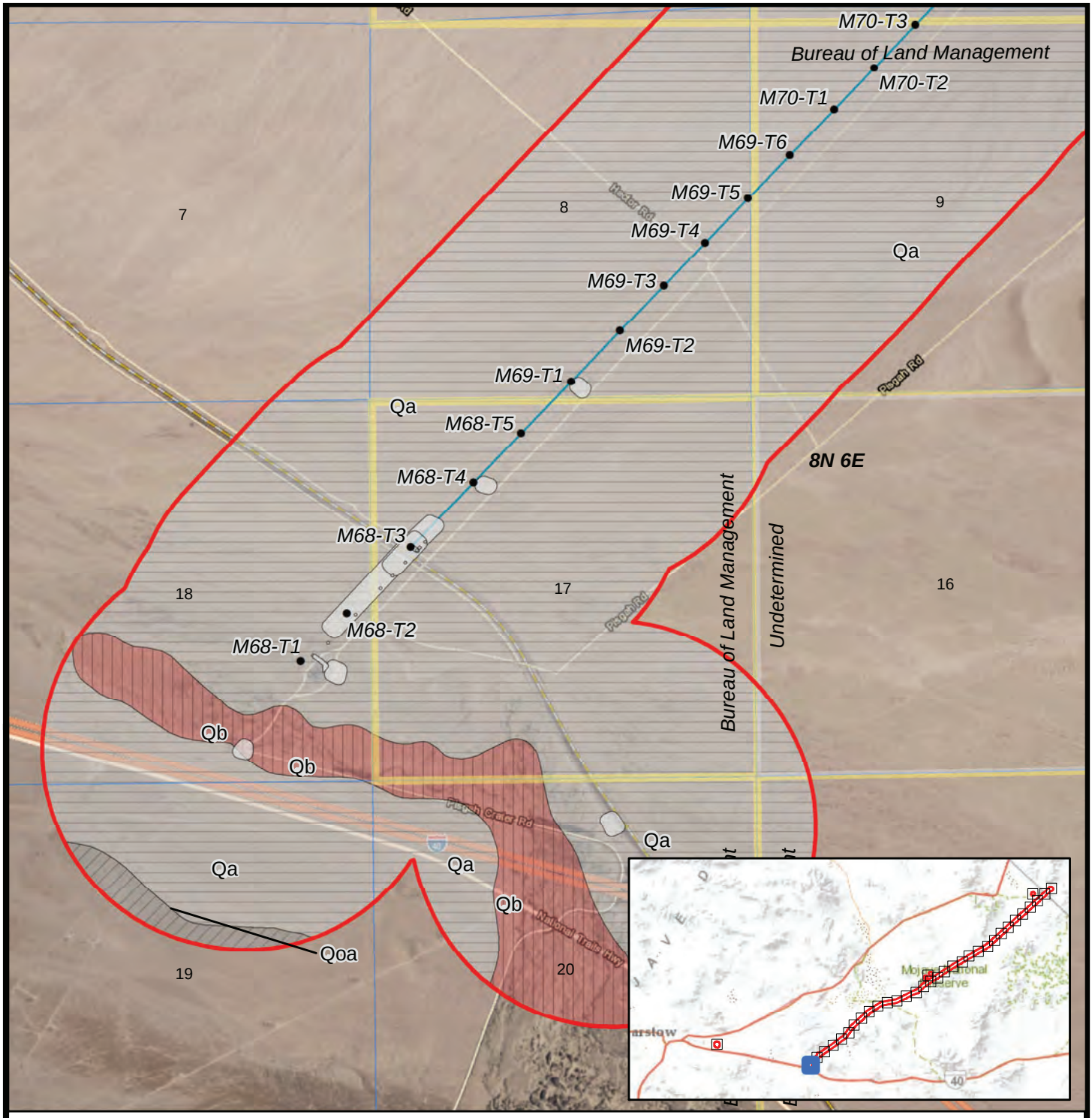
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 2

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qb/Qtb/QTb: Basalt (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

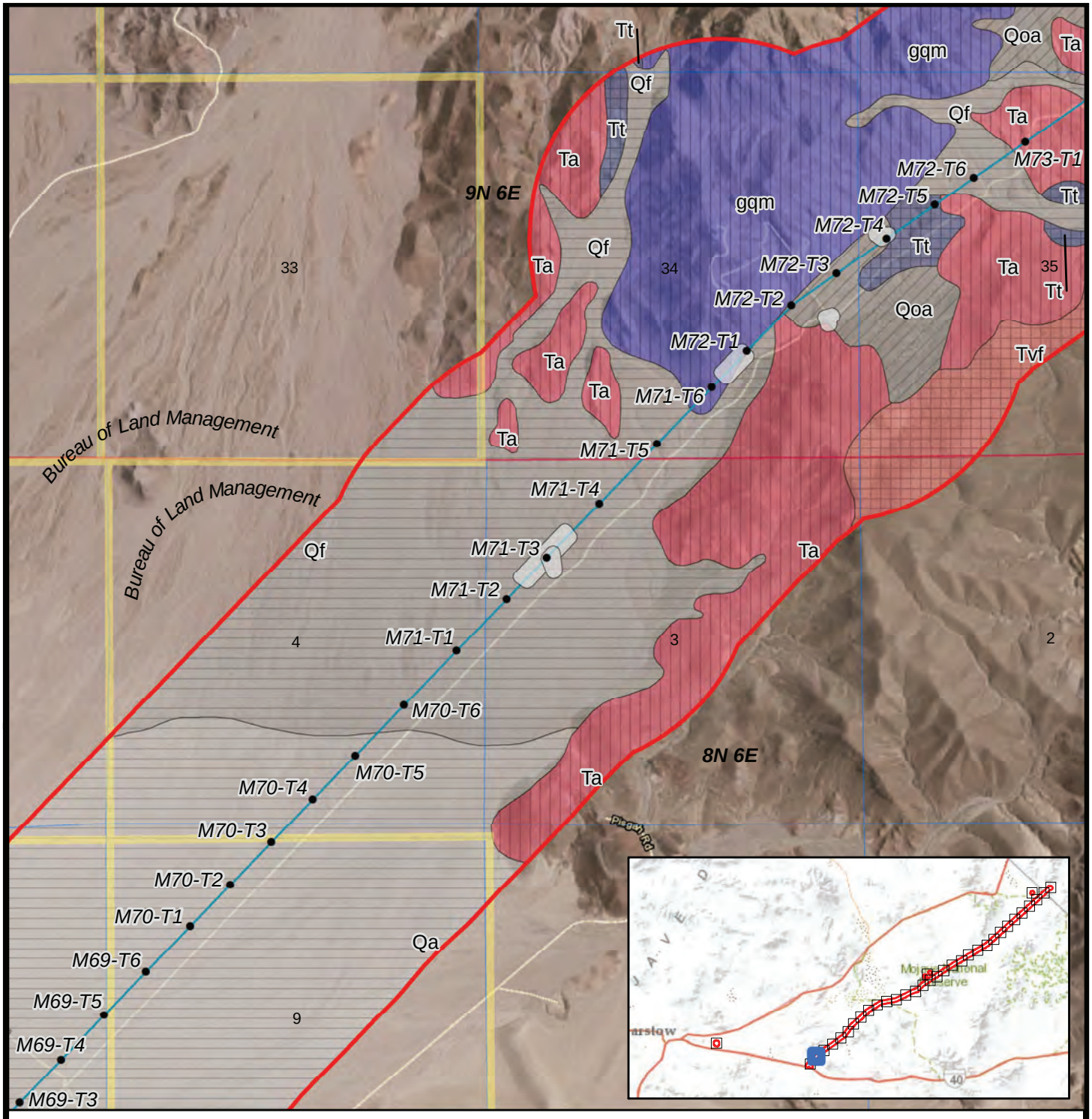
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 3

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Tvf: Volcanic Fanglomerate (Late Miocene or Early Quaternary)
- Ta: Andesite (Oligocene or Miocene)
- Tt: Tuff Breccia (Oligocene or Miocene)
- gqm: Granite or Quartz Monzonite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

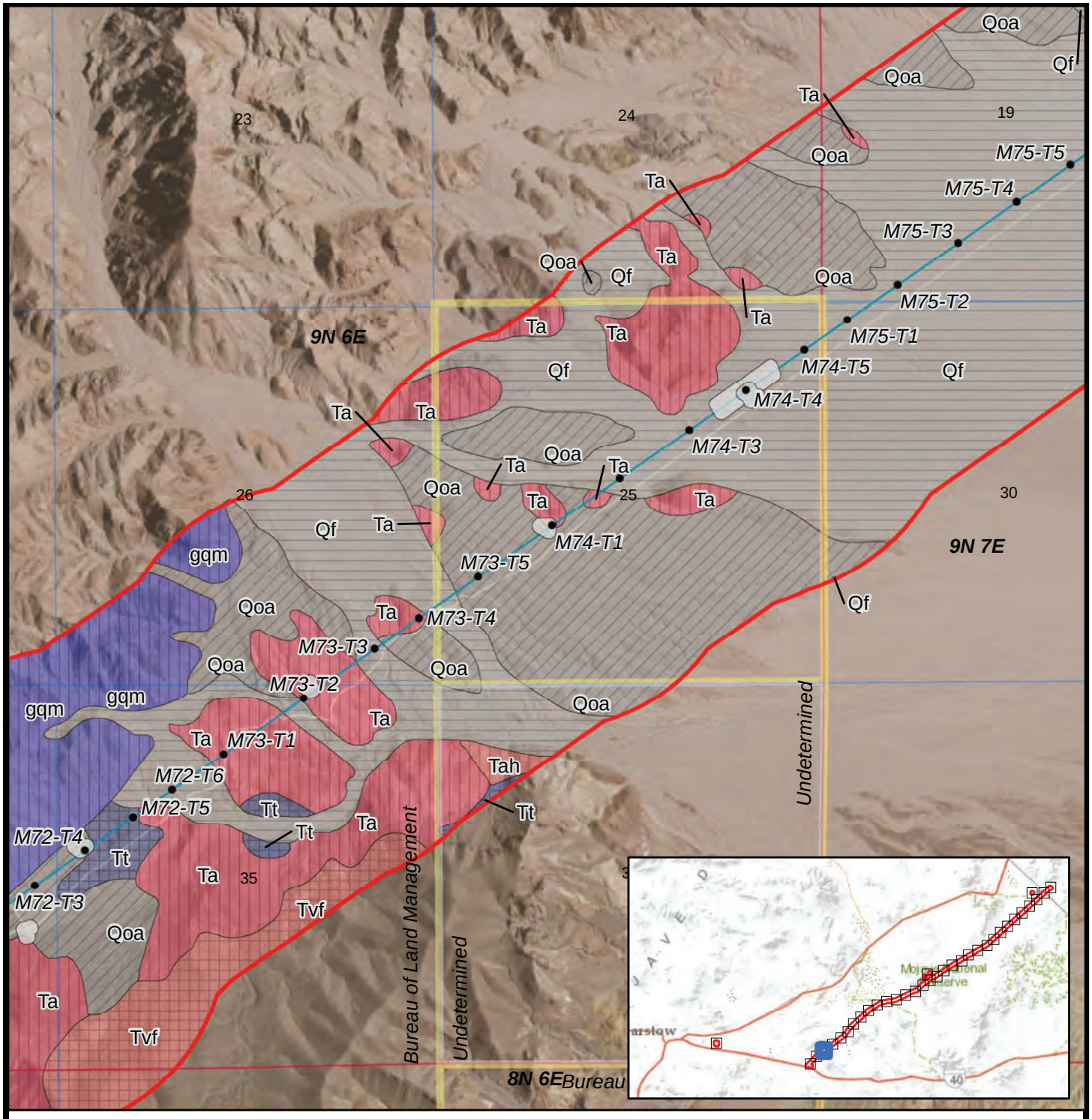
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 4

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Tvf: Volcanic Fanglomerate (Late Miocene or Early Quaternary)
- Ta: Andesite (Oligocene or Miocene)
- Tah: Altered Andesite Porphyry (Oligocene or Miocene)
- Tt: Tuff Breccia (Oligocene or Miocene
- gqm: Granite or Quartz Monzonite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

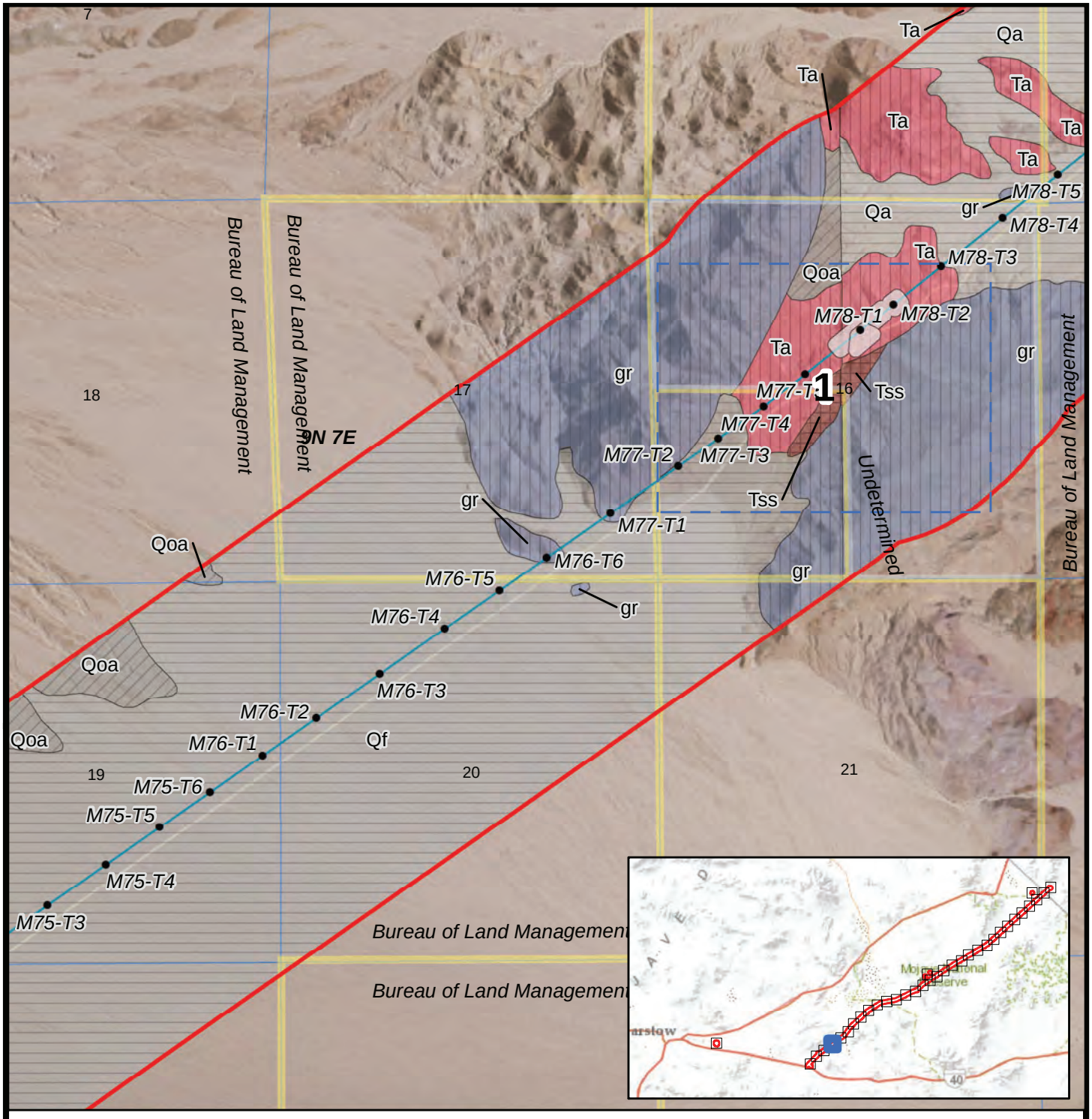
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 5

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Ta: Andesite (Oligocene or Miocene)
- Tss: Sandstone (Oligocene or Miocene)
- gr: Granite (Mesozoic)

Paleosensitivity

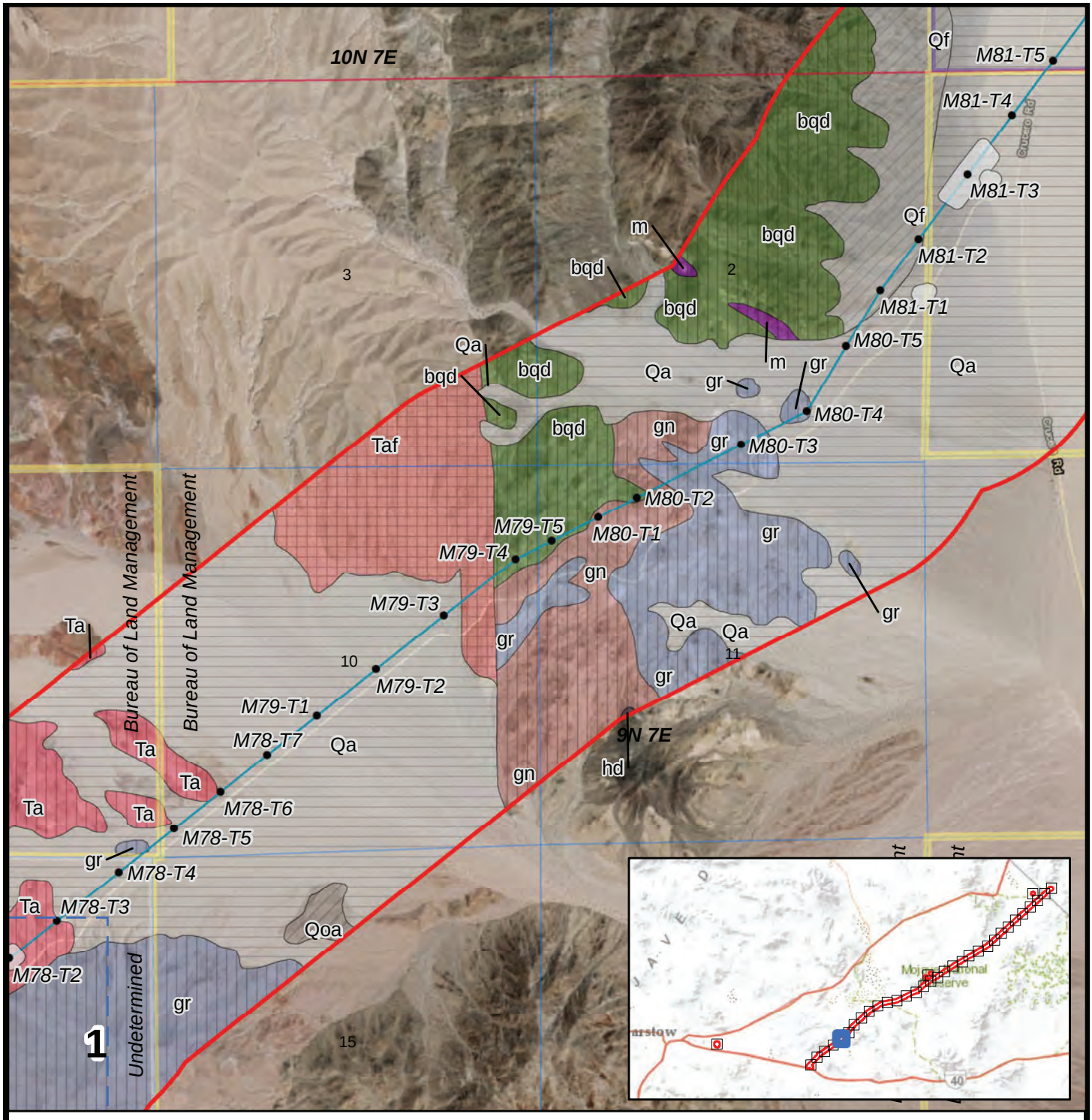
- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

0 ¼ ½ 1 Miles

N

PALEO SOLUTIONS — EST. 2004 — PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California
Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 6

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)
- Ta: Andesite (Oligocene or Miocene)
- Taf: Andesitic Fanglomerate (Miocene or Pliocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gn: Gneiss (Mesozoic or Older)
- gr: Granite (Mesozoic)
- hd: Hornblende Diorite - Gabbro (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

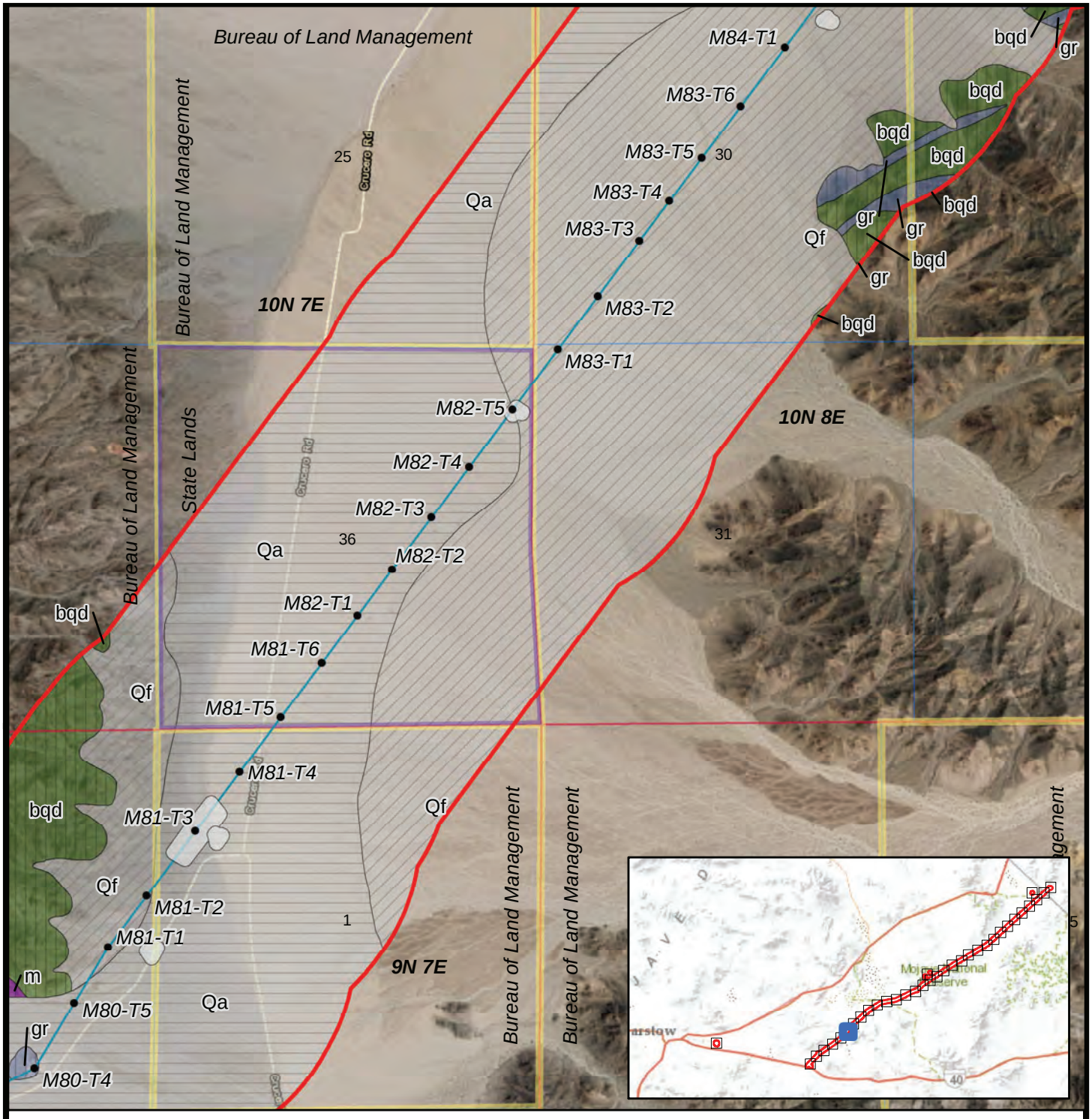
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 7

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gr: Granite (Mesozoic)

Paleosensitivity

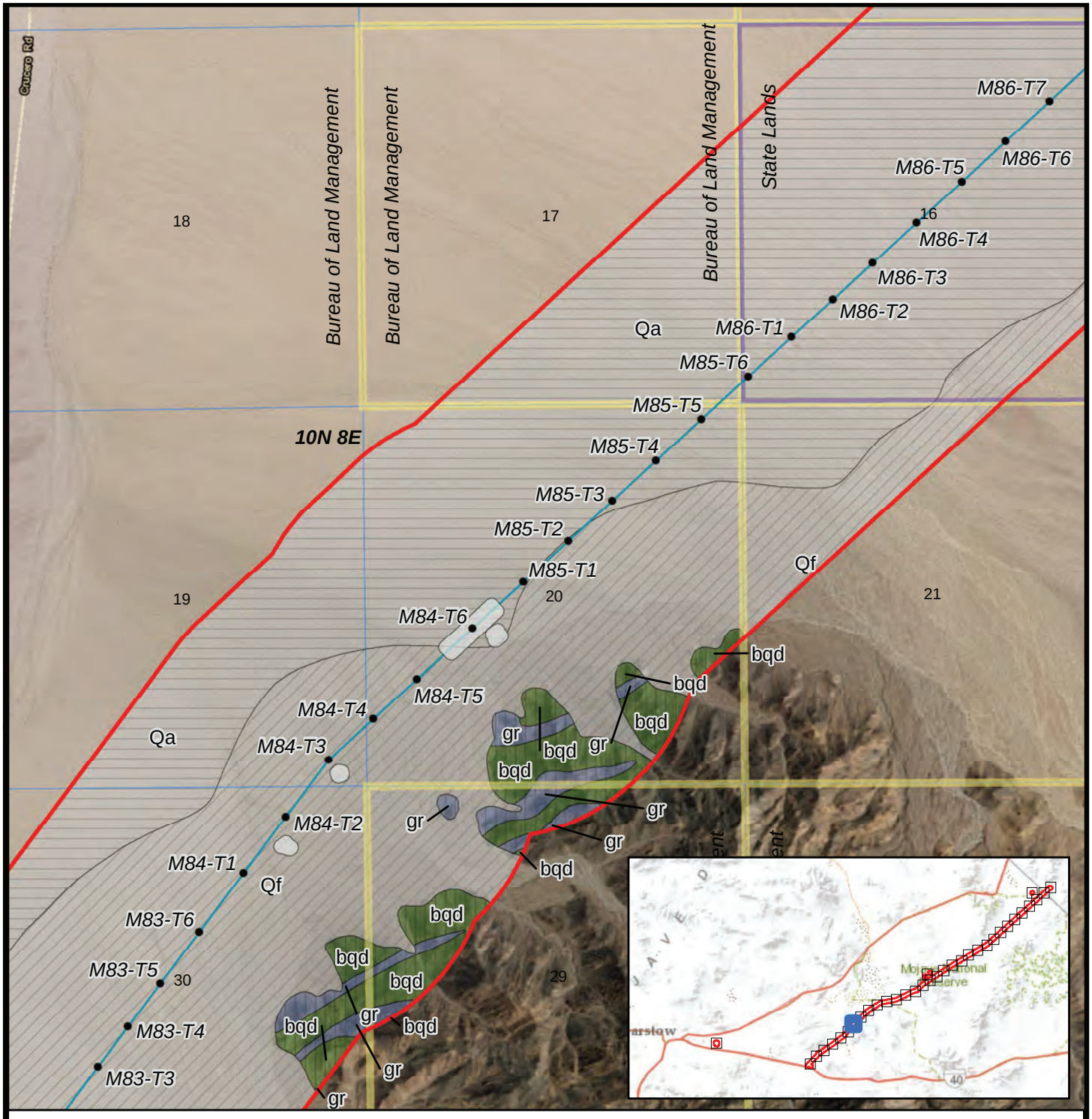
- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1 Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 8

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gr: Granite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

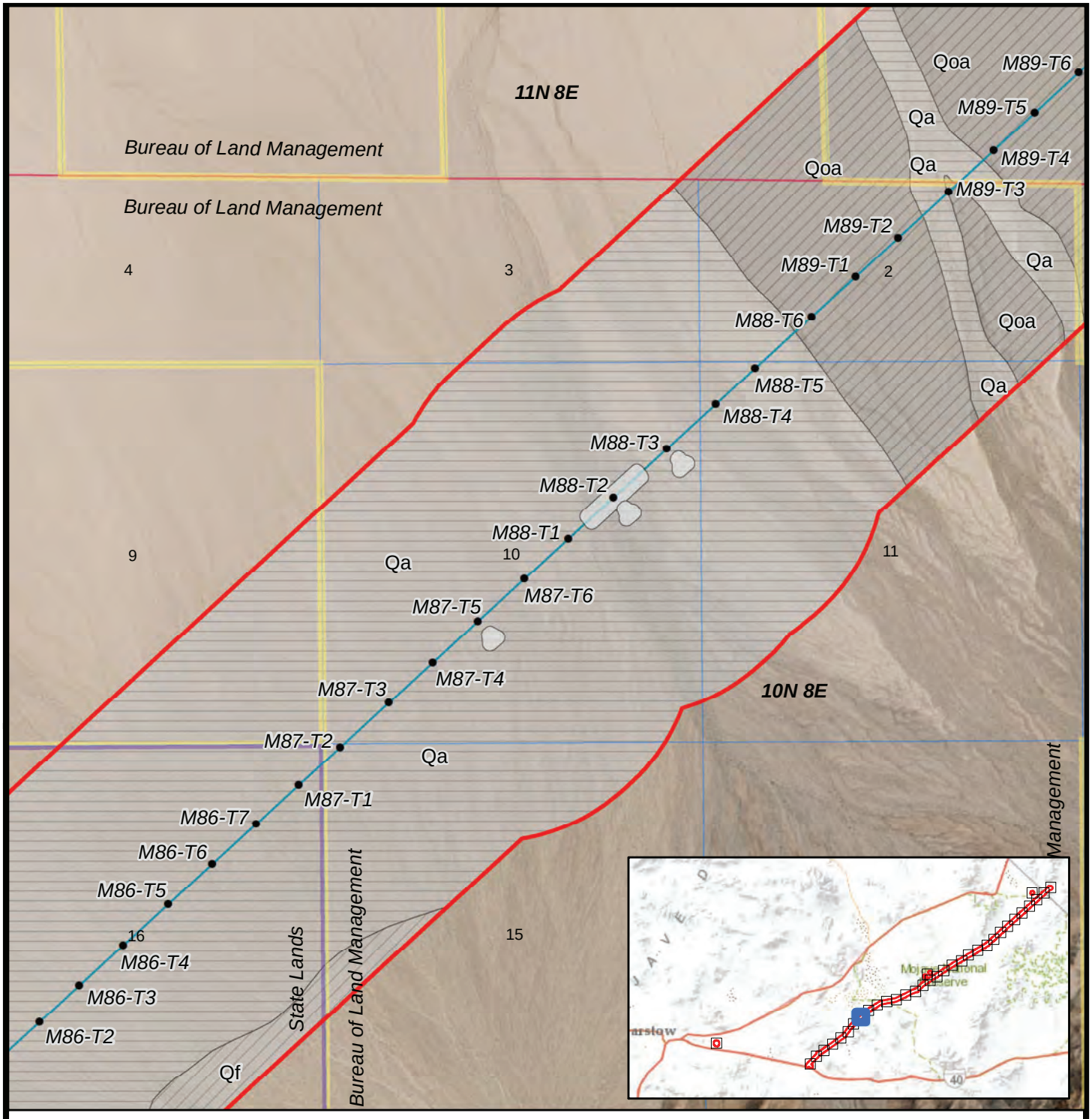
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 9

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

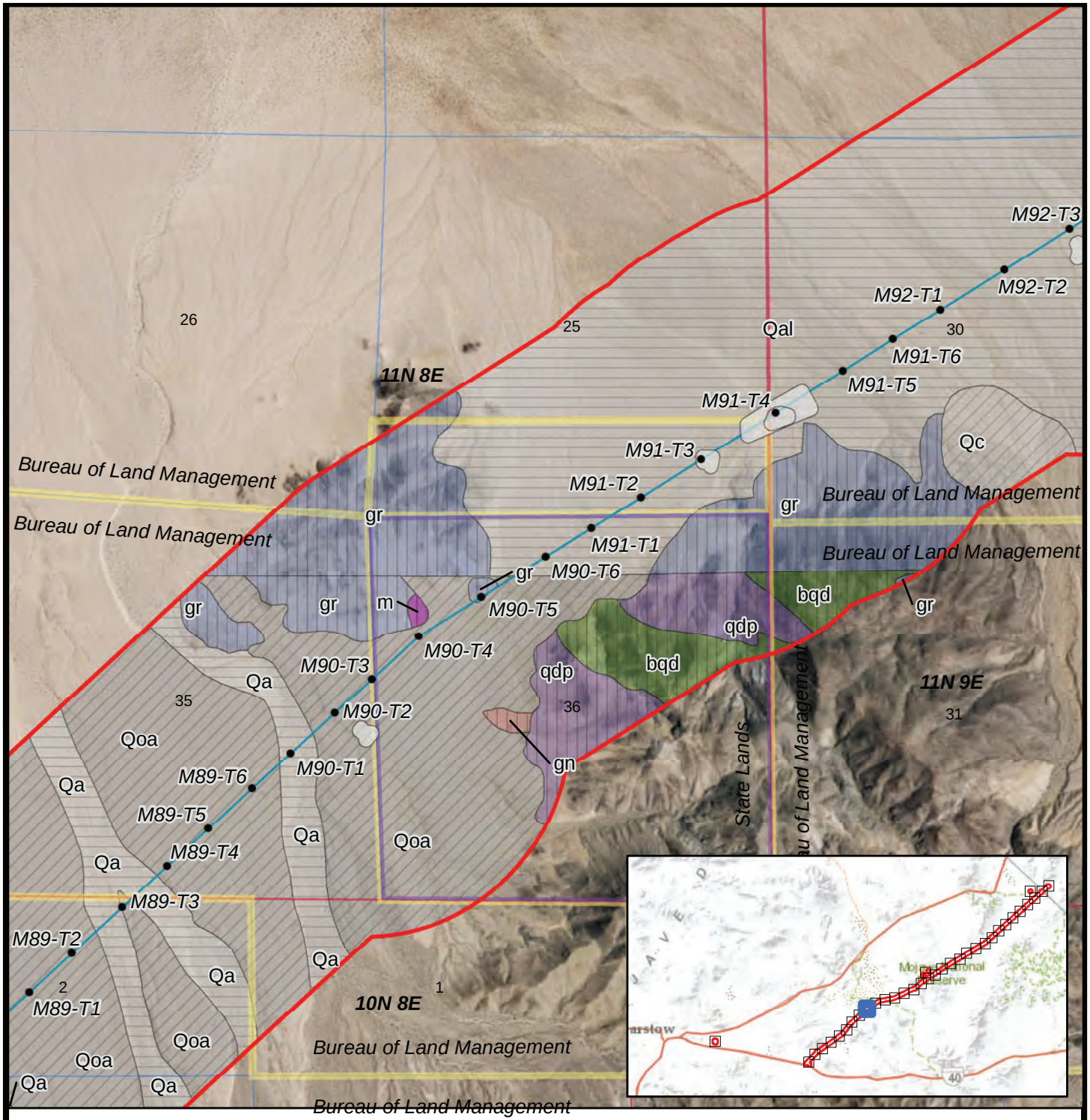
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 10

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Qc: Older Alluvium (Pleistocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gn: Gneiss (Mesozoic or Older)
- gr: Granite (Mesozoic)
- qdp: Quartz Diorite Porphyry (Mesozoi or Older)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

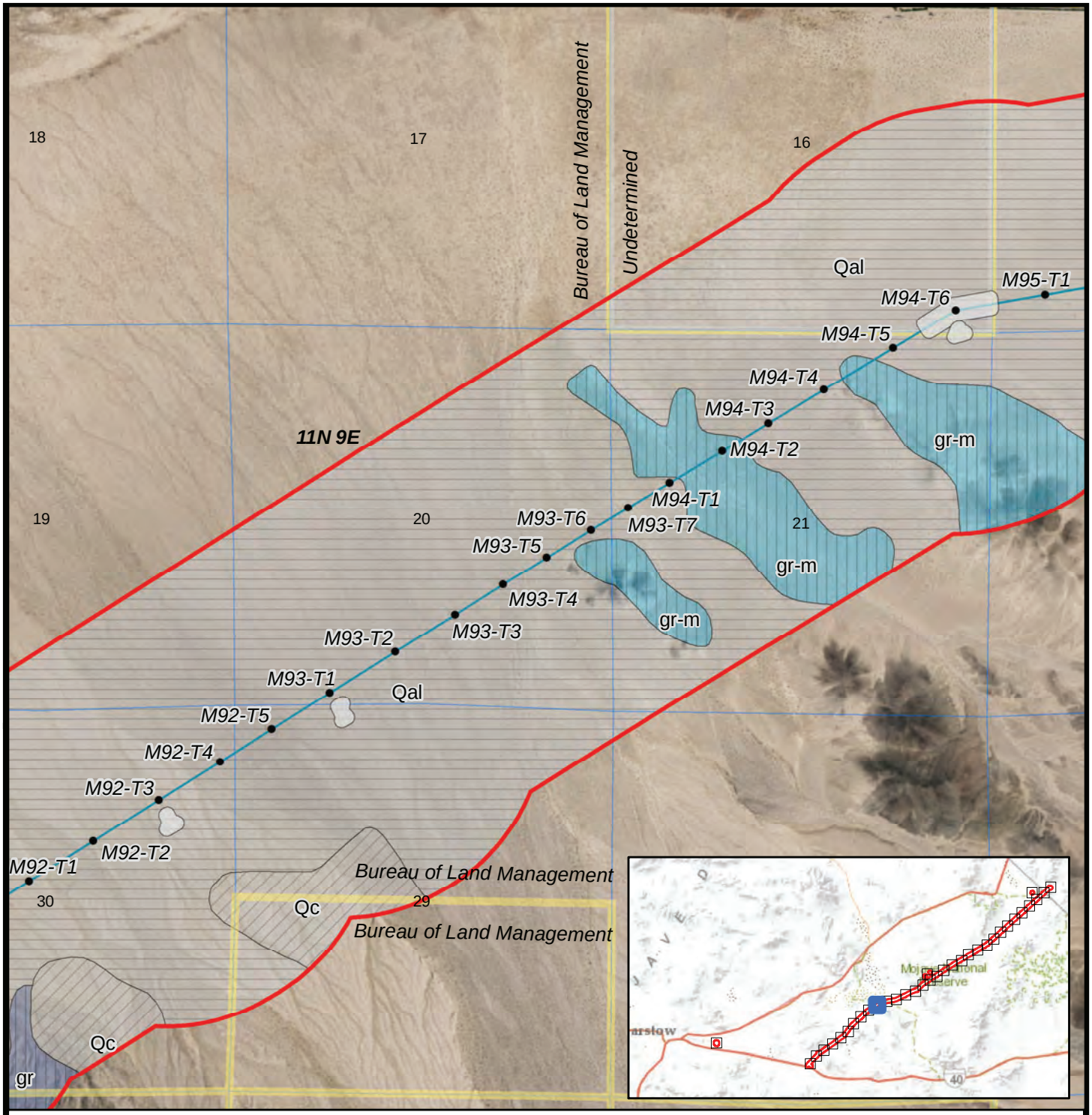
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of California: Trona Sheet
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 11

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qc: Older Alluvium (Pleistocene)
- gr-m: Granitic or Metamorphic (Pre-Cretaceous)
- gr: Granite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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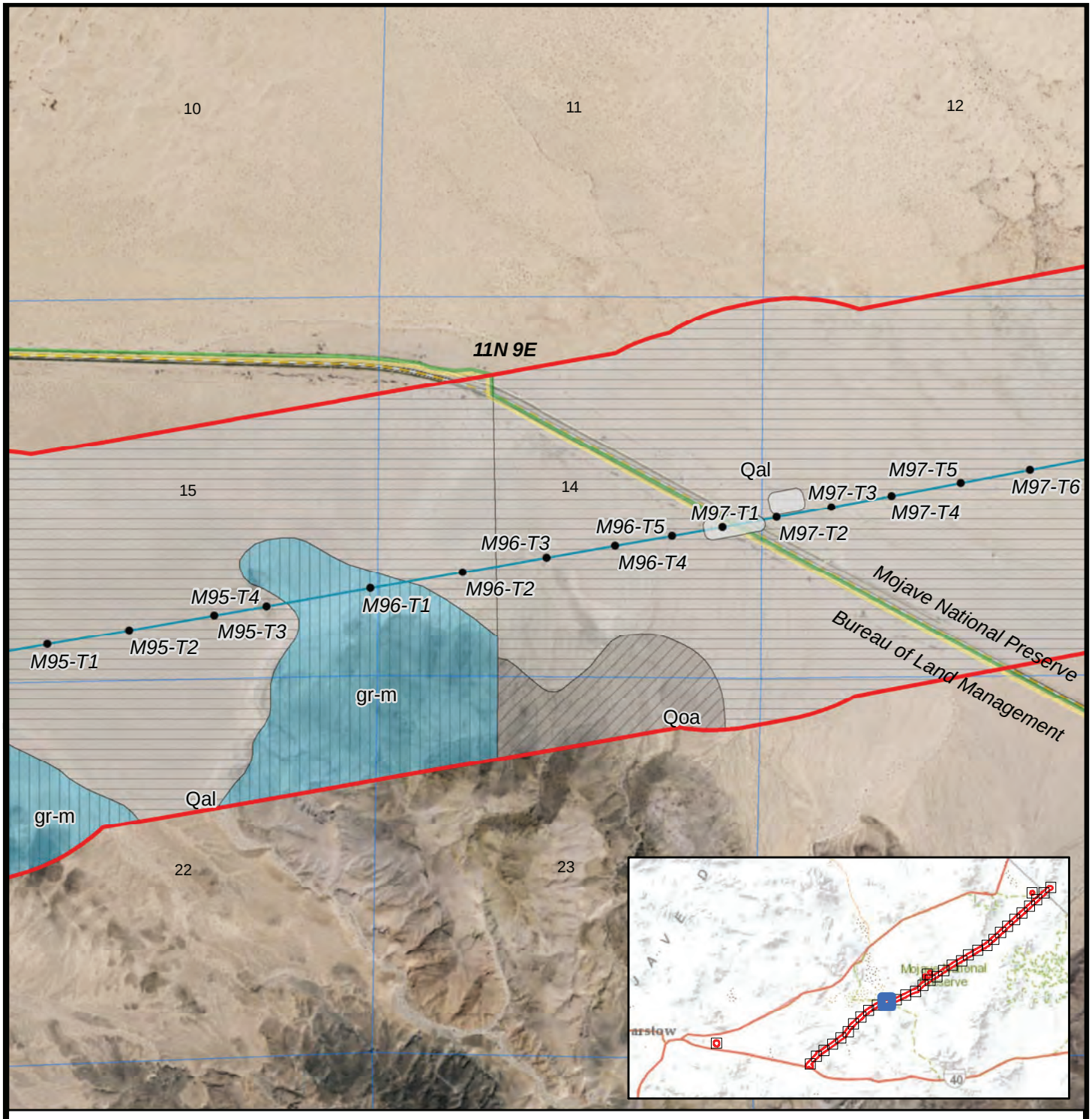
Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center
Geologic Map of California: Trona Sheet



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 12

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- gr-m: Granitic or Metamorphic (Pre-Cretaceous)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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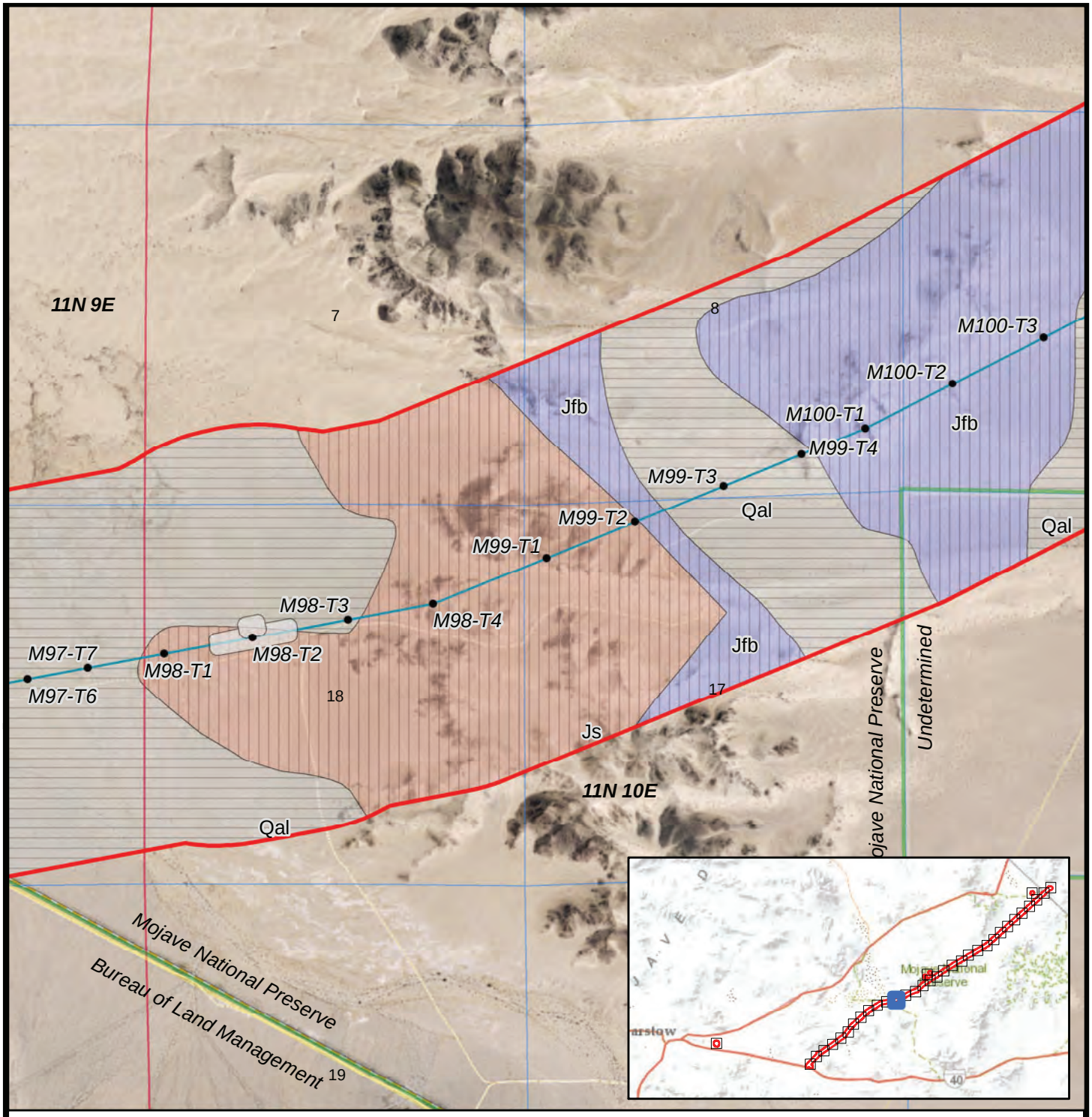
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah Quadrangle, California-Nevada
Geologic Map of California: Trona Sheet



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 13

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Jfb: Dacite Flow Breccia (Jurassic)
- Js: Sands Granite (Jurassic)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

N

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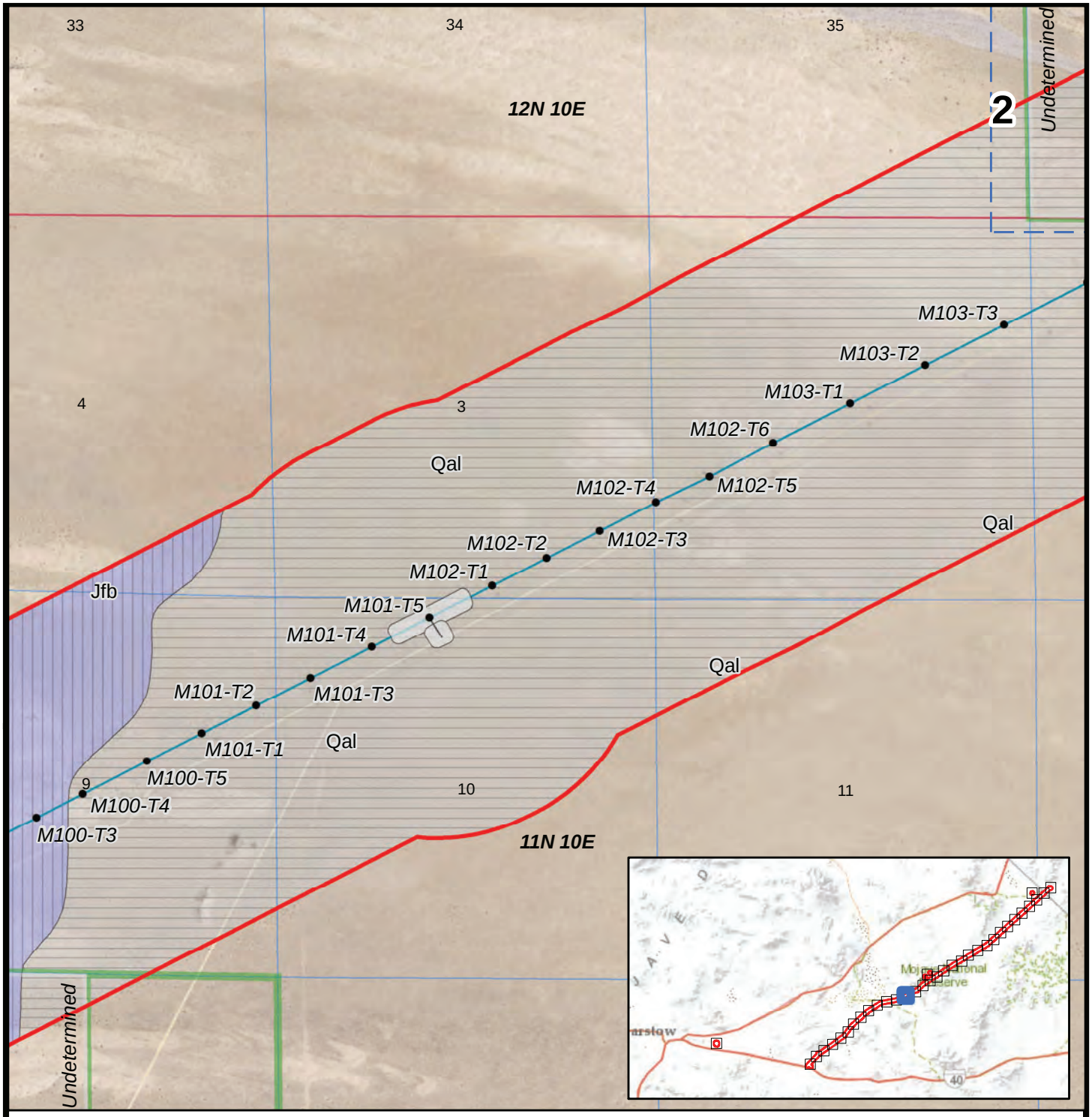
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 14

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Jfb: Dacite Flow Breccia (Jurassic)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

N

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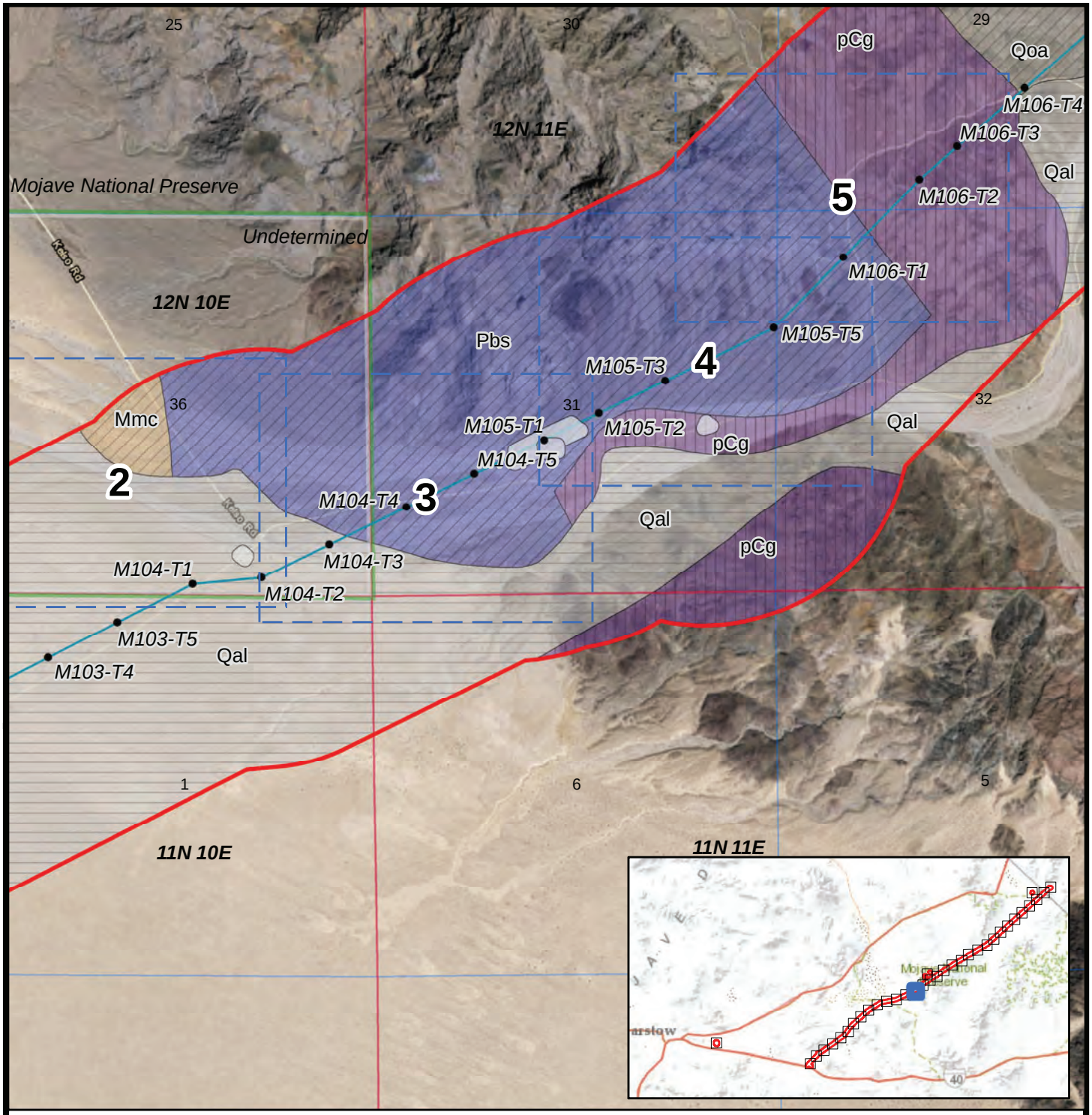
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 15

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Pbs: Bird Spring Formation (Pennsylvanian)
- Mmc: Monte Cristo Limestone (Devonian)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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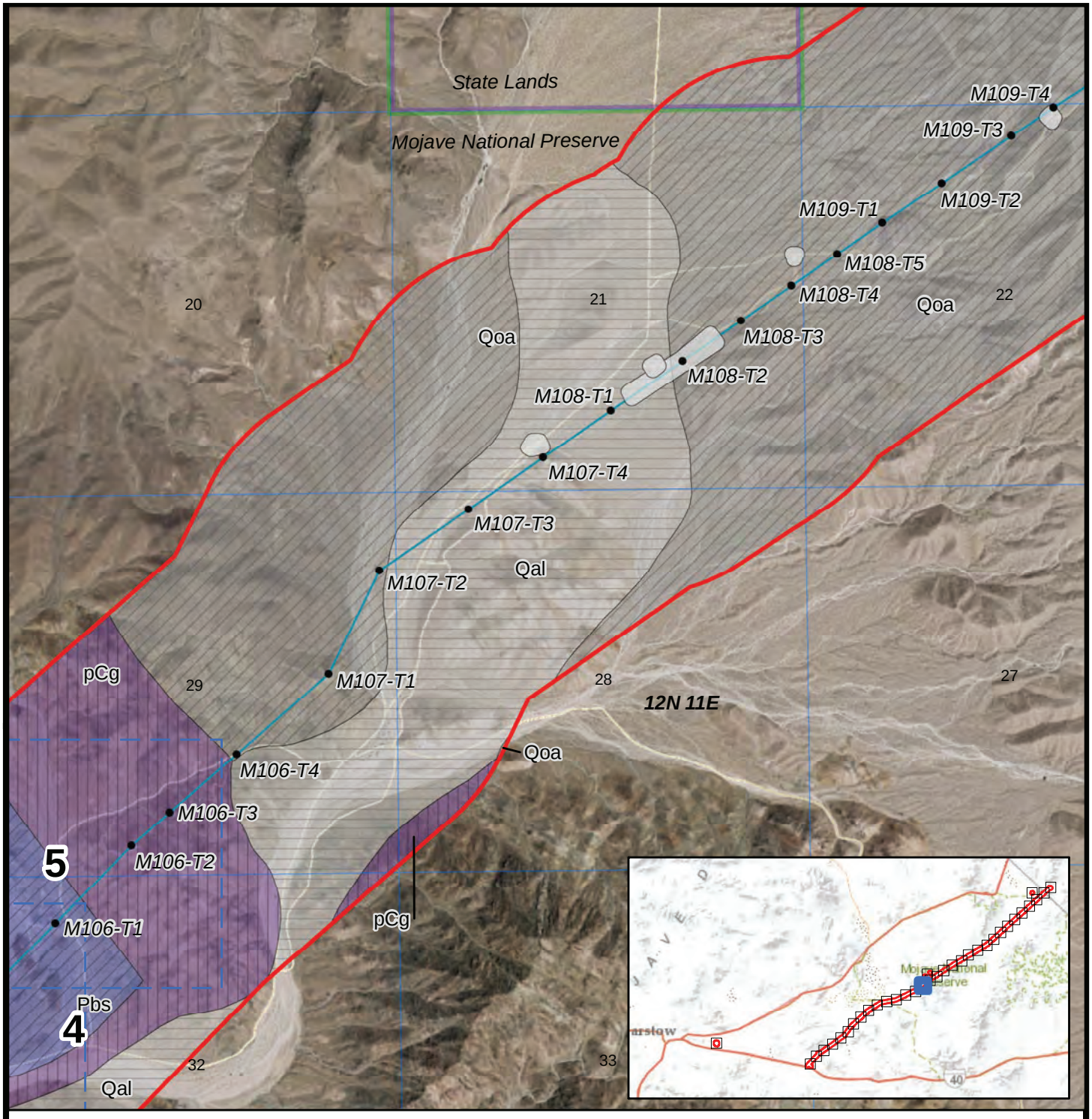
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 16

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Pbs: Bird Spring Formation (Pennsylvanian)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1 Miles

N

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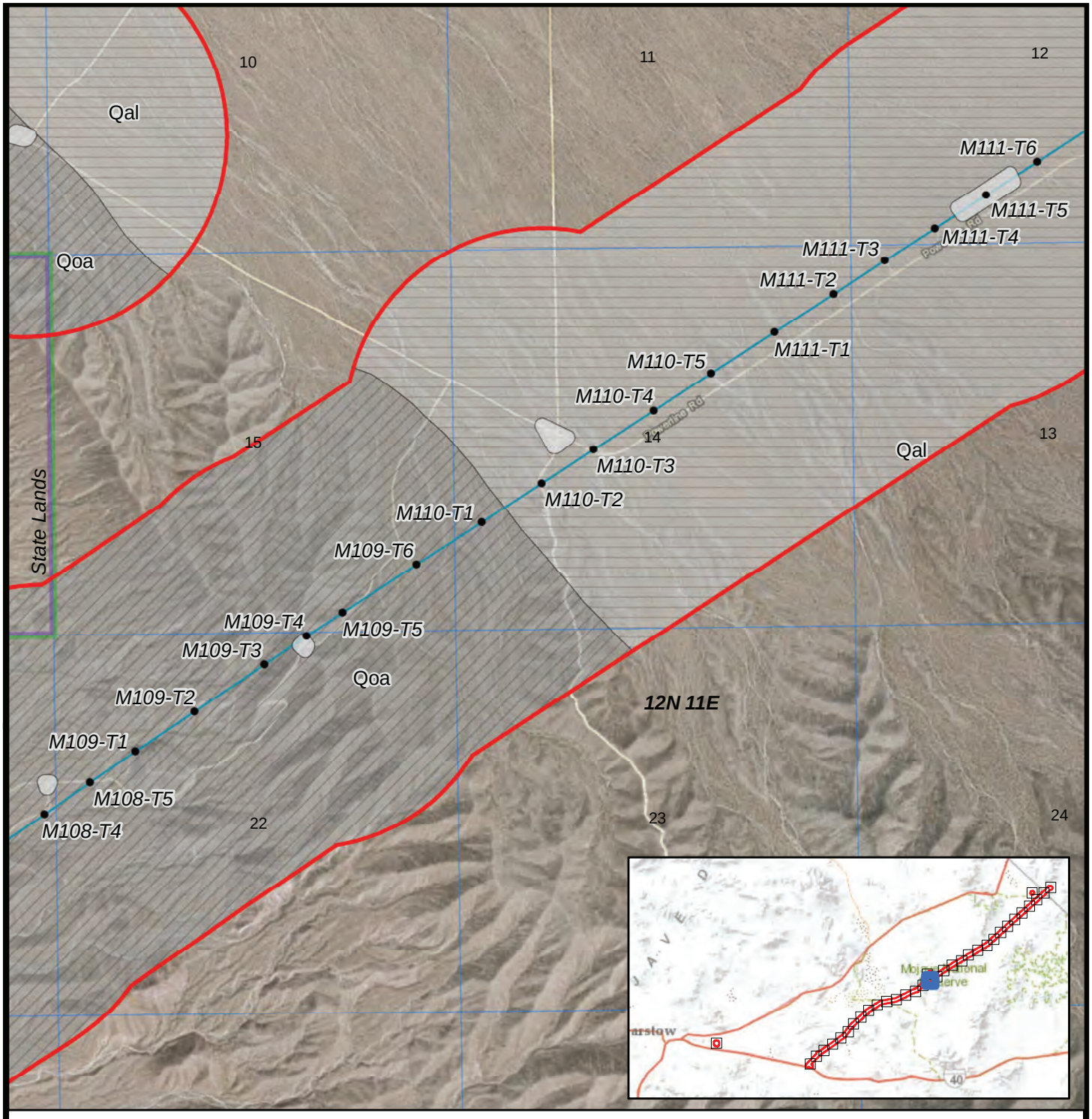
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 17

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

0 ¼ ½ 1

Miles

N

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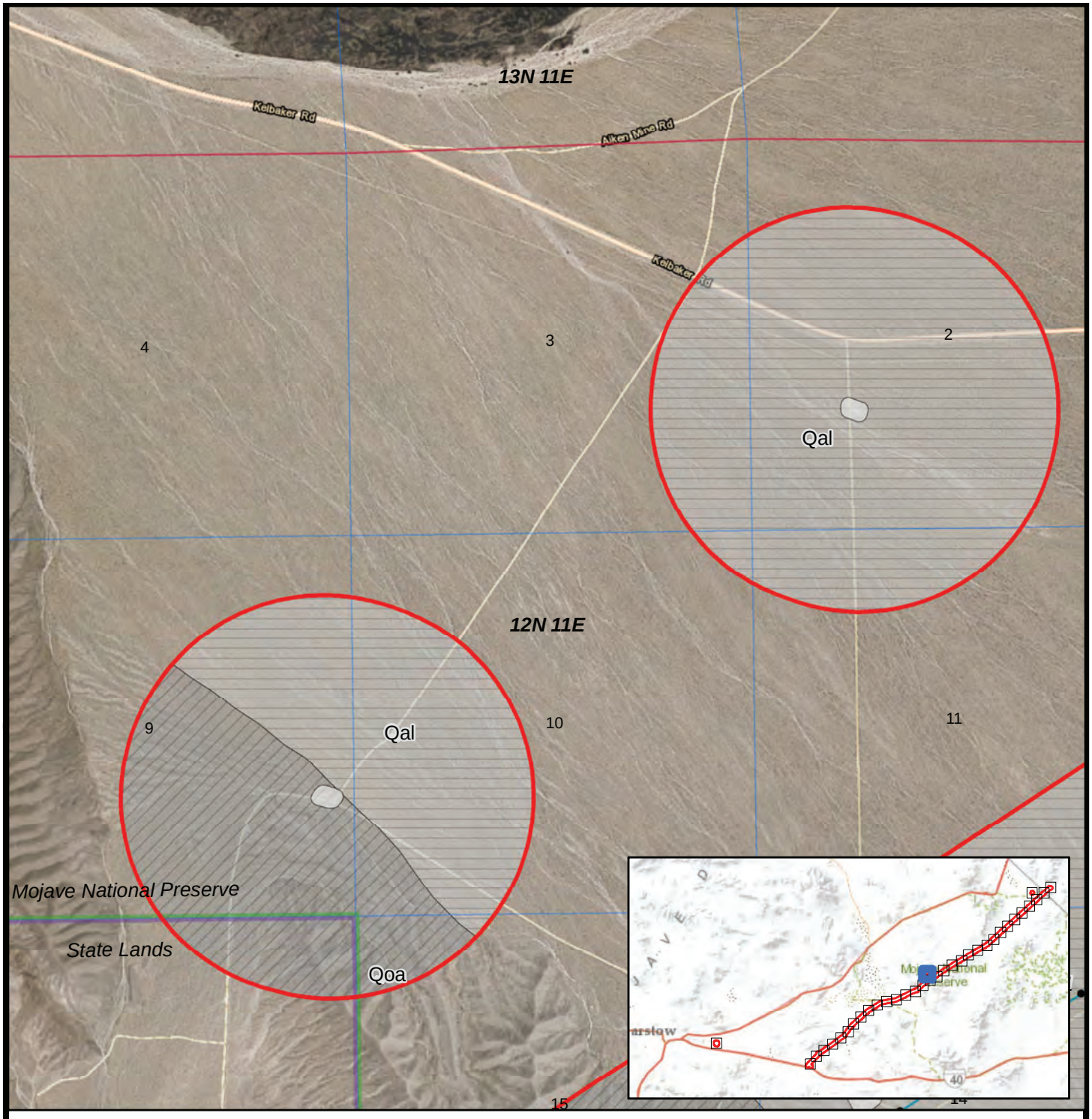
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 18

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

0 ¼ ½ 1

Miles

N

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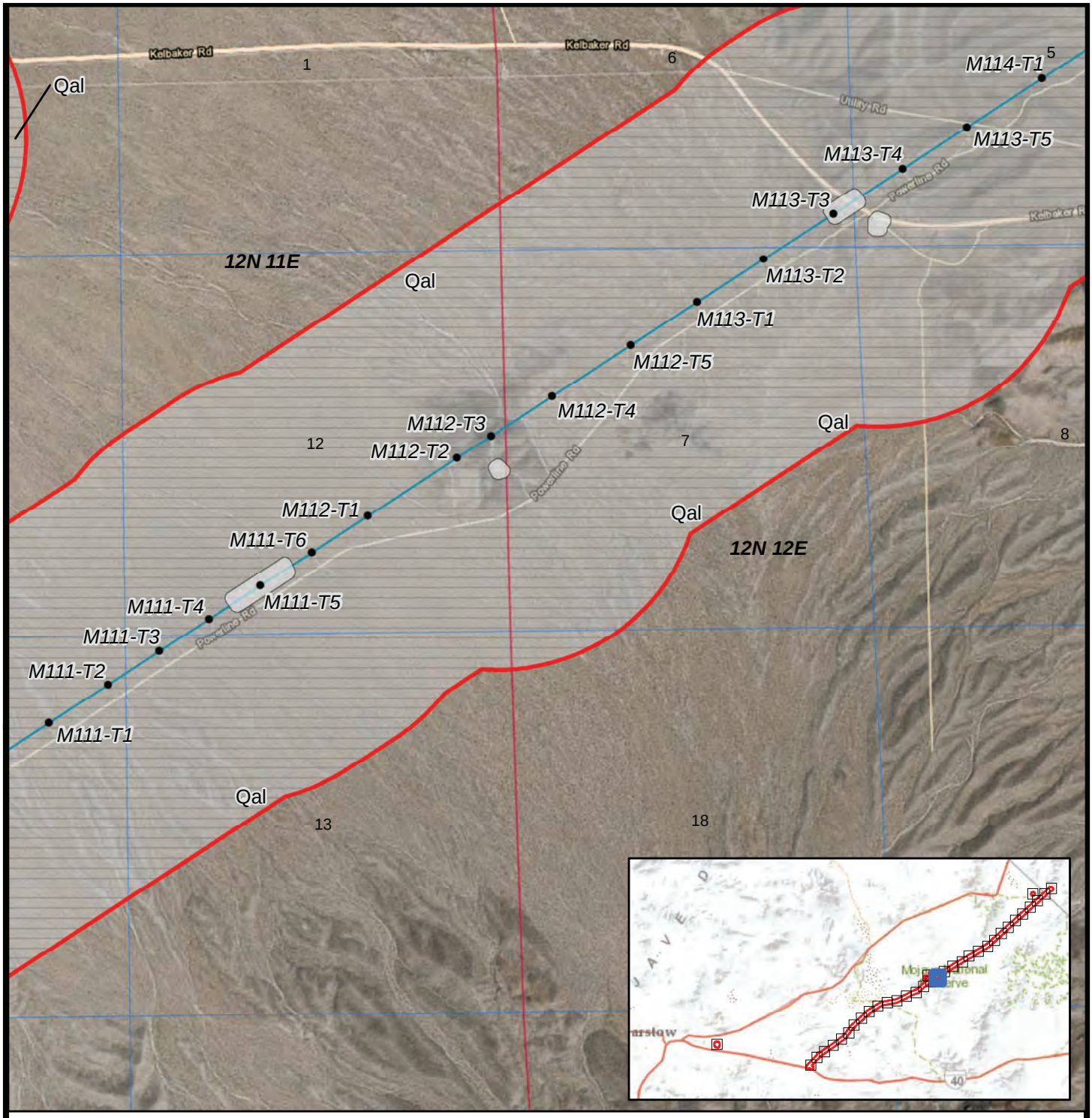
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 19

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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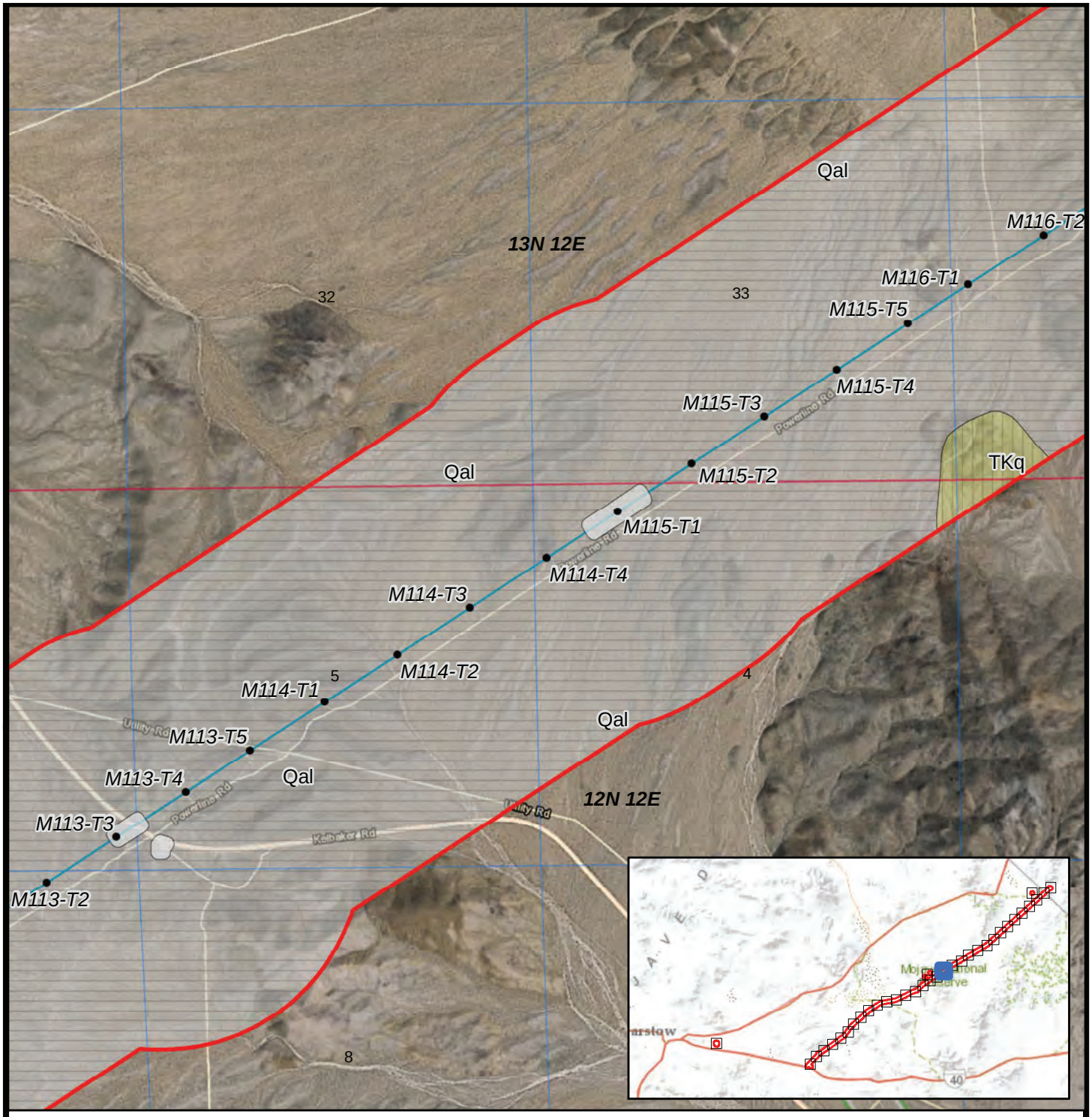
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 20

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

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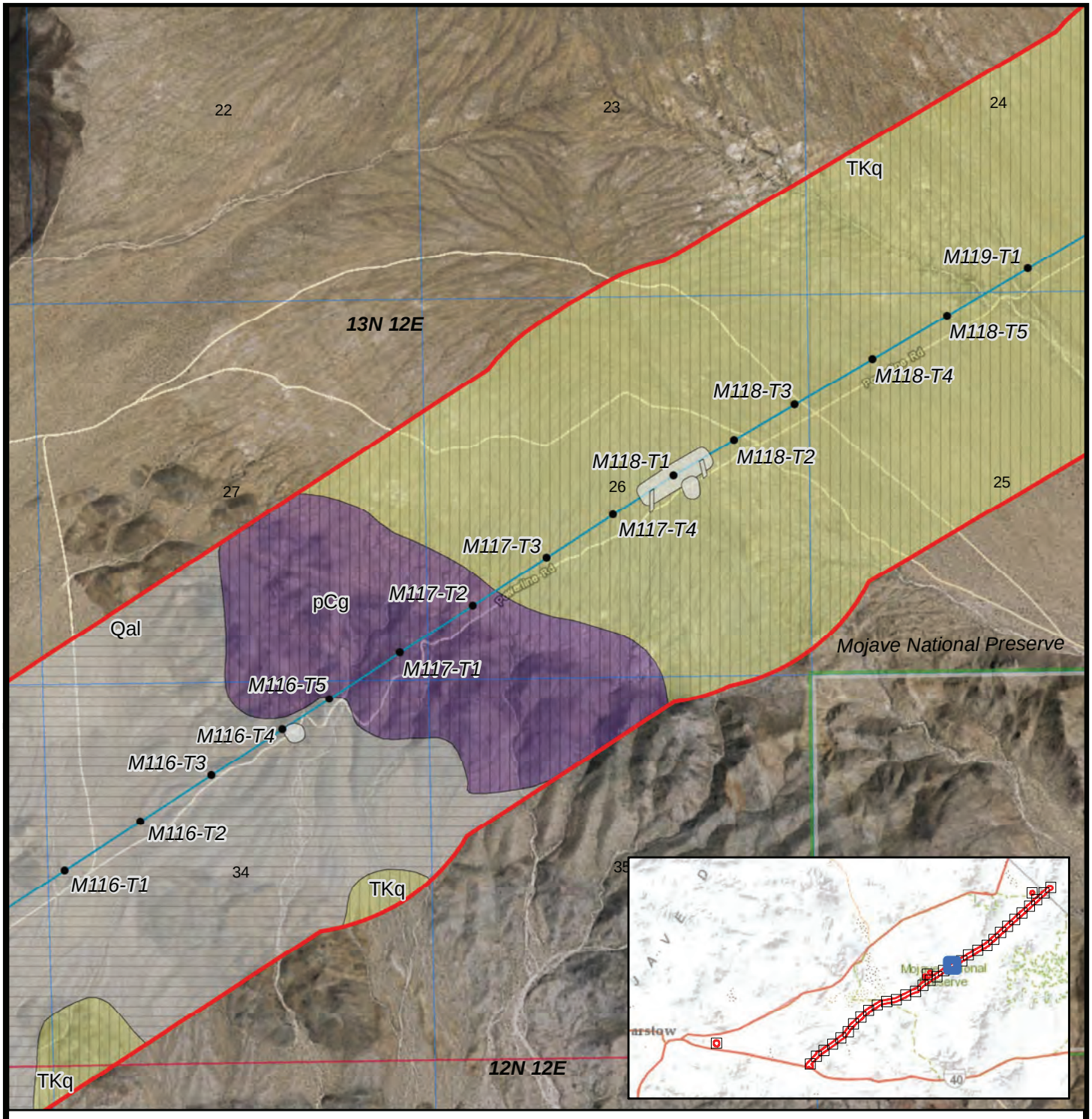
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 21

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

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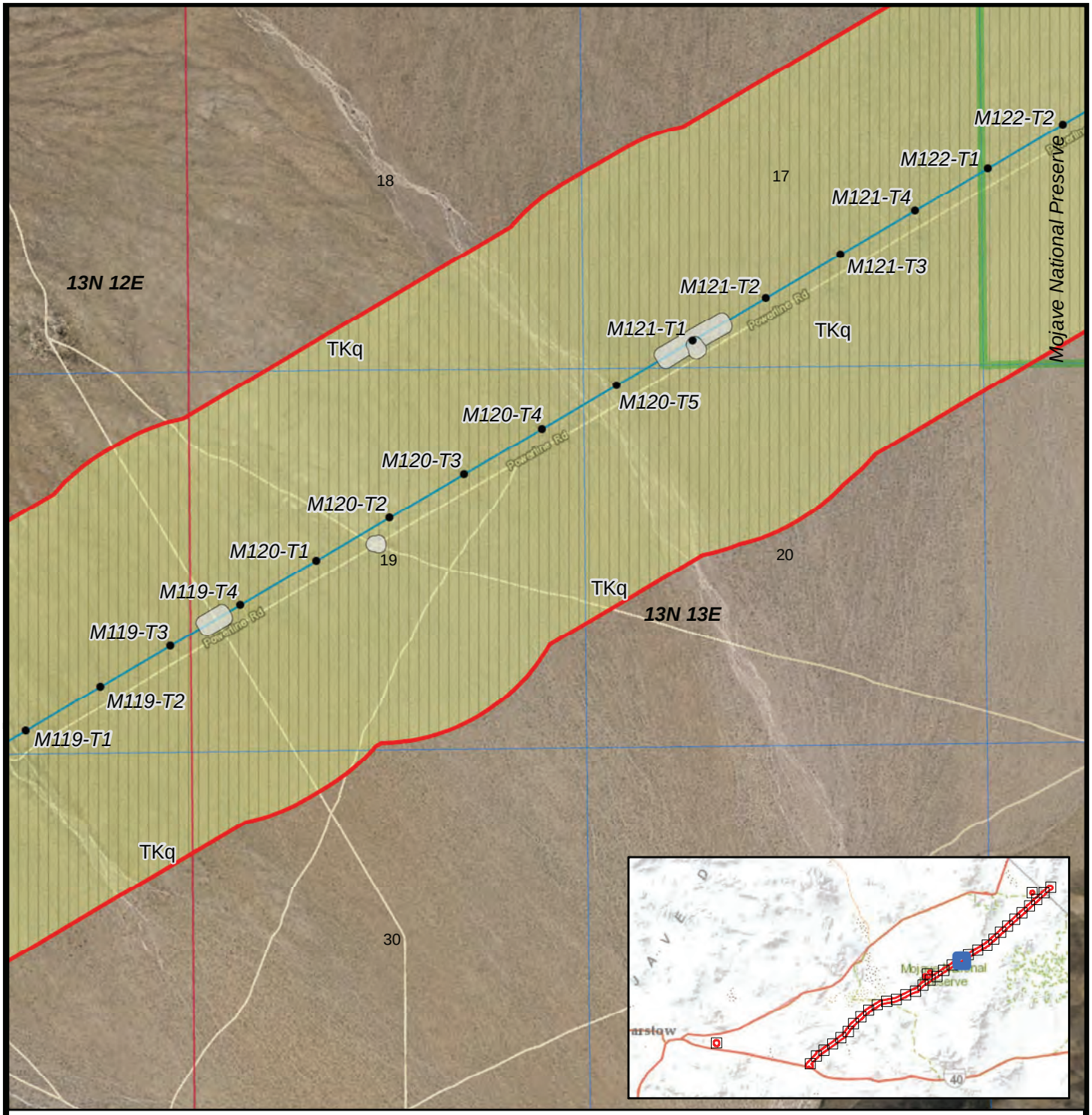
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 22

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

0 ¼ ½ 1

Miles

N

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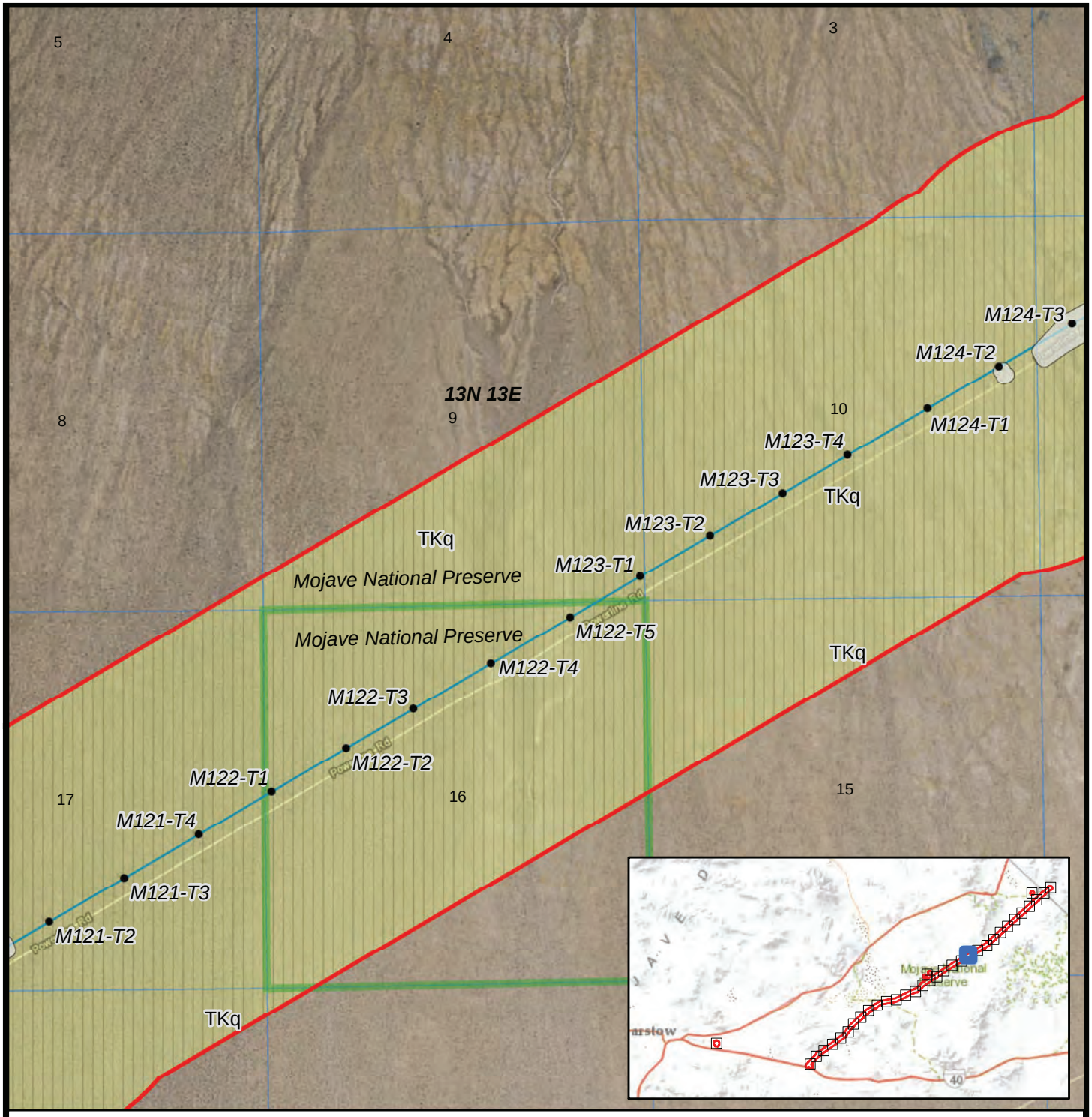
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 23

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

0 ¼ ½ 1

Miles

N

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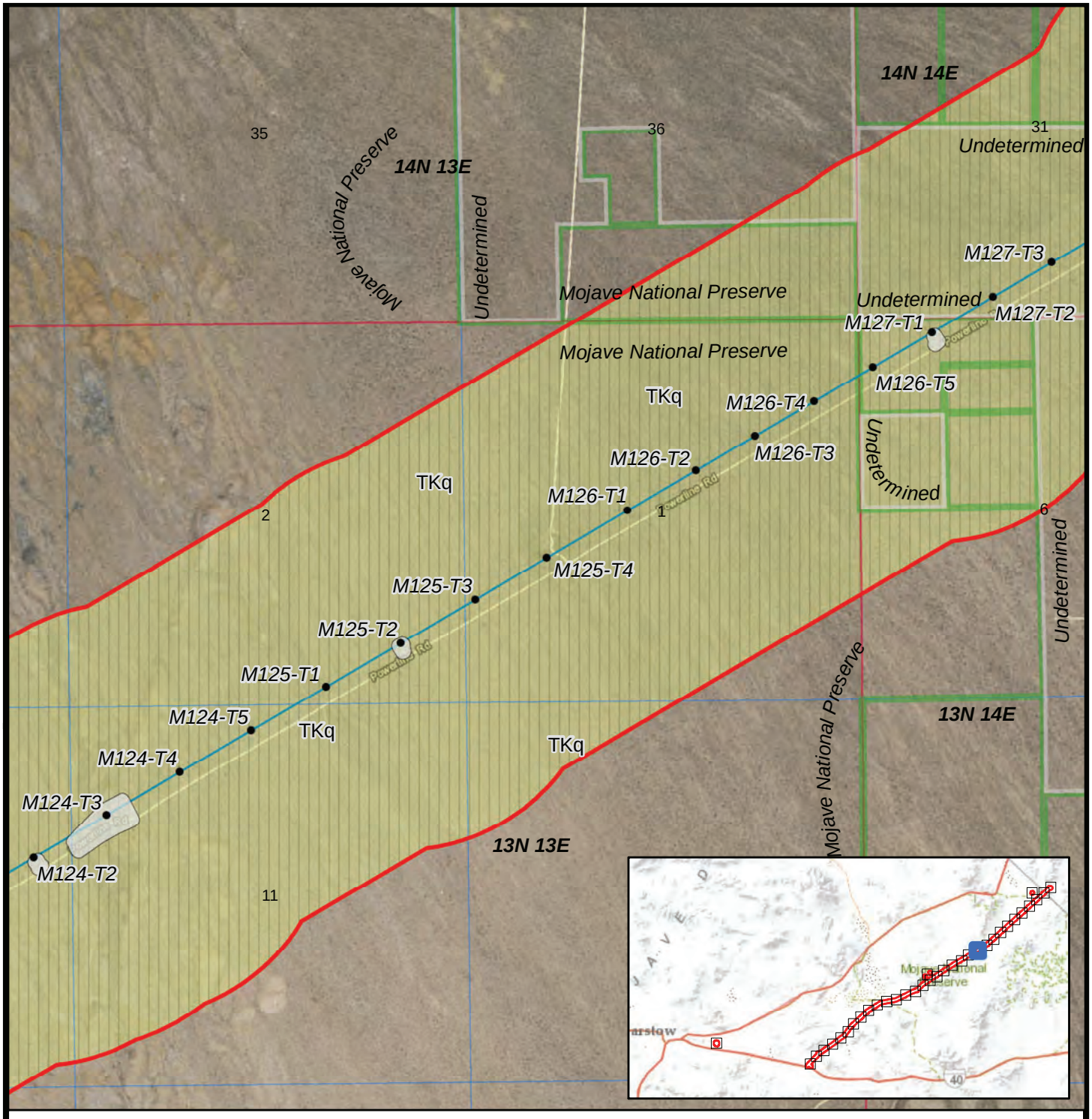
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 24

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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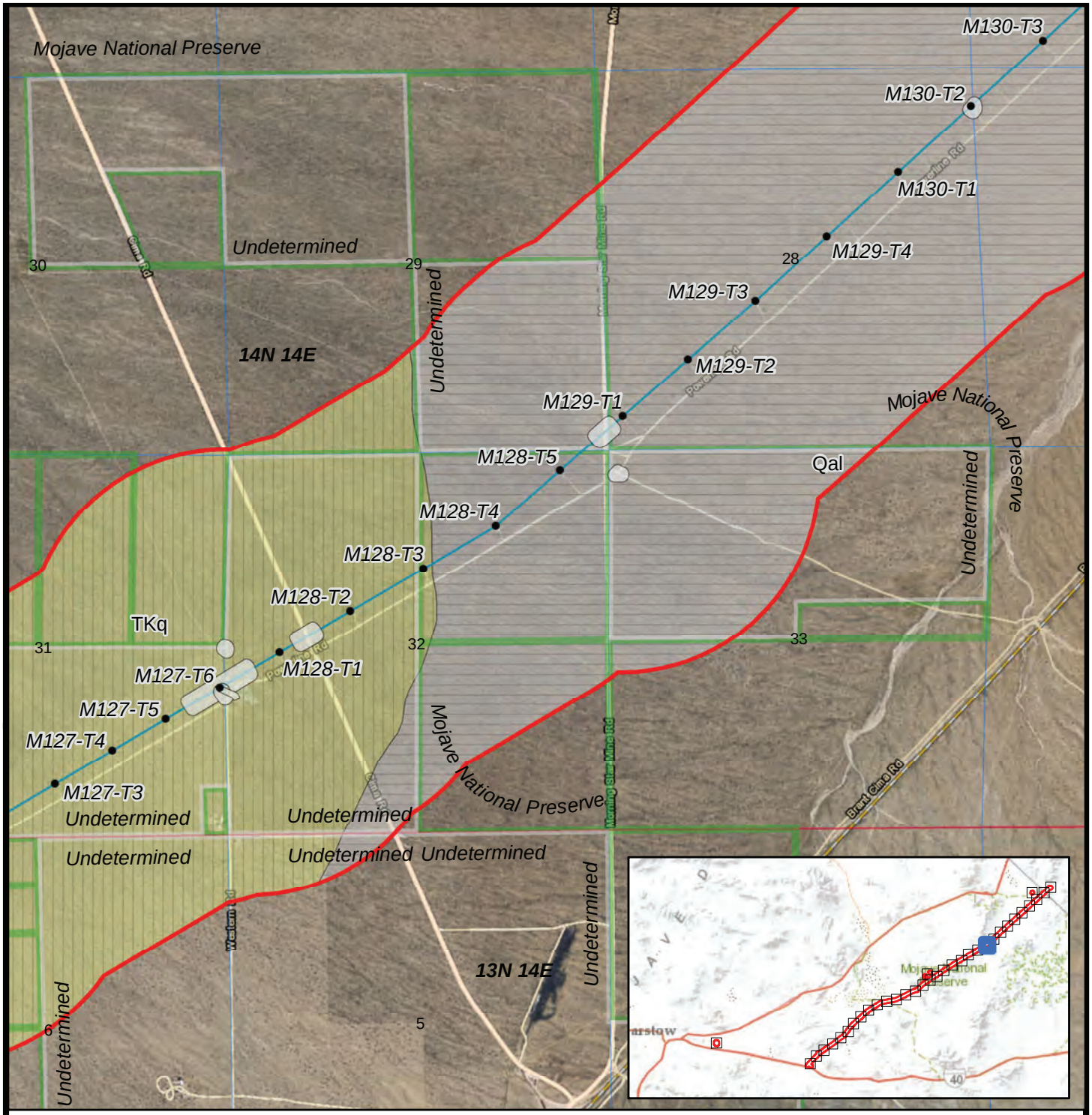
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 25

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

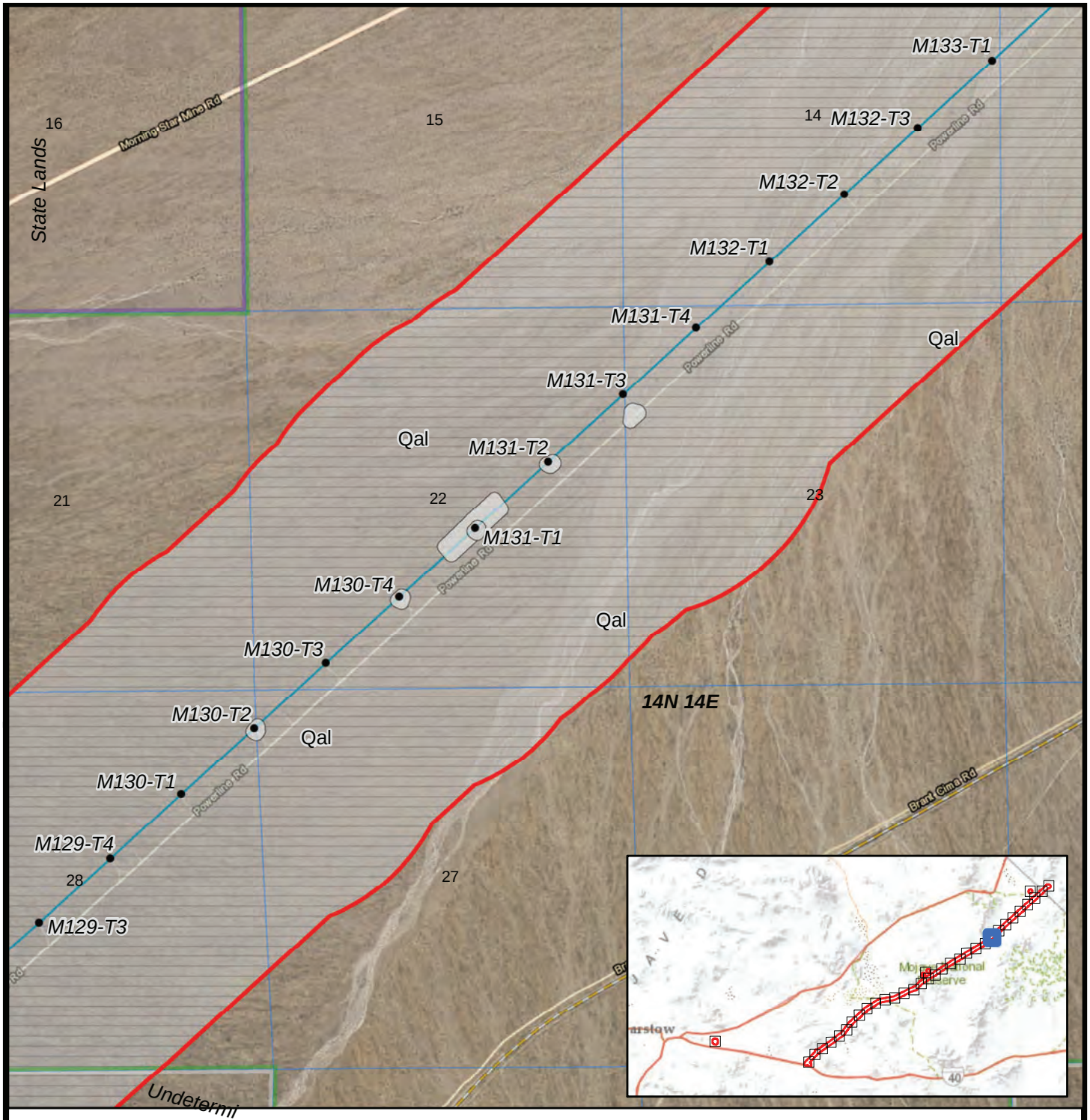
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 26

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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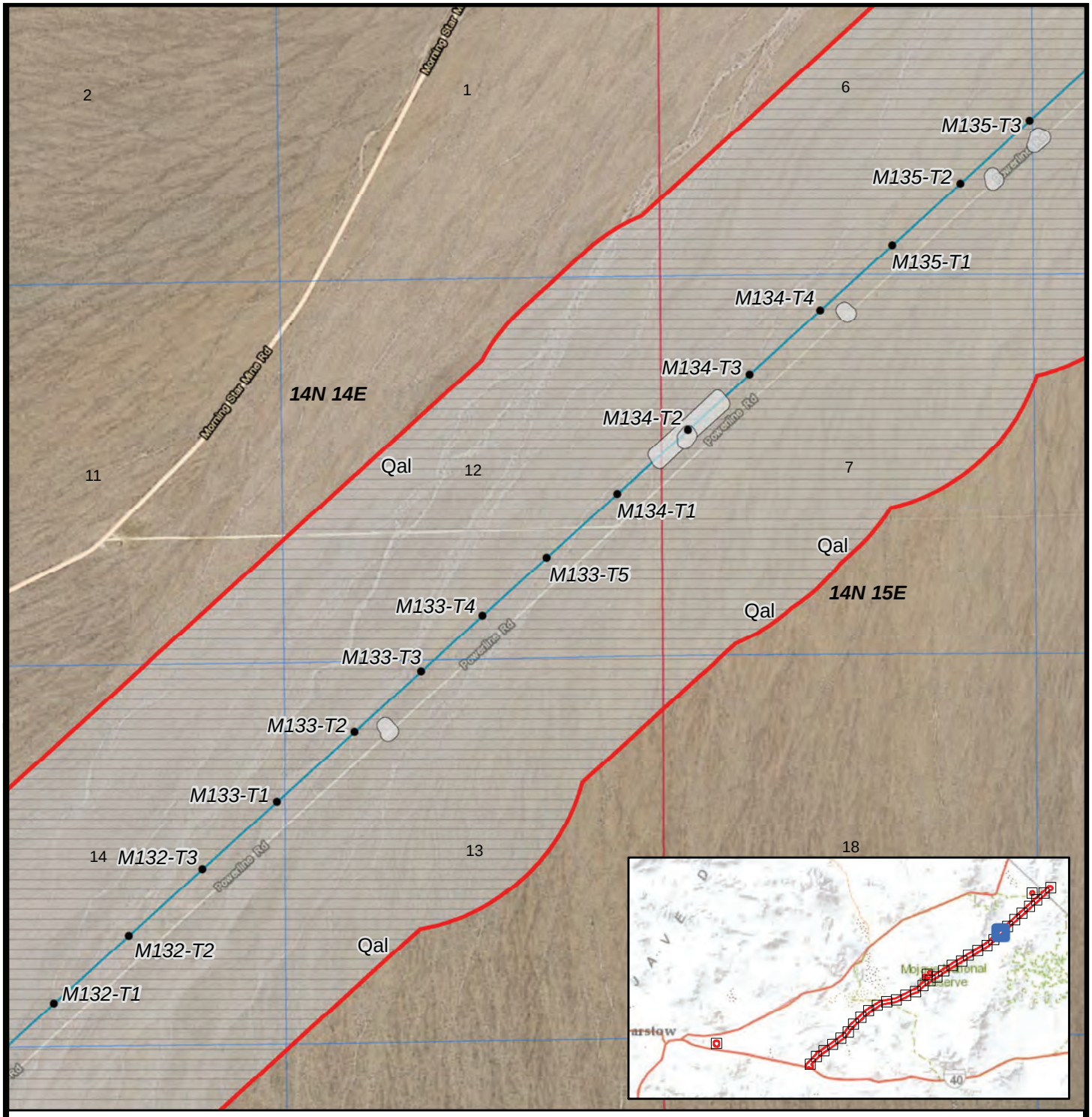
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 27

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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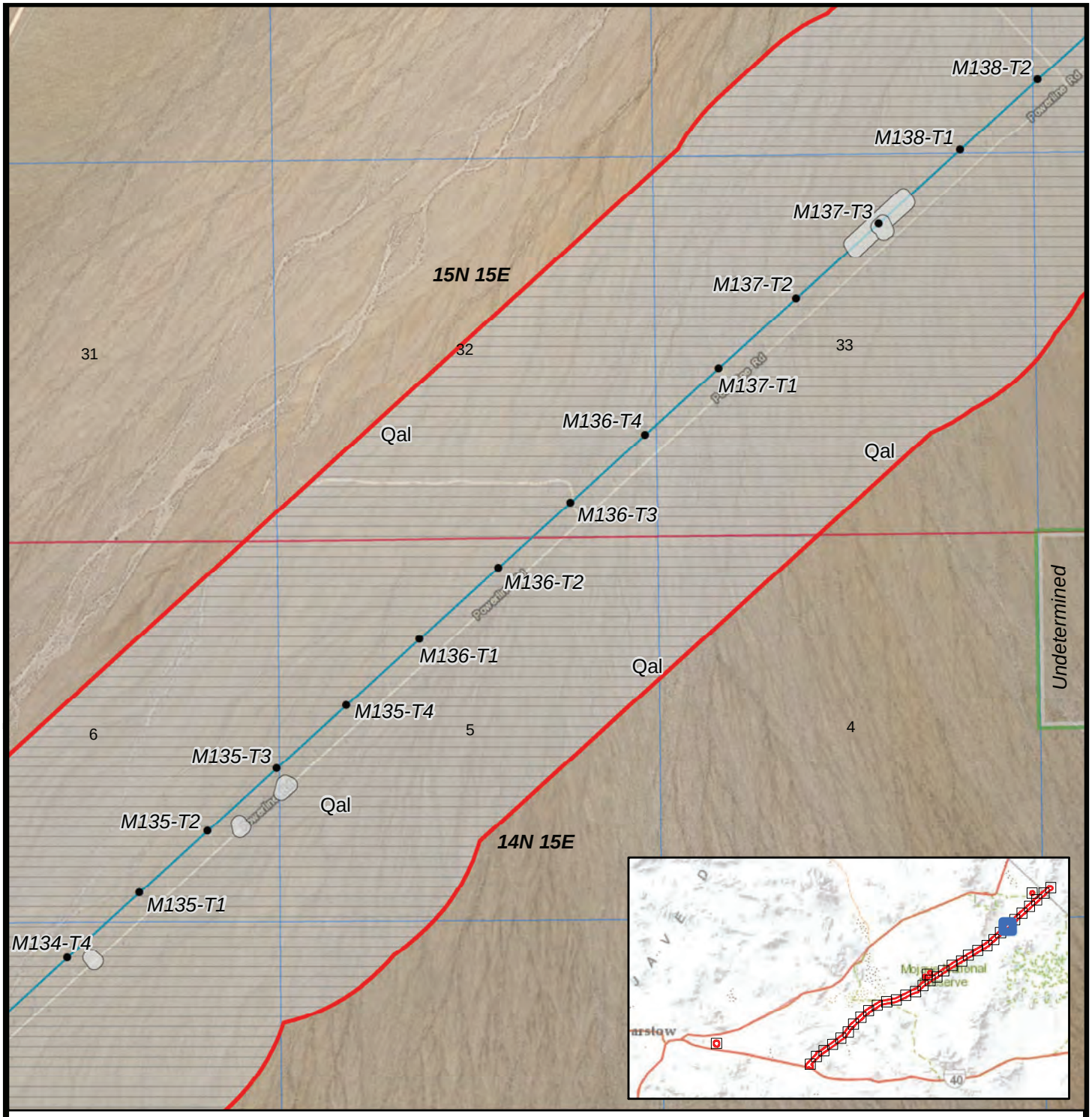
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 28

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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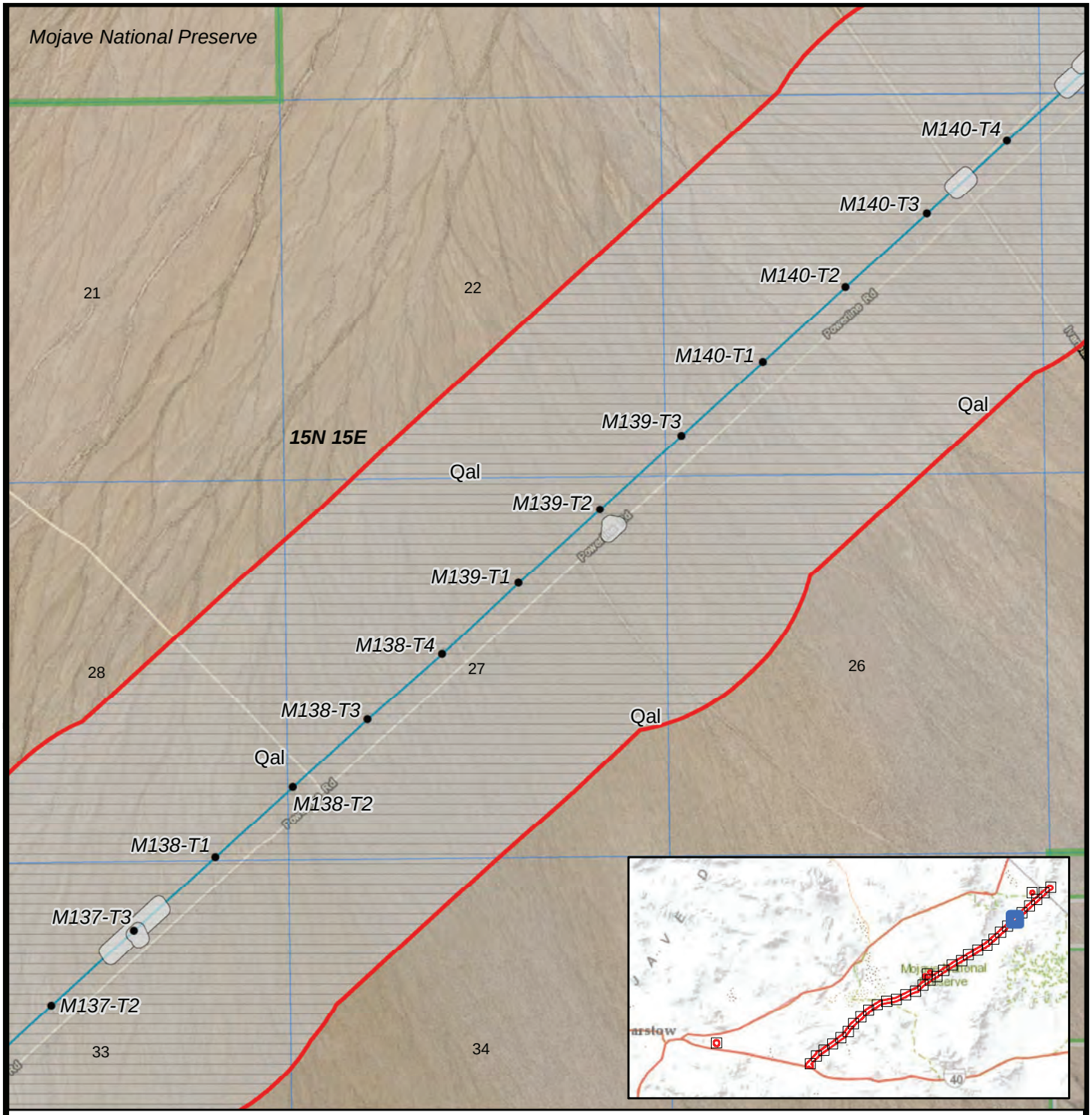
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 29

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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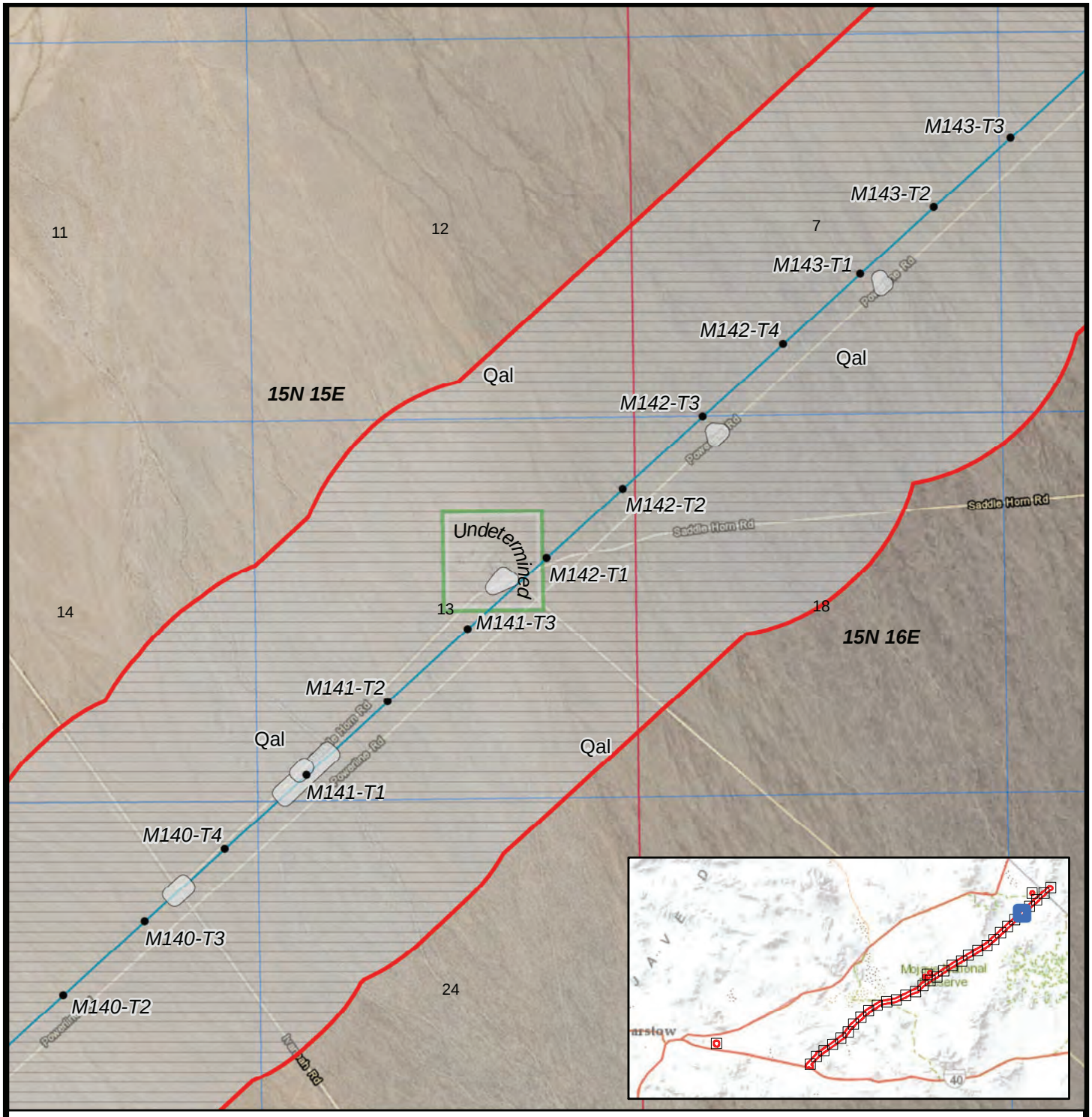
Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 30

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

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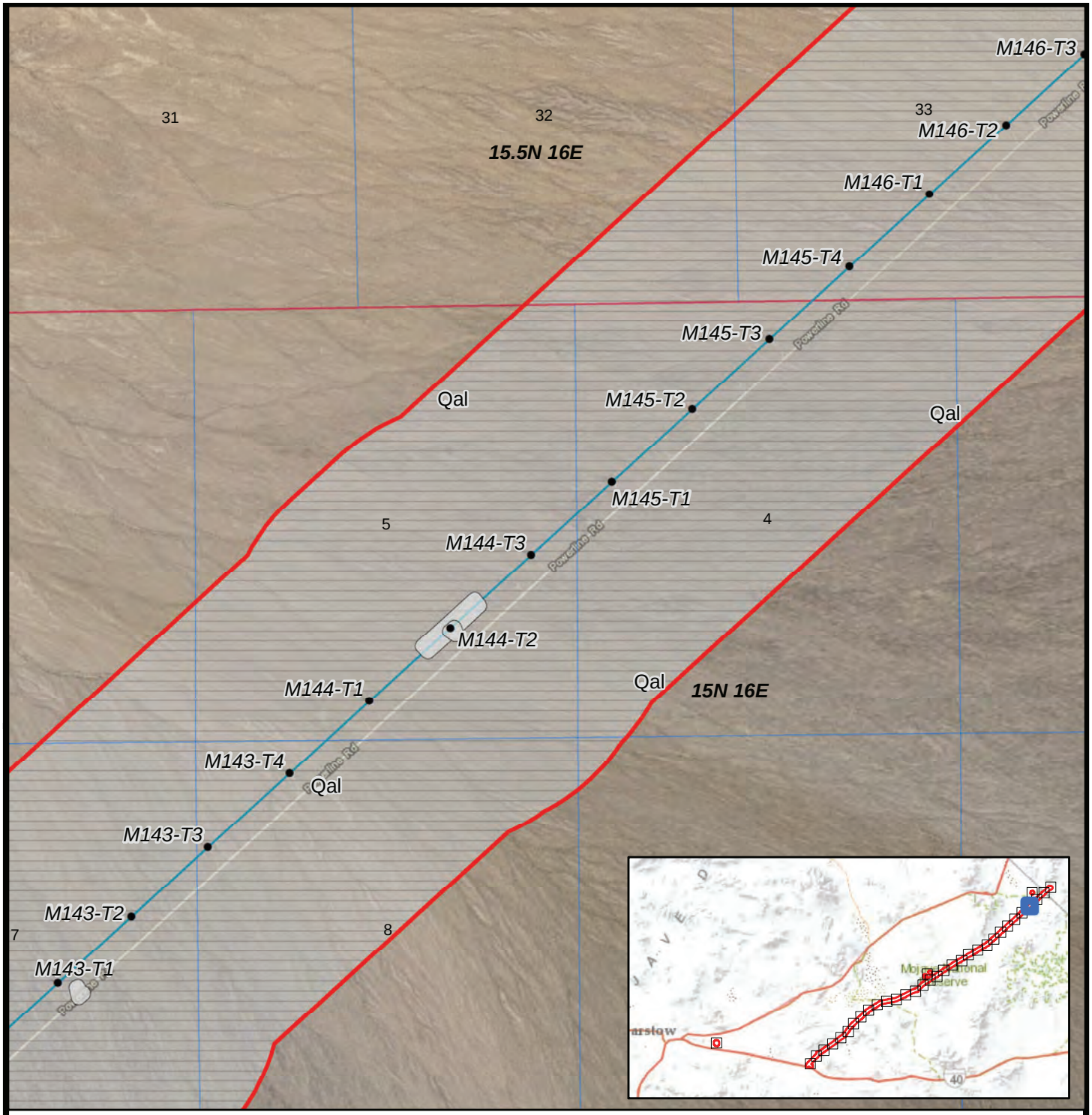
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 31

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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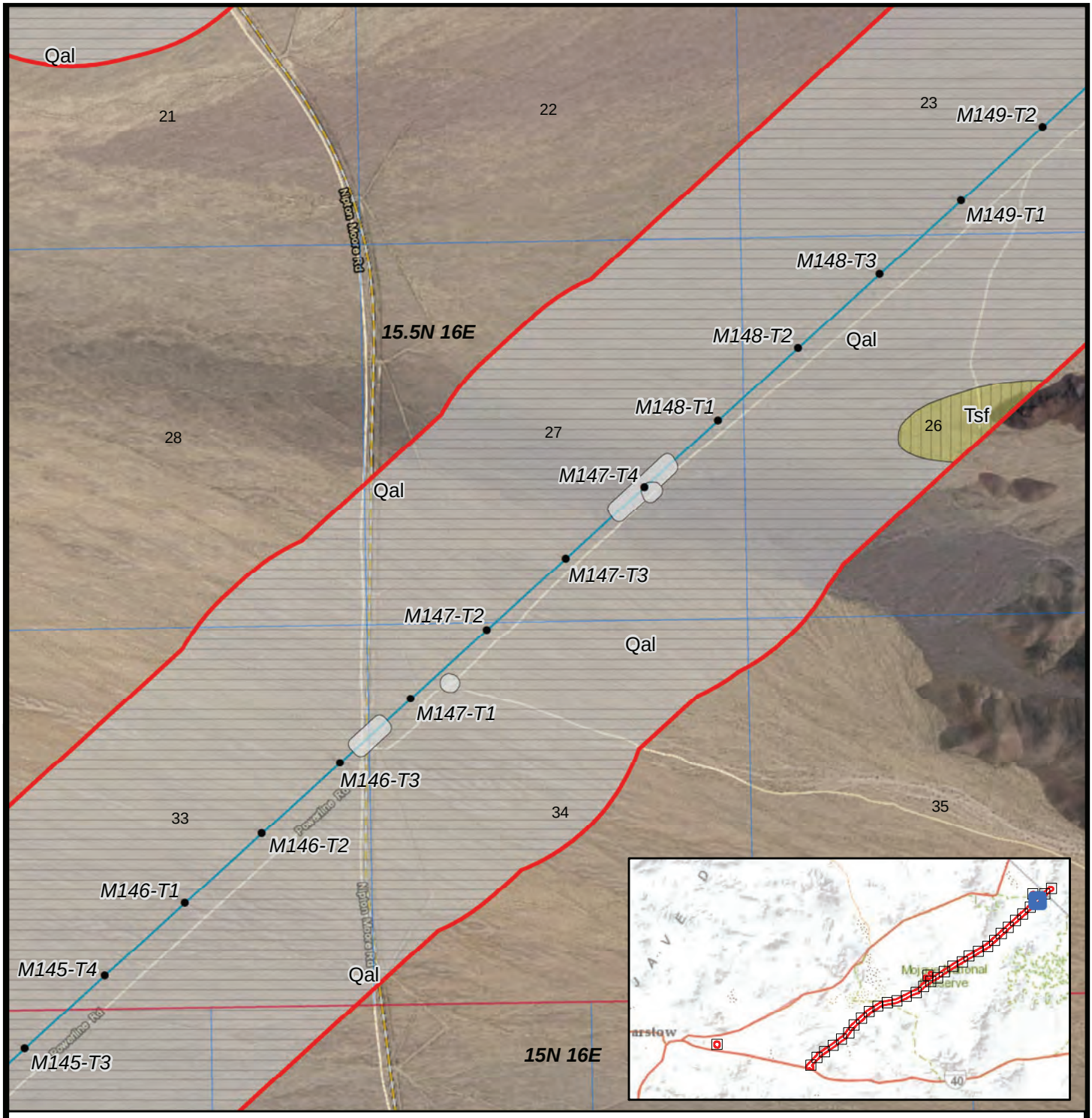
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 32

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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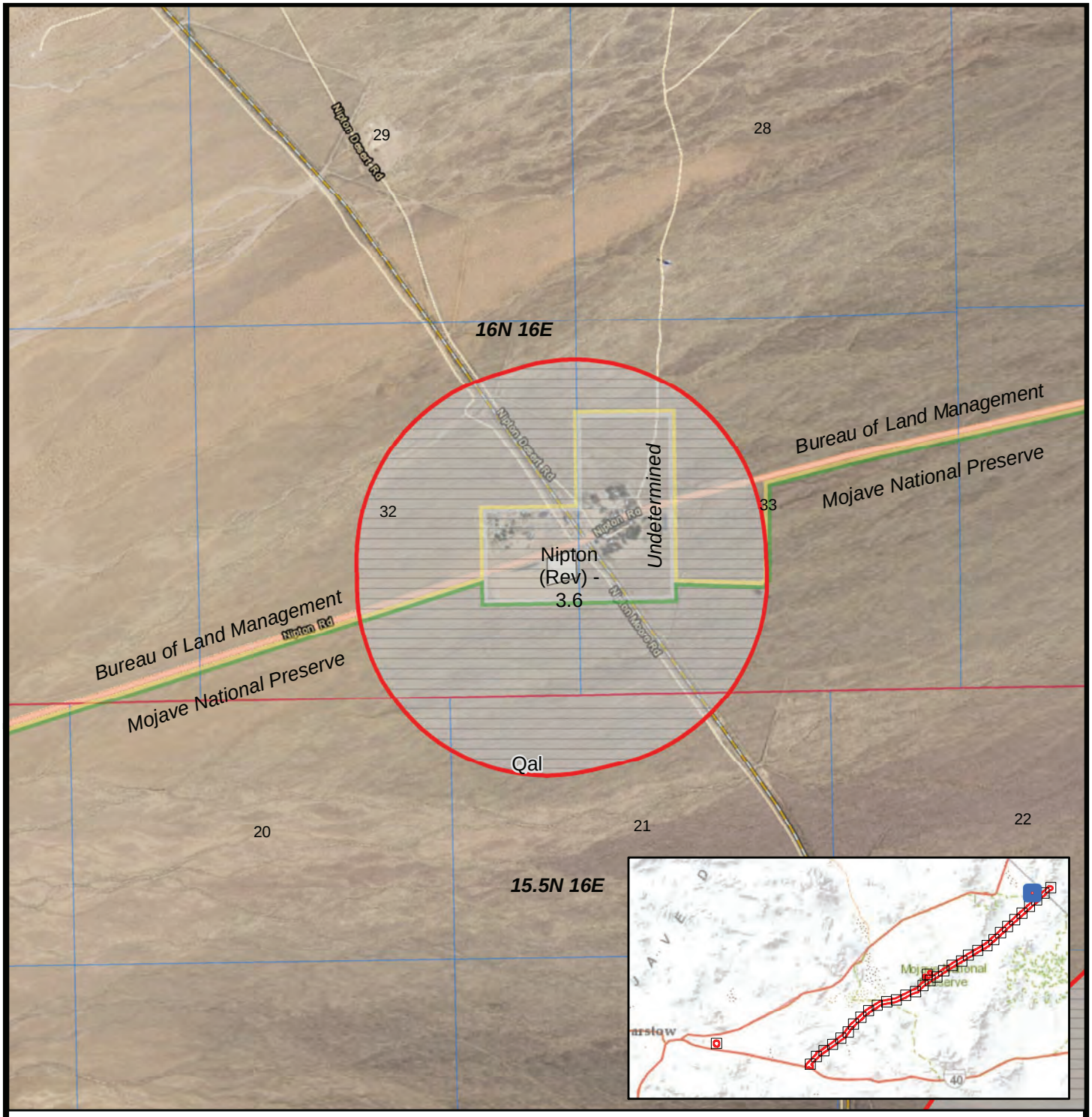
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 33

Material Laydown Yard

1/2 Mile Buffer

Geology

Qa/Qal: Alluvium (Holocene)

Paleosensitivity

2 - Low

0 ¼ ½ 1

Miles

N

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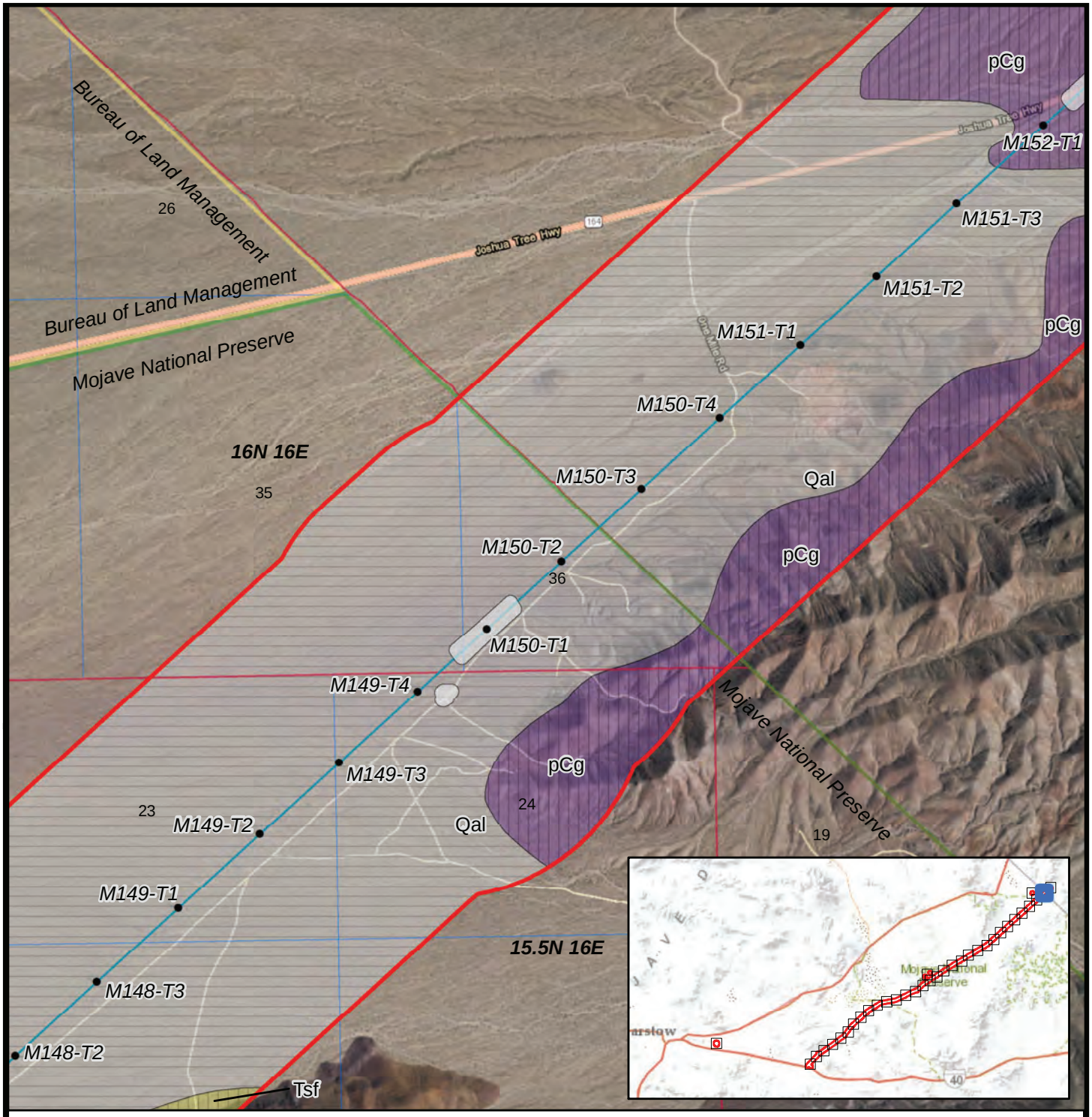
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 34

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

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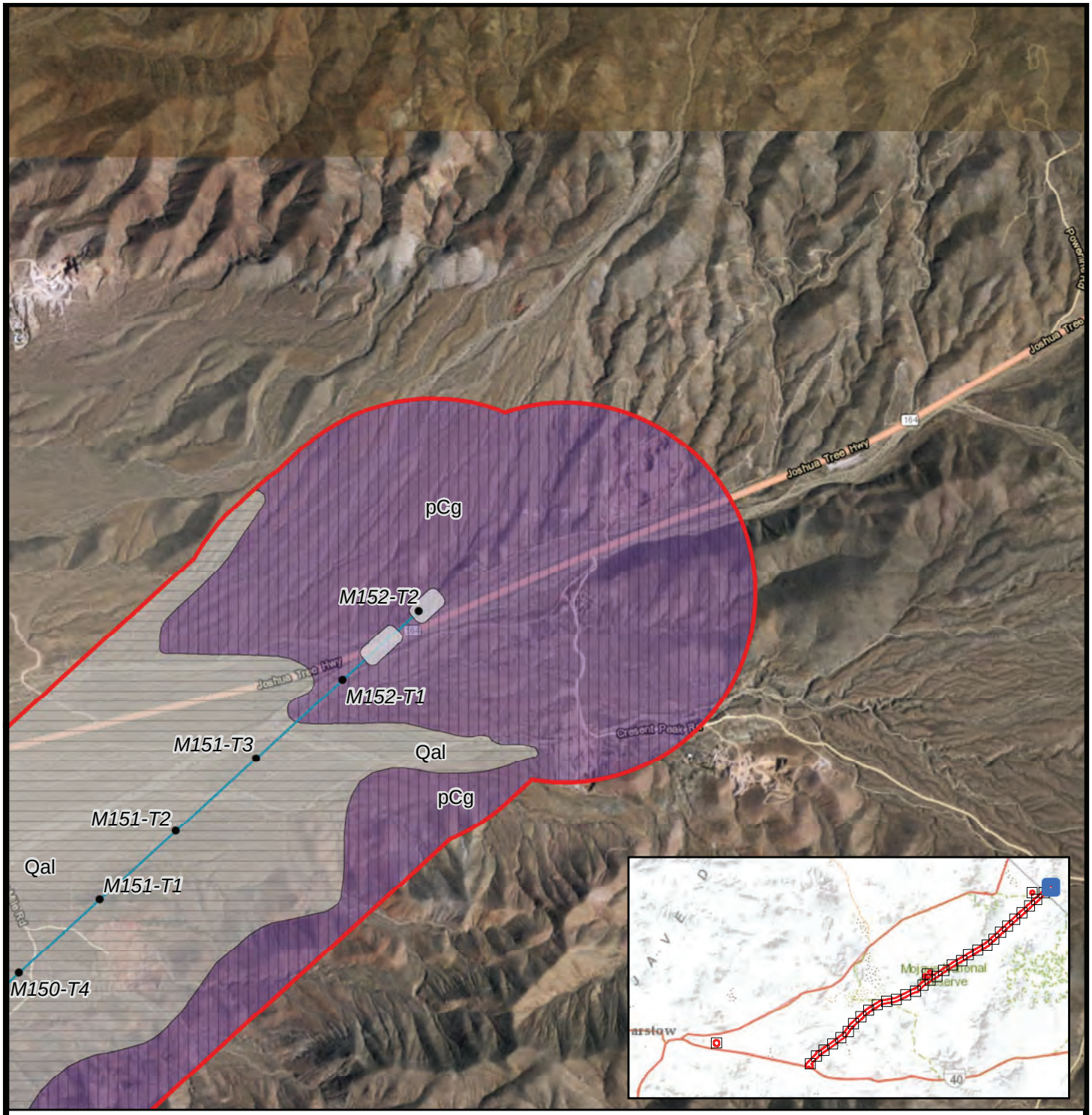
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 35

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
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Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada

APPENDIX B. BLM PERMITS AND FIELDWORK AUTHORIZATIONS

United States Department of the Interior
BUREAU OF LAND MANAGEMENT

California State Office
2800 Cottage Way, Suite W1623
Sacramento, CA 95825
www.blm.gov/ca

March 16, 2016

In Reply Refer To:
CA930 8151(P)

Geraldine Aron
Paleo Solutions, Inc.
911 S. Primrose Ave, Unit N
Monrovia, CA 91016

Dear Ms. Aron:

The Bureau of Land Management (BLM) is pleased to issue a 3-year Scientific Paleontological Permit (*CA-16-03P*) to Paleo Solutions, Inc. for use on Public Lands managed by California BLM as specified in your permit. This permit is issued under the authority of the Federal Land Policy and Management Act (FLPMA) and the Antiquities Act of 1906. Keep a copy with you at all times in the field.

This permit authorizes the permit holder to conduct and collect paleontological resources pertaining to both scientific research and commercial projects. BLM would like to emphasize a few points. First, this permit assigns to your firm the responsibility to submit reports and other documents in a timely fashion and such submittal will be a major point of review of your firm's performance under this permit. Second, you are required to contact the appropriate Field Office to obtain a Field Use Authorization before you begin any fieldwork. Please allow the Field Office sufficient lead-time to process your application for a Field Use Authorization. The Field Office may impose additional conditions and stipulations at that time. Third, please be mindful that it is your firm's responsibility to ensure assignment of supervisory field personnel (crew chiefs) to projects that have at least four months' local experience and who otherwise meet the standards of the Bureau.

Our office is enclosing a map of California BLM Field Offices with phone numbers of cultural heritage staff and a copy of your permit with attached National special permit conditions. BLM draws your attention to these stipulations and encourages you to read and understand them. Please sign page 5, as indicated, and **return a copy of this signature page to the California BLM State Office within 30 days of your receipt of the permit**. Your permit will be valid after your signature is received.

Should you have any questions contact James Barnes at email jjbarnes@blm.gov or by phone 916-978-4676.

Sincerely,

Tom Pogacnik
Deputy State Director
Natural Resources Division

Enclosures as stated

DI Form 1991 (Rev Sept 2004)
OMB No. 1024-0037
Exp. Date (01/31/2008)

United States Department of the Interior

PERMIT FOR PALEONTOLOGICAL INVESTIGATIONS

To conduct archeological work on Department of the Interior lands and Indian lands under the authority of:

- ☐ The Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm) and its regulations (43 CFR 7).
- ☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).
- ☐ Supplemental regulations (25 CFR 262) pertaining to Indian lands.
- ☒ Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit
No.: CA-16-03P

1. Permit issued to Paleo Solutions, Inc.	2. Under application dated January 21, 2016
3. Address 911 S. Primrose Ave., Unit N, Monrovia, CA 91016	4. Telephone number(s) (562) 818-7713
	5. E-mail address(es) geraldine@paleosolutions.com

6. Name of Permit Administrator Geraldine Aron Telephone number(s): (562) 818-7713 Email address(es): geraldine@paleosolutions.com	7. Name of Principal Investigator(s) Geraldine Aron, Paul Murphy, Jennifer Kelly, Courtney Richards Telephone number(s): GA: (562) 818-7713, PM: (303) 514-1095, JK: (714) 206-5433, CR: (626) 716-2000 Email address(es): geraldine@paleosolutions.com, pmurphy@paleosolutions.com, jkelly@paleosolutions.com, crichards@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects	Telephone number(s): Email address(es):
9. Activity authorized Survey and limited surface collection	
10. On lands described as follows All lands managed by the Bureau of Land Management-California	
11. During the duration of the project From March 16, 2016 To March 16, 2019	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of approving official Tom Pogacnik, Deputy State Director, Natural Resources Division	15. Date 03/17/2016

15. Standard Permit Conditions

a. This permit is subject to all applicable provisions of 43 CFR Part 3, 43 CFR 7, and 25 CFR 262, and applicable departmental and bureau policies and procedures, which are made a part hereof.

b. The permittee and this permit are subject to all other Federal, State, and local laws and regulations applicable to the public lands and resources.

c. This permit shall not be exclusive in character, and shall not affect the ability of the land managing bureau to use, lease or permit the use of lands subject to this permit for any purpose.

d. This permit may not be assigned.

e. This permit may be suspended or terminated for breach of any condition or for management purposes at the discretion of the approving official, upon written notice.

f. This permit is issued for the term specified in 11 above.

g. Permits issued for a duration of more than one year must be reviewed annually by the agency official and the permittee.

h. The permittee shall obtain all other required permit(s) to conduct the specified project.

i. Archeological project design, literature review, development of the regional historic context framework, site evaluation, and recommendations for subsequent investigations must be developed with direct involvement of an archeologist who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation; fieldwork must be generally overseen by an individual who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation.

j. Permittee shall immediately request that the approving official (14. above) make a modification to accommodate any change in an essential condition of the permit, including individuals named and the nature, location, purpose, and time of authorized work, and shall without delay notify the approving official of any other changes affecting the permit or regarding information submitted as part of the application for the permit. Failure to do so may result in permit suspension or revocation.

k. Permittee may request permit extension, in writing, at any time prior to expiration of the term of the permit, specifying a limited, definite amount of time required to complete permitted work.

l. Any correspondence about this permit or work conducted under its authority must cite the permit number. Any publication of results of work conducted under the authority of this permit must cite the approving bureau and the permit number.

m. Permittee shall submit a copy of any published journal article and any published or unpublished report, paper, and manuscript resulting from the permitted work (apart from those required in items q. and s., below), to the approving official and the appropriate official of the approved curatorial facility (item 12 above).

n. Prior to beginning any fieldwork under the authority of this permit, the permittee, following the affected bureau's policies and procedures, shall contact the field office manager responsible for administering the lands involved to obtain further instructions.

o. Permittee may request a review, in writing to the official concerned, of any disputed decision regarding inclusion of specific terms and conditions or the modification, suspension, or revocation of this permit, setting out reasons for believing that the decision should be reconsidered.

p. Permittee shall not be released from requirements of this permit until all outstanding obligations have been satisfied, whether or not the term of the permit has expired. Permittee may be subject to civil penalties for violation of any term or condition of this permit.

15. Standard Permit Conditions (continued)

q. Permittee shall submit a preliminary report to the approving official within a timeframe established by the approving official, which shall be no later than 6 weeks after the completion of any episode of fieldwork, setting out what was done, how it was done, by whom, specifically where, and with what results, including maps, GPS data, an approved site form for each newly recorded archeological site, and the permittee's professional recommendations, as results require. If other than 6 weeks, the timeframe shall be specified in Special Permit Condition p. Depending on the scope, duration, and nature of the work, the approving official may require progress reports, during or after the fieldwork period or both, and as specified in Special Permit Condition r.

r. Permittee shall submit a clean, edited draft final report to the agency official for review to insure conformance with standards, guidelines, regulations, and all stipulations of the permit. The schedule for submitting the draft shall be determined by the agency official.

s. Permittee shall submit a final report to the approving official not later than 180 days after completion of fieldwork. Where a fieldwork episode involved only minor work and/or minor findings, a final report may be submitted in place of the preliminary report. If the size or nature of fieldwork merits, the approving official may authorize a longer timeframe for the submission of the final report as specified in Special Permit Condition q.

t. Two copies of the final report, a completed NTIS Report Documentation Page (SF-298), available at http://www.ntis.gov/pdf/rdpform.pdf, and a completed NADB-Reports Citation Form, available at http://www.cr.nps.gov/aad/tools/nadbform_update.doc, will be submitted to the office issuing the permit.

u. The permittee agrees to keep the specific location of sensitive resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

v. Permittee shall deposit all artifacts, samples and collections, as applicable, and original or clear copies of all records, data, photographs, and other documents, resulting from work conducted under this permit, with the curatorial facility named in item 12, above, not later than 90 days after the date the final report is submitted to the approving official. Not later than 180 days after the final report is submitted, permittee shall provide the approving official with a catalog and evaluation of all materials deposited with the curatorial facility, including the facility's accession and/or catalog numbers.

w. Permittee shall provide the approving official with a confirmation that museum collections described in v. above were deposited with the approved curatorial facility, signed by an authorized curatorial facility official, stating the date materials were deposited, and the type, number and condition of the collected museum objects deposited at the facility.

x. Permittee shall not publish, without the approving official's prior permission, any locational or other identifying archeological site information that could compromise the Government's protection and management of archeological sites.

y. For excavations, permittee shall consult the OSHA excavation standards which are contained in 29 CFR §1926.650, §1926.651 and §1926.652. For questions regarding these standards contact the local area OSHA office, OSHA at 1-800-321-OSHA, or the OSHA website at http://www.osha.gov.

z. Special permit conditions attached to this permit are made a part hereof.

16. Special Permit Conditions

☒ a. Permittee shall allow the approving official and bureau field officials, or their representatives, full access to the work area specified in this permit at any time the permittee is in the field, for purposes of examining the work area and any recovered materials and related records.

☒ b. Permittee shall cease work upon discovering any human remains and shall immediately notify the approving official or bureau field official. Work in the vicinity of the discovery may not resume until the authorized official has given permission.

☒ c. Permittee shall backfill all subsurface test exposures and excavation units as soon as possible after recording the results, and shall restore them as closely as reasonable to the original contour.

☒ d. Permittee shall not use mechanized equipment in designated, proposed, or potential wilderness areas unless authorized by the agency official or a designee in additional specific conditions associated with this permit.

☒ e. Permittee shall take precautions to protect livestock, wildlife, the public, or other users of the public lands from accidental injury in any excavation unit.

☒ f. Permittee shall not conduct any flint knapping or lithic replication experiments at any archeological site, aboriginal quarry source, or non-site location that might be mistaken for an archeological site as a result of such experiments.

☒ g. Permittee shall perform the fieldwork authorized in this permit in a way that does not impede or interfere with other legitimate uses of the public lands, except when the authorized officer specifically provides otherwise.

☒ h. Permittee shall restrict vehicular activity to existing roads and trails unless the authorized officer provides otherwise.

☒ i. Permittee shall keep disturbance to the minimum area consistent with the nature and purpose of the fieldwork.

☒ j. Permittee shall not cut or otherwise damage living trees unless the authorized officer gives permission.

☒ k. Permittee shall take precautions at all times to prevent wildfire. Permittee shall be held responsible for suppression costs for any fires on public lands caused by the permittee's negligence. Permittee may not burn debris without the authorized officer's specific permission.

☒ l. Permittee shall conduct all operations in such a manner as to prevent or minimize scarring and erosion of the land, pollution of the water resources, and damage to the watershed.

☒ m. Permittee shall not disturb resource management facilities within the permit area, such as fences, reservoirs, and other improvements, without the authorized officer's approval. Where disturbance is necessary, permittee shall return the facility to its prior condition, as determined by the authorized officer.

☒ n. Permittee shall remove temporary stakes and/or flagging, which the permittee has installed, upon completion of fieldwork.

☒ o. Permittee shall clean all camp and work areas before leaving the permit area. Permittee shall take precautions to prevent littering or pollution on public lands, waterways, and adjoining properties. Refuse shall be carried out and deposited in approved disposal areas.

☐ p. Permittee shall submit the preliminary report within _____ days/weeks of completion of any episode of fieldwork..

☐ q. Permittee shall submit the final report within _____ days/weeks/months after completion of fieldwork..

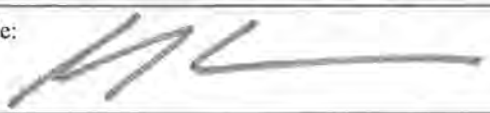
☐ r. Permittee shall submit progress reports every _____ months over the duration of the project.

☒ s. California special permit conditions are attached.

Special Permit Conditions Continuation Sheet: California Conditions

- a. Work under this permit is limited to specific service approved for each permit. This may consist of non-collection survey, limited testing to determine site content and limits or extensive testing emergency excavation and/or salvage projects. Testing/ excavation projects may be conducted under the authority of this permit only upon completion of ARPA consultation with Native American Groups and written approval from the Bureau for such work. (CARIDAPs for the purpose of the identification of archaeological resources are authorized under a FLPMA/ARPA Permit).
- b. Permittees shall verbally and subsequently in writing contact the appropriate BLM Field Manager prior to the beginning of each of his field operations (with follow-up written notification) to inform the BLM of specific work to be conducted. At this time, the BLM Field Manager may impose additional stipulation as deemed necessary to provide for the protection and management of resource values in the general site or project area.
- c. All cultural artifacts and other related materials such as notes, photographs, etc., acquired under the provisions of this permit **remain the property of the United States Government and may be recalled at any time for the use of the Department of the interior or other agencies of the Federal Government.** Cultural materials collected under the provisions of this permit must be curated at a repository approved by the BLM. Curation shall be at a local qualified repository, if feasible, and an approved curation facility shall be designated prior to all field projects. An itemized list of all materials with accession numbers, curated at the repository will be submitted to the State Office and to the appropriate Field Office within 180 days of the completion of individual field projects. A copy of a receipt from the curation facility must be submitted with the list or catalogue.
- d. Permittees shall acquire a primary number from the appropriate Information Center for each cultural resource documented while undertaking work authorized by this permit.
- e. The BLM Field Manager or authorized representative may require a monthly letter progress report outlining what was accomplished. This report, if required, is due by the fifth day of the following month, unless different arrangements are approved.
- f. The individual(s) in direct charge must be academically qualified and possess adequate field experience. At least two weeks prior to initiation field work, the permittees must provide the BLM Field Manager with the vitae of individuals proposed to be in direct charge if not approved at the time of permit issuance. A list of field crew members should be submitted at the same time. Only the individual(s) listed in Item No. 8 of the permit is/are authorized to be in direct charge of field work conducted under this permit.
- g. The person(s) in direct charge of field work, shall be on site at all times when work is in progress. Failure to comply with permit stipulations will result in removal of subject's name(s) from the approved list of person-in-direct-charge.
- h. Care should be exercised to avoid directly or indirectly increasing access or potential vandalism to sensitive sites.
- i. All National Permit Stipulations are binding. The authority for issuing permits in the Bureau of Land Management rests solely with the State Director as Delegated by the Secretary of the Interior and all further delegation is prohibited by Secretarial Order. No Modification of National Permit Conditions 8 or 9 or of the California Special Permit Conditions may occur except by written decision of the State Director.
- j. The Bureau of Land Management shall be cited in any report of work done under this permit, including publications such as books, news articles and scientific publications, as well as oral reports, films, television programs, and presentations in other media.

By signing below, I, the Principal Investigator, acknowledge that I have read and understand the Permit for Archeological Investigations and agree to its terms and conditions as evidenced by my signature below and initiation of work or other activities under the authority of this permit.

Signature and title:	Date:
	03/17/2016

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Nevada State Office
1340 Financial Blvd.
Reno, Nevada 89502-7147
http://www.nv.blm.gov

In Reply Refer To:
N-91420
8270 (NV-930)

Jennifer Kelly
Paleo Solutions, Inc.
911 South Primrose Ave., Unit N
Monrovia, CA 91016

Dear Ms. Kelly:

The modified Paleontological Resources Use Permit No. N-91420 is enclosed, reflecting the requests received April 6 and 14, 2016. As requested, Jen DiCenzo and Kate Zubin-Stathopolos have been added to your permit as field monitors. The request to add Mr. Dean Reed as a field monitor is denied. Mr. Reed does not demonstrate the education nor experience with paleontological resources to serve as a monitor.

All questions should be directed to me at (775) 861-6546, or you may reach me via email at b50hocke@blm.gov.

Sincerely,

Bryan Hockett, Ph.D.
Archaeologist
Resources, Lands, and Planning

Enclosure(s)
As Stated

cc: BLM Nevada Archaeologists
Nevada State Museum

Form 8270-2 (Temporary)
(December 1994)

United States
Department of the Interior
Bureau of Land Management

PERMIT NUMBER:
N– 91420

Paleontological Resources Use Permit

A copy of this permit must be carried by the individual(s)
named in Line 8 whenever fieldwork is in progress.

modified April 14, 2016

1a.Permittee: Geraldine Aron & Jennifer Kelly	1b. Affiliation: Paleo Solutions, Inc.
2. Mailing address Office: 911 South Primrose Ave., Unit N Monrovia, CA 91016 Field Party: Geraldine Aron, Paul Murphey, Courtney Richards, and Jennifer Kelly Field Monitor: Cecilio Garcia, Jen DiCenzo, Kate Zubin-Stathopolos	3. Telephone number Office: 562/818-7713 Fax: 626/359-0712 e-mail: jkelly@paleosolutions.com Field Party cell:
4. Nature of paleontological fieldwork proposed: a. Survey |X|	
5. Location of fieldwork proposed: This permit authorizes activities on public lands in Nevada administered by the State Office of the Bureau of Land Management, in relation to land use applications statewide.	
6. Authorized Start Date: September 23, 2015	7. Expiration Date: September 23, 2018
8. Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork: Geraldine Aron and Jennifer Kelly	
9. Repository Name and Address: Los Angeles County Museum of Natural History 900 Exposition Blvd. Los Angeles, CA 90007	
10. Special conditions are attached and must be adhered to.	

Area Manager — Date

Area Manager — Date

Bryan Hockett, Ph.D. — Date 4/14/2016
Archaeologist
Resources, Lands and Planning

United States Department of the Interior
FIELDWORK REQUEST AND AUTHORIZATION
PALEONTOLOGICAL INVESTIGATIONS

DI Form 1991
(BLM Rev July 2005)
OMB No. 1024-0037

Authorization to conduct Paleontological studies on public lands managed by the Bureau of Land Management under the authority of:

☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).
☒Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit

No.: CA-16-03P / CA690 - FA - 17 - 17P CDH

1. Applicant (Business/Firm) and BLM State Permit Number Paleo Solutions, Inc	**2. Application date**: 6/26/2017
3. Address 911 S Primrose Ave, Unit N Monrovia, CA 91016	**4. Telephone number(s)** 562-818-7713 **5. E-mail address(es)** geraldine@paleosolutions.com
6. Name of Permit Administrator Geraldine Aron **Telephone number(s):** 562-818-7713 **Email address(es):** geraldine@paleosolutions.com	**7. Name of Principal Investigator(s)** Geraldine Aron, Courtney Richards, and Paul Murphey **Telephone number(s):** 562-818-7713; 626-716-2000; 303-882-8048 **Email address(es):** geraldine@paleosolutions.com, crichards@paleosolutions.com; paul@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects Joey Raum, Jeff Hathaway	**Telephone number(s):** 240-446-8435; 714-305-3326 **Email address(es):** jraum@paleosolutions.com; jhathaway@paleosolutions.com

9. Nature of paleontological fieldwork proposed:

☒ **Survey and limited surface collection.** ☐ **Excavation**

Breifly describe: A paleontology survey is being recommend for SCE Lugo-Victorville Remedial Action Scheme Project: A field survey of paleontologically sensitive locations (PFYC U, 3, 4 or 5) within the Project area will be conducted as well as verification of geologic extents of PFYC 1 and PFYC 2 units and previously recorded fossil localities. The survey will occur in areas where scientifically significant fossils can be potentially expected to occur within the boundary and immediate vicinity of the anticipated disturbance, or where the probability of encountering fossils is unknown, and in locations where fossils have been recorded in the past. The survey corridor will be the impact area plus 100 feet on either side of the centerline.

The field survey will be conducted by a survey crew consisting of two paleontologists. The crew will complete a 100% pedestrian linear survey of all potentially fossiliferous bedrock outcrops and exposures of surficial sediments that occur on PFYC U, 3, 4, or 5 formations and verification of PFYC Class 1 and 2 extents (see Appendix A). Areas with very low to low sensitivity will not be intensively surveyed.

Paleo Solutions' Principal Investigator, Geraldine Aron, will oversee the paleontological field crew during all field survey activities. The field survey is anticipated to take a maximum of ten working days to complete (10 hours/day) based on the initial analysis of existing data, and the access roads mapped for the Project.

The project covers the jurisdiction of Barstow and Needles Field BLM Offices. We are submitting a FA request from Barstow and Needles for this project. A separate request will be submitted to the Southern District of Nevada.

Please see the attached map for Needles.

10. Location of proposed work (attach topographic map copy with project boundaries

Please see the attached map

11. Dates of proposed work: **From:** 6/26/17 **To:** 12/31/17	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County (LACM), 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of applicant:	**15. Date** 6/26/17
16. Signature and title of approving official:	**17. Date** 07/03/17

United States Department of the Interior
FIELDWORK REQUEST AND AUTHORIZATION
PALEONTOLOGICAL INVESTIGATIONS

DI Form 1991
(BLM Rev July 2005)
OMB No. 1024-0037

FA-680-17-27

Authorization to conduct Paleontological studies on public lands managed by the Bureau of Land Management under the authority of:

☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).

☒ Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit

No.: CA-16-03P

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	5. E-mail address(es) geraldine@paleosolutions.com
6. Name of Permit Administrator Geraldine Aron **Telephone number(s):** 562-818-7713 **Email address(es):** geraldine@paleosolutions.com	**7. Name of Principal Investigator(s)** Geraldine Aron, Courtney Richards, and Paul Murphey **Telephone number(s):** 562-818-7713; 626-716-2000; 303-882-8048 **Email address(es):** geraldine@paleosolutions.com, crichards@paleosolutions.com; paul@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects Joey Raum, Jeff Hathaway	**Telephone number(s):** 240-446-8435; 714-305-3326 **Email address(es):** jraum@paleosolutions.com; jhathaway@paleosolutions.com

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Paleo Solutions' Principal Investigator, Geraldine Aron, will oversee the paleontological field crew during all field survey activities. The field survey is anticipated to take a maximum of ten working days to complete (10 hours/day) based on the initial analysis of existing data, and the access roads mapped for the Project.

The project covers the jurisdiction of Barstow and Needles Field BLM Offices, but we assume Barstow is overseeing this project. A separate request will be submitted to the Southern District of Nevada.

Please see the attached map.

10. Location of proposed work (attach topographic map copy with project boundaries

Please see the attached map

11. Dates of proposed work: From: 6/26/17 To: 12/31/17	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County (LACM), 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of applicant:	**15. Date** 6/26/17
16. Signature and title of approving official:	**17. Date** 6/27/17

Form 8270-2 (Temporary)
(December 1994)

United States
Department of the Interior
Bureau of Land Management

PERMIT NUMBER:
N- 91420

Paleontological Resources Use Permit

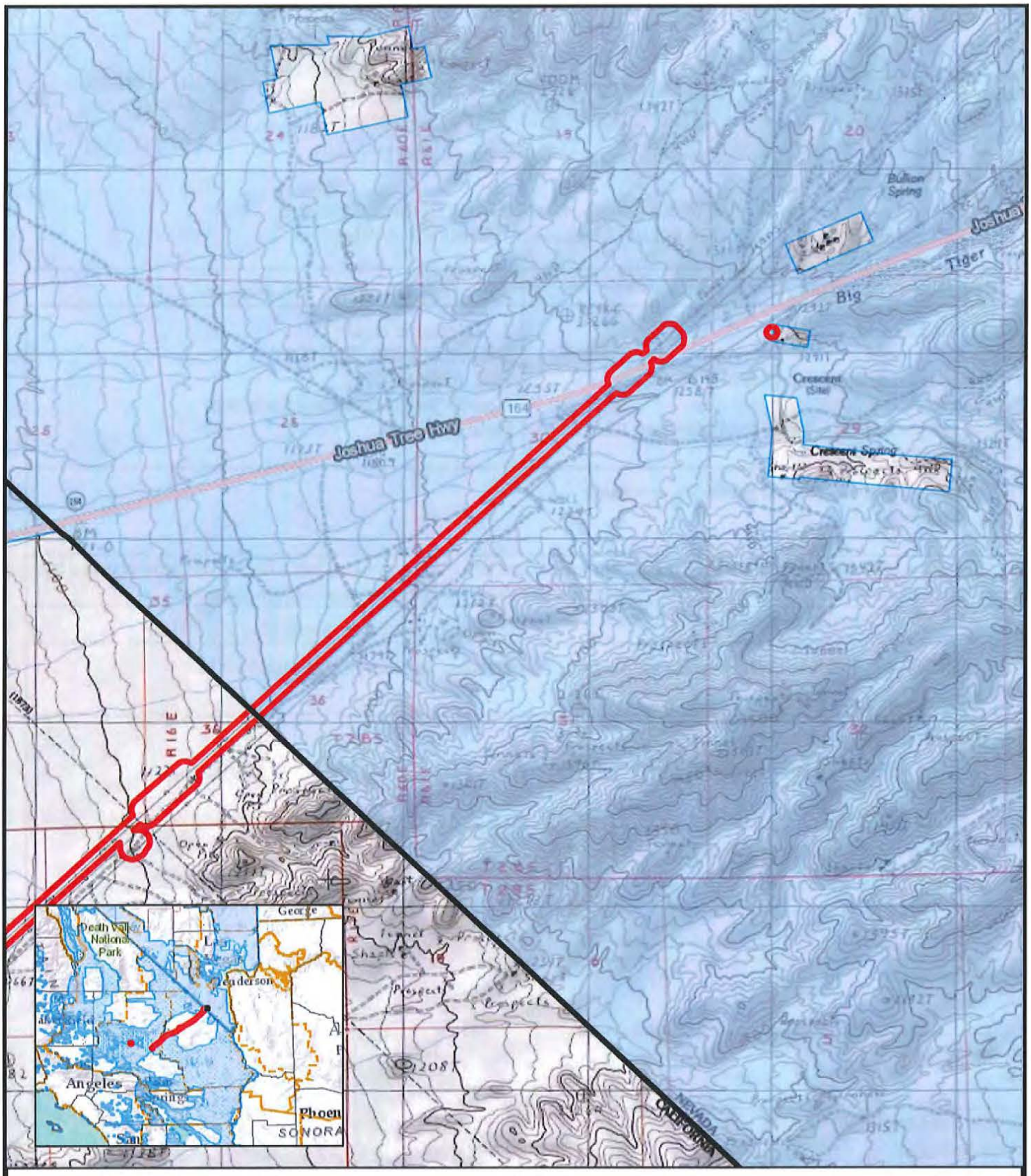
A copy of this permit must be carried by the individual(s) named in Line 8 whenever fieldwork is in progress.

1a.Permittee: Geraldine Aron & Jennifer Kelly	1b. Affiliation: Paleo Solutions, Inc.
2. Mailing address Office: 911 South Primrose Ave., Unit N Monrovia, CA 91016 Field Party: Geraldine Aron, Paul Murphey, Courtney Richards, and Jennifer Kelly	3. Telephone number Office: 562/818-7713 Fax: 626/359-0712 e-mail: jkelly@paleosolutions.com Field Party cell:
4. Nature of paleontological fieldwork proposed: a. Survey |X|	
5. Location of fieldwork proposed: This permit authorizes activities on public lands in Nevada administered by the State Office of the Bureau of Land Management, in relation to land use applications statewide.	
6. Authorized Start Date: September 23, 2015	7. Expiration Date: September 23, 2018
8. Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork: Geraldine Aron and Jennifer Kelly	
9. Repository Name and Address: Los Angeles County Museum of Natural History 900 Exposition Blvd. Los Angeles, CA 90007	
10. Special conditions are attached and must be adhered to.	

Area Manager — Date 7/11/17

Area Manager — Date

Bryan Hockett, Ph.D.
Archaeologist
Resources, Lands and Planning — Date 9/23/2015



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Survey

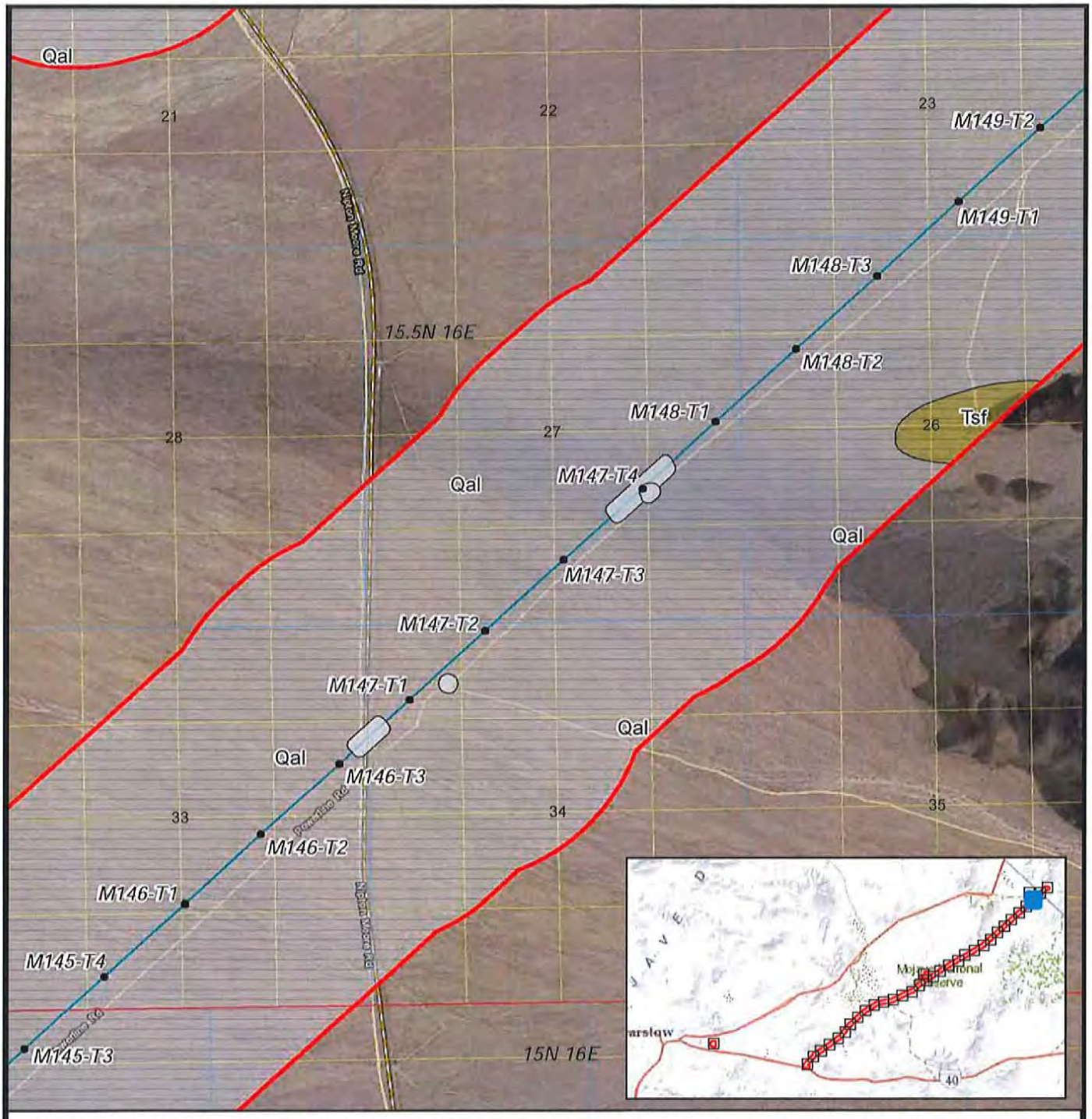
- BLM Administrative Unit Boundaries
- Survey Area
- BLM

0 0.45 0.9 Miles

N

Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center

PALEO SOLUTIONS EST. 2004



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 32

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Paleosensitivity

- 2 - Low

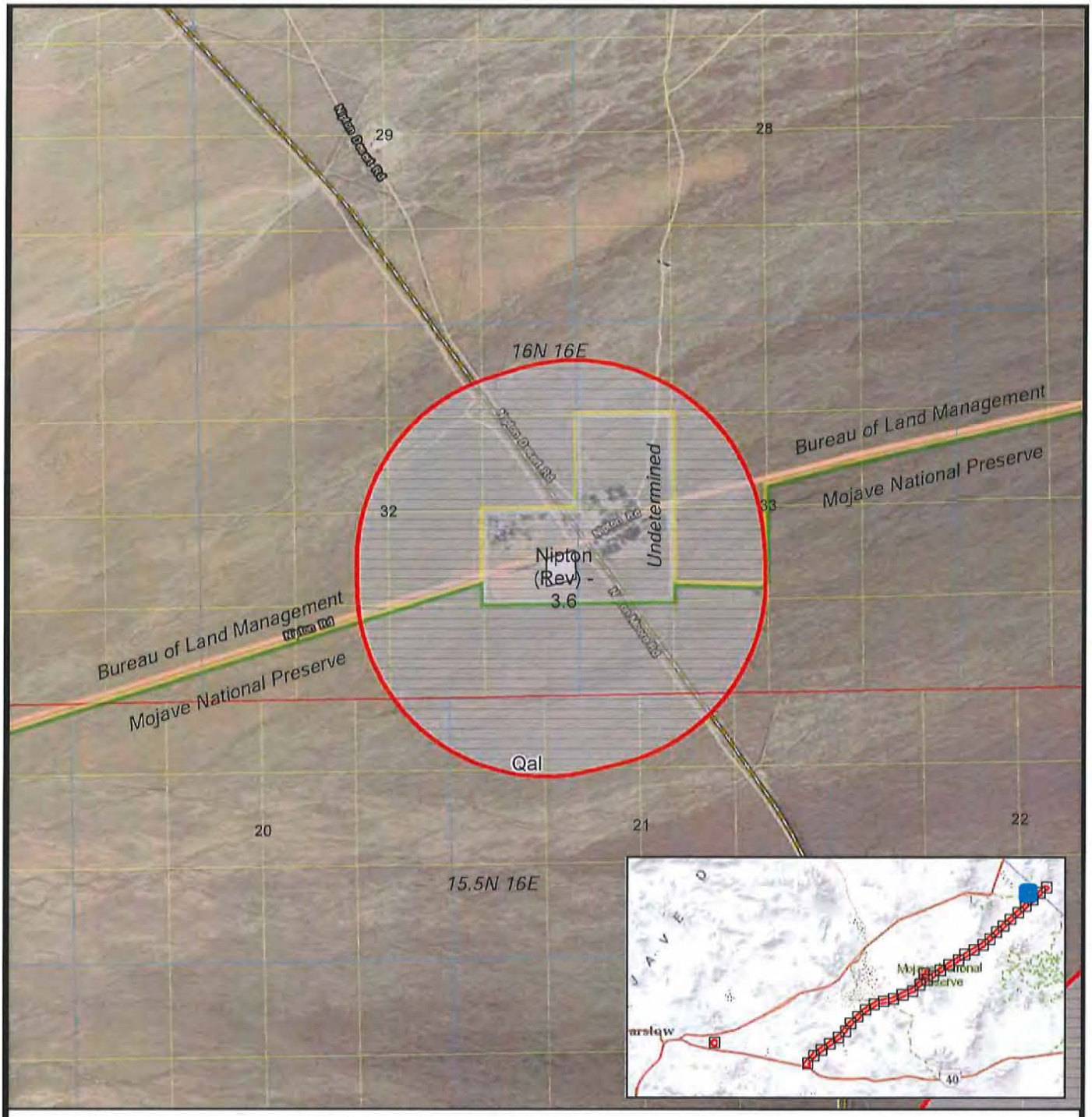
Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)

0 ¼ ½ 1
Miles

PALEO SOLUTIONS
EST 2004
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 33

Material Laydown Yard

1/2 Mile Buffer

Geology

Qa/Qal: Alluvium (Holocene)

Paleosensitivity

2 - Low

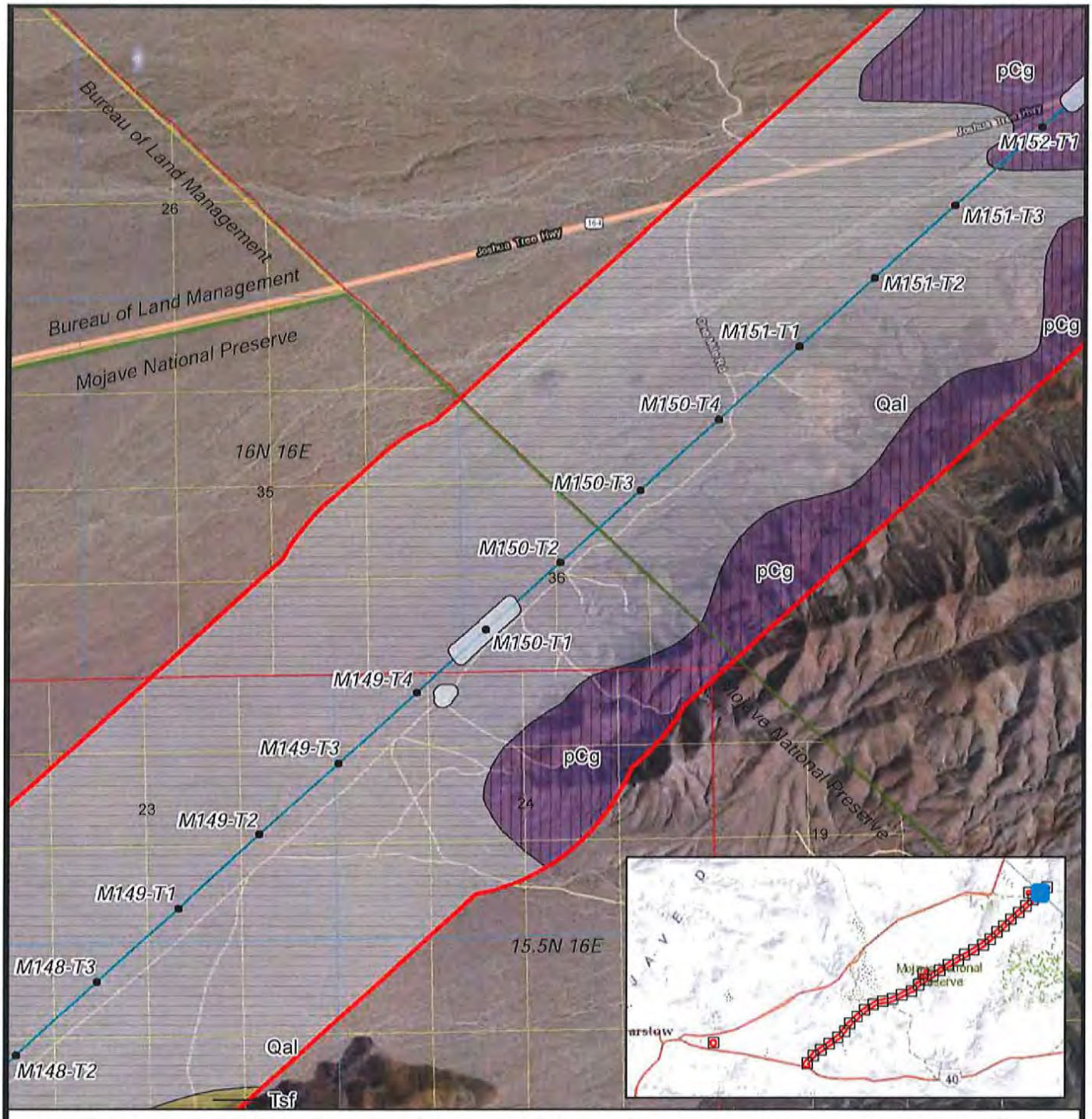
0 ¼ ½ 1

Miles

PALEO SOLUTIONS

PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 34

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

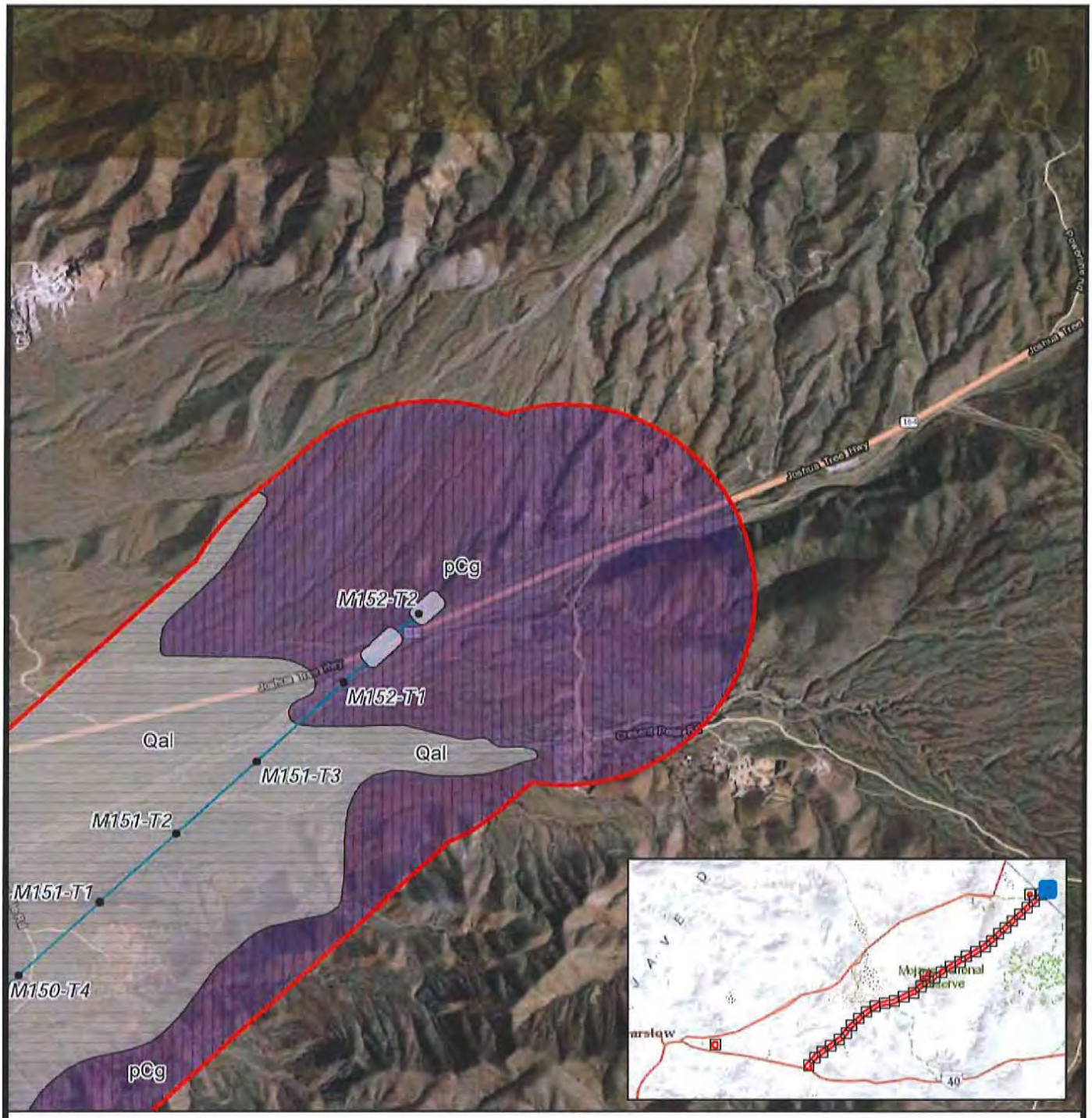
- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

N

PALEO SOLUTIONS
EST 2004
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 35

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

PALEO SOLUTIONS
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada

APPENDIX C. LOCATION (PLSS)

Quarter-Quarter	Section	Township	Range
L 5 L 8 NENE NWSE SENE SWNE SWSE	36	10N	7E
L 2 L 3 SESW SWSW	2	10N	8E
NENE NESW NWSE SENE SESW SWNE SWSW	10		
NWNW, SWNW	11		
NWNW	15		
NENE NESW NWNE NWSE NWSW SENE SENW SWNE SWSW	16		
SESE	17		
L 7	19		
NENE NESW NWNE NWSW SENW SWNE SWSW	20		
L 3 L 4 NENE NESW NWNE SENW SESW SWNE	30		
L 1	31	10N	8E
L 1, L 2	1	11N	10E
L 1 L 2 NESW NWSE NWSW SWSW	2		
NESE, SESE, SESW, SWSE	3		
SESE, SESW, SWSE	8		
NENE, NESW, NWSE, NWSW, SENE, SWNE, SWSW	9		
NENW, NWNE, NWNW, SWNW	10		
NENW, NWNE, NWNW	17		
L 1, L2, NENE, NWNE, SENE, SWNE	18		
L 1, L 3, L 4, L 6, L 7	25	11N	8E
L 1, L 4, L 6, L 7	30		
NESE, NWSE, SENE, SESW, SWSE	35		
L 2, NENW, NWNW, NWSW, SENW, SWNW	36		
NESW, NWSE, NWSW, SENE, SENW, SWNE, SWNW	13	11N	9E
NESE, NESW, NWSE, NWSW, SWSW	14		
NESE, SESE, SESW, SWSE, SWSW	15		
SESE	16		
NESE, NWSE, SENE, SESW, SWSE, SWSW	20		
NENE, NENW, NWNE, NWSW, SENW, SWNW	21		
L 1, L 4, L 6, L 7	25		
NENW, NWNW	29		
L 1, L 4, L 5, L 6, L 7, NENE, SENE, SWNE	30		
SESE, SESW, SWSE	36	12N	10E
NESW, NWSW	2	12N	11E
NESE	9		
NESE, NWSE, SENE, SESW, SWSE, SWSW	12		
NWNW	13		
NENE, NESW, NWNE, NWSW, SENE, SENW, SWNE, SWNW, SWSW	14		
NESE, SESE, SWSE	15		
NESE, NWSE, SENE, SESW, SWSE, SWSW	21		
NENW, NWNE, NWNW, SENW, SWNW	22		
NENW, NWNW	28		
NENE, NESE, NWSE, SENE, SESW, SWSE	29		
L 1, L 2, NESE, NWSE, SENE, SWNE	31		
NENW, NWNW, SWNW	32		
L 2	4	12N	12E
L 1, L 2, NESW, NWSE, NWSW, SWSW	5		
SESE	6		
L 1, L 2, NENE, NWNE	7		
NESE, SESE, SESW, SWSE	24	13N	12E
NENW, NWNE, NWNW, SWNW	25		
NENE, NESW, NWSE, NWSW, SENE, SWNE, SWSW	26		
SESE	27		
NESE, NWSE, SENE, SESW, SWSE, SWSW	33		
NENE, NENW, NWNE, NWSW, SENW, SWNW	34		
L 1, L 2, NESW, NWSW, SWSW	1		

NESE, SESE, SWSE	2	13N	13E
SESE	9		
NESE, NESW, NWSE, SENE, SESW, SWNE, SWSW	10		
NENW, NWNE, NWNW, SWNW	11		
NENE, NENW, NWNE, NWSW, SENW, SWNW	16		
NESE, NWSE, SENE, SESW, SWSE, SWSW	17		
L 1, L 2, NENE, NWNE, SENE, SWNE	19		
NWNW	20		
L 2	6	13N	14E
NESE, NWSE, SENE, SESW, SWSE	12	14N	14E
NENW, NWNW, SWNW	13		
NESE, NWSE, SENE, SESW, SWSE, SWSW	14		
NENE, NESW, SWSE, SENE, SESW, SWNE, SWSW	22		
NENW, NWNW, SWNW	23		
NWNW	27		
NENE, NESW, NWSE, NWSW, SENE, SENW, SESW, SWNE, SWSW	28		
SESE	29		
NESE, SWSE, SENE, SESE, SESW, SWSE	31		
NENE, NESW, NWNE, NWSW, SENW, SWSE, SWNW	32		
NWNW	33		
L 2, L 2, NWSW	5	14N	15E
NESE, SESE, SWSE	6		
L 1, L 2, NWNE	7		
L 3, SWSW	4	15N	16E
L 3, SWSW	33		
NENE, NESW, NWSE, SENE, SESW, SWNE, SWSW	13	15N	15E
SESE	22		
NENE, NESW, NWNE, NWSE, NWSW, SENE, SENW, SWNE, SWSW	23		
NWNW	24		
NENE, NESW, NWNE, NWSW, SENW, SWNE, SWSW	27		
SESE	28		
NESE, SESE, SWSE	32		
NENE, NENW, NESW, NWNE, NWSW, SENW, SWNE, SWNW	33		
L 1, L 2, L 3, SWSW	4	15N	16E
L 1, NESE, NWSE, SESW, SWSE	5		
L 1, L 2, NESE, NWSE, SENE, SWSE	7		
NENW, NWNW, SWNW	8		
L 1, L 2	18		
L 1	20		
L 2, L 3, L 4, NESW, NWSW	21		
NESE, NWSE, SESE, SESW, SWSE	23		
L 3, L 4, NWSW	24		
NENW, NWNE, NWNW, SWNW	26		
NESE, NWSE, SENE, SESW, SWSE	27		
L 3, NENE, NESE, NESW, NWSE, SENE, SESW, SWNE, SWSE, SWSW,	33		
NENW, NWNW, SWNW	34		
NENE, NESE, NESW, NWNE, NWSE, SENE, SENW, SESE, SESW, SWNE, SWSE	32	16N	16E
NENW, NESW, NWNW, NWSW, SENW, SESW, SWNW, SWSW	33		
SESE	35		
L 2, L 3, SESW, SWSW	36		
L 1, L 2	3	8N	6E
L 1, NESE, NWSE, SESE, SESW, SWSE	4		
NESE, NWSE, SENE, SESE, SESW, SWSE	8		
NENW, NWNE, NWNW, NWSW, SENW, SWNW	9		
NENW, NWNE, NWNW, NWSW, SENW, SWNW	17		
NESE, SENE, SESE, SWSE	18		
NWNE	20		

SESE, SWSE	11	9N	1E
SESE, SESW, SWSE, SWSW	12		
NENE, NENW, NESE, NESW, NWNE, NWNW, NWSE, NWSW, SENE, SENW, SESE, SESW, SWNE, SWNW, SWSE, SWSW	13		
NENE, NESE, NESW, NWNE, NWSE, SENE, SENW, SESE, SESW, SWNE, SWSE	14		
NENE, NWNE, SENE	23		
NENE, NENW, NESW, NWNE, NWNW, NWSE, NWSW, SENE, SENW, SWNE, SWNW	24		
L 1, L 2, NESW, NWNE, NWSW, SENW, SWNE, SWSW	25	9N	6E
SESE, SWSE	26		
L 2, L 3, NESE, NWSE, SENE, SWNE	34		
NENW, NWNE, NWSW, SENW, SWNW	35		
L 1, L 2, NWSW	1	9N	7E
L 1, L 12, L 13, L 14, L 7, L 8	2		
L 10	9		
L 1, L 7, L 8, NESW, NWSE, NWSW, SESW, SWSW	10		
L 3, L 4	11		
NENE, NESW, NWNE, NWSW, SENW, SWNE, SWSW	16		
NESE, SESE, SWSE	17		
L 1, L 2, NESE, NWSE, SENE, SWSE	19		
NENW, NWNE, NWNW, SENW, SWNW	20		
L 2	30		

APPENDIX D. RECORD SEARCH RESULTS

Confidential Appendix Removed

APPENDIX E. MAPPED GEOLOGY BY CONSTRUCTION AREA

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_69	Helicopter Landing Zone	M68-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_70	Helicopter Landing Zone	M68-T1	Qb: Basalt (Pleistocene)	1 - Very Low
LZ_70	Helicopter Landing Zone	M68-T1	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T1	Qa: Alluvium (Holocene)	2 - Low
TBD	Wire Setup (Telecommunication)	M68-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_71	Helicopter Landing Zone	M68-T2	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M68-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M68-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M68-T3	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M68-T3	Qa: Alluvium (Holocene)	2 - Low
TBD	Wire Setup (Telecommunication)	M68-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_68	Helicopter Landing Zone	M68-T4	Qa: Alluvium (Holocene)	2 - Low
LZ_67	Helicopter Landing Zone	M69-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_66	Helicopter Landing Zone	M71-T3	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Wire Setup	M71-T3	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Guard Pole	M72-T1	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
n/a	Guard Pole	M72-T1	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Guard Pole Area	M72-T1	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
n/a	Guard Pole Area	M72-T1	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
LZ_65	Helicopter Landing Zone	M72-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_65	Helicopter Landing Zone	M72-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_64	Helicopter Landing Zone	M72-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_64	Helicopter Landing Zone	M72-T4	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
LZ_64	Helicopter Landing Zone	M72-T4	Tt: Tuff Breccia (Oligocene or Miocene)	U - Unknown
LZ_63	Helicopter Landing Zone	M73-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_62	Helicopter Landing Zone	M74-T1	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_62	Helicopter Landing Zone	M74-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_61	Helicopter Landing Zone	M74-T4	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Wire Setup	M74-T4	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
LZ_60	Helicopter Landing Zone	M78-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
n/a	Wire Setup	M78-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
n/a	Wire Setup	M78-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_59	Helicopter Landing Zone	M81-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_58	Helicopter Landing Zone	M81-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M81-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_57	Helicopter Landing Zone	M82-T5	Qf: Fanglomerate (Pleistocene)	3 - Moderate
LZ_57	Helicopter Landing Zone	M82-T5	Qa: Alluvium (Holocene)	2 - Low
LZ_56	Helicopter Landing Zone	M84-T2	Qf: Fanglomerate (Pleistocene)	3 - Moderate
LZ_55	Helicopter Landing Zone	M84-T3	Qf: Fanglomerate (Pleistocene)	3 - Moderate

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_54	Helicopter Landing Zone	M84-T6	Qa: Alluvium (Holocene)	2 - Low
LZ_54	Helicopter Landing Zone	M84-T6	Qf: Fanglomerate (Pleistocene)	3 - Moderate
n/a	Wire Setup	M84-T6	Qf: Fanglomerate (Pleistocene)	3 - Moderate
n/a	Wire Setup	M84-T6	Qa: Alluvium (Holocene)	2 - Low
LZ_53	Helicopter Landing Zone	M87-T5	Qa: Alluvium (Holocene)	2 - Low
LZ_52	Helicopter Landing Zone	M88-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M88-T2	Qa: Alluvium (Holocene)	2 - Low
LZ_51	Helicopter Landing Zone	M88-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_50	Helicopter Landing Zone	M90-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_49	Helicopter Landing Zone	M91-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_48	Helicopter Landing Zone	M91-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M91-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_47	Helicopter Landing Zone	M92-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_46	Helicopter Landing Zone	M93-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_45	Helicopter Landing Zone	M94-T6	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M94-T6	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M97-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_44	Helicopter Landing Zone	M97-T2	Qal: Alluvium (Holocene)	2 - Low
PD1	General Disturbance	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
LZ_43	Helicopter Landing Zone	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
LZ_43	Helicopter Landing Zone	M98-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
n/a	Wire Setup	M98-T2	Qal: Alluvium (Holocene)	2 - Low
PD2	General Disturbance	M101-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_42	Helicopter Landing Zone	M101-T5	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M101-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_41	Helicopter Landing Zone	M104-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_40	Helicopter Landing Zone	M105-T1	Pbs: Bird Spring Formation (Pennsylvanian)	3 - Moderate
n/a	Wire Setup	M105-T1	Pbs: Bird Spring Formation (Pennsylvanian)	3 - Moderate
LZ_39	Helicopter Landing Zone	M105-T3	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
LZ_38	Helicopter Landing Zone	M107-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_37	Helicopter Landing Zone	M108-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M108-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
n/a	Wire Setup	M108-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_36	Helicopter Landing Zone	M108-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_35	Helicopter Landing Zone	M109-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
Old Dad Base Camp	Helicopter Landing Zone	M109-T5	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
Old Dad Base Camp	Helicopter Landing Zone	M109-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_34	Helicopter Landing Zone	M110-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_33	Helicopter Landing Zone	M111-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M111-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_32	Helicopter Landing Zone	M112-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M113-T3	Qal: Alluvium (Holocene)	2 - Low

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
n/a	Guard Pole Area	M113-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_31	Helicopter Landing Zone	M113-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M115-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_30	Helicopter Landing Zone	M116-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_29	Helicopter Landing Zone	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
M118-T1	General Disturbance	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole	M119-T4	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole Area	M119-T4	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_28	Helicopter Landing Zone	M120-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_27	Helicopter Landing Zone	M121-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M121-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_26	Helicopter Landing Zone	M124-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
PD3	General Disturbance	M124-T3	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M124-T3	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_25	Helicopter Landing Zone	M125-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_24	Helicopter Landing Zone	M127-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_22	Helicopter Landing Zone	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_23	Helicopter Landing Zone	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
TBD	Wire Setup (Telecommunication)	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
TBD	Telecommunication	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole	M128-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole Area	M128-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_21	Helicopter Landing Zone	M128-T5	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M129-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M129-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_20	Helicopter Landing Zone	M130-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_19	Helicopter Landing Zone	M130-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_18	Helicopter Landing Zone	M131-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M131-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_17	Helicopter Landing Zone	M131-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_16	Helicopter Landing Zone	M131-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_15	Helicopter Landing Zone	M133-T2	Qal: Alluvium (Holocene)	2 - Low

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_14	Helicopter Landing Zone	M134-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M134-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_13	Helicopter Landing Zone	M134-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_12	Helicopter Landing Zone	M135-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_11	Helicopter Landing Zone	M135-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_10	Helicopter Landing Zone	M137-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M137-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_9	Helicopter Landing Zone	M139-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M140-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M140-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_8	Helicopter Landing Zone	M141-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M141-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_7	Helicopter Landing Zone	M142-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_6	Helicopter Landing Zone	M142-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_5	Helicopter Landing Zone	M143-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_4	Helicopter Landing Zone	M144-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M144-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M146-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M146-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_3	Helicopter Landing Zone	M147-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_2	Helicopter Landing Zone	M147-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M147-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_1	Helicopter Landing Zone	M149-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M150-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M152-T1	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole Area	M152-T1	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole Area	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Wire Setup	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
Nipton (Rev) - 3.6	Material Laydown Yard	n/a	Qal: Alluvium (Holocene)	2 - Low
Daggett training and storage yard	Material Laydown Yard	n/a	Qa: Alluvium (Holocene)	2 - Low

May 28, 2019

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RE: Addendum: Summary of Paleontological Resources Assessment of the Helicopter Landing Zones for the Southern California Edison Lugo-Victorville Remedial Action Scheme Project, San Bernardino County, California

This addendum to the paleontological technical study completed by Paleo Solutions, Inc. (Paleo Solutions, 2017; see Attachment B) for the Southern California Edison Company (SCE) Lugo-Victorville Remedial Action Scheme Project (LVRAS Project or Project) includes an assessment of the newly added Helicopter Landing Zones, which include LZ-40a, LZ-40b, LZ-43a, LZ-43b, LZ-44a, and LZ-44b (Figure 1). The Helicopter Landing Zones are located approximately within the central portion of the LVRAS Project alignment within San Bernardino County, California and are located on land managed by the Bureau of Land Management (BLM) Needles Field Office and National Park Service (NPS) Mojave National Preserve. All paleontological work was conducted under California BLM Paleontological Use Permit CA-19-04P (Expiration March 13, 2022), BLM Fieldwork Authorization (FA) CA690-FA-19-10P approved by the Needles Field Office on May 3, 2019, and Mojave National Preserve Special Use Permit PWR-MOJA-5600-19-0033 issued by the National Park Service on April 23, 2019 (see Attachment A). All work was conducted in compliance with federal, state, and local regulations.

1.0 Project Description

SCE is proposing to install a new 84-mile telecommunication path consisting of Optical Ground Wire (OPGW) between Nipton Road in Clark County, Nevada (near Eldorado Substation) and Interstate 40 near Ludlow, California (Pisgah Substation) on the existing Eldorado-Lugo 500 kilovolt (kV) Transmission Line. The Project includes bucket truck work on disturbed areas at approximately 408 transmission tower locations, installation of guard poles at 14 locations, 72 helicopter landing zones, pulling/tensioning activities at 27 locations, and the use and maintenance of several laydown yards. In addition, six new Helicopter Landing Zones were added to the central portion of the Project alignment. The six new Helicopter Landing Zones include LZ-40a, LZ-40b, LZ-43a, LZ-43b, LZ-44a, and LZ-44b (Figure 1).

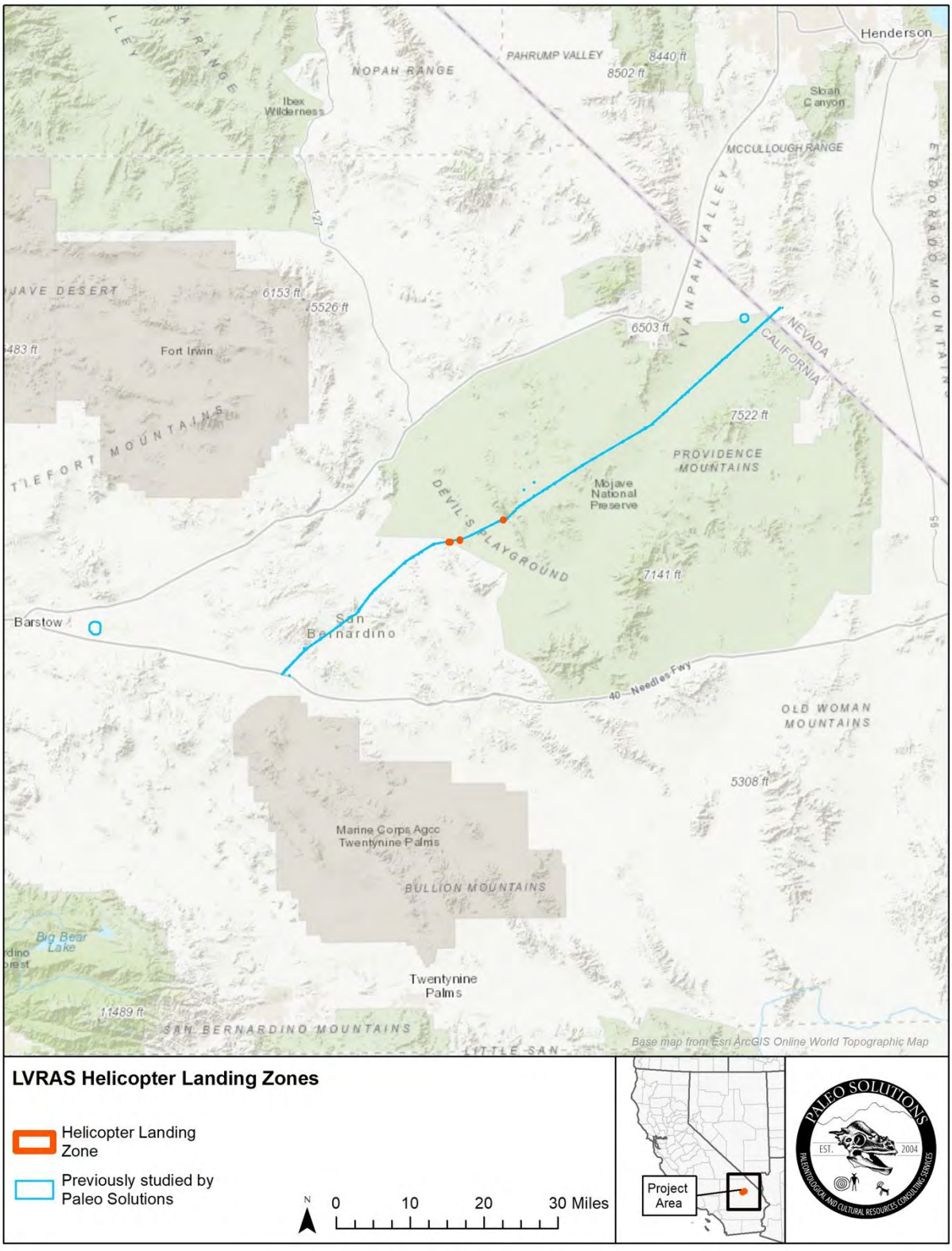

Figure 1. Project Location Map.

2.0 METHODS

In 2017, Paleo Solutions completed a paleontological resources study for the LVRAS Project to determine whether paleontological resources would be affected by the proposed construction (Paleo Solutions, 2017). The study included geologic map reviews, record searches, and literature reviews to identify previously recorded resources within the LVRAS Project alignment, and a pedestrian paleontological survey. The initial paleontological resources study for the LVRAS Project is included in this memorandum as Attachment B.

Since the time of initial paleontological assessment, the LVRAS Project study area was adjusted to include six Helicopter Landing Zones including LZ-40a, LZ-40b, LZ-43a, LZ-43b, LZ-44a, and LZ-44b. These additional portions were analyzed by Paleo Solutions in a paleontological resources assessment, which included a review of the paleontological resources study completed for the LVRAS Project (Paleo Solutions, 2017) and a review of the geologic mapping of the Helicopter Landing Zones. This paleontological resources assessment was supplemented with a pedestrian field survey of the Helicopter Landing Zones. The goal of this paleontological study is to evaluate the paleontological potential of the newly added Helicopter Landing Zones within the LVRAS Project area.

Joey Raum, B.S., performed the background research and co-authored this report with Mathew Carson, M.S., and Courtney Richards, M.S. Courtney Richards, M.S., reviewed the final report. Geraldine Aron, M.S. oversaw all aspects of the Project as the Paleontological Principal Investigator. GIS maps were prepared by Barbara Webster, M.S. The survey was conducted by Betsy Kruk, M.S., and Joey Raum, B.S.

Copies of this report will be submitted to the BLM and NPS. Paleo Solutions will retain an archival copy of all Project information.

2.1 Paleontological Analysis

Paleo Solutions reviewed geologic mapping of the new Helicopter Landing Zones portion of the LVRAS Project area and half-mile buffer by D.F. Hewett (1956). The literature reviewed included published and unpublished scientific papers and paleontological records searches. The field survey was conducted by Paleo Solutions staff on May 8, 2019. The paleontological field survey was performed in order to determine the paleontological potential of the geologic units underlying the study area. The survey was conducted after a review of aerial photographs indicated the Helicopter Landing Zones included areas of undisturbed native sediment. The field survey included inspection of the six polygon-shaped Helicopter Landing Zones with the majority of the focus occurring in areas with native sediment exposures. Sediment exposures as well as the surrounding areas were photographed and documented. Reference points were acquired using a GPS unit. Sediment lithologies were recorded and analyzed and used to better interpret the Helicopter Landing Zones' paleontological potential, and thus better understand the Project's potential impact.

2.2 Criteria for Evaluating Paleontological Potential

The Potential Fossil Yield Classification (PFYC) system was developed by the BLM (BLM, 2016). Because of its demonstrated usefulness as a resource management tool, the PFYC has been utilized for many years for projects across the country, regardless of land ownership. It is a predictive resource management tool that classifies geologic units on their likelihood to contain paleontological resources on a scale of 1 (very low potential) to 5 (very high potential). This system is intended to aid in predicting, assessing, and mitigating paleontological resources. The PFYC ranking system is summarized in Table 1.

Table 1. Potential Fossil Yield Classification (BLM, 2016)

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low Potential	Geologic units are not likely to contain paleontological resources.
	Field surveys have verified that significant paleontological resources are not present or are very rare.
	Units are generally younger than 10,000 years before present.
	Recent 4eolian deposits.
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered.
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	Significant paleontological resources have been documented but may vary in occurrence and predictability.
	Surface-disturbing activities may adversely affect paleontological resources.
	Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
	Illegal collecting activities may impact some areas.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	Significant paleontological resources have been documented and occur consistently.
	Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities.
	Unit is frequently the focus of illegal collecting activities.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
U = Unknown Potential	Geologic units that cannot receive an informed PFYC assignment.
	Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is unknown.
	Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
	Scientific literature does not exist or does not reveal the nature of paleontological resources.
	Reports of paleontological resources are anecdotal or have not been verified.
	Area or geologic unit is poorly or under-studied.
	BLM staff has not yet been able to assess the nature of the geologic unit.
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

3.0 RESULTS

3.1 Geologic Map Review

Geologic mapping by D.F. Hewett (1956) indicates that the Helicopter Landing Zones are underlain by Holocene-aged younger alluvium (Qal) (PFYC 2), Jurassic-aged Sands Granite (Js) (PFYC 1), and Permian-aged Bird Spring Formation (Pbs) (PFYC 3). Specifically, locations LZ-44a and LZ-44b are underlain by younger alluvium; locations LZ-43a and LZ-43b are underlain by Sands Granite; and locations LZ-40a and LZ-40b are underlain by Bird Spring Formation (Figure 2). Additionally, there are several geologic units mapped adjacent to the Helicopter Landing Zones within the half-mile buffer, including Precambrian- (also referred to as Pre-Cambrian) aged gneiss and granite (pCg) (PFYC 1), Jurassic-aged dacite flow breccia (Jfb) (PFYC 1), Carboniferous-aged Monte Cristo Limestone (Mmc), and Pleistocene-aged older alluvium (Qoa) (PFYC 3) (Hewett, 1956; Figure 2).

3.1.1 Igneous and Metamorphic Rocks – Precambrian (pCg)

Precambrian-aged gneiss and granite (pCg) is mapped east and southeast of Helicopter Landing Zones LZ-40a and LZ-40b (Hewett, 1956; Figure 2).

Gneiss is a metamorphic rock. Metamorphic rocks result from the transformation of other rocks due to high temperature and high pressure. The parent rock can be igneous, sedimentary, or a pre-existing metamorphic rock. Metamorphic rocks comprise a large portion of the earth's crust and are classified on the basis of their chemistry and mineralogy. Most do not preserve fossils due to the conditions under which they were formed. However, metasedimentary rocks are formed from common sedimentary rock types such as limestone, shale, mudstone, siltstone, sandstone, and conglomerate. These types of metamorphic rocks do sometimes preserve fossils, but rarely fossils of scientific importance. Examples of fossils in metasedimentary rock include mollusks preserved in marble and echinoderms and graptolites preserved in slate.

Granite is an igneous rock. Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava or magma. Intrusive (plutonic) igneous rocks form below the earth's surface, and extrusive (volcanic) rocks form on the earth's surface. Lava and magma are formed by the melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition. Extreme temperatures in the environments in which intrusive igneous rocks form prevent the preservation of fossils. The formation of extrusive igneous rocks as a result of volcanic processes is associated with extremely high temperatures that also generally prevents the

preservation of fossils. Igneous rock units, therefore, have a very low paleontological potential (PFYC 1) using BLM (2016) guidelines.

3.1.2 Monte Cristo Limestone – Carboniferous (Early Mississippian) (Mcm)

The Monte Cristo Limestone, also called Monte Cristo Group, is an Early Mississippian in age (approximately 346 to 359 million years old) unit originally documented by Hewett (1931) who named it after an exposure near the Monte Cristo mine in the Goodsprings Quadrangle in Clark County, Nevada (Hewett, 1931; Reade, 1962). The unit ranges from approximately 350 to 1,100 feet thick; it unconformably overlies the Sultan Limestone; it unconformably underlies the Bird Spring Formation; and it is equivalent in age to the Tin Mountain Limestone. The Monte Cristo Limestone has been documented in Nevada, California, and Arizona and contains five members, which include from oldest to youngest, the Dawn Limestone, Anchor Limestone, Bullion Dolomite, Arrowhead Limestone, and the Yellowpine Limestone members (Hewett, 1931, 1956; Reade, 1962). The Monte Cristo Limestone was deposited in a warm, shallow-water marine environment, and it is generally composed of limestone, altered dolomite, and occasional thin shale beds (Hewett, 1931). The Dawn Limestone Member is composed of blue gray to dark gray limestone with localized dolomite alterations. The Anchor Limestone Member is mostly light bluish gray limestone with chert nodules and locally altered dolomite. The Bullion Dolomite Member is composed of light gray to white dolomite with coarse crystallization and vugs. The Arrowhead Limestone Member is composed of alternating layers of limestone and thin shale beds. The Yellowpine Limestone Member is composed of dark gray to black limestone and altered dolomite (Hewett, 1956; Reade, 1962). Not all members are present throughout the distribution of the Monte Cristo Limestone (Hewett, 1931, 1956; Reade, 1962). Monte Cristo Limestone is mapped to the west of Helicopter Landing Zones LZ-40a and LZ-40b (Figure 2; Hewett, 1956).

The fossil assemblage found in the Monte Cristo are not found uniformly throughout this unit, but are found within "fossil horizons" that represent short periods of warm shallow water at the time of deposition (Reade, 1962). Hewett (1956) documented fossils, identified by George H. Girty in 1928, which was then supplemented by Reade (1962). The most abundant and well-preserved fossils occur in the Anchor Limestone Member. These fossils included corals (*Syringopora* sp., *Lithostrotionella* sp., *Caninophyllum incrassatum*, *Neozaphrentis* sp., *Triplophyllites* sp., *Homalophyllites* sp., *Zaphrentis* sp., and *Pleurodictyum* sp.), brachiopods (*Spirifer* sp., *Rhipidomella* sp., *Camarotoechia* sp., *Rhytiophora gallatinensis*, *Avonia* sp., *Dictyoclostus* sp., *Echinoconchus* sp., *Linoproductus* sp., and *Syringothyris* sp.), bryozoans (*Fenestrellina* sp.), crinoids (*Displodocrinus* sp., *Dilatocrinus* sp., *Tarantocrinus* sp., *Agaricocrinus* sp., and *Ancalocrinus* sp.), bivalves (*Cypricardinia* sp. and *Schizodus* sp.), gastropods (*Pleurotomaria* sp. and *Straparolus* sp.), cephalopods (*Orthoceras* sp.), trilobite fragments, and an ostracod (*Bairdia* sp.) (Hewett, 1931, 1956; Reade, 1962; Webster and Lane, 1987). While not abundant, many of the fossils found in the Monte Cristo Limestone are considered to fill in gaps in the paleontologic and biostratigraphic record for the lower Mississippian, and constrain the age of the Monte Cristo to the Kinderhookian to upper Osagean stages of the lower Mississippian Period (Webster and Lane, 1987). The Monte Cristo Limestone has a moderate paleontological potential (PFYC 3) using BLM (2016) guidelines.

3.1.3 Bird Spring Formation – Permian (Pbs)

The Bird Spring Formation is a 1,200 to 2,500-foot-thick series of limestone, sandstone, and shale beds named by Hewett (1931) after its significant exposure in the Bird Spring Range (Hewett, 1956). It was originally thought to be Pennsylvanian in age, but later determined to be early Permian (280 to 299 million years old) (Wilson, 1991). It mostly consists of beds of limestone less than 20 feet thick alternating with thinner beds of shale, sandstone, and dolomite. Small quantities of chert are present throughout the formation but are most abundant near the base. In the Spring Mountains, it is mostly pure blue-gray limestone but grades westward into mostly brown-weathering sandy limestone (Hewett, 1956). It is overlain by the Permian-aged Kaibab Limestone and Supai Formation, and at its base is a local unconformity where it overlies the Carboniferous- (Early Mississippian-) aged Monte Cristo Limestone. While the Bird Spring Formation is only locally continuous through the Bird Spring Range in Nevada, it may be equivalent to other fossiliferous early Permian-aged limestone units throughout Nevada and eastern California (Hewett, 1956). It

was deposited in a shallow marine environment. Permian-aged Bird Spring Formation is mapped at the surface of both Helicopter Landing Zones LZ-40a and LZ-40b (Hewett, 1956; Figure 2).

The Bird Spring Formation contains a vast multitude of marine invertebrate micro- and mega-fossils including many species of annelids, brachiopods, bryozoa, corals, crustaceans, echinoderms, gastropods, pelecypods, and protozoa. These fossils are most common in the lower part of the formation and are abundant in some beds 100 to 300 feet above the base (Hewett, 1931). This formation has proven to be a highly productive source of material for paleontological study for many investigators (Clapham and Bottjer, 2007; Webster and Lane, 2007; Wilson, 1991; Wilson and Langenheim, 1993; etc.). Recently discovered taxa include a feather star (*Poteriocrinites permicus*), crinoids (*Ekteinocrinus battleshipensis*), and the first evidence of a Permian age actinocrinitid in North America (Webster and Lane, 2007). Exposures of the formation near the mouth of Battleship Wash, Clark County, Nevada, "has yielded the largest early Permian crinoid fauna known in North America" (Webster and Lane, 2007), and fusilinid-based regional strata correlations have resulted in a significantly improved understanding of the tectonic history of North America (Stevens and Stone, 2007). Due to the abundance, diversity, and excellent preservation of scientifically significant marine invertebrates, the Bird Spring Formation has a moderate paleontological potential (PFYC 3) using BLM (2016) guidelines.

3.1.4 Igneous Rocks – Mesozoic (Jfb, Js)

One Mesozoic igneous rock unit, the Jurassic-aged Sands Granite (Js), is mapped at the surface of both Helicopter Landing Zones LZ-43a and LZ-43b (Hewett, 1956; Figure 2). Additionally, Jurassic-aged dacite flow breccia is mapped east of Helicopter Landing Zones LZ-43a and LZ-43b (Hewett, 1956; Figure 2). See Section 3.1.1 (Igneous and Metamorphic Rocks – Precambrian) for a full discussion on these types of rocks. Igneous rock units including Jurassic-aged Sands Granite and dacite flow breccia have a very low paleontological potential (PFYC 1) using BLM (2016) guidelines.

3.1.5 Older Alluvium – Pleistocene (Qoa)

Older alluvium (Qoa) is middle to late Pleistocene in age (approximately 11,000 to 780,000 years old) and is generally composed of poorly to moderately consolidated, massive to poorly bedded, reddish-brown to gray, fine- to coarse-grained sand with gravel derived from nearby highlands (Hewett, 1956). Older alluvium is mapped to the southwest of Helicopter Landing Zones LZ-44a and LZ-44b (Hewett, 1956; Figure 2).

Ice Age taxa have been recovered from Pleistocene-aged deposits of San Bernardino County, including specimens of rodents (*Peromyscus* sp., *Dipodomys ordii*, *Neotoma* sp., *Thomomys* sp., among others), rabbits (*Lepus* sp.), horse (*Equus conversidens*), badger (*Taxidea taxus*), cats (*Smilodon* sp., *Puma concolor*), mammoth (*Mammuthus* sp.), camel (*Camelops* sp., *Hemiauchenia* sp.), sloth (*Nothrotheriops* sp., *Megalonyx* sp.), tortoise (*Opherus agassizi*) as well as bison, antelope, and many other taxa of mammals (Jefferson, 1991; Reynolds, 1991; Brattstrom, 1961). There are numerous Pleistocene-aged localities throughout San Bernardino County and the Mojave Desert, some of which are accumulations of material by woodrats for nests (woodrat middens) in caves, and many of which are deposits from along the shorelines of Pleistocene lakes (Stegner, 2015; Grayson, 2011). While the depositional environment of the cave deposits and lake deposits differs from that of the Project area, there is the potential for a similar fauna to be recovered during Project excavations.

Some Pleistocene-aged alluvial deposits are composed of coarse-grained material, which is not typically conducive to the preservation of fossils. For example, coarse-grained surficial Pleistocene-aged deposits derived from the local plutonic igneous rocks have a low probability to contain fossils; however, older, finer grained alluvial sediments may contain significant paleontological resources. Older alluvium has a moderate paleontological potential (PFYC 3) using BLM (2016) guidelines.

3.1.6 Younger Alluvium – Holocene (Qal)

Holocene-aged sediments within the Helicopter Landing Zones consist of younger alluvium (Qal) (Hewett, 1956), which typically consists of variable compositions of unconsolidated clay, silt, sand, gravel, and larger

clasts. Holocene-aged (less than 11,000 years old) sediments are typically too young to contain fossilized material (Society of Vertebrate Paleontology [SVP], 2010), but they may overlie sensitive older (e.g., Pliocene- and Pleistocene-aged) deposits at variable depth. Younger alluvium has a low paleontological potential (PFYC 2) at the surface using BLM (2016) guidelines. However, it has an unknown paleontological potential in the subsurface since there is potential for these deposits to be conformably underlain by older, paleontologically sensitive geologic units.

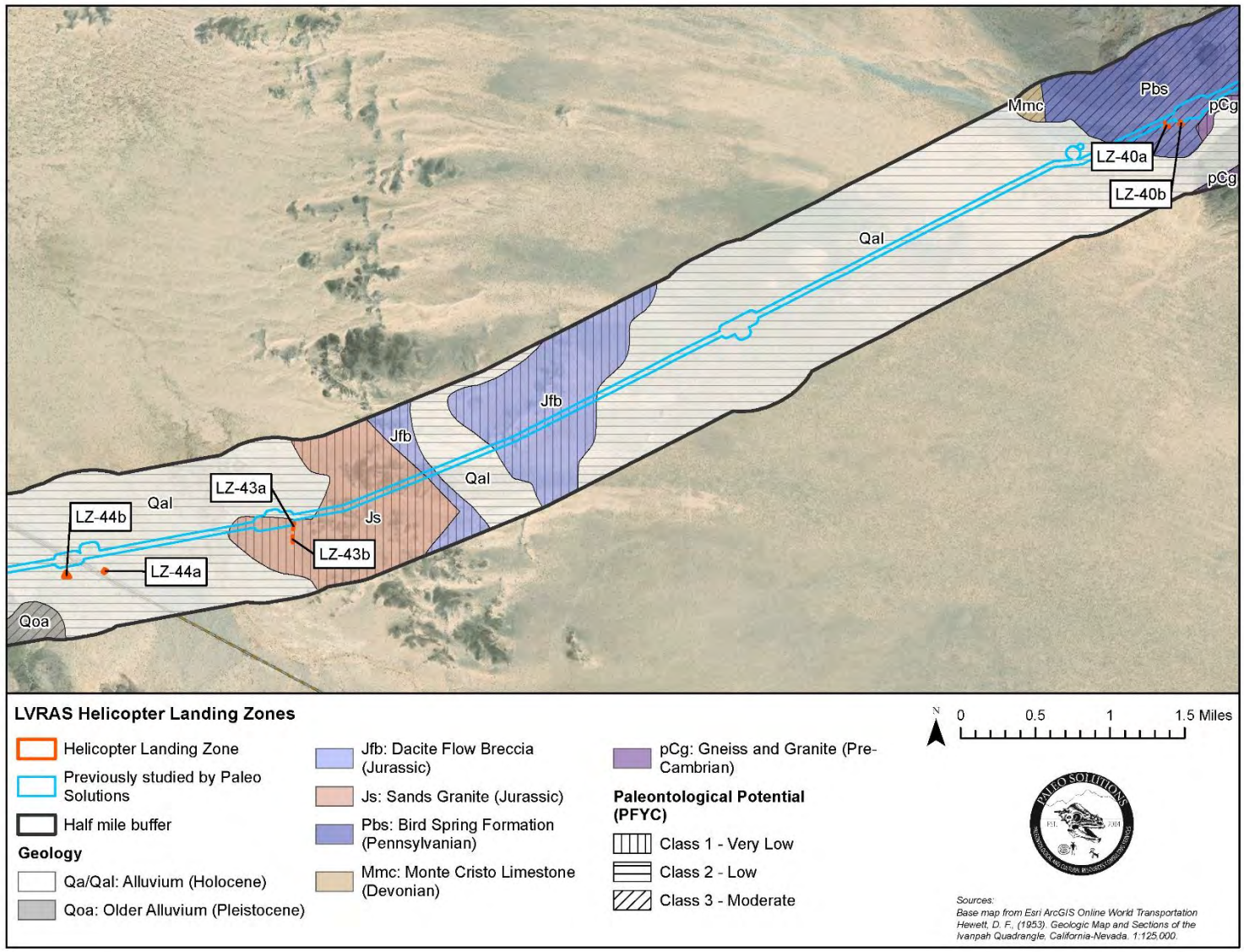

Figure 2. Helicopter Landing Zones Geology Map.

3.2 Paleontological Record Search Results

The six new Helicopter Landing Zone survey areas are all within the buffer of the paleontological records searches conducted for the LVRAS Project in 2017 by the San Bernardino County Museum (SBCM), Las Vegas Natural History Museum (LVNHM), and NPS Mojave National Preserve. No fossil localities were reported from within the boundaries of the Helicopter Landing Zones (Paleo Solutions, 2017; Gilbert, 2017; Bonde, 2017; David Burdette, Pers. Comm., 6/6/2017; see Appendix B).

3.3 Paleontological Survey

The Helicopter Landing Zone survey areas are located approximately in the central portion of the 84-mile Project right-of-way (ROW), which spans between Ludlow, San Bernardino County, California to an unincorporated area in Clark County, Nevada adjacent to Joshua Tree Highway 164 at Nipton Road. The ROW is accessible via a graded access road which generally parallels the electrical transmission line and traverses a series of low to high relief alluvial fans, valleys, and several hill ranges. Segments of this access road have remnants of paved asphalt that has been heavily eroded. Existing ground disturbances include the graded access road, a railroad track, transmission distribution lines with associated graded pads and spur roads, roads and berms constructed from local sediment, fences, and litter debris. Surface sediments are exposed at the surface of all six survey locations with the exception of areas with graded roads or natural vegetation. All locations are situated immediately adjacent to the graded access road. The locations are grouped in pairs, which, from east to west, are LZ-40a and LZ-40b; LZ-43a and LZ-43b; and LZ-44a and LZ-44b.

3.3.1 Helicopter Landing Zones 40a and 40b

Locations LZ-40a and LZ-40b are both located south of the existing transmission line and north of the access road (Figure 2). The terrain at these locations is mostly flat and relatively low-lying, and the valley floor gently slopes down toward the south (Figures 3 and 4). Geologic units observed include Holocene-aged younger alluvium, which consists of surficial deposits that cover the valley floor, Permian-aged Bird Spring Formation limestone, which forms massive, high relief mountains to the north of the survey locations, and Precambrian-aged gneiss and granite, which lies below limestone in parts of the mountains. Younger alluvium consists of buff, light gray, to light-brown colored, poorly consolidated, poorly to moderately sorted, fine- to coarse-grained sand with angular to subangular pebble- to large cobble-sized clasts composed of igneous and metamorphic rocks. No surface exposures of Permian-aged Bird Spring Formation limestone or Precambrian-aged gneiss and granite were observed within the survey areas.

3.3.2 Helicopter Landing Zones 43a and 43b

Locations LZ-43a and LZ-43b are both located south of the existing transmission line and south of the access road (Figure 2). The terrain at these locations is mostly flat and relatively low lying, and locations are situated near the base of a gentle hill that slopes down toward the west (Figures 5 and 6). Geologic units observed include Holocene-aged younger alluvium and Jurassic-aged Sands Granite. Younger alluvium consists of buff, light gray, to light-brown colored, poorly consolidated, moderately to well sorted, fine- to coarse-grained sand with angular to subangular granule- to pebble-sized clasts composed of igneous and metamorphic rocks. Although mapped in these locations, no granite exposures were observed within the survey areas. However, outcrops of granite are exposed immediately east of the survey areas.

3.3.3 Helicopter Landing Zones 44a and 44b

Locations LZ-44a and LZ-44b are both located south of the existing transmission line and north of the access road (Figure 2). Location LZ-44a is located immediately north of the railroad track. The terrain at these locations is mostly flat and relatively low lying with some low-relief washes (Figures 7 and 8). Geologic units observed include Holocene-aged younger alluvium, which consists of buff, light gray, to light-brown colored, poorly consolidated, moderately to well sorted, fine- to coarse-grained sand with angular to subangular granule- to pebble-sized clasts composed of igneous and metamorphic rocks.

No paleontological resources were encountered during the field survey. Additionally, no sediments conducive to fossil preservation were observed at the surface of any of the Helicopter Landing Zone survey areas.

Figure 3. Location LZ-40a. Mapped as Permian-aged Bird Spring Formation. Sediments exposed include very coarse Holocene-aged younger alluvium (flat area) with adjacent mountains composed of Bird Spring Formation and Precambrian-aged gneiss. View west.

Figure 4. Location LZ-40b. Mapped as Permian-aged Bird Spring Formation. Sediments exposed include very coarse Holocene-aged younger alluvium (flat area) with adjacent mountains composed of Bird Spring Formation and Precambrian-aged gneiss. View north.

Figure 5. Location LZ-43a. Outcrops of Jurassic-aged Sands Granite (Js) and surficial deposits of Holocene-aged younger alluvium (Qal). View east.

Figure 6. Location LZ-43b. Outcrops of Jurassic-aged Sands Granite (Js) and surficial deposits of Holocene-aged younger alluvium (Qal). View north.

Figure 7. Location LZ-44a. Holocene-aged younger alluvium and low-relief washes. View east.

Figure 8. Location LZ-44b. Holocene-aged younger alluvium, tree lines, and existing railroad tracks. View south.

4.0 CONCLUSIONS AND RECOMMENDATIONS

No paleontological resources were identified during the field survey of the Helicopter Landing Zones. Furthermore, no sediments conducive to fossil preservation were observed exposed at the surface in any of the six surveyed locations. However, there is the potential for fossils to be discovered during ground disturbance in moderate paleontological sensitivity (PFYC 3) Carboniferous-aged Monte Cristo Limestone, Permian-aged Bird Spring Formation, and Pleistocene-aged older alluvium if encountered in the subsurface of the Project. Therefore, paleontological monitoring and spot-checking should be implemented during ground disturbance in areas of the Helicopter Landing Zones mapped as moderate paleontological sensitivity geologic units (see Figure 2). Surface grading or shallow excavations entirely within Holocene-aged younger alluvium or previously disturbed sediments (PFYC 2) are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene-aged younger alluvium. Therefore, excavations into younger alluvium that have the potential to impact underlying sedimentary deposits of relatively higher paleontological potential should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units (PFYC 1), including Precambrian-aged gneiss and granite, Jurassic-aged Sands Granite, and Jurassic-aged dacite flow breccia will not require monitoring or spot checking.

Prior to construction, a paleontological monitoring and mitigation plan (PRMMP) should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

If you have any questions concerning the results for this study, please contact me at: crichards@paleosolutions.com.

Sincerely,

Courtney Richards, M.S.
Principal Paleontologist
Paleo Solutions

Joey Raum, B.S.
Report Author

Attachments:

Attachment A Permits and Field Authorization
Attachment B Paleontological Resources Study for the SCE LVRAS Project (Paleo Solutions, 2017).

References Cited:

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Attachment A
Permits and Field Work Authorization

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
California State Office
2800 Cottage Way, Suite W1623
Sacramento, CA 95825
www.blm.gov/california

MAR 0 1 2019

In Reply Refer To:
8151(CA-930) P

Geraldine Aron, President
Paleo Solutions, Inc.
911 S. Primrose Ave., Unit N,
Monrovia, CA 91016

Dear Ms. Aron:

The Bureau of Land Management (BLM) is pleased to issue a Paleontological Resource Use Permit (*CA-19-04P*) to Paleo Solutions, Inc. for use on Public Lands managed by California BLM as specified in your permit. This permit is issued under the authority of the Federal Land Policy and Management Act (FLPMA) and the Antiquities Act of 1906. Keep a copy with you at all times in the field.

This permit authorizes the permit holder to conduct and collect paleontological resources pertaining to both scientific research and commercial projects. BLM would like to emphasize a few points. First, this permit assigns to your firm the responsibility to submit reports and other documents in a timely fashion and such submittal will be a major point of review of your firm's performance under this permit. Second, you are required to contact the appropriate Field Office to obtain a Field Use Authorization before you begin any fieldwork. Please allow the Field Office sufficient lead-time to process your application for a Field Use Authorization. The Field Office may impose additional conditions and stipulations at that time. Third, please be mindful that it is your firm's responsibility to ensure assignment of supervisory field personnel (crew chiefs) to projects that have at least four months' local experience and who otherwise meet the standards of the Bureau.

Our office is enclosing a map of California BLM Field Offices with phone numbers of cultural heritage staff and a copy of your permit with attached National special permit conditions. BLM draws your attention to these stipulations and encourages you to read and understand them. Please sign page 5, as indicated, and **return a copy of this signature page to the California BLM State Office within 30 days of your receipt of the permit**. Your permit will be valid after your signature is received.

Should you have any questions contact James Barnes at email jjbarnes@blm.gov or by phone 916-978-4676.

Sincerely,

Danielle Chi
Deputy State Director

Enclosures as stated

DI Form 1991 (Rev Sept 2004)
OMB No. 1024-0037
Exp. Date (01/31/2008)

United States Department of the Interior

PERMIT FOR PALEONTOLOGICAL INVESTIGATIONS

To conduct archeological work on Department of the Interior lands and Indian lands under the authority of:

- ☐ The Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm) and its regulations (43 CFR 7).
- ☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).
- ☐ Supplemental regulations (25 CFR 262) pertaining to Indian lands.
- ☒ Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit
No.: CA-19-04P

1. Permit issued to Paleo Solutions, Inc.	2. Under application dated January 31, 2019
3. Address 911 S. Primrose Ave., Unit N, Monrovia, CA 91016	4. Telephone number(s) (562) 818-7713
	5. E-mail address(es) geraldine@paleosolutions.com

6. Name of Permit Administrator Geraldine Aron Telephone number(s): (562) 818-7713 Email address(es): geraldine@paleosolutions.com	7. Name of Principal Investigator(s) Geraldine Aron, Courtney Richards, Paul Murphey, John Foster, Mathew Carson Telephone number(s): Aron: (562) 818-7713 Richards: (626) 716-2000 Murphey: (303) 882-8048 Foster: (435) 790-5747 Carson: (626) 319-9629 Email address(es): Aron: geraldine@paleosolutions.com Richards: crichards@paleosolutions.com Murphey: paul@paleosolutions.com Foster: john@paleosolutions.com Carson: mcarson@paleosolutions.com

8. Name of Field Director(s) authorized to carry out field projects	Telephone number(s):	Email address(es):
Kate Zubin-Stathopolous	(716) 261-6461	kate@paleosolutions.com
Joseph Raum	(240) 446-8435	jraum@paleosolutions.com
Betsy Kruk	(312) 533-8841	bkruk@paleosolutions.com
Madeline Weigner	(770) 880-1521	mweigner@paleosolutions.com

9. Activity authorized Survey and limited surface collection
10. On lands described as follows All lands managed by the Bureau of Land Management-California.
11. During the duration of the project From March 14, 2019 To March 13, 2022

Permit No.**CA-19-04P** **DI Form 1991 (Rev Sept 2004) Page 2**

12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, CA 90007
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.

14. Signature and title of approving official	15. Date
Danielle Chi Danielle Chi, Deputy State Director, Natural Resources Division	3/1/19

Permit No.**CA-19-04P** **DI Form 1991 (Rev Sept 2004) Page 3**

15. Standard Permit Conditions

a. This permit is subject to all applicable provisions of 43 CFR Part 3, 43 CFR 7, and 25 CFR 262, and applicable departmental and bureau policies and procedures, which are made a part hereof.

b. The permittee and this permit are subject to all other Federal, State, and local laws and regulations applicable to the public lands and resources.

c. This permit shall not be exclusive in character, and shall not affect the ability of the land managing bureau to use, lease or permit the use of lands subject to this permit for any purpose.

d. This permit may not be assigned.

e. This permit may be suspended or terminated for breach of any condition or for management purposes at the discretion of the approving official, upon written notice.

f. This permit is issued for the term specified in 11 above.

g. Permits issued for a duration of more than one year must be reviewed annually by the agency official and the permittee.

h. The permittee shall obtain all other required permit(s) to conduct the specified project.

i. Archeological project design, literature review, development of the regional historic context framework, site evaluation, and recommendations for subsequent investigations must be developed with direct involvement of an archeologist who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation; fieldwork must be generally overseen by an individual who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation.

j. Permittee shall immediately request that the approving official (14. above) make a modification to accommodate any change in an essential condition of the permit, including individuals named and the nature, location, purpose, and time of authorized work, and shall without delay notify the approving official of any other changes affecting the permit or regarding information submitted as part of the application for the permit. Failure to do so may result in permit suspension or revocation.

k. Permittee may request permit extension, in writing, at any time prior to expiration of the term of the permit, specifying a limited, definite amount of time required to complete permitted work.

l. Any correspondence about this permit or work conducted under its authority must cite the permit number. Any publication of results of work conducted under the authority of this permit must cite the approving bureau and the permit number.

m. Permittee shall submit a copy of any published journal article and any published or unpublished report, paper, and manuscript resulting from the permitted work (apart from those required in items q. and s., below), to the approving official and the appropriate official of the approved curatorial facility (item 12 above).

n. Prior to beginning any fieldwork under the authority of this permit, the permittee, following the affected bureau's policies and procedures, shall contact the field office manager responsible for administering the lands involved to obtain further instructions.

o. Permittee may request a review, in writing to the official concerned, of any disputed decision regarding inclusion of specific terms and conditions or the modification, suspension, or revocation of this permit, setting out reasons for believing that the decision should be reconsidered.

p. Permittee shall not be released from requirements of this permit until all outstanding obligations have been satisfied, whether or not the term of the permit has expired. Permittee may be subject to civil penalties for violation of any term or condition of this permit.

15. Standard Permit Conditions (continued)

q. Permittee shall submit a preliminary report to the approving official within a timeframe established by the approving official, which shall be no later than 6 weeks after the completion of any episode of fieldwork, setting out what was done, how it was done, by whom, specifically where, and with what results, including maps, GPS data, an approved site form for each newly recorded archeological site, and the permittee's professional recommendations, as results require. If other than 6 weeks, the timeframe shall be specified in Special Permit Condition p. Depending on the scope, duration, and nature of the work, the approving official may require progress reports, during or after the fieldwork period or both, and as specified in Special Permit Condition r.

r. Permittee shall submit a clean, edited draft final report to the agency official for review to insure conformance with standards, guidelines, regulations, and all stipulations of the permit. The schedule for submitting the draft shall be determined by the agency official.

s. Permittee shall submit a final report to the approving official not later than 180 days after completion of fieldwork. Where a fieldwork episode involved only minor work and/or minor findings, a final report may be submitted in place of the preliminary report. If the size or nature of fieldwork merits, the approving official may authorize a longer timeframe for the submission of the final report as specified in Special Permit Condition q.

t. Two copies of the final report, a completed NTIS Report Documentation Page (SF-298), available at http://www.ntis.gov/pdf/rdpform.pdf, and a completed NADB-Reports Citation Form, available at http://www.cr.nps.gov/aad/tools/nadbform_update.doc, will be submitted to the office issuing the permit.

u. The permittee agrees to keep the specific location of sensitive resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

v. Permittee shall deposit all artifacts, samples and collections, as applicable, and original or clear copies of all records, data, photographs, and other documents, resulting from work conducted under this permit, with the curatorial facility named in item 12, above, not later than 90 days after the date the final report is submitted to the approving official. Not later than 180 days after the final report is submitted, permittee shall provide the approving official with a catalog and evaluation of all materials deposited with the curatorial facility, including the facility's accession and/or catalog numbers.

w. Permittee shall provide the approving official with a confirmation that museum collections described in v. above were deposited with the approved curatorial facility, signed by an authorized curatorial facility official, stating the date materials were deposited, and the type, number and condition of the collected museum objects deposited at the facility.

x. Permittee shall not publish, without the approving official's prior permission, any locational or other identifying archeological site information that could compromise the Government's protection and management of archeological sites.

y. For excavations, permittee shall consult the OSHA excavation standards which are contained in 29 CFR §1926.650, §1926.651 and §1926.652. For questions regarding these standards contact the local area OSHA office, OSHA at 1-800-321-OSHA, or the OSHA website at http://www.osha.gov.

z. Special permit conditions attached to this permit are made a part hereof.

Permit No.**CA-19-04P** **DI Form 1991 (Rev Sept 2004) Page 5**

16. Special Permit Conditions

- ☒ a. Permittee shall allow the approving official and bureau field officials, or their representatives, full access to the work area specified in this permit at any time the permittee is in the field, for purposes of examining the work area and any recovered materials and related records.
- ☒ b. Permittee shall cease work upon discovering any human remains and shall immediately notify the approving official or bureau field official. Work in the vicinity of the discovery may not resume until the authorized official has given permission.
- ☒ c. Permittee shall backfill all subsurface test exposures and excavation units as soon as possible after recording the results, and shall restore them as closely as reasonable to the original contour.
- ☒ d. Permittee shall not use mechanized equipment in designated, proposed, or potential wilderness areas unless authorized by the agency official or a designee in additional specific conditions associated with this permit.
- ☒ e. Permittee shall take precautions to protect livestock, wildlife, the public, or other users of the public lands from accidental injury in any excavation unit.
- ☒ f. Permittee shall not conduct any flint knapping or lithic replication experiments at any archeological site, aboriginal quarry source, or non-site location that might be mistaken for an archeological site as a result of such experiments.
- ☒ g. Permittee shall perform the fieldwork authorized in this permit in a way that does not impede or interfere with other legitimate uses of the public lands, except when the authorized officer specifically provides otherwise.
- ☒ h. Permittee shall restrict vehicular activity to existing roads and trails unless the authorized officer provides otherwise.
- ☒ i. Permittee shall keep disturbance to the minimum area consistent with the nature and purpose of the fieldwork.
- ☒ j. Permittee shall not cut or otherwise damage living trees unless the authorized officer gives permission.
- ☒ k. Permittee shall take precautions at all times to prevent wildfire. Permittee shall be held responsible for suppression costs for any fires on public lands caused by the permittee's negligence. Permittee may not burn debris without the authorized officer's specific permission.
- ☒ l. Permittee shall conduct all operations in such a manner as to prevent or minimize scarring and erosion of the land, pollution of the water resources, and damage to the watershed.
- ☒ m. Permittee shall not disturb resource management facilities within the permit area, such as fences, reservoirs, and other improvements, without the authorized officer's approval. Where disturbance is necessary, permittee shall return the facility to its prior condition, as determined by the authorized officer.
- ☒ n. Permittee shall remove temporary stakes and/or flagging, which the permittee has installed, upon completion of fieldwork.
- ☒ o. Permittee shall clean all camp and work areas before leaving the permit area. Permittee shall take precautions to prevent littering or pollution on public lands, waterways, and adjoining properties. Refuse shall be carried out and deposited in approved disposal areas.
- ☐ p. Permittee shall submit the preliminary report within _____ days/weeks of completion of any episode of fieldwork..
- ☐ q. Permittee shall submit the final report within _____ days/weeks/months after completion of fieldwork..
- ☐ r. Permittee shall submit progress reports every _____ months over the duration of the project.
- ☒ s. California special permit conditions are attached.

Permit No.**CA-19-04P** **DI Form 1991 (Rev Sept 2004) Page 6**

Special Permit Conditions Continuation Sheet: California Conditions

a. Work under this permit is limited to specific service approved for each permit as specified in box # 9 on page 1 of this permit.

b. Permittees shall verbally and subsequently in writing contact the appropriate BLM Field Manager prior to the beginning of each of his field operations (with follow-up written notification) to inform the BLM of specific work to be conducted. At this time, the BLM Field Manager may impose additional stipulation as deemed necessary to provide for the protection and management of resource values in the general site or project area.

c. All cultural artifacts and other related materials such as notes, photographs, etc., acquired under the provisions of this permit **remain the property of the United States Government and may be recalled at any time for the use of the Department of the interior or other agencies of the Federal Government.** Cultural materials collected under the provisions of this permit must be curated at a repository approved by the BLM. Curation shall be at a local qualified repository, if feasible, and an approved curation facility shall be designated prior to all field projects. An itemized list of all materials with accession numbers, curated at the repository will be submitted to the State Office and to the appropriate Field Office within 180 days of the completion of individual field projects. A copy of a receipt from the curation facility must be submitted with the list or catalogue.

d. Permittees shall acquire a primary number from the appropriate Information Center for each cultural resource documented while undertaking work authorized by this permit.

e. The BLM Field Manager or authorized representative may require a monthly letter progress report outlining what was accomplished. This report, if required, is due by the fifth day of the following month, unless different arrangements are approved.

f. The individual(s) in direct charge must be academically qualified and possess adequate field experience. At least two weeks prior to initiation field work, the permittees must provide the BLM Field Manager with the vitae of individuals proposed to be in direct charge if not approved at the time of permit issuance. A list of field crew members should be submitted at the same time. Only the individual(s) listed in Item No. 8 of the permit is/are authorized to be in direct charge of field work conducted under this permit.

g. The person(s) in direct charge of field work, shall be on site at all times when work is in progress. Failure to comply with permit stipulations will result in removal of subject's name(s) from the approved list of person-in-direct-charge.

h. Care should be exercised to avoid directly or indirectly increasing access or potential vandalism to sensitive sites.

i. All National Permit Stipulations are binding. The authority for issuing permits in the Bureau of Land Management rests solely with the State Director as Delegated by the Secretary of the Interior and all further delegation is prohibited by Secretarial Order. No Modification of National Permit Conditions 8 or 9 or of the California Special Permit Conditions may occur except by written decision of the State Director.

j. The Bureau of Land Management shall be cited in any report of work done under this permit, including publications such as books, news articles and scientific publications, as well as oral reports, films, television programs, and presentations in other media.

By signing below, I, the Principal Investigator, acknowledge that I have read and understand the Permit for Archeological Investigations and agree to its terms and conditions as evidenced by my signature below and initiation of work or other activities under the authority of this permit.

Signature and title:	Date:
Geraldine Aron and CEO	03/01/2019

Permit No.**CA-19-04P** **DI Form 1991 (Rev Sept 2004) Page 7**

Paperwork Reduction Act and Estimated Burden Statement: This information is being collected pursuant to 16 U.S.C. 470cc and 470mm, to provide the necessary facts to enable the Federal land manager (1) to evaluate the applicant's professional qualifications and organizational capability to conduct the proposed archeological work; (2) to determine whether the proposed work would be in the public interest; (3) to verify the adequacy of arrangements for permanent curatorial preservation, as United States property, of specimens and records resulting from the proposed work; (4) to ensure that the proposed activities would not be inconsistent with any management plan applicable to the public lands involved; (5) to provide the necessary information needed to complete the Secretary's Report to Congress on Federal Archeology Programs; and (6) to allow the National Park Service to evaluate Federal archeological protection programs and assess compliance with the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470). Submission of the information is required before the applicant may enjoy the benefit of using publicly owned archeological resources. To conduct such activities without a permit is punishable by felony-level criminal penalties, civil penalties, and forfeiture of property. A federal agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average one hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Departmental Consulting Archeologist; NPS; 1849 C Street, NW (2275); Washington, DC 20240-0001.

United States Department of the Interior
FIELDWORK REQUEST AND AUTHORIZATION
PALEONTOLOGICAL INVESTIGATIONS

DI Form 1991
(BLM Rev July 2005)
OMB No. 1029-0027

Authorization to conduct Paleontological studies on public lands managed by the Bureau of Land Management under the authority of:

☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).

☒ Resource-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-579), and Section 365 of Public Law 94-4579

Please use this number when referring to this permit

No.: CA-19-04P

1. Applicant (Business/Firm) and BLM State Permit Number Paleo Solutions, Inc	**2. Application date** 5/03/2019
3. Address 911 S Primrose Ave. Unit N Monrovia, CA 91016	**4. Telephone number(s)** 562-818-7713 **5. E-mail address(es)** geraldine@paleosolutions.com
6. Name of Permit Administrator Geraldine Aron Telephone number(s): 562-818-7713 **Email address(es):** geraldine@paleosolutions.com	**7. Name of Principal Investigator(s)** Geraldine Aron, Courtney Richards, Matt Carson, John Foster, and Paul Murphey Telephone number(s): 562 818 7713; 626-716-2000; 303-859-8048 **Email address(es):** geraldine@paleosolutions.com; crichards@paleosolutions.com; mcarson@paleosolutions.com; mattc@paleosolutions.com; pdm@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects Joey Raum, Kate Zubin-Starhopolous; Joseph Raum; Betsy Kruk; Madeline Wenger	**Telephone number(s):** 740-446-6435; 714-205-5226 **Email address(es):** jraum@paleosolutions.com; kate@paleosolutions.com; bkruk@paleosolutions.com; mwenger@paleosolutions.com

9. Nature of paleontological fieldwork proposed:

☒ Survey and limited surface collection. ☐ Excavation

Briefly describe: Additional areas have been added to our orginal paleontology survey conducted in 2017 for SCE Lugo-Victorville Remedial Action Scheme Project

A field survey of paleontologically sensitive locations (PFYC U, 3, 4 or 5) within the Project area will be conducted as well as verification of geologic extents of PFYC 1 and PFYC 2 units and previously recorded fossil localities. The survey will examine areas where scientifically significant fossils can be potentially expected to occur within the boundary and immediate vicinity of the anticipated disturbance, or where the probability of encountering fossils is unknown, and in locations where fossils have been recorded in the past. The survey corridor will be the impact area plus 100 feet on either side of the centerline.

The field survey will be conducted by a survey crew consisting of two paleontologists. The crew will complete a 100% pedestrian linear survey of all potentially fossiliferous bedrock outcrops and exposures of surficial sediments that occur on PFYC U, 3, 4, or 5 formations and verification of PFYC Class 1 and 2 events. Areas with very low to low sensitivity will not be intensively surveyed.

Paleo Solutions' Principal Investigator, Geraldine Aron, will oversee the paleontological field crew during all field survey activities. The field survey is anticipated to take a maximum of one working day to complete (12 hours/day) based on the initial analysis of existing data, and the access roads mapped for the Project.

Please see the attached map for Needles.

DI Form 1991 (Rev. July 2005) Page 2

10. Location of proposed work (attach topographic map/copy with project boundaries):
Please see the attached map

11. Dates of proposed work: From: 5/06/19 To: 07/31/19

12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government.
Natural History Museum of Los Angeles County (LACM), 900 Exposition Blvd., Los Angeles, CA 90007

13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.

14. Signature and title of applicant:

15. Date
5/3/19

16. Signature and title of approving official:
for Mike Pool

17. Date
5/31/2019

NPS Form 10-114 (Rev. 01/2017)
National Park Service

SPECIAL USE PERMIT

MOJAVE NATIONAL PRESERVE
CASTLE MOUNTAINS NATIONAL MONUMENT
2701 Barstow Road
Barstow, CA 92311
(760) 252-6107

Name: Karen Bjurman			
Company/Organization: Southern California Edison			
Street Address: Two Innovation Way, 2nd Floor			
City: Pomona	State: CA	Zip Code: 91768	Country: USA
Telephone Number: (909) 274-1889	Cell Phone Number: n/a		
Fax Number: (909) 274-3978			
Email Address: Karen.Bjurman@sce.com			

Park Alpha Code
MOJA
Type of Use
Commercial Vehicles
Permit #
PWR-MOJA-5600-19-0033

is hereby authorized to use the following described land or facilities in Mojave National Preserve:

Eldorado-Lugo and Lugo-Mohave 500kV transmission line right-of-way corridors which traverse the Preserve.

The area must be restored to its original condition at the end of the permit.

The permit begins at **07:00** ☒ **am** / ☐**pm on 04/23/2019** (mm/dd/yyyy).

The permit expires at **06:00** ☐ **am** / ☒**pm on 12/31/2019** (mm/dd/yyyy).

SUMMARY OF PERMITTED ACTIVITY: (see attached sheets for additional information and conditions)

Operation of commercial vehicles in Mojave National Preserve to transport SCE contractors within the right-of-way corridors referenced above for pedestrian survey work. Motor vehicles must remain on existing roads at all times. Survey schedule is attached to the end of this permit.

Person on site responsible for adherence to the terms and conditions of the permit (include contact information)
Travis Kegel, EI lead (949) 257-8031
Rob Curley, Insignia lead (650) 520-5307

Authorizing legislation or other authority
California Desert Protection Act of 1994 (PL 103-433)
NEPA reference: 18-moja-010/ PEPC 76818 CE

APPLICATION FEE	☐ Received ☒ Not Required	Amount $
PERFORMANCE BOND	☐ Required ☒ Not Required	Amount $
LIABILITY INSURANCE	☒ Required ☐ Not Required	Amount **$ 1,000,000.00**
COST RECOVERY: administrative processing + estimated monitoring (mileage costs to be assessed after the conclusion of this permit)	☐ Required ☒ Not Required	Amount $
LOCATION FEE	☐ Required ☒ Not Required	Amount $

ISSUANCE of this permit is subject to the attached conditions. The undersigned hereby accepts this permit subject to the terms, covenants, obligations, and reservations, expressed or implied herein.

Karen Bjurman — PERMITTEE Signature — Title: Land Services Agent — Date: April 22, 2019

Authorizing NPS Official — Title: Superintendent ACTING — Date: Apr 23 2019

Authorizing NPS Official *(additional, if required)* — Title: — Date:

NPS Form 10-114 (Rev. 01/2017)
National Park Service

PWR-MOJA-5600-19-0033, Southern California Edison, commercial vehicles
Page 2 of 5

CONDITIONS OF THIS PERMIT

Failure to comply with any of the terms and conditions of this permit may result in the immediate suspension or revocation of the permit. [36 CFR 1.6(h)]

1. The permittee is prohibited from giving false information; to do so will be considered a breach of conditions and be grounds for revocation: [36 CFR 2.32(a)(3)].
2. This permit may not be transferred or assigned without the prior written consent of the Superintendent.
3. The permittee shall exercise this privilege subject to the supervision of the Superintendent or designee, and shall comply with all applicable Federal, State, county and municipal laws, ordinances, regulations, codes, and the terms and conditions of this permit. Failure to do so may result in the immediate suspension of the permitted activity or the revocation of the permit. All costs associated with clean up or damage repairs in conjunction with a revoked permit will be the responsibility of the permittee.
4. The permittee is responsible for making all necessary contacts and arrangements with other Federal, State, and local agencies to secure required inspections, permits, licenses, etc.
5. The park area associated with this permit will remain open and available to the public during park visiting hours. This permit does not guarantee exclusive use of an area. Permit activities will not unduly interfere with other park visitors' use and enjoyment of the area.
6. This permit may be revoked at the discretion of the Superintendent upon 24 hours notice.
7. This permit may be revoked without notice if damage to resources or facilities occurs or is threatened, notwithstanding any other term or condition of the permit to the contrary.
8. This permit is made upon the express condition that the United States, its agents and employees shall be free from all liabilities and claims for damages and/or suits for or by reason of any injury, injuries, or death to any person or persons or property of any kind whatsoever, whether to the person or property of the Permittee, its agents or employees, or third parties, from any cause or causes whatsoever while in or upon said premises or any part thereof during the term of this permit or occasioned by any occupancy or use of said premises or any activity carried on by the Permittee in connection herewith, and the Permittee hereby covenants and agrees to indemnify, defend, save and hold harmless the United States, its agents, and employees from all liabilities, charges, expenses and costs on account of or by reason of any such injuries, deaths, liabilities, claims, suits or losses however occurring or damages growing out of the same.
9. Permittee agrees to carry general liability insurance against claims occasioned by the action or omissions of the permittee, its agents and employees in carrying out the activities and operations authorized by this permit. The policy shall be in the amount of $1,000,000.00 per Occurrence, $1,000,000.00 Aggregate and underwritten by a United States company naming the United States of America as **additional insured**. The permittee agrees to provide the Superintendent with a Certificate of Insurance with the proper endorsements prior to the effective date of the permit.
10. Permittee agrees to deposit with the park a bond in the amount of $0.00 from an authorized bonding company or in the form of cash or cash equivalent, to guarantee that all financial obligations to the park will be met.
11. Costs incurred by the park as a result of accepting and processing the application and managing and monitoring the permitted activity will be reimbursed by the permittee. Administrative costs and estimated costs for activities on site must be paid when the permit is approved. If any additional costs are incurred by the park, the permittee will be billed at the conclusion of the permit. Should the estimated costs paid exceed the actual costs incurred; the difference will be returned to the permittee.
12. The person(s) named on the permit as in charge of the permitted activity on-site must have full authority to make any decisions about the activity and must remain available at all times. He/she shall be responsible for all individuals, groups, vendors, etc. involved with the permit.
13. Nothing herein contained shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress or administratively allocated for the purpose of this permit for the fiscal year, or to involve the Service in any contract or other obligation for the further expenditure of money in excess of such appropriations or allocations.
14. If any provision of this permit shall be found to be invalid or unenforceable, the remainder of this permit shall not be affected and the other provisions of this permit shall be valid and be enforced to the fullest extent permitted by law.

15. The Permit Holder shall notify Mojave National Preserve at least 24 hours before the start of each survey covered under this permit.
    Email notification: moja_le_rangers@nps.gov, michael_ice@nps.gov
    Alternate Contacts: (760) 252-6137, Michael Ice

16. For each Rare Plants survey, the Permit Holder shall notify the Mojave National Preserve botanist at least 24 hours in advance. At the completion of this permit, the Permit Holder shall provide results of each survey, including SHP files or equivalent GPS coordinates for mapping purposes, to Mojave National Preserve.
    Contact: Drew Kaiser, andrew_kaiser@nps.gov or (760) 252-6106

17. All pages of this permit must be carried by the permit holder or the person identified on the permit as s/he in charge of the permitted event. This person must remain on-site at all times during the event. Failure to present all pages (paper or electronic format) when requested is a violation of the terms and conditions of the permit.

18. Use of a mineral or metal detector in the Preserve is prohibited. (36 CFR §2.1(a)(7))

19. Permitted activities shall not interfere with traffic (vehicle or foot traffic) for longer than five (5) minutes at a time.

20. Collecting, defacing, destroying historic or prehistoric artifacts is prohibited. Archeological, historic structures and/or artifacts will be left in place, undisturbed. Rubbings or other type of transfer of any form of rock art is prohibited. Permittee will immediately bring to the attention of the Chief Ranger, Mojave NP any archaeological resources encountered during operations, and maintain the integrity of such resources pending subsequent investigation.
    Contacts: (760) 252-6137, Michael Ice
    (760) 928-2101, David Nichols

21. Natural features will not be disturbed. Collecting of plants, animals, or mineral specimens is prohibited; destruction of any vegetation or natural areas is not permitted. No exotic plants/animals will be introduced and/or left behind.

22. All vehicles and equipment must be cleaned of all plant debris prior to entering Mojave National Preserve, to prevent new establishments of non-native vegetation.

23. Permittee shall insure that no damage to vegetation or wildlife shall occur, especially at parking area locations. Vegetation within the Preserve may not be cut, trimmed or moved. No disturbance of soil or mineral matter (e.g., pounding stakes into soil) is allowed outside of existing disturbed areas such as pre-existing campsites.

24. The permittee shall follow, and provide information to and ask each of their participants to become familiar with and follow, the Special Conditions of this permit and the "Leave No Trace" philosophy.

25. Permittee shall be responsible for all clean-up of gathering points, rest stops, and campsites. The area will be left as if no one had been there.
    a. If horses/mules are used, all feed and water shall be packed in for their use.
    b. All trash and food items must be stored in a manner that prevents wildlife conflicts. Trash attracts ravens which, in turn, prey on juvenile desert tortoises. Therefore, All materials packed in shall be packed out. All garbage, including food materials, must be carried out and disposed of in a proper manner, including removal from the Preserve.
    c. Cigarette butts are litter; permittee will provide butt cans for all disposals. Permittee is responsible for removing all trash.
    d. Human waste must be disposed of properly in a provided toilet, packed out, and removed from Mojave National Preserve upon departure.

26. Discarding/spilling of any fuel/hazardous materials is prohibited; any discharge or spill should be reported immediately.
    Contacts: (760) 252-6137, Michael Ice
    (760) 252-6147, Dave Burdette

27. All pets must be confined or on a lease no longer than six (6) feet at all times.

Wilderness (#s 28-29)

28. No motorized vehicles or mechanized transport may be operated in wilderness. In general, Wilderness begins:
    - ✓ 100' to either side of the centerline of all maintained roads (e.g., Kelbaker Road, Cedar Canyon Road, Black Canyon Road, etc.)
    - ✓ 30' to either side of unmaintained roads.

29. Vehicles will use only existing roads or previously disturbed areas outside of wilderness. Permittee shall not in any way harm or damage any vegetation or wildlife. Parking along the roadway shall occur on previously disturbed

sites only.

Desert Tortoise (#s 30-36)

30. All organizers and participants must orient themselves with risks to desert tortoise and tortoise protective measures on roads before arriving at Mojave National Preserve. Brief videos are readily available on the Internet – good examples include:
    - https://www.nps.gov/media/video/view.htm?id=DBCCFE6F-F66A-FDCE-1909BC5E55030DFF), and
    - https://www.insideedison.com/stories/protecting-threatened-tortoises-part-of-sces-environmental-stewardship).
31. This event(s) may be conducted at a time when the desert tortoise is active above ground. All participants must exercise the utmost in care to prevent injury or death to tortoises. A threatened species, this reptile is susceptible to crushing by automobile and foot traffic. Juvenile tortoises are particularly vulnerable; they are soft-shelled, slow moving, and difficult to see because of their small size and drab coloring. Tortoises are particularly active in the early mornings, evenings, and during the day when temperatures are mild (mid 70's-low 80's). They are frequently seen on or near paved road areas. All participants must be informed of and comply with these conditions.
32. The desert tortoise is protected by law. It is illegal to disturb a tortoise or its habitat in any way. This includes touching, handling, moving, or possessing a tortoise.
33. Vehicle parking must occur on previously disturbed areas. Destruction of natural undisturbed areas, including vegetation, is not permitted.
34. Tortoises will sometimes crawl under vehicles to escape the heat of the sun. Check under vehicles prior to leaving if the vehicle has been parked longer than two minutes.
35. All event-related tortoise injuries and/or deaths must be reported to the National Park Service as soon as possible.
    CONTACTS: Federal Interagency Communications Center, (909) 383-5651
    Danette Woo, danette_woo@nps.gov, (760) 252-6107
36. All motorized vehicles shall remain on existing roads, designated routes and vehicle ways. No cross-country travel by motorized vehicles is permitted. Vehicle use is prohibited in wilderness areas. Observe speed limits. Watch for tortoises on the road or road shoulder area. Driving off the established roadways and parking outside of designated parking areas is prohibited.
37. Vehicles must be spaced far enough apart and move slowly enough to ensure visibility of the road surface and avoid desert tortoises. Hatchlings are as small as two inches (2") and require focused scrutiny to be avoided.
38. Permission for travel on or across private property is required by the appropriate land owner. Permittee and participants will observe and respect areas of private property. All gates must be left as they are found (either open or shut). Permittee is responsible to the property owner for all costs incurred for damages to range improvements and/or if stock is injured or killed.
39. Permittee shall provide for basic first aid and initial transport at the standard first aid level. For all other emergencies, Permittee shall notify the Federal Interagency Communications Center at 909-383-5651.
40. All emergency costs of participants will be borne by the permittee. Monitoring fees may be charged (minimum of two hours), for NPS staff to ensure compliance with park regulations and stipulations of this permit. Permittee will remit to NPS any recovery of costs incurred by NPS in conjunction with this permit. If such costs are incurred, the permittee will be billed at the conclusion of this permit.
41. No sales of promotional items or promotional filming of activities is authorized under this permit. Any filming of activities for commercial use must be authorized under a separate permit.
42. All participants will be made aware of stipulations stated in this permit.
43. The Permittee expressly agrees that the terms and conditions of the permit shall not establish a precedent for any future permit within Mojave National Preserve or any other unit of the National Park System; failure to follow the conditions of the Permit may result in revocation of this permit and denial of future permits.

KB
Initials

ATTACHMENTS:
Desert Tortoise Report Form
Leave No Trace Philosophy

NPS Form 10-114 (Rev. 01/2017)
National Park Service

PWR-MOJA-5600-18-0010, Southern California Edison, commercial vehicles
Page 5 of 5

Type of Survey	Project/ROW Corridor Segment	Proposed dates
Rare Plants Survey, 5-10 days	LVRAS/Eldorado-Lugo 500kV transmission line	April 23 – May 31, 2019
Rare Plants Survey, 5-10 days	ELM/Lugo-Mohave 500kV transmission line	April 23 – May 31, 2019
Rare Plants Survey, 5-10 days	LVRAS/Eldorado-Lugo 500kV transmission line	September 1 – November 30, 2019
Rare Plants Survey, 5-10 days	ELM/Lugo-Mohave 500kV transmission line	September 1 – November 30, 2019
Cultural Resources, Paleontological Resources, and Biological Resources Surveys for relocation of LZs in MNP, 5-10 days	LVRAS/Eldorado-Lugo 500 kV transmission line	April 23 – December 31, 2019
Cultural Resources, Paleontological Resources, and Biological Resources Surveys for relocation of LZs in MNP, 5-10 days	ELM/Eldorado-Lugo 500 kV transmission line and Lugo-Mohave 500kV transmission line	April 23 – December 31, 2019
Note: The surveys listed are visual only. They are non-invasive and do not cause any ground disturbance. Vehicles will remain on access roads and team will only walk in survey areas.		

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

John Butler
Director, Corporate Risk Management
P. O. Box 800
2244 Walnut Grove Avenue
Rosemead, CA 91770

CERTIFICATE OF SELF INSURANCE

Issued To:

Certificate Holder:	**Mohave National Preserve, Castle Mountains National Monument**
Address:	**2701 Barstow Road**
City:	**Barstow**
State:	**CA**
Zip Code	**92311**

SCE certifies that the self-insurance programs listed below are in force with regard to the following:
Eldorado-Lugo/Lugo-Mohave 500kV Transmission line
Right-of-way Corridors, PWR-MOJA-5600-19-0033

Company & Type of Insurance	Policy No.	Policy Period	Limits of Liability
Commercial General Liability	**Self-Insured**	**Continuous**	**$1 Million per Occurrence Bodily Injury & Property Damage; No Aggregate**

This certificate is not valid unless signed by an authorized representative of Southern California Edison's Risk Management Department. Additional certificate holder status: United States of America is an additional insured under the general liability program above.

Connie Garcia
Connie Garcia
Corporate Risk Management

Mojave National Preserve.BDiaz.docx

Attachment B
Paleontological Resources Study for SCE LVRAS Project

FINAL PALEONTOLOGICAL TECHNICAL STUDY

LUGO-VICTORVILLE REMEDIAL ACTION SCHEME PROJECT

Southern California Edison Company

Prepared for: **BLM Barstow Field Office**

BLM Needles Field Office

BLM Southern Nevada District

NPS Mojave National Preserve

Prepared by: **Paleo Solutions, Inc.**
911 S. Primrose Ave., Unit N
Monrovia, CA 91016

Geraldine Aron, M.S. – Principal Investigator
Cecilio Garcia, B.A. – Report Author
Courtney Richards, M.S. – Report Author
Kate Zubin-Stathopoulos, M.S. – Report Author
Nathan Dickey, M.S. – Report Author

PSI Report: CA17SanBernardinoICF02R

September 19, 2017

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TABLE OF CONTENTS

1.0 Executive Summary 5

2.0 Introduction 7
2.1 Project Description 7

3.0 Definition and Significance of Paleontological Resources 11

4.0 Laws, Ordinances, Regulations, and Standards 12
4.1 Federal Regulatory Setting 12
4.1.1 National Environmental Policy Act of 1969 (NEPA) 12
4.1.2 Antiquities Act of 1906 12
4.1.3 Federal Land Management and Policy Act (FLMPA) (43 USC 1701) 13
4.1.4 Paleontological Resources Preservation Act (PRPA) 13
4.2 State Regulatory Setting 13
4.2.1 California Environmental Quality Act (CEQA) 13
4.2.2 State of California Public Resources Code 14
4.3 Local Regulatory Setting 14
4.3.1 San Bernardino County 14
4.4 Permits 14

5.0 Methods 14
5.1 Paleontological Analysis 15
5.2 Criteria For Evaluating Paleontological Potential 15

6.0 Analysis of Existing Data 17
6.1 Literature Search 17
6.1.1 Igneous and Metamorphic Rocks – Precambrian and Paleozoic (pCg, m) 17
6.1.2 Monte Cristo Limestone – Carboniferous (Lower Mississippian) (Mmc) 18
6.1.3 Bird Spring Formation – Early Permian (Pbs) 18
6.1.4 Igneous and Metamorphic Rocks – Mesozoic (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m) 19
6.1.5 Igneous Rocks – Tertiary and Quaternary (Tah, Ta, Qb) 20
6.1.6 Unnamed Sedimentary Deposits – Paleogene and Early Neogene (Taf, Tt, Tsf, Tss, Tvf) 20
6.1.7 Older Quaternary Deposits – Pleistocene (Qf, Qc, Qoa) 21
6.1.8 Younger Quaternary Deposits – Holocene (Qa, Qal, Qrs, Qf) 21
6.2 Paleontological Record Search Results 21

7.0 Field Survey 22
7.1 Geology 22
7.2 Paleontology 23

8.0 Impacts to Paleontological Resources 38

9.0 Recommendations 38

References 40

Appendix A. Geologic Maps 42

Appendix B. BLM Permits and Fieldwork Authorizations 43

Appendix C. Location (PLSS) 44

Appendix D. Record Search Results 45

Appendix E. Mapped Geology by Construction Area 46

TABLES

Table 1. SCE LVRAS Project Summary 7
Table 2. Potential Fossil Yield Classification (BLM, 2016) 15

FIGURES

Figure 1. Project Location and Surface Management Map. 10
Figure 2. View along ROW from Qa fan looking toward hills. View to northeast. 24
Figure 3. View of Qa valley with hills in foreground and background composed of mixed igneous and metamorphic rock. View to north 25
Figure 4. Overview photo taken from M109-T4 showing terrain of alluvial fans, washes, and moderate to high relief hills. View to southwest. 25
Figure 5. Shallow wash in Qal. View to south. 26
Figure 6. 5-10' high Qoa lobe dissected by wash. View to west. 26
Figure 7. Qal fan exposed by gravelly wash. View to west. 27
Figure 8. Moderate relief hills composed of igneous plutonic and volcanic rock above Tss exposures. View to west. 27
Figure 9. High relief cliffs of Bird Spring Formation limestone rising above Qal valley. View to north. 28
Figure 10. Qal wash with indurated banks. View to east. 28
Figure 11. Disturbed surface Qa at Daggett Storage Yard. View to south. 29
Figure 12. Lobe of coarse Qoa above wash. View to southwest. 29
Figure 13. Greenish Tertiary tuff breccia exposed in hillside under Quaternary alluvium. View to northwest. 30
Figure 14. Tertiary andesitic fanglomerate exposure. View to south. 30
Figure 15. Tss exposure beside wash. View down. 31
Figure 16. Planar laminations and cross-bedding observed in Tss outcrop. View to north. 31
Figure 17. Tss outcrop within hillside. View to west. 32
Figure 18. Bird Spring Formation limestone outcrop. View to north. 32
Figure 19. Bird Spring Formation limestone cliffs and hills above wash. View to south. 33
Figure 20. Tertiary sediments and flows (Tsf) hill. View to east. 33
Figure 21. Outcrop of Tsf with Qal valley below. View to west. 34
Figure 22. Outcrop of pre-Cambrian granite and gneiss adjacent to access road. View to southwest. 34
Figure 23. Outcrop of pre-Cambrian granite and gneiss. View to west. 35
Figure 24. Exposure of pre-Cambrian granite and gneiss adjacent to ROW access road. View to west. 35
Figure 25. Bedrock boulder exposure of Cretaceous Teutonia quartz monzonite surrounded by eroding flats of same quartz monzonite. View to southwest. 36
Figure 26. Mounds of popcorn weathered fine sediments at previously documented horse limb fossil locality. View to west. 36
Figure 27. Shallow, sandy wash topography surrounding previously documented fossil localities. View to east. 37
Figure 28. Bar of cross-bedded, well sorted sand within shallow wash within vicinity of previously documented tooth fragment locality. View to north. 37

1.0 EXECUTIVE SUMMARY

This report presents the results of the paleontological technical study conducted by Paleo Solutions, Inc. (Paleo Solutions) in support of the Southern California Edison Company (SCE) Lugo-Victorville Remedial Action Scheme Project (LVRAS Project) located in San Bernardino County, California and Clark County, Nevada. The LVRAS Project is located on land managed by the Bureau of Land Management (BLM) Barstow and Needles Field Offices and Southern Nevada District (~1235 acres); National Park Service (NPS) Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres) (see Figure 1). All paleontological work was conducted under California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization (FA) CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017 (see Appendix B). Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017. All work was conducted in compliance with federal, state, and local regulations.

The paleontological potential of the Project area was evaluated based on an analysis of existing paleontological data and a Phase 1 field survey. The three components of the analysis of existing data included a geologic map review, a literature search, and institutional record searches. The analysis of existing data was supplemented with a pedestrian field survey. Geologic mapping indicates that the Project and vicinity is underlain by Precambrian to Paleozoic igneous and metamorphic rocks (pCg, m); Carboniferous Monte Cristo Limestone (Mmc); Permian Bird Spring Formation (Pbs); Mesozoic igneous and metamorphic rocks (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m); Tertiary and Quaternary igneous rocks (Tah, Ta, Qb); Tertiary unnamed sedimentary rocks (Taf, Tt, Tsf, Tss, Tvf); older Quaternary (Pleistocene) alluvial deposits (Qf, Qc, Qoa); and younger Quaternary (Holocene) deposits (Qa, Qal, Qrs, Qf) (Dibblee, 1967, 2008a-b; Hewett, 1956; Jennings et al., 1962). The field survey confirmed the presence of younger Quaternary deposits (Qa/Qal), older Quaternary deposits (Qoa), Tertiary sandstone (Tss), Tertiary tuff breccia (Tt), Tertiary andesitic fanglomerate (Taf), Tertiary volcanic fanglomerate sediments (Tvf), Permian Bird Spring Formation (Pbs), and igneous and metamorphic units, including Tertiary flow deposits (Tsf). Monte Cristo Limestone bedrock (Mmc) was not observed during the survey, although it may underlie alluvial units at depth. No fossils were observed or collected.

Paleontological record searches were requested from the San Bernardino County Museum (SBCM) and the Las Vegas Natural History Museum (LVNHM). SBCM reported that they have one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius. The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. LVNHM reported that they did not have any fossil localities within the Project boundaries or one-mile radius. The NPS National Preserve also reported that they had two Pleistocene vertebrate localities located approximately a mile south of the LVRAS Project. Literature and database reviews identified numerous invertebrate fossils (e.g., coral, bryozoans, trilobites, gastropods, and bivalves) from the Monte Cristo Limestone and Bird Springs Formation, and vertebrate fossils (e.g., camel, mammoth, horse, sloth, rodents, and tortoise) from older Quaternary alluvium. Therefore these geologic units are assigned a moderate paleontological potential (Potential Fossil Yield Classification [PFYC] 3). Tertiary unnamed deposits have not been assigned to a specific formation, therefore the paleontologic content of these units is unknown, though sedimentary deposits often have the potential to contain fossils. Therefore, the Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf) are assigned an unknown potential (PFYC U). The Tsf sediments in the Project area were confirmed on

the survey to consist of very low paleontological potential (PFYC 1) flow deposits. Holocene young alluvial deposits are estimated to be less than 10,000 years old, and have low paleontological potential (PFYC 2), because they are too young to contain in-situ fossils. However, these younger deposits often overlie older geologic units with higher paleontological potential which may be impacted at depth. Due to the high heat and pressure under which they form, igneous and metamorphic rock units generally have very low potential to produce scientifically important paleontological resources (PFYC 1).

Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources during excavation within older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate (Tvf); Permian Bird Spring Formation (Pbs); and Lower Mississippian Monte Cristo Limestone (Mmc). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units, including the Tsf flow deposits, will not require monitoring or spot checking.

Prior to construction, a paleontological resources monitoring and mitigation plan (PRMMP) should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

A Project summary is provided in Table 1.

2.0 INTRODUCTION

This report presents the results of the paleontological technical study conducted by Paleo Solutions in support of the SCE Lugo-Victorville Remedial Action Scheme Project located in San Bernardino County, California and Clark County, Nevada. The LVRAS Project is located on land managed by the California BLM Barstow and Needles Field Offices and the Southern Nevada District (~1235 acres); NPS Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres) (Figure 1).

2.1 PROJECT DESCRIPTION

SCE is proposing to install a new 84 mile telecommunication path consisting of Optical Ground Wire (OPGW) between Nipton Road in Clark County, Nevada (near Eldorado Substation) and Interstate 40 near Ludlow, California (Pisgah Substation) on the existing Eldorado-Lugo 500 kilovolt (kV) Transmission Line. The project includes bucket truck work on disturbed areas at approximately 408 transmission tower locations, installation of guard poles at 14 locations, 72 helicopter landing zones, and pulling/tensioning activities at 27 locations. In addition, the Project includes several laydown yards.

Table 1. SCE LVRAS Project Summary

Project Name	SCE Lugo-Victorville Remedial Action Plan Scheme Project			
Project Description	Install a new 84 mile telecommunication path consisting of OPGW between Nipton Road in Clark County, Nevada (near Eldorado Substation) and Interstate 40 near Ludlow, California (Pisgah Substation) on the existing Eldorado-Lugo 500 kV Transmission Line			
Project Area	The Project is located north of Interstate 40 and east of Interstate 15 in the Mojave Desert spanning from Daggett, San Bernardino County, California into Clark County, Nevada.			
Total Acreage	84 linear miles			
Location (PLSS)	**Quarter-Quarter**	**Section**	**Township**	**Range**
	See Appendix C			
Land Owner/Managing Agency	California BLM Barstow and Needles Field Offices and Southern Nevada District (~1235 acres); NPS Mojave National Preserve (~1793 acres); and State of California (State Lands Commission) (~82 acres); and private lands (~1519 acres)			
Geologic Map(s)	Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California (Dibblee, 1967); Geologic Map of the Barstow & Daggett 15 Minute Quadrangles, San Bernardino County, CA (Dibblee, 2008a); Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California (Dibblee, 2008b); Geology and Mineral Resources of the Ivanpah Quadrangle, California and Nevada (Hewett, 1956); Geologic map of California: Trona Sheet (Jennings et al., 1962)			
Geologic Formation(s) and Age(s)	**Formation**	**Map Symbol**	**Age**	**Paleontological Potential (PFYC)**
	Quaternary alluvium	Qa/Qal	Holocene	Low (2)
	Quaternary fanglomerate	Qf	Holocene	Low (2)
	Quaternary Mojave River channel sand	Qrs	Pleistocene to Holocene	Low (2)
	Quaternary colluvium	Qc	Pleistocene	Moderate (3)

	Quaternary fanglomerate	Qf	Pleistocene	Moderate (3)
	Quaternary older alluvium	Qoa	Pleistocene	Moderate (3)
	Quaternary basalt	Qb/Qtb/ QTb	Pleistocene	Very Low (1)
	Tertiary andesitic fanglomerate	Taf	Miocene or Pliocene	Unknown (U)
	Tertiary tuff breccia	Tt	Oligocene or Miocene	Unknown (U)
	Tertiary sediments and flows*	Tsf	Tertiary	Very Low (1)
	Tertiary sandstone	Tss	Oligocene or Miocene	Unknown (U)
	Tertiary volcanic fanglomerate	Tvf	Late Miocene or Early Quaternary	Unknown (U)
	Andesite	Ta	Oligocene or Miocene	Very Low (1)
	Altered Andesite Porphyry	Tah	Oligocene or Miocene	Very Low (1)
	Quartz Diorite Porphyry	qdp	Mesozoic or older	Very Low (1)
	Biotite Quartz Diorite	bqd	Mesozoic or older	Very Low (1)
	Gneiss	gn	Mesozoic or older	Very Low (1)
	Granite	gr	Mesozoic	Very Low (1)
	Hornblende Diorite-Gabbro	hd	Mesozoic	Very Low (1)
	Granite or Quartz Monzonite	gqm	Mesozoic	Very Low (1)
	Dacite Flow Breccia	Jfb	Jurassic	Very Low (1)
	Sands Granite	Js	Jurassic	Very Low (1)
	Teutonia Quartz Monzonite	TKq	Cretaceous or Tertiary	Very Low (1)
	Granite or Metamorphic Rocks	gr-m	Pre-Cretaceous	Very Low (1)
	Bird Spring Formation	Pbs	Permian	Moderate (3)
	Monte Cristo Limestone	Mmc	Lower Mississippian	Moderate (3)
	Marble	m	Paleozoic	Very Low (1)
	Gneiss or Granite	pCg	Precambrian	Very Low (1)
Surveyors(s)	Geraldine L. Aron, M.S., Cecilio D. Garcia, B.A., Joseph T. Raum, B.S, Madeline M. Weigner, M.S.			
Dates(s) Surveyed	July 12-14, 2017, July 19-22, 2017, and July 27-29, 2017			
Formations Surveyed	Younger Quaternary alluvium (Qa/Qal), older Quaternary alluvium (Qoa), Tertiary			

	andesitic fanglomerate (Taf), Tertiary volcanic fanglomerate (Tvf), Tertiary sediments and flows (Tsf), Tertiary tuff breccia (Tt), Tertiary sandstone (Tss), Permian Bird Spring Formation (Pbs).
Permits	California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017. Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017.
Previously Documented Fossil Localities in Project Area	SBCM reported that they have one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius. The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. LVNHM reported that they did not have any fossil localities within the Project boundaries or one-mile radius. The NPS National Preserve reported that they had two Pleistocene vertebrate localities located approximately a mile south of the LVRAS Project.
Paleontological Results	No fossils were observed or collected during the survey.
Disposition of Fossils and Data	Not applicable; no fossils observed or collected.
Recommendation(s)	Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources within older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate (Tvf); Permian Bird Spring Formation (Pbs); and Lower Mississippian Monte Cristo Limestone (Mmc). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units, including the Tsf flow deposits, will not require monitoring or spot checking. Prior to construction, a PRMMP should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

*Only the Tsf volcanic flow deposits were observed during the field survey

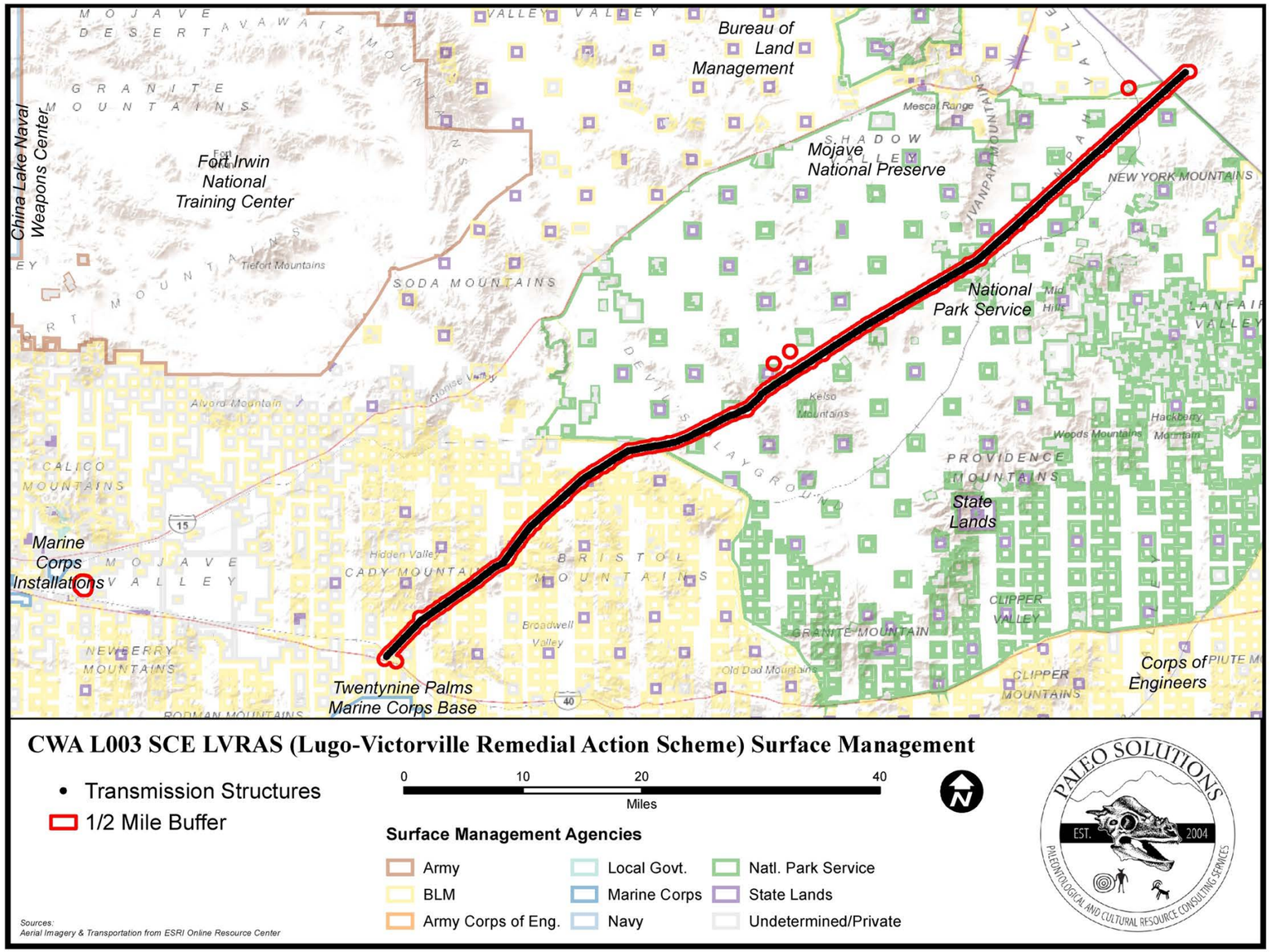

Figure 1. Project Location and Surface Management Map.

3.0 DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

As defined by Murphey and Daitch (2007): "Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates."

Fossil resources vary widely in their relative abundance and distribution and not all are regarded as significant. According to BLM Instructional Memorandum (IM) 2009-011, a "Significant Paleontological Resource" is defined as:

> "Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be of scientific interest if it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has an identified educational or recreational value. Paleontological resources that may be considered not to have scientific significance include those that lack provenience or context, lack physical integrity due to decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate

> coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities" (BLM, 2008).

Vertebrate fossils, whether preserved remains or track ways, are classified as significant by most state and federal agencies and professional groups (and are specifically protected under the California Public Resources Code). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments.

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected fossils. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental and taphonomic conditions.

4.0 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section of the report presents the regulatory requirements pertaining to paleontological resources that apply to this Project.

4.1 FEDERAL REGULATORY SETTING

If any federal funding is used to wholly or partially finance a project, it is sited on federal lands, involves a federal permit, and/or includes a perceived federal impact, federal laws and standards apply, and an evaluation of potential impacts on paleontological resources may be appropriate and/or required. The management and preservation of paleontological resources on public and federal lands are prescribed under various laws, regulations, and guidelines.

4.1.1 National Environmental Policy Act of 1969 (NEPA)

The National Environmental Policy Act of 1969, [NEPA] as amended (Public Law [Pub. L.] 91-190, 42 United States Code [USC] 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258 § 4(b), Sept. 13, 1982) recognizes the continuing responsibility of the Federal Government to "preserve important historic, cultural, and natural aspects of our national heritage . . ." (Sec. 101 [42 USC § 4321]) (#382). With the passage of the Paleontological Resources Preservation Act (PRPA) (2009), paleontological resources are considered to be a significant resource and it is therefore now standard practice to include paleontological resources in NEPA studies in all instances where there is a possible impact.

4.1.2 Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431-433) states, in part:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR 3]), the term "objects of antiquity" has been interpreted to include fossils by the NPS, the BLM, the Forest Service (FS), and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this act. However, due to the large gray areas left open to interpretation due to the imprecision of the wording, agencies are hesitant to interpret this act as governing paleontological resources.

4.1.3 Federal Land Management and Policy Act (FLMPA) (43 USC 1701)

Federal law including the Federal Land Management and Policy Act (FLMPA) of 1976 (43 USC 1701) includes objectives such as the evaluation, management, protection and location of fossils on BLM-managed lands, defines fossils, and lays out penalties for the destruction of significant fossils. Also, NEPA requires the preservation of "historic, cultural, and natural aspects of our national heritage." Most recently, the Omnibus Public Lands Act refines NEPA and FLMPA guidelines and strictures, as well as outlines minimum punishments for removal or destruction of fossils from federal/public lands (see below).

4.1.4 Paleontological Resources Preservation Act (PRPA)

Paleontological Resources Preservation, Title VI, Subtitle D in the Omnibus Public Lands Act of 2009, Pub. L. 111-011 Purpose: The Secretary (Interior and Agriculture) shall manage and protect paleontological resources on federal land using scientific principles and expertise. With the passage of the PRPA, Congress officially recognizes the importance of paleontological resources on federal lands (U.S. Department of the Interior, US Department of Agriculture) by declaring that fossils from federal lands are federal property that must be preserved and protected using scientific principles and expertise. The PRPA provides:

- Uniform definitions for "paleontological resources" and "casual collecting";
- Uniform minimum requirements for paleontological resource use permit issuance (terms, conditions, and qualifications of applicants);
- Uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from Federal lands; and
- Uniform requirements for curation of federal fossils in approved repositories.

4.2 STATE REGULATORY SETTING

4.2.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with the California Environmental Quality Act (CEQA) are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations) and further amended January 4th, 2013. One of the questions listed in the CEQA Environmental Checklist is: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (State CEQA Guidelines Section 15064.5 and Appendix G, Section V, Part C).

4.2.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological "sites" or "features" from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, "state lands" refers to lands owned by, or under the jurisdiction of, the state or any state agency. "Public lands" is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

4.3 LOCAL REGULATORY SETTING

4.3.1 San Bernardino County

The Conservation Element of the San Bernardino County General Plan (2007) contains one goal (CO 3) and one map (Paleontologic Resources Overlay Map, noted in the General Plan as "not available yet"), as well as three programs regarding paleontological resources within the County. Goal CO 3 requires that the County will preserve and promote its historic and prehistoric cultural heritage. Three programs within the General Plan delineate the required County actions regarding paleontological resources. In areas of potential but unknown sensitivity, field surveys prior to grading will be required to establish the need for paleontologic monitoring. Projects requiring grading plans that are located in areas of known fossil occurrences, or demonstrated in a field survey to have fossils present, will have all rough grading (cuts greater than 3 feet) monitored by trained paleontologic crews working under the direction of a qualified professional, so that fossils exposed during grading can be recovered and preserved. Fossils include large and small vertebrate fossils; the latter recovered by screen washing of bulk samples.

Finally, a report of findings with an itemized accession inventory will be prepared as evidence that monitoring has been successfully completed. A preliminary report will be submitted and approved prior to granting of building permits, and a final report will be submitted and approved prior to granting of occupancy permits. The adequacy of paleontologic reports will be determined in consultation with the Curator of Earth Science, San Bernardino County Museum.

4.4 PERMITS

All paleontological work was conducted under California BLM Paleontological Use Permit CA-16-03P (Expiration March 16, 2019), Nevada BLM Paleontological Use Permit N-091420 (Expiration September 23, 2018), BLM Fieldwork Authorization (FA) CA690-FA-17-17P approved by the Needles Field Office on July 3, 2017, FA-680-17-27 approved by the Barstow Field Office on June 27, 2017, and an FA approved by the Southern Nevada District on July 11, 2017 (Appendix B). Electronic approval to conduct a survey on the NPS Mojave National Preserve was also received on June 2, 2017. Geraldine Aron, Principal Investigator, oversaw all work as the permit holder and administrator.

5.0 METHODS

This paleontological analysis of existing data included a geologic map review, a literature search, two institutional record searches, and a record search conducted by the NPS Mojave National Preserve.

The analysis of existing data was supplemented with a Phase 1 field survey. The goal of this paleontological study is to evaluate the paleontological potential of the Project. Kate Zubin-Stathopoulos, M.S. and Nathan Dickey, M.S. performed the background research and co-authored this report with Courtney Richards, M.S and Cecilio Garcia, B.A. Geraldine Aron, M.S. oversaw all aspects of the Project as the Paleontological Principal Investigator. GIS maps were prepared by Nathan Dickey, M.S.

Copies of this report will be submitted to the BLM, NPS, and other appropriate federal and state agencies. Paleo Solutions will retain an archival copy of all Project information.

5.1 PALEONTOLOGICAL ANALYSIS

Paleo Solutions reviewed geologic maps of the Project area published by T.W. Dibblee Jr. (1967, 2008a-b), D.F. Hewett (1956), and C.W. Jennings et al. (1962). The literature reviewed included published and unpublished scientific papers. Paleontological record searches were requested from the San Bernardino County Museum (SBCM) and the Las Vegas Natural History Museum (LVNHM). The museum record search results are attached as Appendix D. An additional record search was provided by the NPS Mojave National Preserve and searches of online databases were completed by Paleo Solutions staff.

The Phase 1 field survey was conducted by Paleo Solutions staff members Geraldine L. Aron, M.S., Cecilio D. Garcia, B.A., Joseph T. Raum, B.S, Madeline M. Weigner, M.S., on the following dates: July 12-14, 2017, July 19-22, 2017, and July 27-29, 2017. The paleontological survey was performed in order to determine the paleontological sensitivity of the geologic deposits underlying the survey areas. The survey was conducted after a review of aerial photographs indicated the Project area included areas of undisturbed native sediment. The pedestrian survey included inspection of the Project area with the majority of focus occurring in areas with native sediment exposures. This included close inspection of sediment and bedrock outcrops. Rock exposures as well as the surrounding areas were photographed and documented. Reference points were acquired using a Trimble GPS unit. Sediment and bedrock lithologies were recorded and analyzed and used to better interpret the Project's paleontological sensitivity, and thus better understand the Project's potential impact.

5.2 CRITERIA FOR EVALUATING PALEONTOLOGICAL POTENTIAL

The PFYC system was developed by the BLM (BLM, 2016). Because of its demonstrated usefulness as a resource management tool, the PFYC has been utilized for many years for projects across the country, regardless of land ownership. It is a predictive resource management tool that classifies geologic units on their likelihood to contain paleontological resources on a scale of 1 (very low potential) to 5 (very high potential). This system is intended to aid in predicting, assessing, and mitigating paleontological resources. The PFYC ranking system is summarized in Table 2.

Table 2. Potential Fossil Yield Classification (BLM, 2016)

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low	Geologic units are not likely to contain paleontological resources.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
	Field surveys have verified that significant paleontological resources are not present or are very rare.
	Units are generally younger than 10,000 years before present.
	Recent 16eolian deposits
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	Significant paleontological resources have been documented but may vary in occurrence and predictability.
	Surface-disturbing activities may adversely affect paleontological resources.
	Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
	Illegal collecting activities may impact some areas.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	Significant paleontological resources have been documented and occur consistently
	Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities.
	Unit is frequently the focus of illegal collecting activities.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
U = Unknown	Geologic units that cannot receive an informed PFYC assignment
	Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is unknown.
	Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
	Scientific literature does not exist or does not reveal the nature of paleontological resources.
	Reports of paleontological resources are anecdotal or have not been verified.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
	Area or geologic unit is poorly or under-studied.
	BLM staff has not yet been able to assess the nature of the geologic unit.
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

6.0 ANALYSIS OF EXISTING DATA

6.1 LITERATURE SEARCH

Geologic mapping by indicates that the Project is underlain by Precambrian to Paleozoic igneous and metamorphic rocks (pCg, m); Carboniferous Monte Cristo Limestone (Mmc); Permian Bird Spring Formation (Pbs); Mesozoic igneous and metamorphic rocks (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m); Tertiary and Quaternary igneous rocks (Tah, Ta, Qb); Tertiary unnamed sedimentary rocks (Taf, Tt, Tsf, Tss, Tvf); older Quaternary (Pleistocene) alluvial deposits (Qf, Qc, Qoa); and younger Quaternary (Holocene) deposits (Qa, Qal, Qrs, Qf) (Dibblee, 1967, 2008a-b; Hewett, 1956; Jennings et al., 1962). The geographic distributions of the geologic units in the Project area, as mapped by Dibblee (1967, 2008a-b), Hewett (1956), and Jennings et al. (1962) are provided in Appendix A; and a list of mapped geologic units by construction area is provided in Appendix E.

6.1.1 Igneous and Metamorphic Rocks – Precambrian and Paleozoic (pCg, m)

The Project area is underlain by two Precambrian to Paleozoic igneous and metamorphic rock units (pCg, m), both of which have very low potential to produce scientifically important paleontological resources (PFYC 1).

Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava or magma. Intrusive (plutonic) igneous rocks form below the earth's surface, and extrusive (volcanic) rocks form on the earth's surface. Lava and magma are formed by the melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition. Extreme temperatures in the environments in which intrusive igneous rocks form prevent the preservation of fossils. The formation of extrusive igneous rocks as a result of volcanic processes is associated with extremely high temperatures that also generally prevents the preservation of fossils.

Metamorphic rocks result from the transformation of other rocks due to high temperature and high pressure. The parent rock can be igneous, sedimentary, or a pre-existing metamorphic rock. Metamorphic rocks comprise a large portion of the earth's crust and are classified on the basis of their chemistry and mineralogy. Most do not preserve fossils due to the conditions under which they were formed. However, metasedimentary rocks are formed from common sedimentary rock types such as limestone, shale, mudstone, siltstone, sandstone, and conglomerate. These types of metamorphic rocks do sometimes preserve fossils, but rarely fossils of scientific importance. Examples of fossils in metasedimentary rock include mollusks preserved in marble and echinoderms and graptolites preserved in slate.

The following Precambrian to Paleozoic igneous and metamorphic rocks are present within the Project area (Dibblee, 1967; Hewett, 1956):

- Gneiss or Granite (pCg) – Precambrian: In some areas this may include small bodies of late Mesozoic intrusive rocks; and
- Marble (m) – Paleozoic: White to gray-white, coarsely crystalline, thickly bedded marble composed of calcite and some dolomite; adjacent to granitic contacts locally silicate to garnet, epidote and diopside.

6.1.2 Monte Cristo Limestone – Carboniferous (Lower Mississippian) (Mmc)

The Monte Cristo Limestone, also called Monte Cristo Group, is an Early Mississippian unit originally documented by Hewett (1931). He named it after an exposure near the Monte Cristo mine in the Goodsprings Quadrangle in Clark County, Nevada (Hewett, 1931; Reade, 1962). It unconformably overlies the Sultan Limestone, unconformably underlies the Bird Spring Formation and is equivalent in age to the Tin Mountain Limestone. The Monte Cristo has been documented in Nevada, California, and Arizona and contains five members, which include from oldest to youngest, the Dawn Limestone, Anchor Limestone, Bullion Dolomite, Arrowhead Limestone, and the Yellowpine Limestone members (Hewett, 1931, 1956; Reade, 1962). The Monte Cristo Limestone is generally composed of limestone, altered dolomite, and occasional thin shale beds. The Dawn Limestone Member is composed of blue gray to dark gray limestone with localized dolomite alterations. The Anchor Limestone Member is mostly light bluish gray limestone with chert nodules and locally altered dolomite. The Bullion Dolomite Member is composed of light gray to white with coarse crystallization and vugs. The Arrowhead Limestone Member is composed of alternating layers of limestone and thin shale beds. The Yellowpine Limestone Member is composed of dark gray to black limestone and altered dolomite (Hewett, 1956; Reade, 1962). The thickness of the Monte Cristo Limestone varies from locality to locality, ranging anywhere from 350 feet to 1133 feet. Not all members are present throughout the distribution of the Monte Cristo Limestone (Hewett, 1931, 1956; Reade, 1962). It was deposited in a warm, shallow-water marine environment.

The fossil assemblage found in the Monte Cristo are not found uniformly throughout this unit, but are found within "fossil horizons" that represent short periods of warm shallow water at the time of deposition (Reade, 1962). Hewett (1956) documented fossils, identified by George H. Girty in 1928, which was then supplemented by Reade (1962). The most abundant and well-preserved fossils occur in the Anchor Limestone Member. These fossils included corals (*Syringopora* sp., *Lithostrotionella* sp., *Caninophyllum incrassatum*, *Neozaphrentis* sp., *Triplophyllites* sp., *Homalophyllites* sp., *Zaphrentis* sp., and *Pleurodictyum* sp.), brachiopods (*Spirifer* sp., *Rhipidomella* sp., *Camarotoechia* sp., *Rhytiophora gallatinensis*, *Avonia* sp., *Dictyoclostus* sp., *Echinoconchus* sp., *Linoproductus* sp., and *Syringothyris* sp.), bryozoans (*Fenestrellina* sp.), crinoids (*Displodocrinus* sp., *Dilatocrinus* sp., *Tarantocrinus* sp., *Agaricocrinus* sp., and *Ancalocrinus* sp.), bivalves (*Cypricardinia* sp. and *Schizodus* sp.), gastropods (*Pleurotomaria* sp., *Straparolus* sp.), cephalopods (*Orthoceras* sp.), trilobite fragments, and an ostracod (*Bairdia* sp.) (Hewett, 1931, 1956; Reade, 1962; Webster and Lane, 1987). While not abundant, many of the fossils found in the Monte Cristo Limestone are considered to fill in gaps in the paleontologic and biostratigraphic record for the Lower Mississippian, and constrain the age of the Monte Cristo to the Kinderhookian to Upper Osagean stages of the Lower Mississippian Period (Webster and Lane, 1987). The Monte Cristo Limestone has been assigned moderate paleontological potential (PFYC 3).

6.1.3 Bird Spring Formation – Early Permian (Pbs)

The Bird Spring Formation is a 1,200 to 2,500 foot thick series of limestone, sandstone, and shale beds named by Hewett (1931) after its significant exposure in the Bird Spring Range (Hewett, 1956). It was originally thought to be Pennsylvanian in age, but later determined to be Early Permian (299 to 280 million years ago) (Wilson, 1991). It mostly consists of beds of limestone less than 20 feet thick alternating with thinner beds of shale, sandstone, and dolomite. Small quantities of chert are

present throughout the formation, but are most abundant near the base. In the Spring Mountains, it is mostly pure blue-grey limestone, but grades westward into mostly brown-weathering sandy limestone (Hewett, 1956). It is overlain by the Permian Kaibab Limestone and Supai Formation, and at its base is a local unconformity where it overlies the Mississippian Monte Cristo Limestone. While the Bird Spring Formation is only locally continuous through the Bird Springs Range in Nevada, it may be equivalent to other fossiliferous Early Permian limestone units throughout Nevada and eastern California (Hewett, 1956). It was deposited in a shallow marine environment.

The Bird Spring Formation contains a vast multitude of marine invertebrate micro- and mega-fossils including many species of annelids, brachiopods, bryozoa, corals, crustaceans, echinoderms, gastropods, pelecypods, and protozoa. These fossils are most common in the lower part of the formation and are abundant in some beds 100 to 300 feet above the base (Hewett, 1931). This formation has proven to be a highly productive source of material for paleontological study for many investigators (Clapham and Bottjer, 2007; Webster and Lane, 2007; Wilson, 1991; Wilson and Langenheim, 1993; etc.). Recently discovered taxa include a feather star (*Poteriocrinites permicus*), crinoids (*Ekteinocrinus battleshipensis*), and the first evidence of a Permian age actinocrinitid in North America (Webster and Lane, 2007). Exposures of the formation near the mouth of Battleship Wash, Clark County, Nevada, "has yielded the largest Early Permian crinoid fauna known in North America" (Webster and Lane, 2007), and fusilinid-based regional strata correlations have resulted in a significantly improved understanding of the tectonic history of North America (Stevens and Stone, 2007). Due to the abundance, diversity, and excellent preservation of scientifically significant marine invertebrates, the Bird Spring Formation is considered to have moderate paleontological potential (PFYC 3).

6.1.4 Igneous and Metamorphic Rocks – Mesozoic (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m)

The Project area is underlain by 10 Mesozoic igneous and metamorphic rock units (qdp, bqd, gn, gr, hd, gqm, Jfb, Js, TKq, gr-m), all of which have very low potential to produce scientifically important paleontological resources (PFYC 1). See Igneous and Metamorphic Rocks – Precambrian to Paleozoic for a full discussion on these types of rocks.

The following Mesozoic igneous and metamorphic rocks are present within the Project area (Dibblee, 2008b, 1967; Hewett, 1956; Jennings et al., 1962):

- Quartz Diorite Porphyry (qdp) – Mesozoic or older: Gray, massive to gneissoid, porphyritic, medium to coarse grained granitic rock composed of quartz, potassic feldspar and plagioclase;
- Biotite Quartz Diorite (bqd) – Mesozoic or older: Dark gray, medium to fine grained, massive to gneissoid or weakly foliated dioritic rock;
- Gneiss (gn) – Mesozoic or older: Gray banded gneiss;
- Granite (gr) – Mesozoic: Includes Teutonia and Atolia quartz monzonites, granite, diorite, granodiorite, hornblende diorite, pegmatite, alpite, granophyre and gneissic granite;
- Hornblende Diorite-Gabbro (hd) – Mesozoic: Dark gray to black, medium to coarse grained, massive dioritic rock composed mostly of hornblende or biotite and calcic plagioclase;
- Granite or Quartz Monzonite (gqm) – Mesozoic: Light gray, hard, massive, medium to coarse grained quartz monzonite;

- Dacite Flow Breccia (Jfb) – Jurassic: Specific lithology descriptions of this unit are not available;
- Sands Granite (Js) – Jurassic: Specific lithology descriptions of this unit are not available;
- Teutonia Quartz Monzonite (TKq) – Cretaceous or Tertiary: Specific lithology descriptions of this unit are not available; and
- Granite or Metamorphic Rocks (gr-m) – Pre-Cretaceous: Undifferentiated quartzite, marble, talc schist, and meta-igneous rocks.

6.1.5 Igneous Rocks – Tertiary and Quaternary (Tah, Ta, Qb)

The Project area is underlain by three unnamed Tertiary igneous rock units (Tah, Ta, Qb), all of which have very low potential to produce scientifically important paleontological resources (PFYC 1). See Igneous and Metamorphic Rocks – Precambrian to Paleozoic for a full discussion on these types of rocks.

The following Tertiary intrusive and extrusive igneous rocks are present within the Project area (Dibblee, 2008b, 1967):

- Andesite (Ta) – Oligocene or Miocene: Greenish-gray, brown and dark reddish-brown, massive and aphanitic to porphyritic, composed mostly of plagioclase and gradational into andesite breccia unit;
- Basalt Flow of Pisgah Crater (Qb) – Pleistocene: Black, vesicular, microcrystalline and porous with small vugs between grains and forms at least one ropy flow on surficial deposits. Erupted from Pisgah Crater; and
- Altered Andesite Porphyry (Tah) – Oligocene or Miocene: Hydrothermally leached to light buff, softer rock with feldspars partly altered to kaolinite with iron leached out.

6.1.6 Unnamed Sedimentary Deposits – Paleogene and Early Neogene (Taf, Tt, Tsf, Tss, Tvf)

There are several unnamed sedimentary deposits mapped within the Project area. These consist of andesitic fanglomerate (Taf), tuff breccia (Tt), fanglomerate and sediments and flows (Tsf), sandstone (Tss), and volcanic fanglomerate (Tvf) (Dibblee, 1967, 2008b; Hewett, 1956). Since these units have not been assigned to a specific formation, the general geology and paleontologic content of these units is unknown, though sedimentary deposits, especially sandstone, often have the potential to contain fossils. For example, Pliocene alluvial deposits in San Bernardino County have produced numerous well preserved mammalian fossils including fish, salamanders, frogs, toads, giant tortoise, snakes, birds, rodents, rabbits, camels, and cats, among other taxa (Wagner and Prothero, 2001). These fossils were preserved in an undetermined alluvial deposit in a layer that contains calcareous concretionary sandstone and pebbly conglomerate located on Gypsum Ridge in Twentynine Palms, San Bernardino County.

There were no fossils identified form these deposits during the survey, however, with the exception of Tsf, the observed sediments appear conducive to the preservation of fossils and are considered to have unknown paleontological potential (PFYC U) within the Project area (see Section 7). Only the very low paleontological potential (PFYC 1) flow deposits of Tsf were observed within the Project area.

6.1.7 Older Quaternary Deposits – Pleistocene (Qf, Qc, Qoa)

Several unnamed older Quaternary deposits (middle to late Pleistocene; 780,000 to 11,000 years old) are exposed throughout the Project area and consist of fanglomerate (Qf) and older alluvium (Qc, Qoa) (Dibblee, 2008b, 1967; Hewett, 1956; Jennings et al., 1962). Fanglomerate is composed of weekly consolidated, massive to poorly bedded, gray, coarse gravel derived from nearby highlands. Older alluvium is composed of cobble, gravel, and sand that is poorly bedded to massive (Dibblee, 2008b, 1967).

Ice Age taxa have been recovered from Pleistocene age deposits of San Bernardino County, including specimens of rodents (*Peromyscus* sp., *Dipodomys ordii*, *Neotoma* sp., *Thomomys* sp., among others) rabbits (*Lepus* sp.), horse (*Equus conversidens*), badger (*Taxidea taxus*), cats (*Smilodon* sp., *Puma concolor*), mammoth (*Mammuthus* sp.) camel (*Camelops* sp., *Hemiauchenia* sp.), sloth (*Nothrotheriops* sp., *Megalonyx* sp.), tortoise (*Opherus agassizi*) as well as bison, antelope, and many other taxa of mammals (Jefferson, 1991; Reynolds, 1991; Brattstrom, 1961). There are numerous Pleistocene-aged localities throughout San Bernardino County and the Mojave Desert, some of which are accumulations of material by woodrats for nests (woodrat middens) in caves, and many of which are deposits from along the shorelines of Pleistocene lakes (Stegner, 2015; Grayson, 2011). While the depositional environment of the cave deposits and lake deposits differs from that of the Project area, there is the potential for a similar fauna to be recovered during Project excavations.

Some Pleistocene-age alluvial deposits are composed of coarse-grained material, which is not typically conducive to the preservation of fossils. For example, coarse-grained surficial Quaternary deposits derived from the local plutonic igneous rocks have a low probability to contain fossils; however, older, finer grained alluvial sediments may contain significant paleontological resources. Based on the results of the field survey (see Section 7), older Quaternary deposits within the Project area are assigned a moderate paleontological potential (PFYC 3).

6.1.8 Younger Quaternary Deposits – Holocene (Qa, Qal, Qrs, Qf)

Younger Quaternary deposits typically consist of variable compositions of unconsolidated clay, silt, sand, gravel, and larger clasts. Holocene sediments within the Project area consist of alluvium (Qa, Qal), fanglomerate (Qf), and Mojave River channel sand (Qrs) (Dibblee, 2008a, 2008b, 1967; Hewett, 1956; Jennings et al., 1962). Holocene age (less than 11,000 years old) sediments are typically too young to contain fossilized material (Society of Vertebrate Paleontology [SVP] 2010), but they may overlie sensitive older (e.g., Pliocene and Pleistocene age) deposits at variable depth. Younger Quaternary deposits are assigned low paleontological potential (PFYC 2) at the surface using BLM (2016) guidelines. However, they have an unknown paleontological potential in the subsurface since there is potential for these deposits to be conformably underlain by older, paleontologically sensitive geologic units.

6.2 PALEONTOLOGICAL RECORD SEARCH RESULTS

Paleontological records searches were requested from SBCM and LVNHM in order to identify if there are any known fossils within the Project boundaries. On September 14, 2017, SBCM reported that they had one locality from within the Project boundaries near Daggett, two from within a one-mile radius, and seven localities within a two-mile radius (Gilbert, 2017; Appendix D). The localities were all recovered from areas indicated by SBCM as later Neogene- to Quaternary-aged valley alluvium, and consist of a mix of both extinct and extant taxa of Pleistocene age. Recovered fossils include specimens of large mammals such as camel (*Camelops* sp.), horse (*Equus* sp.; cf. *Equus occidentalis*), mammoth (*Mammuthus* sp.), and sloth (Megalonychidae), as well as a variety of smaller taxa such as turtles, lizards, snakes, amphibians, birds, rabbits, and rodents. SBCM also noted that

abundant fusulinid, coral, and other marine fossils have been recovered from the Bird Spring Formation in the Mojave Desert; and that there is also the potential for younger (Pleistocene/Holocene) cave and/or midden deposits to have formed in the Bird Spring Formation (Gilbert, 2017). However, no cave or midden deposits were observed during the survey and are thus not expected to be impacted by the Project.

LVNHM responded on August 29, 2017 that they do not have any localities recorded from within the Project boundaries, and that the closest locality is a ground sloth recovered from Devil's Hole (Bonde, 2017; Appendix D), which is located north of the Project area in Nye County, Nevada.

The NPS Mojave National Preserve also report that they had discovered fossils of Pleistocene horse, camel, rodent, and fish fossils approximately a mile south of the LVRAS Project (David Burdette, Pers. Comm., 6/6/2017).

7.0 FIELD SURVEY

The survey area is located in southeastern California and southwestern Nevada with the Project right of way (ROW) spanning approximately 84 miles between Ludlow, San Bernardino County, California to an unnamed area in Clark County, Nevada adjacent to Joshua Tree Highway 164 as well as an additional storage yard in Daggett, California. The ROW is accessible via a graded access road which traverses a series of low to high relief alluvial fans, valleys, and several hill ranges. Segments of this access road, labeled on maps as Powerline Road, were paved with asphalt some years ago, but due to minimal maintenance the pavement has since been heavily eroded or obscured by drifting sediment making access to certain ROW segments a challenge. Existing ground disturbances include the aforementioned graded and paved access road, transmission line facilities (substations), a railroad, three transmission distribution lines with associated graded pads and spur roads, roads and berms constructed from local sediment, fences, and litter debris. Surface sediments are exposed along the entirety of the ROW with the exception of areas with graded roads or natural vegetation.

7.1 GEOLOGY

Younger Quaternary alluvial deposits (Qa/Qal) are mapped throughout a vast majority of the Project ROW from the southwestern yard in Daggett, California to the northeastern ROW terminus in Clark County, Nevada. These younger sediments were exposed within numerous washes and outcrops atop the many low to moderate relief alluvial fans and valleys along the alignment. Sediments observed are light brown, light brown pink, tan, medium gray, gray green, poorly to moderately consolidated, moderately to poorly sorted, clay, silt, rounded to angular fine to very coarse sand, with subrounded to angular clasts of pebble to cobble sized metamorphic and igneous rock. These Qa/Qal sediments were observed to have some bedding structures as evidenced by clast sorted beds exposed within washes up to several feet high (Figures 2, 3, 4, 5, 7, 9, 10). Washes with banks were observed in the northeast end of the ROW by Nipton, California. These banks contained moderately to well concreted sediments of poorly sorted, rounded to angular fine to coarse sands, pebbles, cobbles (Figure 10).

The Daggett training and storage yard located in Daggett, California is mapped within an area of younger Quaternary alluvium (Qa/Qal) however recent grading and the presence of artificial gravel and temporary structures such as post fencing and trailers indicate that the (Qa/Qal) within the yard is very likely disturbed (Figure 11). Similarly, the Nipton, California yard is also mapped within (Qa/Qal) and has also been disturbed by similar grading and temporary infrastructure.

Older Quaternary alluvium sediments (Qoa) are mapped in several locations along the ROW typically adjacent or near to moderate relief hills composed of igneous or metamorphic rock. These older sediments form alluvial fans or lobes raised above the lower elevation (Qa/Qal). Sediments observed are tan, light brown, pink brown, light gray, poorly consolidated, poorly sorted, very fine to coarse sands, with subrounded to angular clasts of pebble, cobble, and boulder sized igneous, sedimentary, metamorphic rock (Figures 6, 12).

Tertiary (Oligocene- to Miocene-aged) tuff breccia sediments (Tt) are mapped in the vicinities of towers M72-T2 to M73-T2. These tuffaceous sediments ranging from clastic to uniform ashfall are exposed within wash exposures and hillsides typically underlying surficial deposits of Quaternary alluvium. Sediments observed are mint green, grayish green, moderately to well lithified, very poorly to well sorted, ash and very fine to coarse sands, with subrounded to angular clasts of gravel to pebble sized volcanic tephra (Figure 13).

Tertiary andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf) are mapped in the vicinities of M71-T5 to M73-T3 and M79-T3. These sediments are exposed surficially within alluvial lobes and low to moderate relief hill slopes. Sediments observed are light brown, grayish brown, poorly to moderately compacted, poorly to moderately sorted, silty, very fine to coarse sands, with rounded to subangular clasts of pebble to boulder sized igneous volcanic rock (Figure 14).

Tertiary (Oligocene- to Miocene-aged) sandstone (Tss) is mapped within the vicinity of towers M77-T3 to M78-T3. These sediment outcroppings are exposed between moderate relief hills of igneous plutonic and igneous bedrock either adjacent to bedrock or directly below shallow colluvium eroding from said hills. Sediments observed are pale pink red, brick red, well to very well lithified, medium to very coarse sands with subrounded to subangular clasts of igneous plutonic minerals, with laminated and cross bedded structures (Figures 15, 16, 17). Compaction and mineralization of this unit give it an almost granitic crystalline appearance.

Permian-aged Bird Spring Formation limestone (Pbs) is mapped in the vicinities of towers M104-T2 to M106-T1. Outcroppings of this limestone form massive, moderate to high relief hills rising above surrounding low relief alluvial washes and valleys. In addition, Pbs bedrock makes contact with adjacent pre-Cambrian igneous and metamorphic bedrock. Sediments observed are light to dark gray weathering to light to medium gray, microcrystalline, well lithified, well sorted grains (Figures 9, 18, 19). Late Mississippian-aged Monte Cristo Limestone (Mmc) is mapped adjacent to Pbs, but exposures of Mmc were not observed during the survey.

An unnamed unit noted as Tertiary sediments and flows (Tsf) is mapped south of towers M148-T3 and M149-T1 on the northeast end of the alignment. Topographically, the outcrop forms a moderate relief hill sitting above low relief Qal slopes and washes. Observation of this Tsf outcrop revealed an igneous volcanic rock formation purplish black in color weathering to reddish black, very well indurated, with an aphanitic crystalline groundmass (Figures 20, 21).

Paleozoic- to Cenozoic-aged igneous and metamorphic rocks were encountered across the Project area in varying degrees of exposure from small outcroppings to broad slopes to high relief hills. Several segments of the ROW cross through areas where structures and access roads are built directly into these igneous and metamorphic units (Figures 8, 20-25).

7.2 PALEONTOLOGY

No paleontological resources were observed during the survey. However, sediments conducive to fossil preservation were observed within the older Quaternary alluvium (Qoa); Tertiary sandstone

(Tss), tuff breccia (Tt), andesitic fanglomerate (Taf), and volcanic fanglomerate sediments (Tvf); and Permian Bird Spring Formation (Pbs). As part of the survey, previously documented NPS Mojave National Preserve localities outside of the assigned survey buffer, but close to the Project ROW were investigated to determine the sedimentary composition around the localities. Sediments observed were analogous to the previously encountered Qa/Qal sediments observed through the survey; light tan brown to light grayish brown, poorly to moderately compacted, poorly to moderately sorted, clay-sized grains to medium sands with rounded to subangular clasts of igneous and metamorphic rock present as surface float, with cross-bedded and popcorn weathering-like structures (Figures 26-28). The fossils previously discovered at these localities were not present and no new fossil resources were observed or collected.

Figure 2. View along ROW from Qa fan looking toward hills. View to northeast.

Figure 3. View of Qa valley with hills in foreground and background composed of mixed igneous and metamorphic rock. View to north.

Figure 4. Overview photo taken from M109-T4 showing terrain of alluvial fans, washes, and moderate to high relief hills. View to southwest.

Figure 5. Shallow wash in Qal. View to south.

Figure 6. 5-10' high Qoa lobe dissected by wash. View to west.

Figure 7. Qal fan exposed by gravelly wash. View to west.

Figure 8. Moderate relief hills composed of igneous plutonic and volcanic rock above Tss exposures. View to west.

Figure 9. High relief cliffs of Bird Spring Formation limestone rising above Qal valley. View to north.

Figure 10. Qal wash with indurated banks. View to east.

Figure 11. Disturbed surface Qa at Daggett Storage Yard. View to south.

Figure 12. Lobe of coarse Qoa above wash. View to southwest.

Figure 13. Greenish Tertiary tuff breccia exposed in hillside under Quaternary alluvium. View to northwest.

Figure 14. Tertiary andesitic fanglomerate exposure. View to south.

Figure 15. Tss exposure beside wash. View down.

Figure 16. Planar laminations and cross-bedding observed in Tss outcrop. View to north.

Figure 17. Tss outcrop within hillside. View to west.

Figure 18. Bird Spring Formation limestone outcrop. View to north.

Figure 19. Bird Spring Formation limestone cliffs and hills above wash. View to south.

Figure 20. Tertiary sediments and flows (Tsf) hill. View to east.

Figure 21. Outcrop of Tsf with Qal valley below. View to west.

Figure 22. Outcrop of pre-Cambrian granite and gneiss adjacent to access road. View to southwest.

Figure 23. Outcrop of pre-Cambrian granite and gneiss. View to west.

Figure 24. Exposure of pre-Cambrian granite and gneiss adjacent to ROW access road. View to west.

Figure 25. Bedrock boulder exposure of Cretaceous Teutonia quartz monzonite surrounded by eroding flats of same quartz monzonite. View to southwest.

Figure 26. Mounds of popcorn weathered fine sediments at previously documented horse limb fossil locality. View to west.

Figure 27. Shallow, sandy wash topography surrounding previously documented fossil localities. View to east.

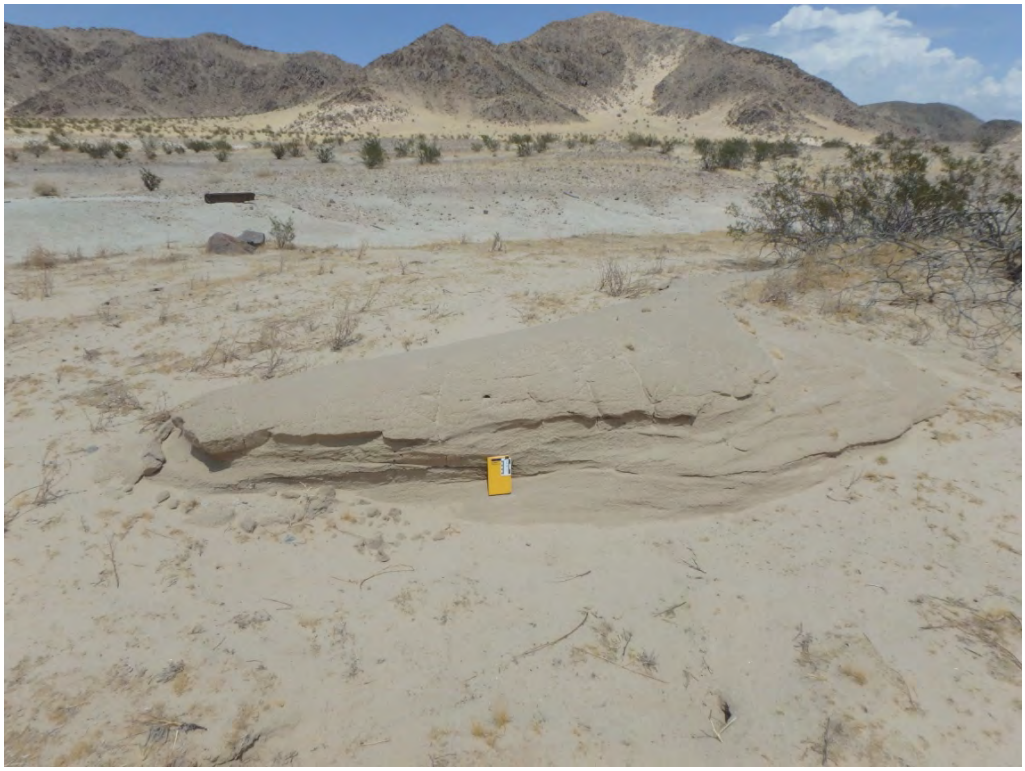

Figure 28. Bar of cross-bedded, well sorted sand within shallow wash within vicinity of previously documented tooth fragment locality. View to north.

8.0 IMPACTS TO PALEONTOLOGICAL RESOURCES

Impacts on paleontological resources can generally be classified as either direct, indirect or cumulative. Direct adverse impacts on surface or subsurface paleontological resources are the result of destruction by breakage and crushing as the result of surface disturbing actions including construction excavations. In areas that contain paleontologically sensitive geologic units, ground disturbance has the potential to adversely impact surface and subsurface paleontological resources of scientific importance. Without mitigation, these fossils and the paleontological data they could provide if properly recovered and documented, could be adversely impacted (damaged or destroyed), rendering them permanently unavailable to science and society.

Indirect impacts typically include those effects which result from the continuing implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of the construction of new roads and trails in areas that were previously less accessible. This increases public access and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. Human activities that increase erosion also cause indirect impacts to surface and subsurface fossils as the result of exposure, transport, weathering, and reburial.

Cumulative impacts can result from incrementally minor but collectively significant actions taking place over a period of time. The incremental loss of paleontological resources over time as a result construction-related surface disturbance or vandalism and unlawful collection would represent a significant cumulative adverse impact because it would result in the destruction of non-renewable paleontological resources and the associated irretrievable loss of scientific information.

Excavations into areas containing native older Quaternary deposits (Qoa); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf) and volcanic fanglomerate sediments (Tvf); Permian Bird Spring Formation (Pbs), and Lower Mississippian Monte Cristo Limestone (Mmc) may result in significant impacts to paleontological resources. Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) are unlikely to uncover significant fossil remains. However, older deposits are likely present below immediately below Holocene soils or alluvium. Excavations entirely within previously disturbed sediments or artificial fill are unlikely to uncover significant fossil remains; furthermore, any recovered resources will lack stratigraphic context. However, these deposits may shallowly overlie older in-situ sedimentary deposits. Therefore, grading and other earthmoving activities may potentially result in significant adverse impacts to paleontological resources throughout areas of the Project containing sedimentary units. Excavations into Proterozoic- to Cenozoic-aged igneous and metamorphic rock units, including the Tsf flow deposits, are unlikely to yield significant recognizable fossil remains.

9.0 RECOMMENDATIONS

Based on the ground disturbance necessary to complete this Project, there is the potential for adverse direct impacts to scientifically significant paleontological resources within older Quaternary deposits (Qoa) (PFYC 3); Tertiary sandstone (Tss), tuff breccia (Tt), andesitic fanglomerate (Taf), and volcanic fanglomerate sediments (Tvf) (PFYC U); Permian Bird Spring Formation (Pbs) (PFCY 3); and Lower Mississippian Monte Cristo Limestone (Mmc) (PFYC 3). Construction excavations which disturb these geologic units should be monitored by a professional paleontologist in order to reduce adverse impacts on scientifically important paleontological resources to a less than significant level.

Surface grading or shallow excavations entirely within Holocene young alluvial deposits (Qa/Qal) or previously disturbed sediments (PFYC 2) are unlikely to uncover significant fossil remains. However, older deposits are likely present below Holocene soils or alluvium. Therefore, excavations into these deposits that have the potential to impact underlying sedimentary deposits should be periodically spot checked. Monitoring and spot checking may be reduced at the discretion of a qualified paleontologist if the observed sediments are determined to be non-conducive to fossil preservation. Excavations into the igneous and metamorphic rock units (PFYC 1), including the Tsf flow deposits, will not require monitoring or spot checking.

Prior to construction, a PRMMP should be prepared. It should provide detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; a curation agreement; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PRMMP.

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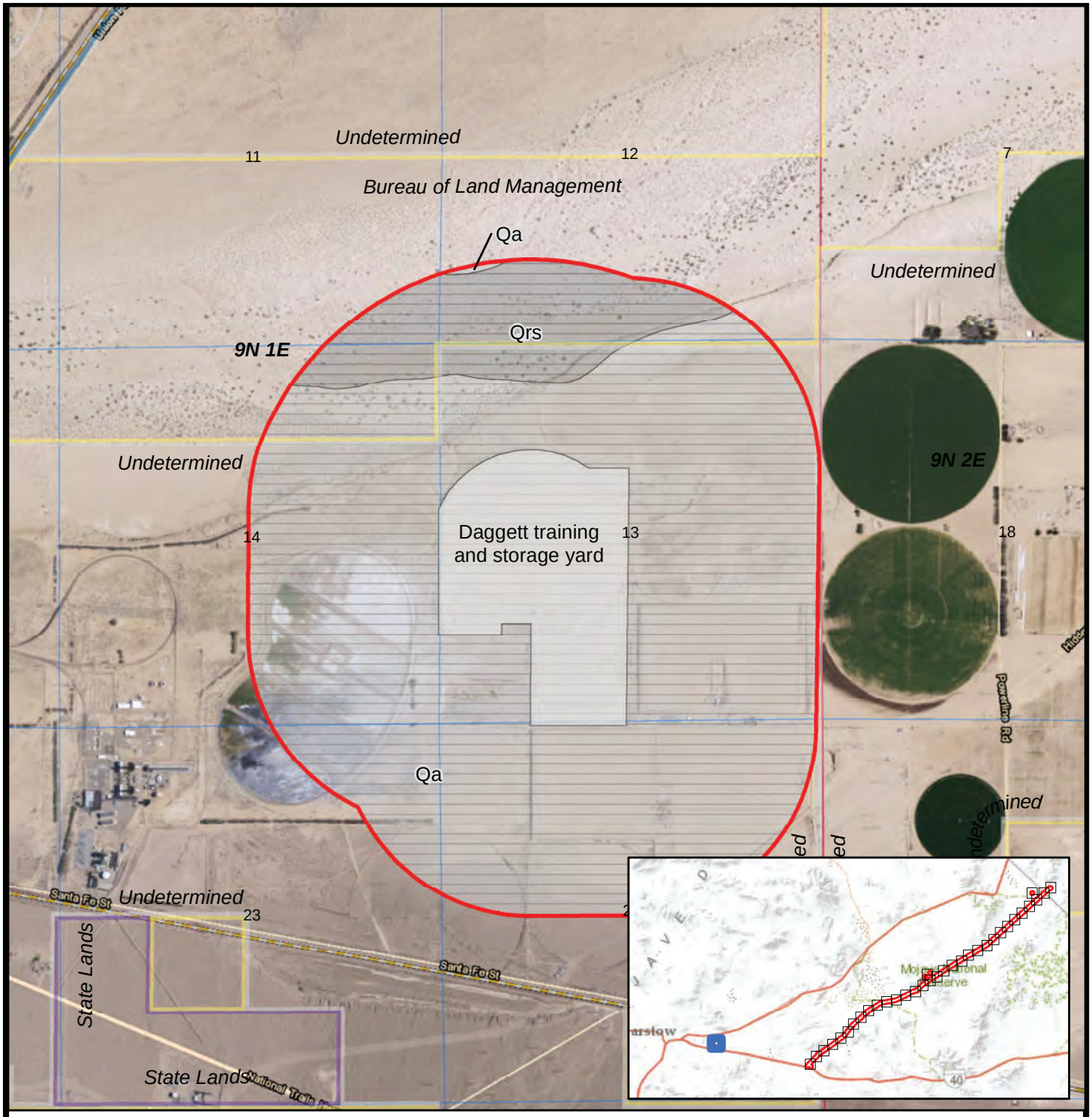
APPENDIX A. GEOLOGIC MAPS



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 1

- Material Laydown Yard
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qrs: Mojave River Channel Sand (Holocene)

Paleosensitivity

- 2 - Low

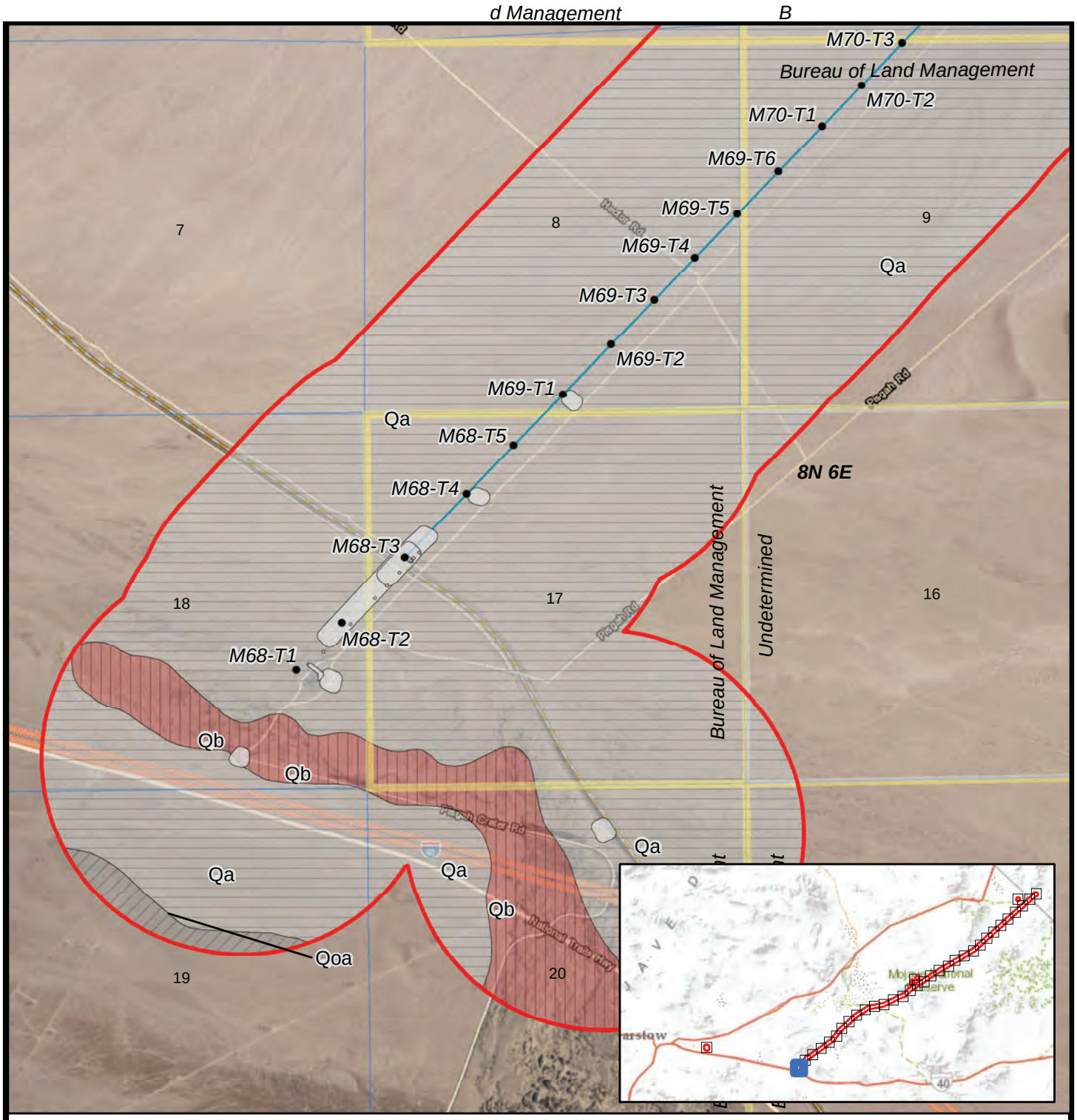
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 2

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qb/Qtb/QTb: Basalt (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1
Miles

N

PALEO SOLUTIONS
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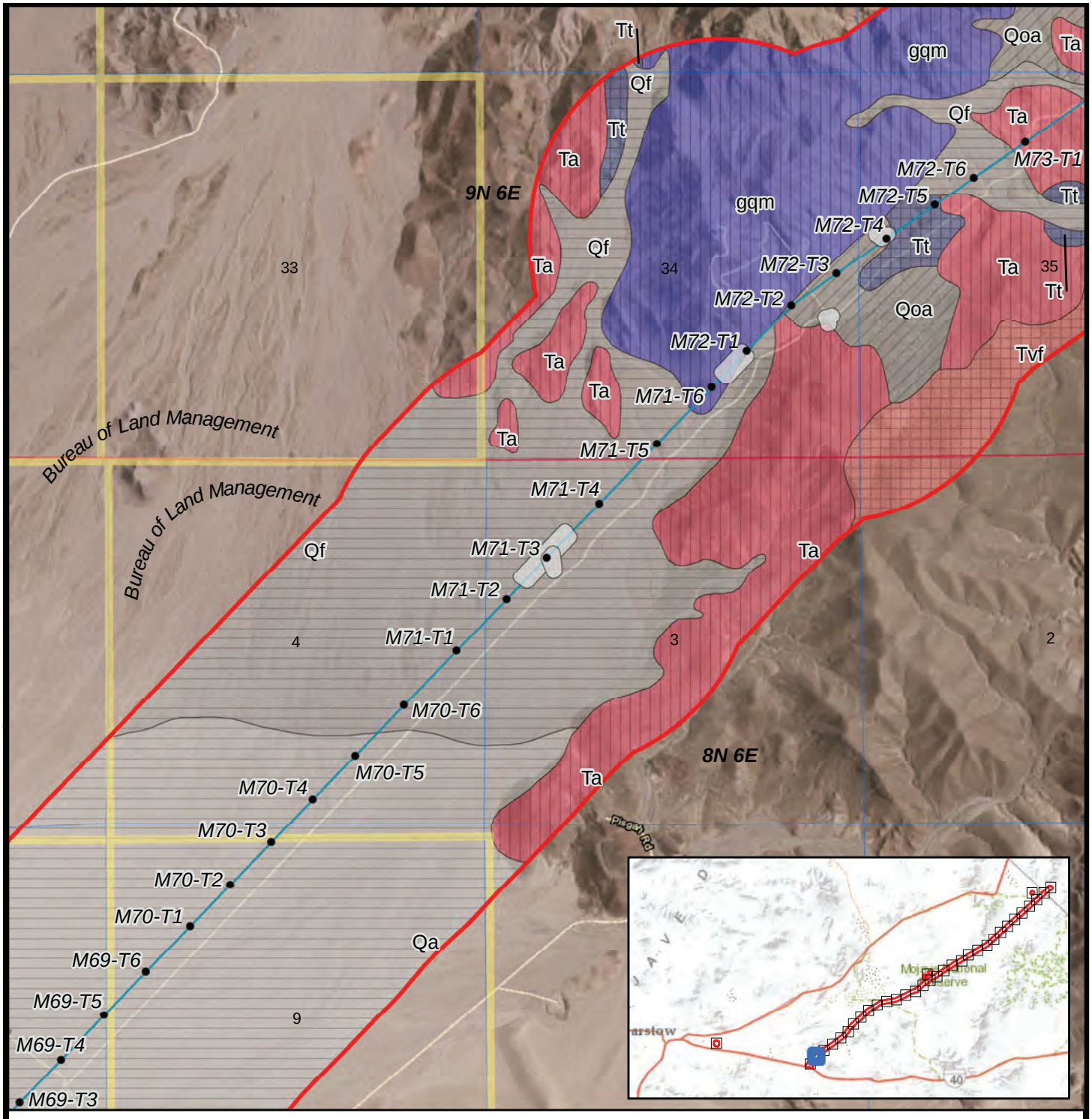
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 3

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Tvf: Volcanic Fanglomerate (Late Miocene or Early Quaternary)
- Ta: Andesite (Oligocene or Miocene)
- Tt: Tuff Breccia (Oligocene or Miocene)
- gqm: Granite or Quartz Monzonite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

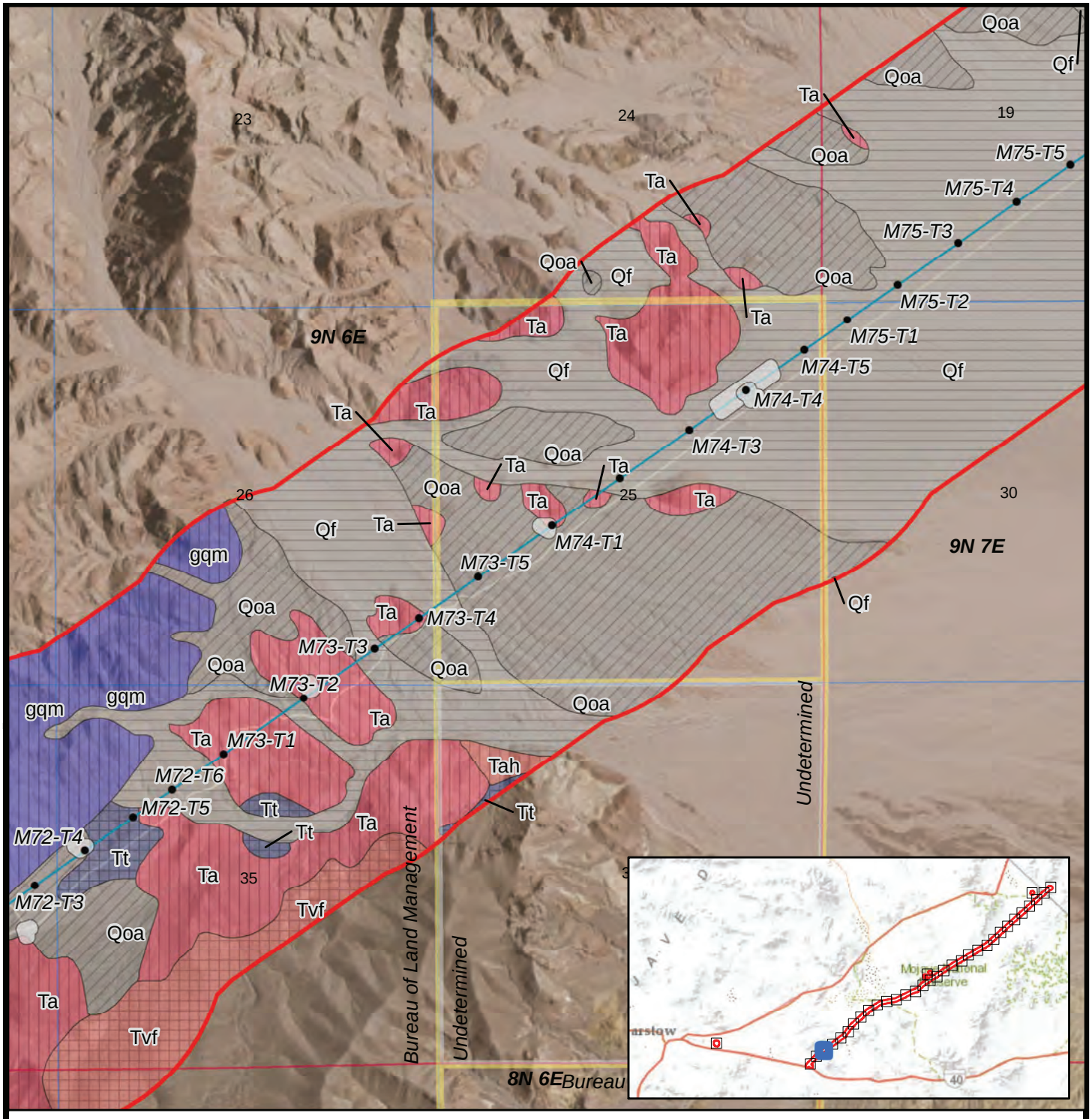
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 4

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Tvf: Volcanic Fanglomerate (Late Miocene or Early Quaternary)
- Ta: Andesite (Oligocene or Miocene)
- Tah: Altered Andesite Porphyry (Oligocene or Miocene)
- Tt: Tuff Breccia (Oligocene or Miocene
- gqm: Granite or Quartz Monzonite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

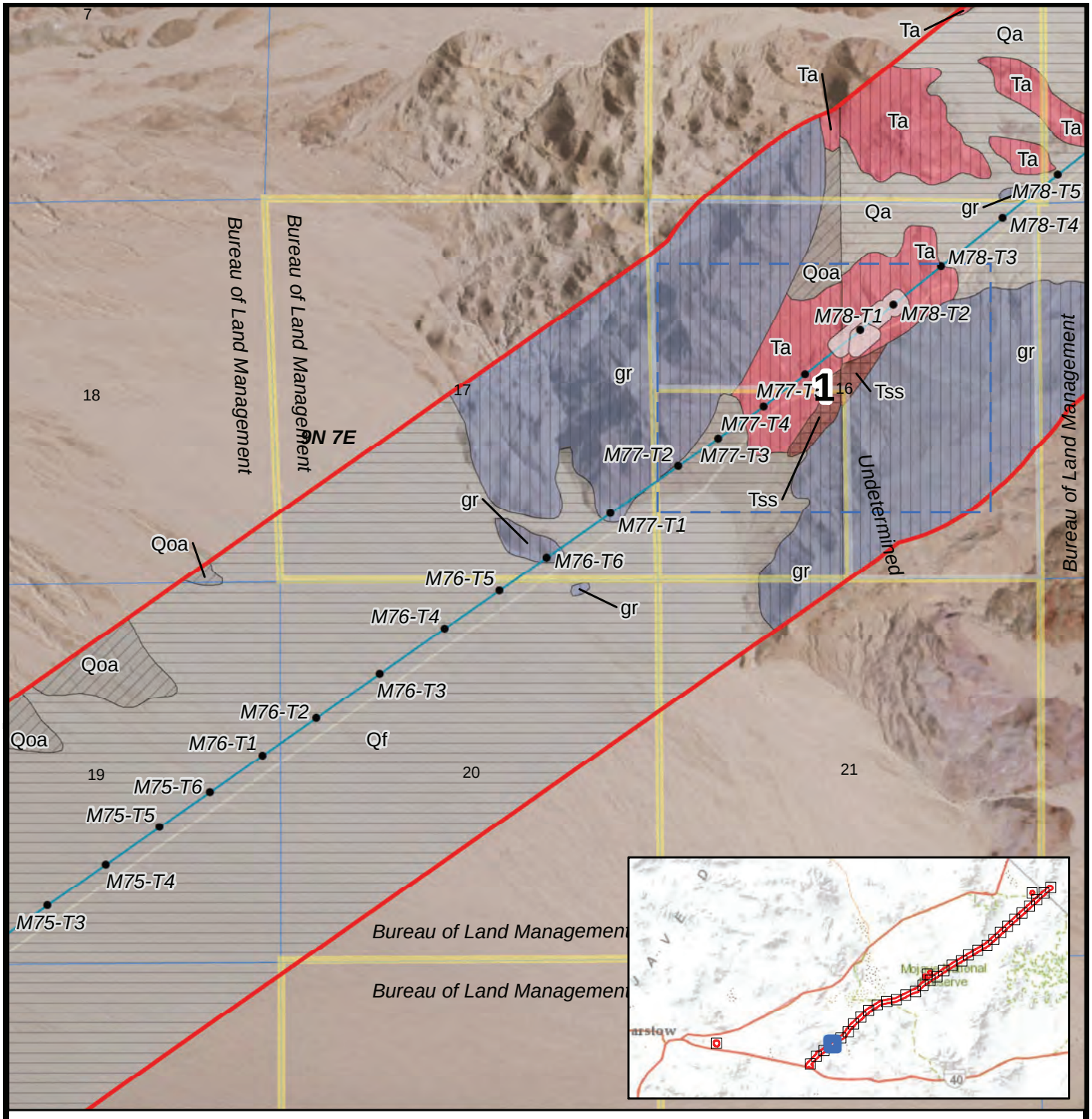
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 5

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Ta: Andesite (Oligocene or Miocene)
- Tss: Sandstone (Oligocene or Miocene)
- gr: Granite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

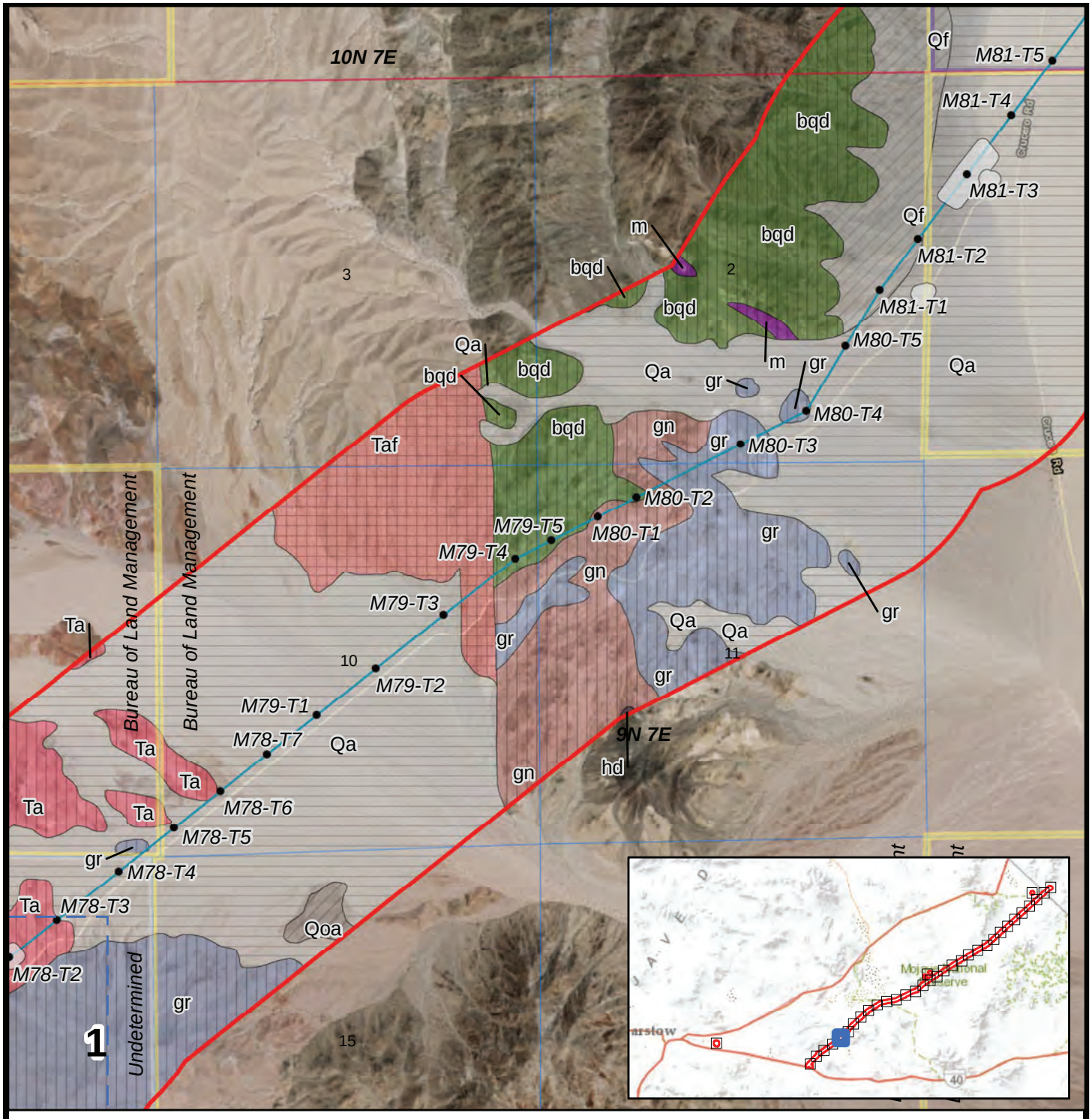
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California
Geologic Map of the Newberry & Cady Mountain 15 Minute Quadrangles, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 6

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)
- Ta: Andesite (Oligocene or Miocene)
- Taf: Andesitic Fanglomerate (Miocene or Pliocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gn: Gneiss (Mesozoic or Older)
- gr: Granite (Mesozoic)
- hd: Hornblende Diorite - Gabbro (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate
- U - Unknown

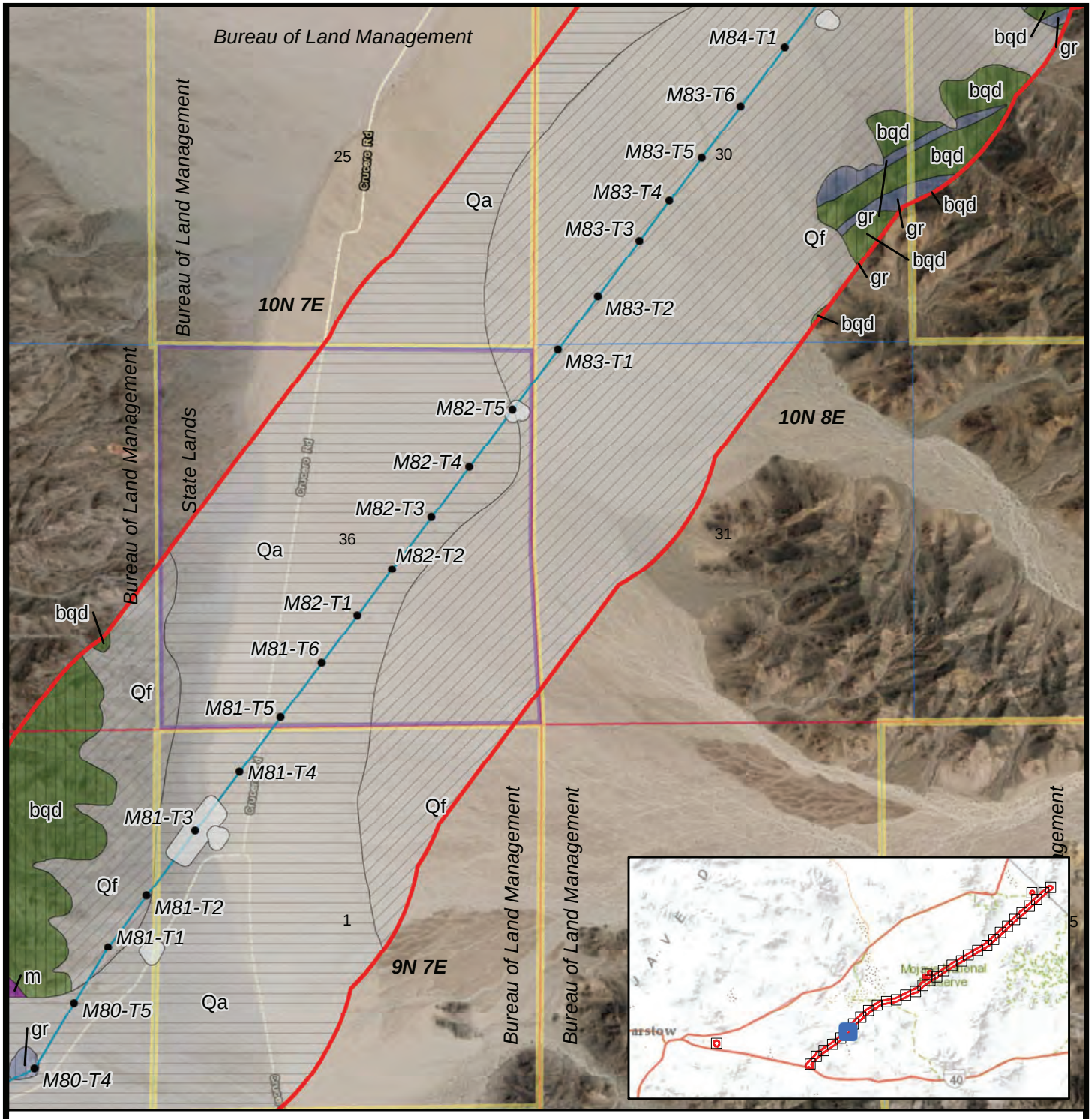
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 7

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gr: Granite (Mesozoic)

Paleosensitivity

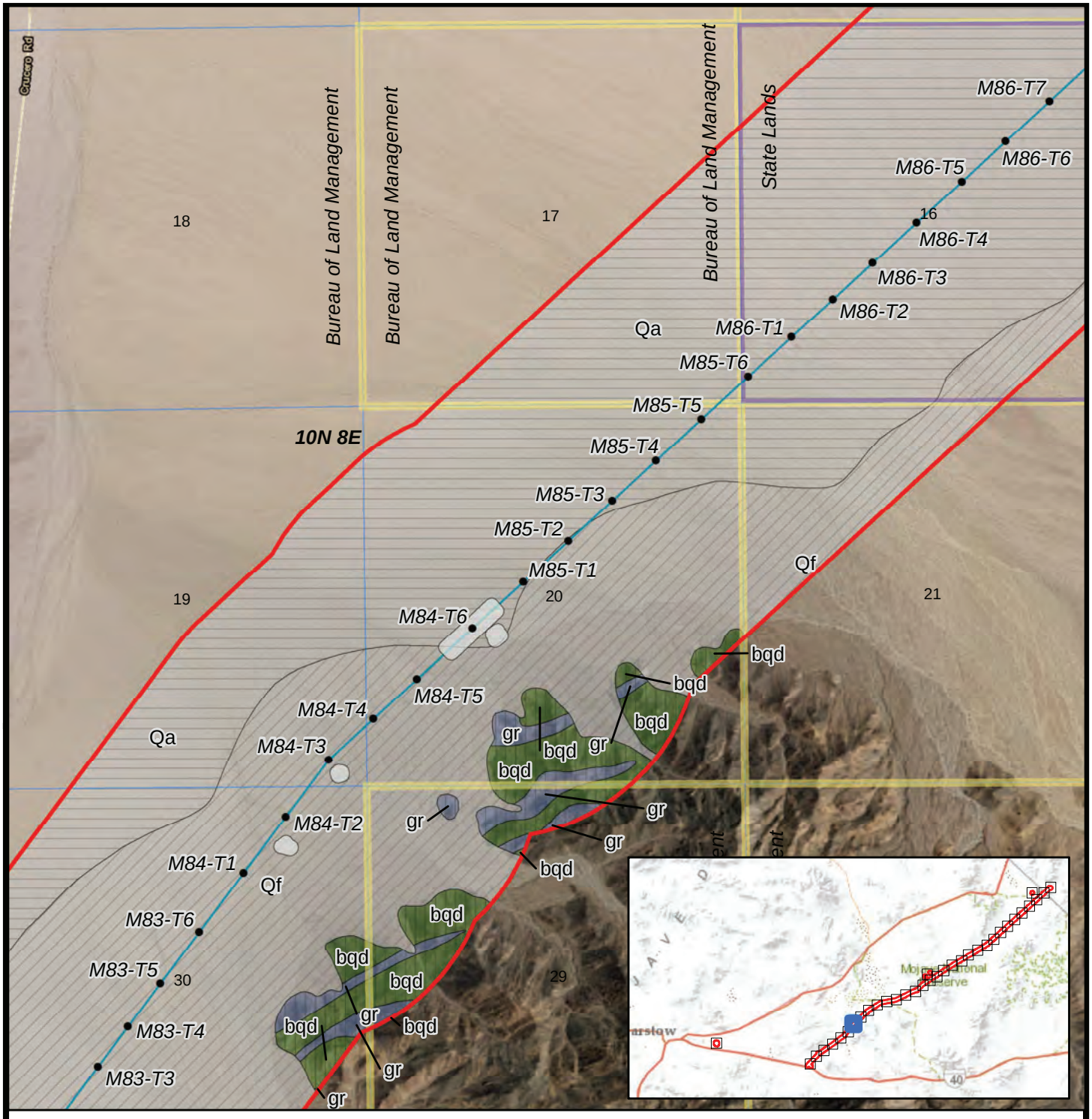
- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1 Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 8

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gr: Granite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

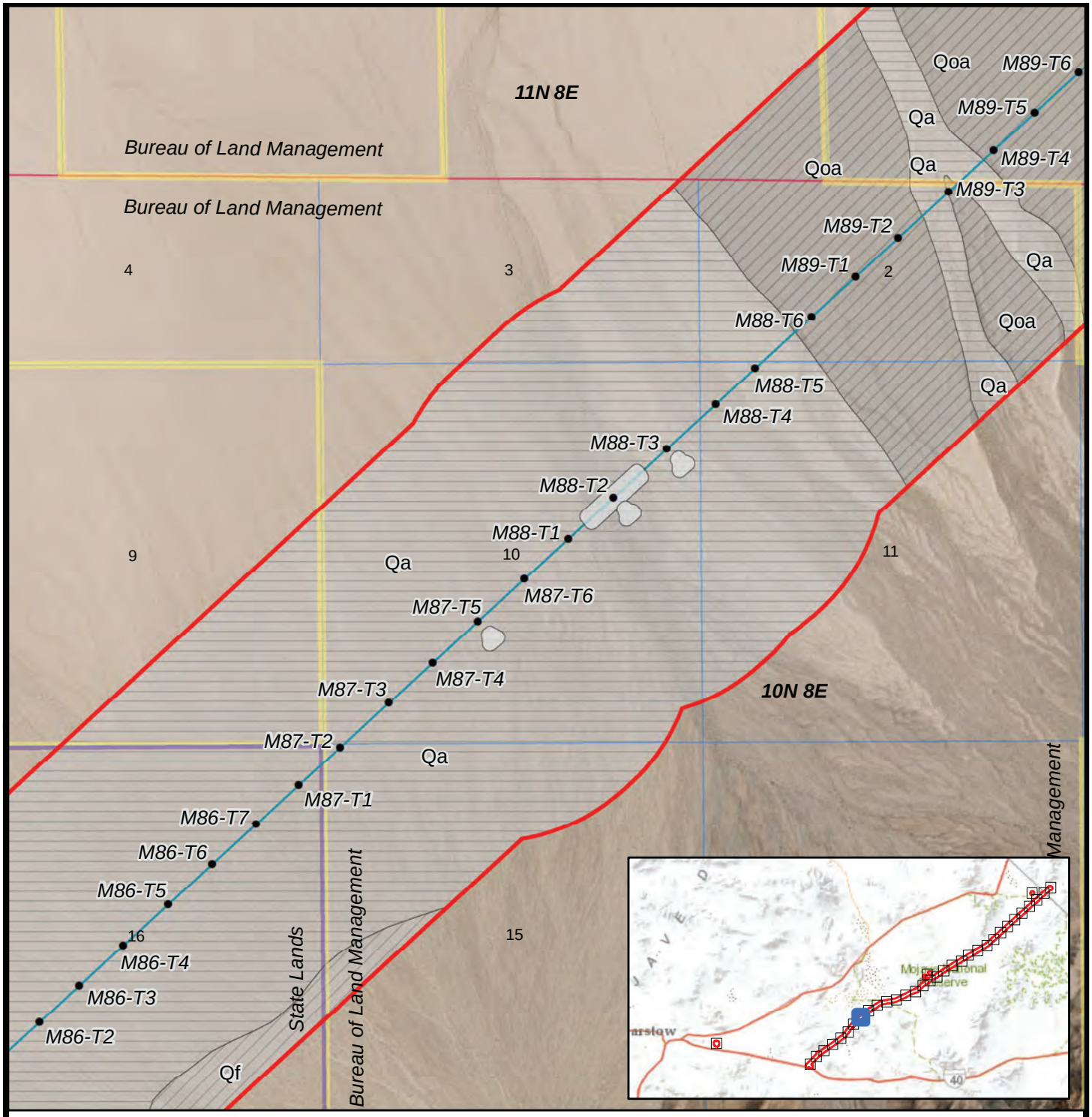
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 9

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qf: Fanglomerate (Pleistocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

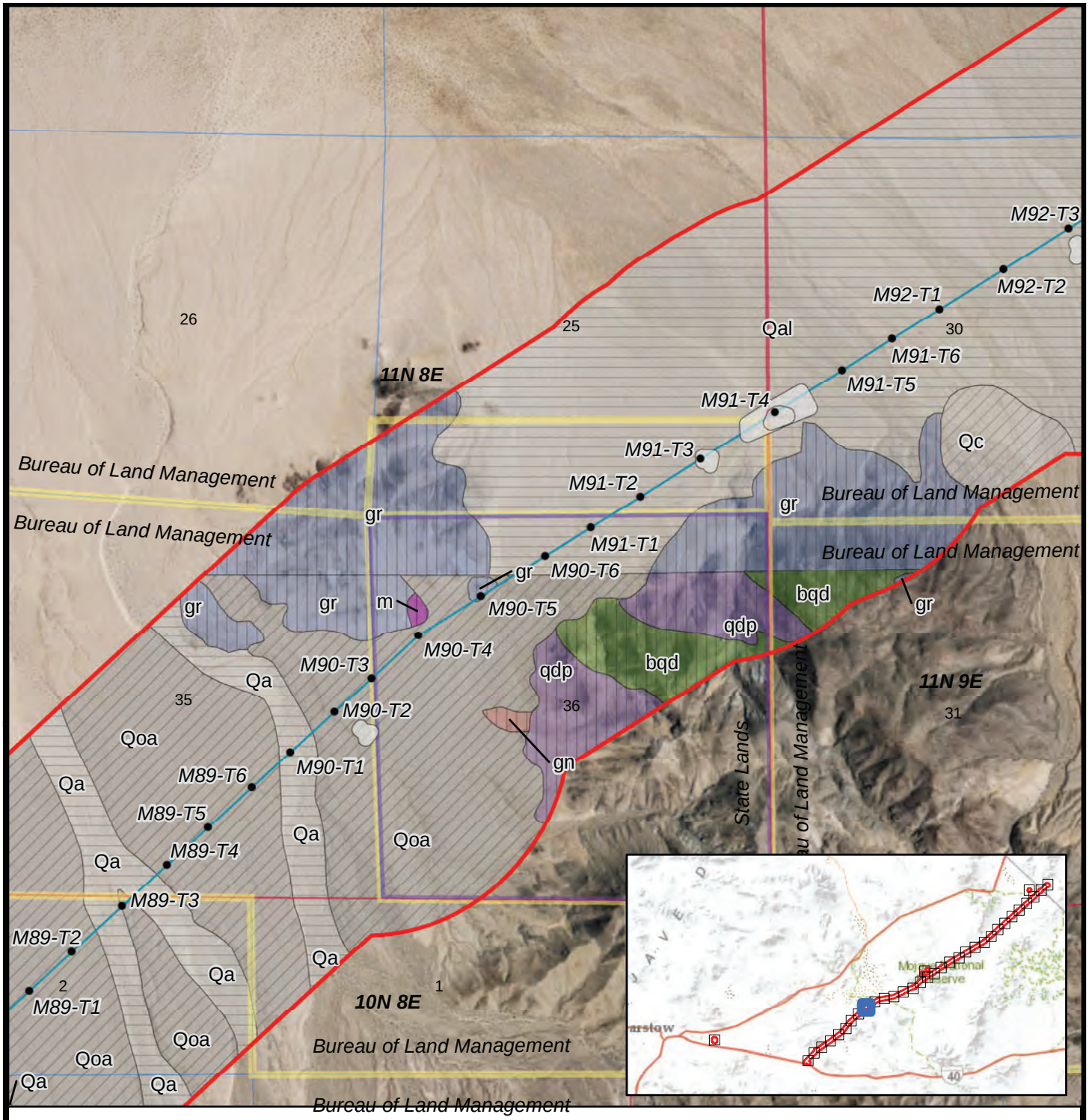
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of the Broadwell Lake
Quadrangle, San Bernardino County,
California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 10

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Qc: Older Alluvium (Pleistocene)
- m: Marble (Pre-Mesozoic)
- bqd: Biotite Quartz Diorite (Mesozoic or Older)
- gn: Gneiss (Mesozoic or Older)
- gr: Granite (Mesozoic)
- qdp: Quartz Diorite Porphyry (Mesozoi or Older)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

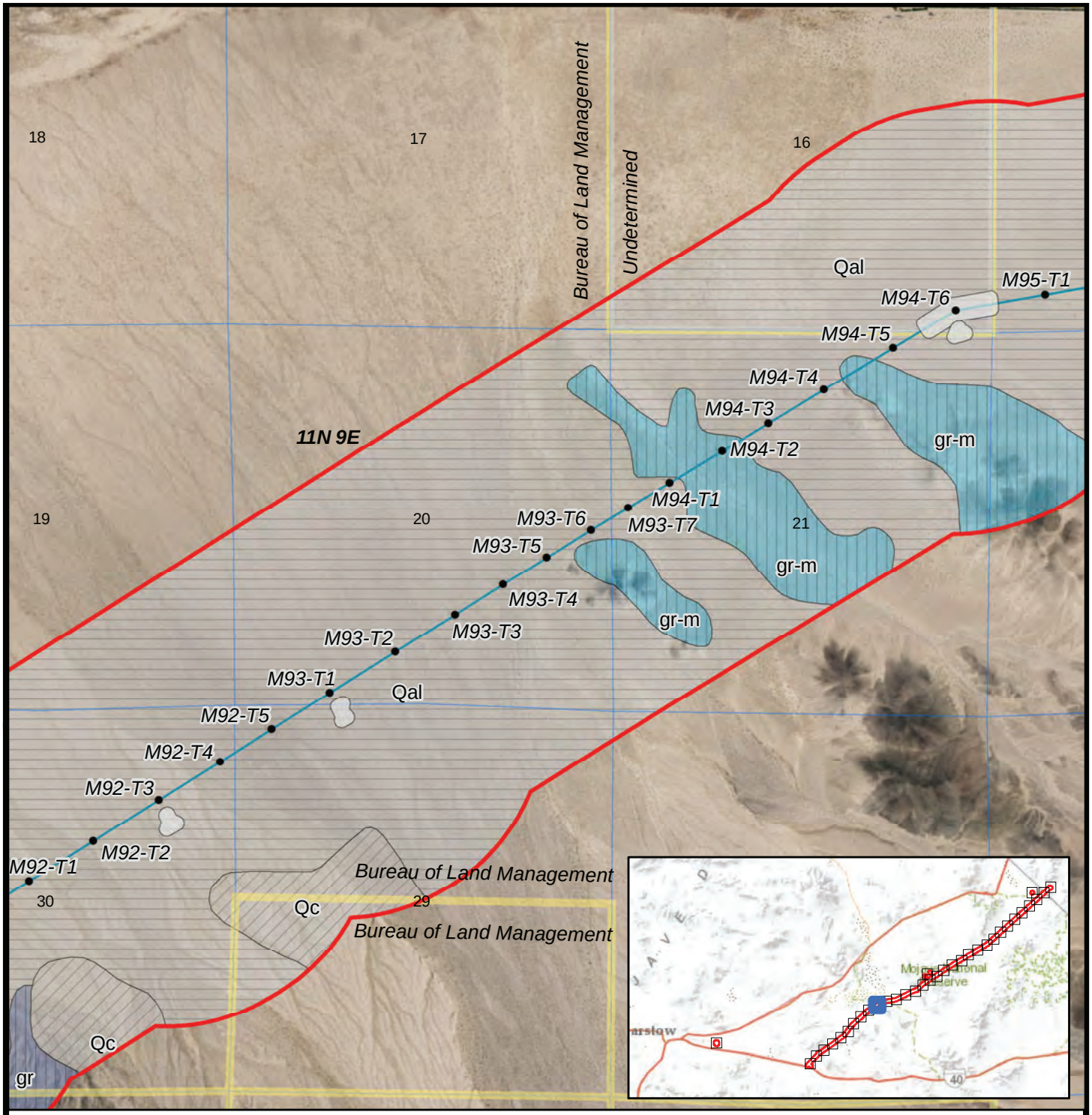
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map of California: Trona Sheet
Geologic Map of the Broadwell Lake Quadrangle, San Bernardino County, California



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 11

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qc: Older Alluvium (Pleistocene)
- gr-m: Granitic or Metamorphic (Pre-Cretaceous)
- gr: Granite (Mesozoic)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

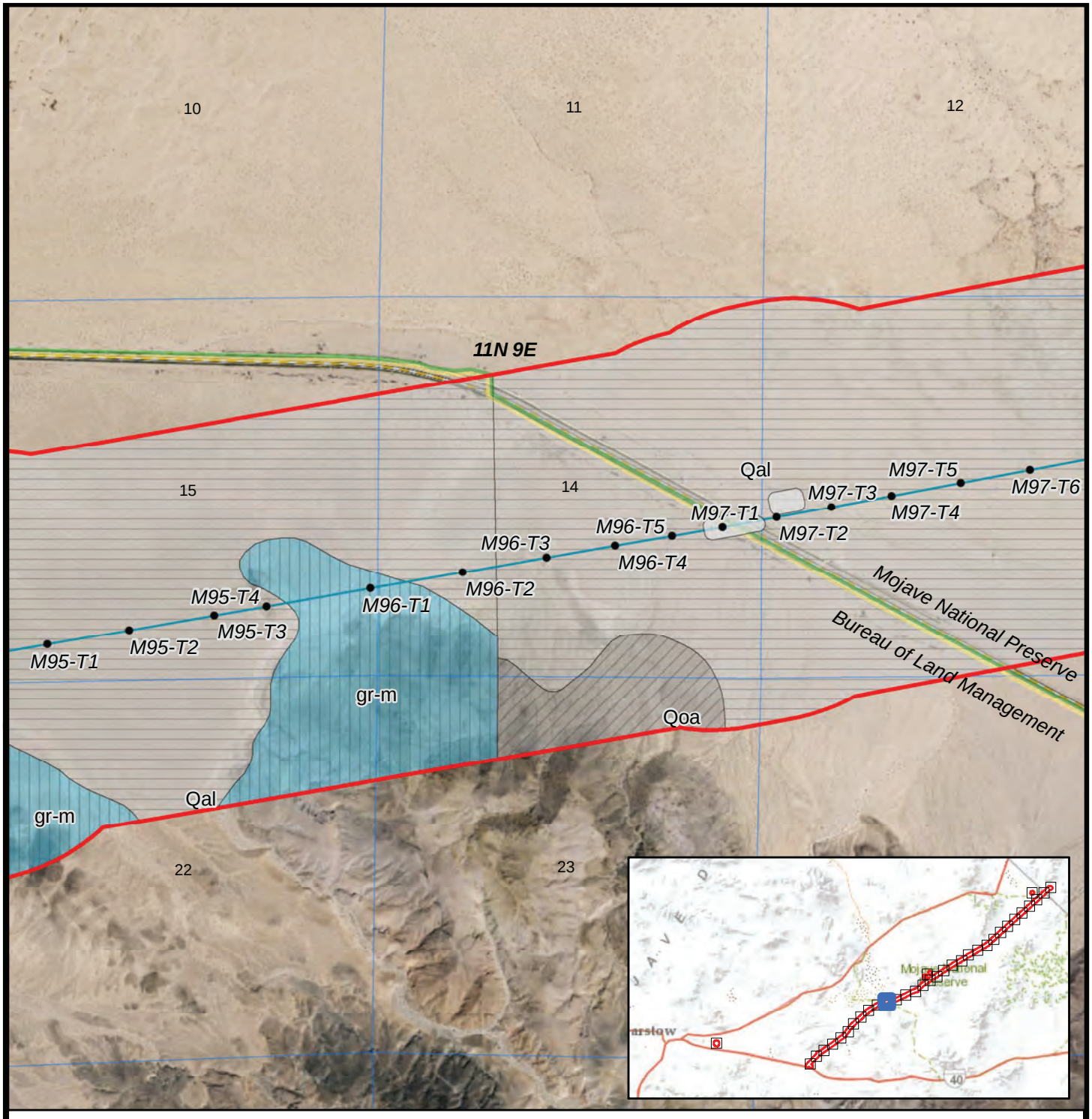
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center
Geologic Map of California: Trona Sheet



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 12

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- gr-m: Granitic or Metamorphic (Pre-Cretaceous)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

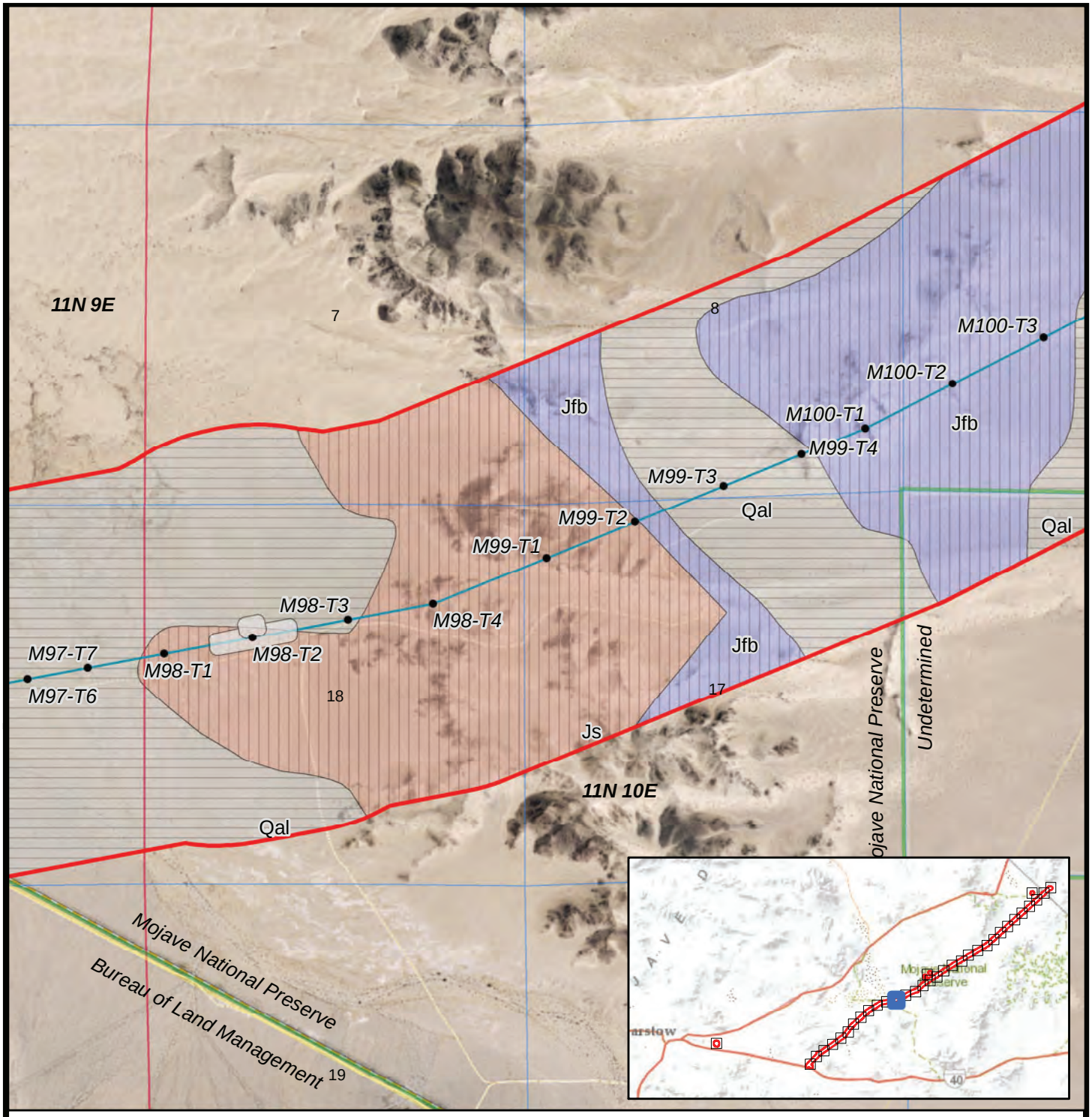
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah Quadrangle, California-Nevada
Geologic Map of California: Trona Sheet



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 13

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Jfb: Dacite Flow Breccia (Jurassic)
- Js: Sands Granite (Jurassic)

Paleosensitivity

- 1 - Very Low
- 2 - Low

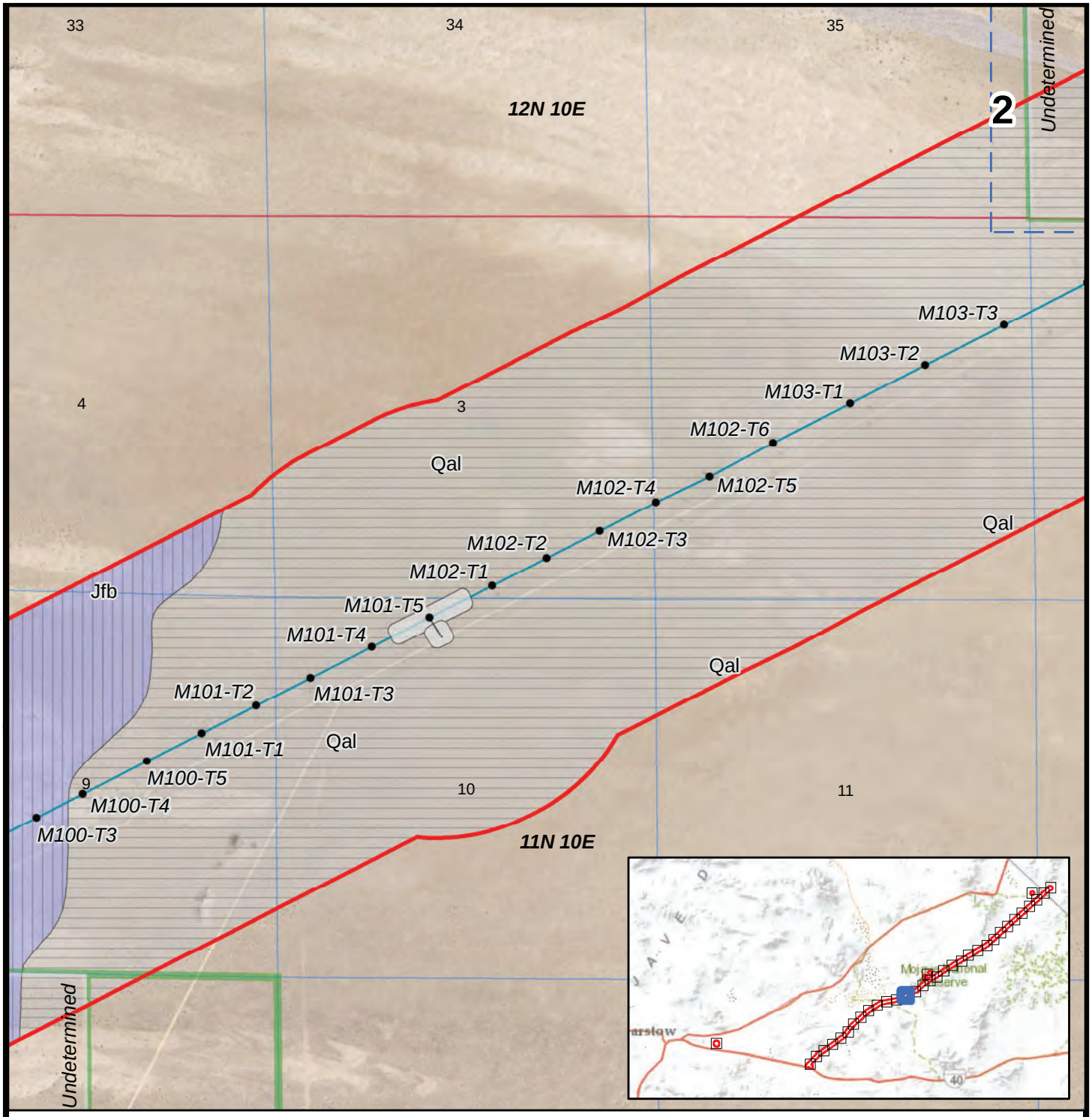
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 14

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Jfb: Dacite Flow Breccia (Jurassic)

Paleosensitivity

- 1 - Very Low
- 2 - Low

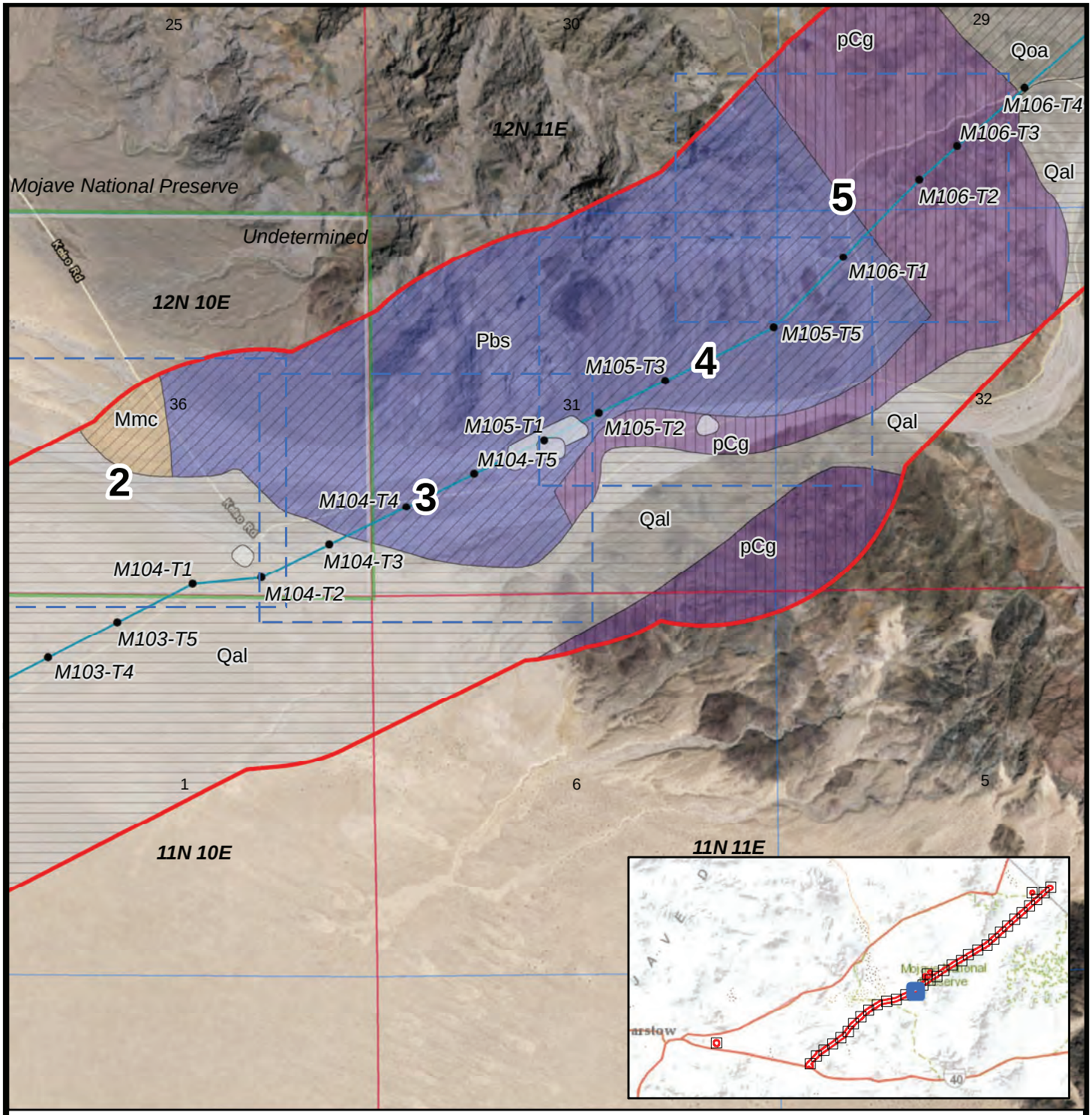
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 15

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Pbs: Bird Spring Formation (Pennsylvanian)
- Mmc: Monte Cristo Limestone (Devonian)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low
- 3 - Moderate

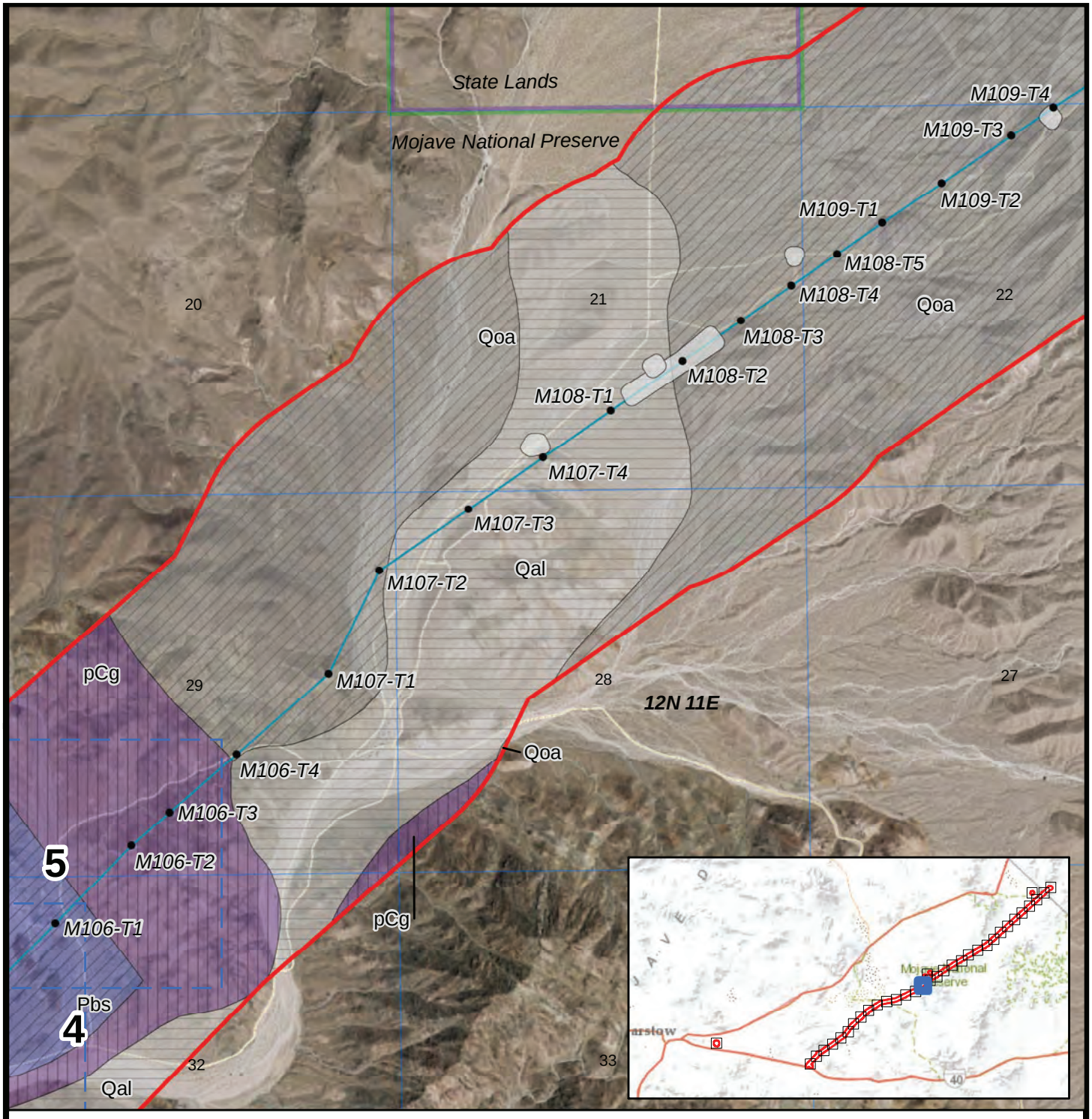
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 16

- Survey Pages
- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)
- Pbs: Bird Spring Formation (Pennsylvanian)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

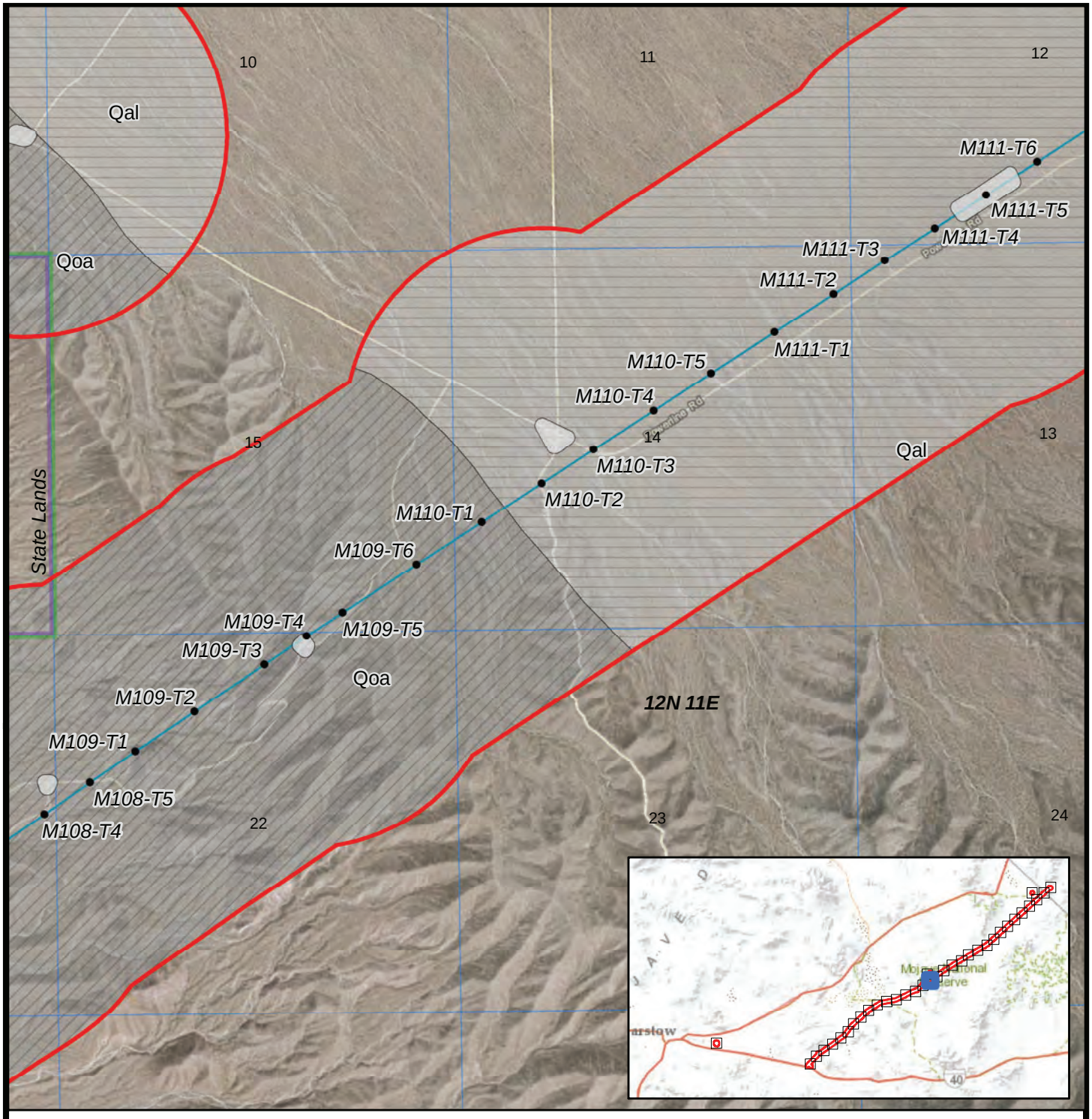
- 1 - Very Low
- 2 - Low
- 3 - Moderate

0 ¼ ½ 1 Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 17

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

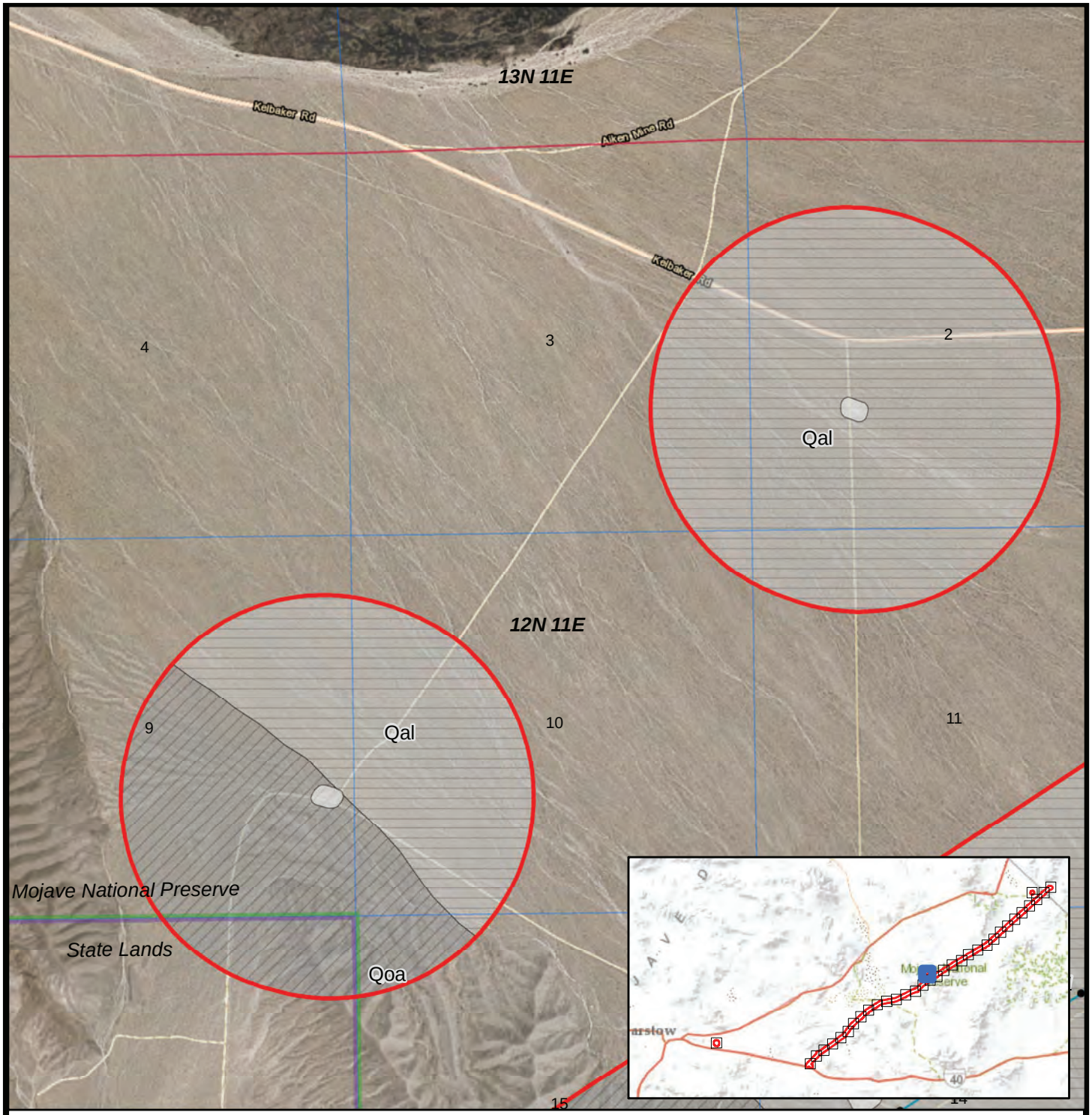
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 18

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Qoa: Older Alluvium (Pleistocene)

Paleosensitivity

- 2 - Low
- 3 - Moderate

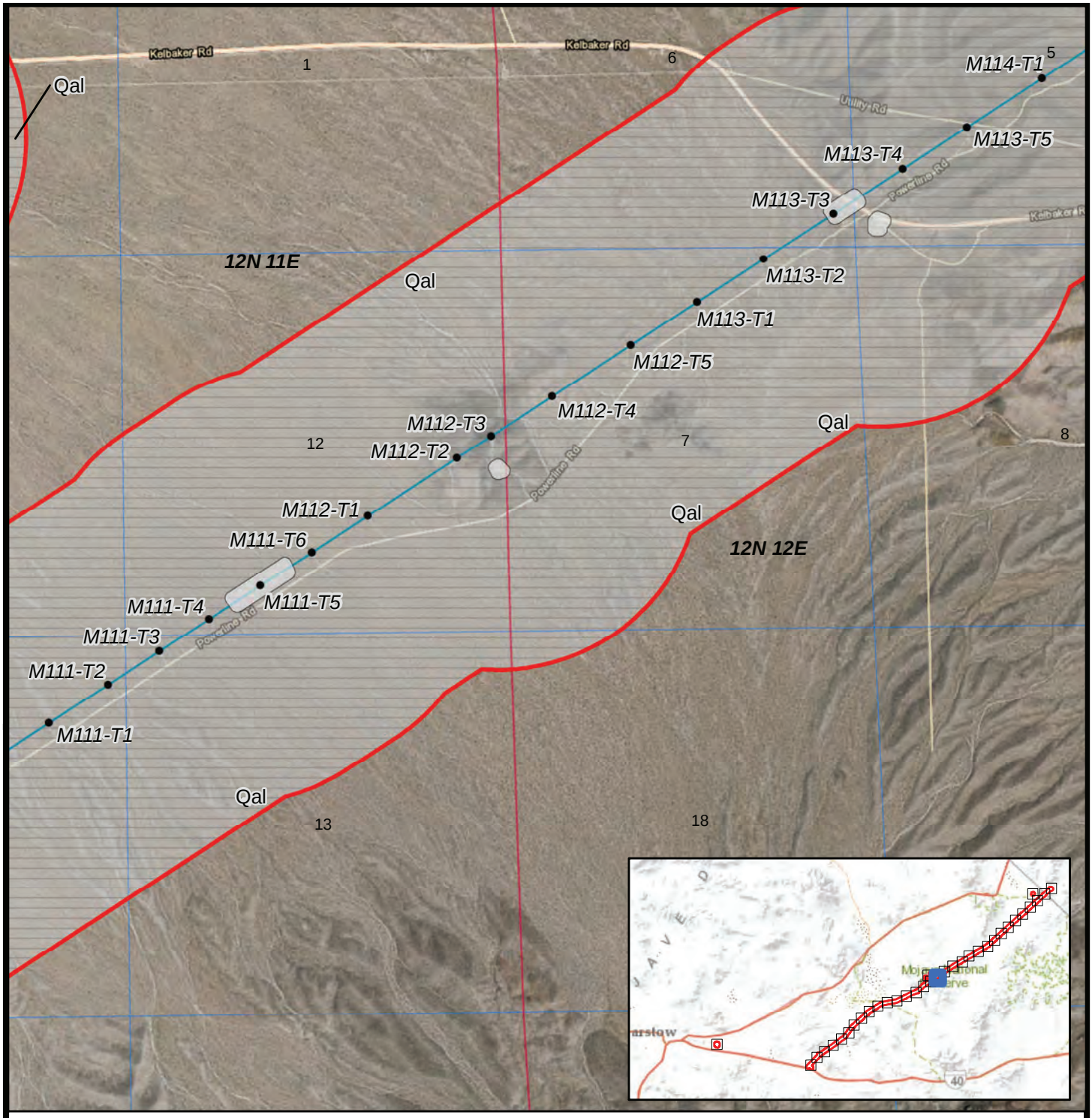
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 19

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

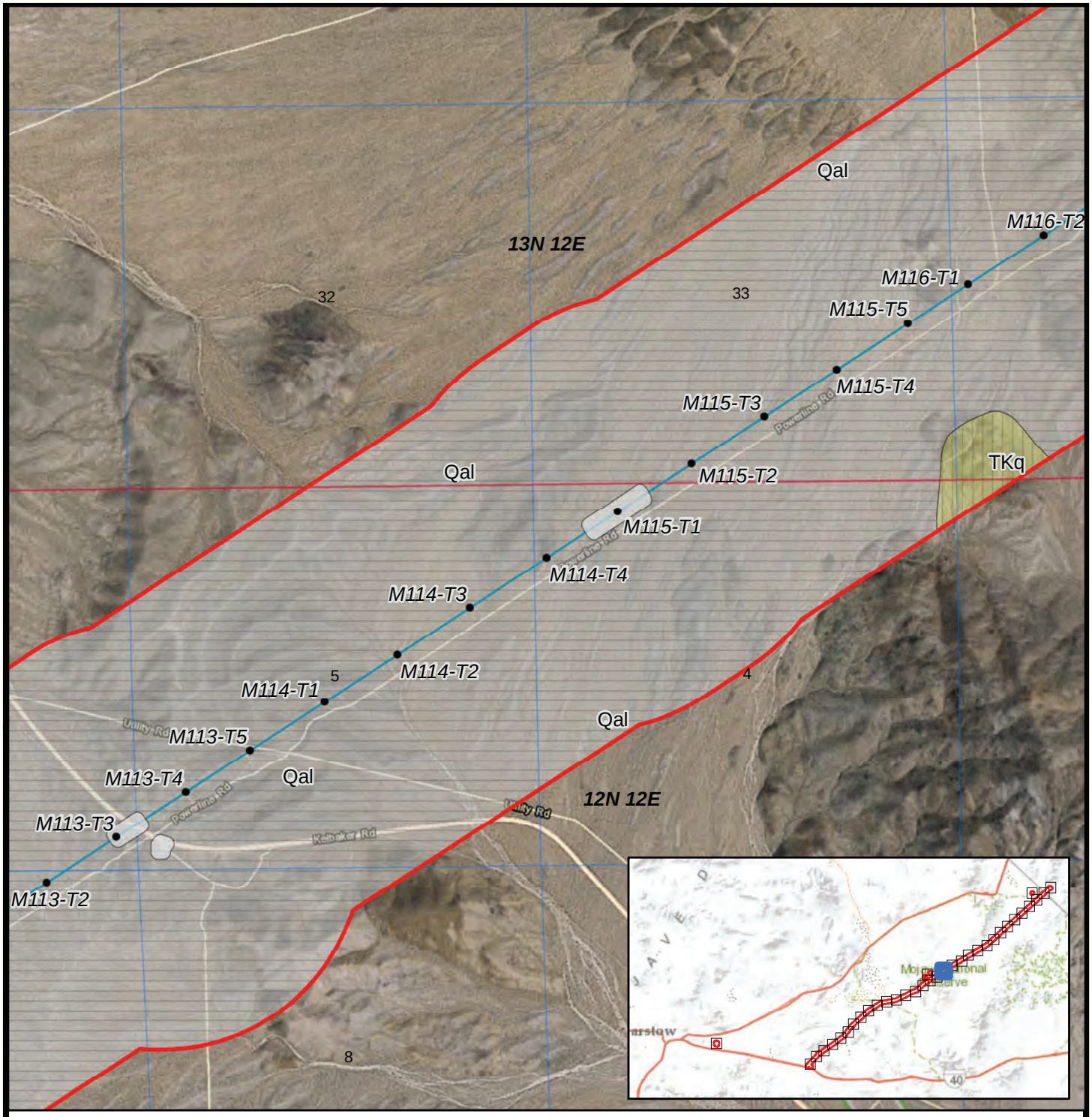
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 20

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

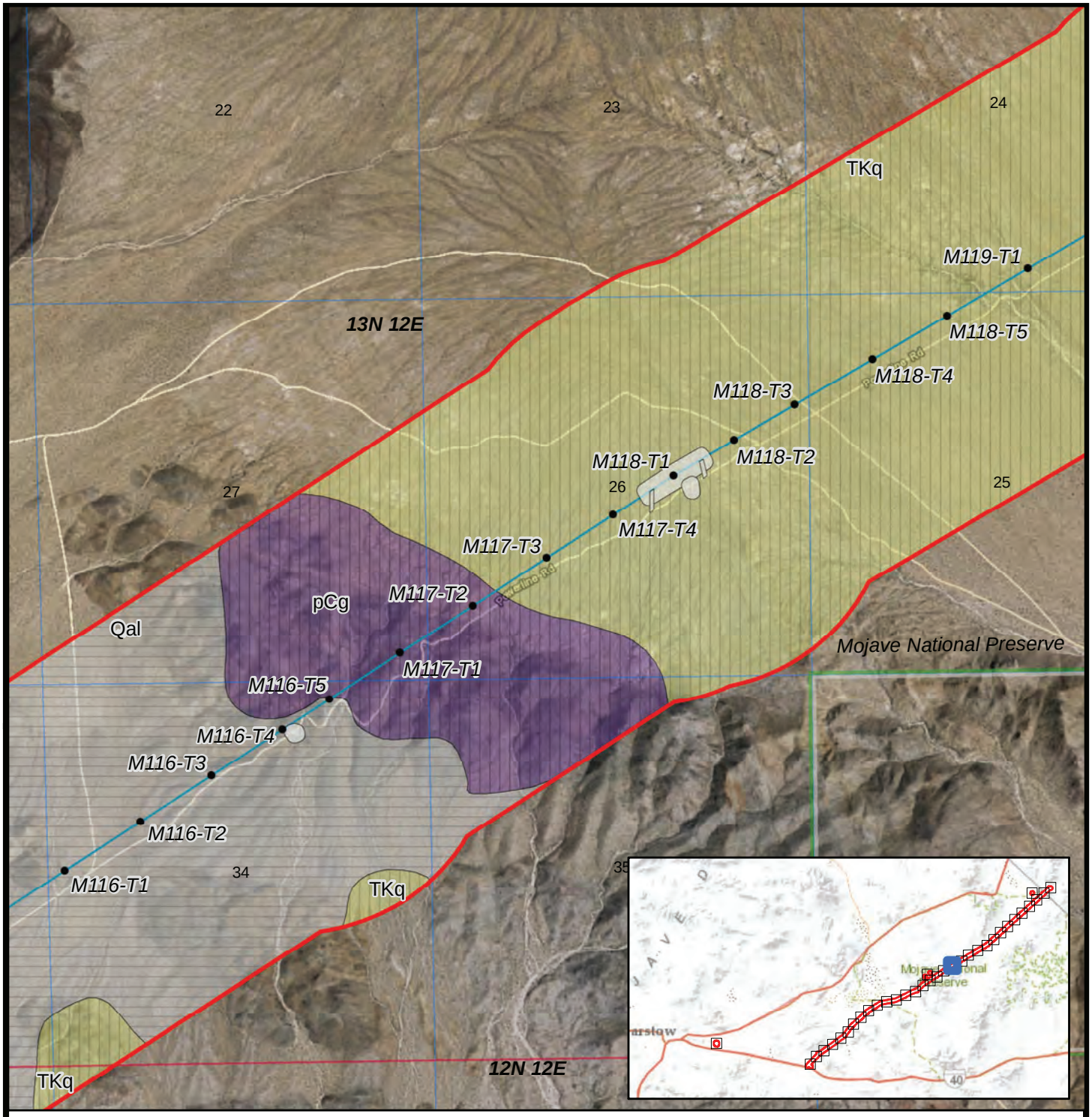
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 21

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

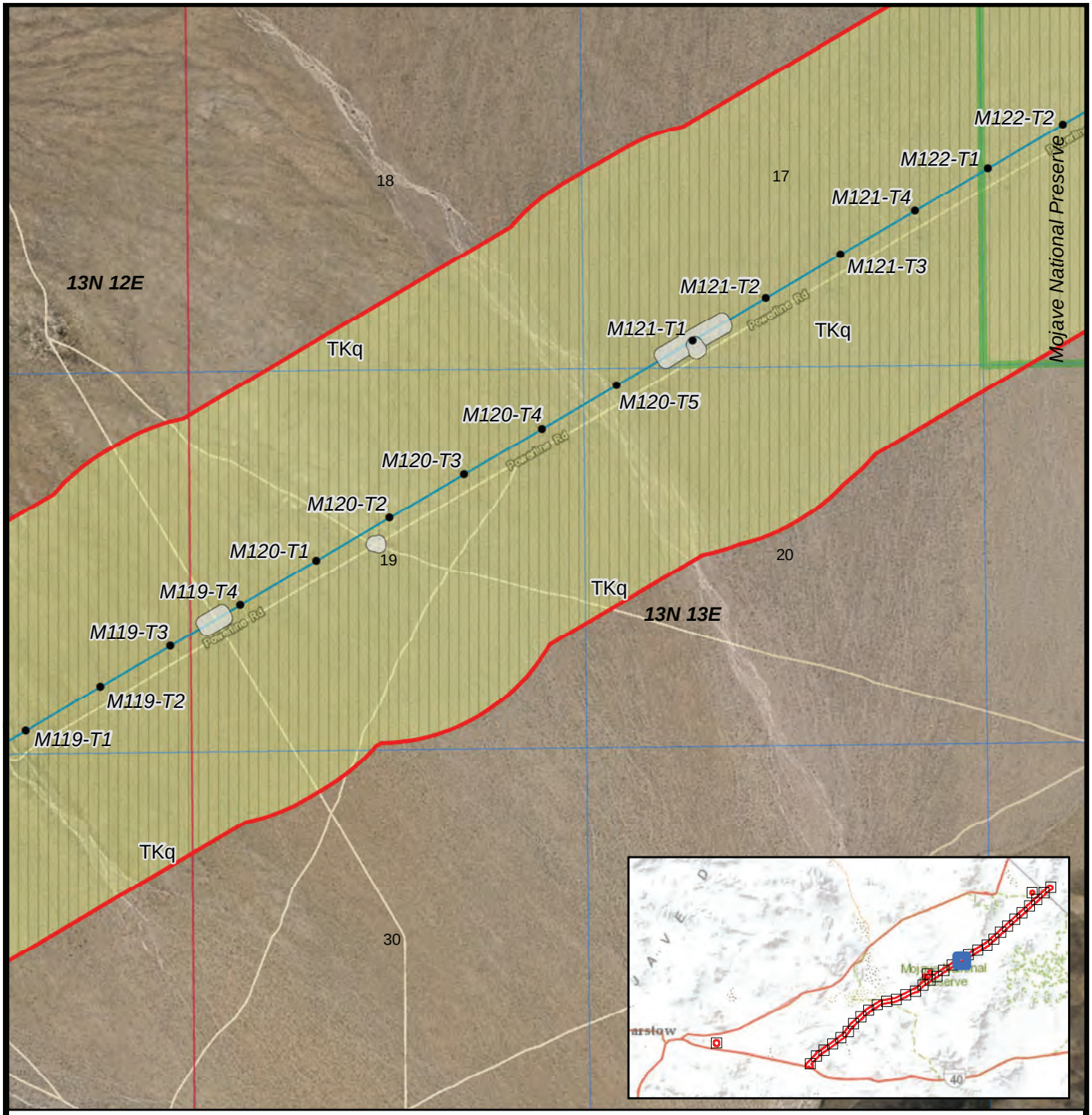
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 22

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

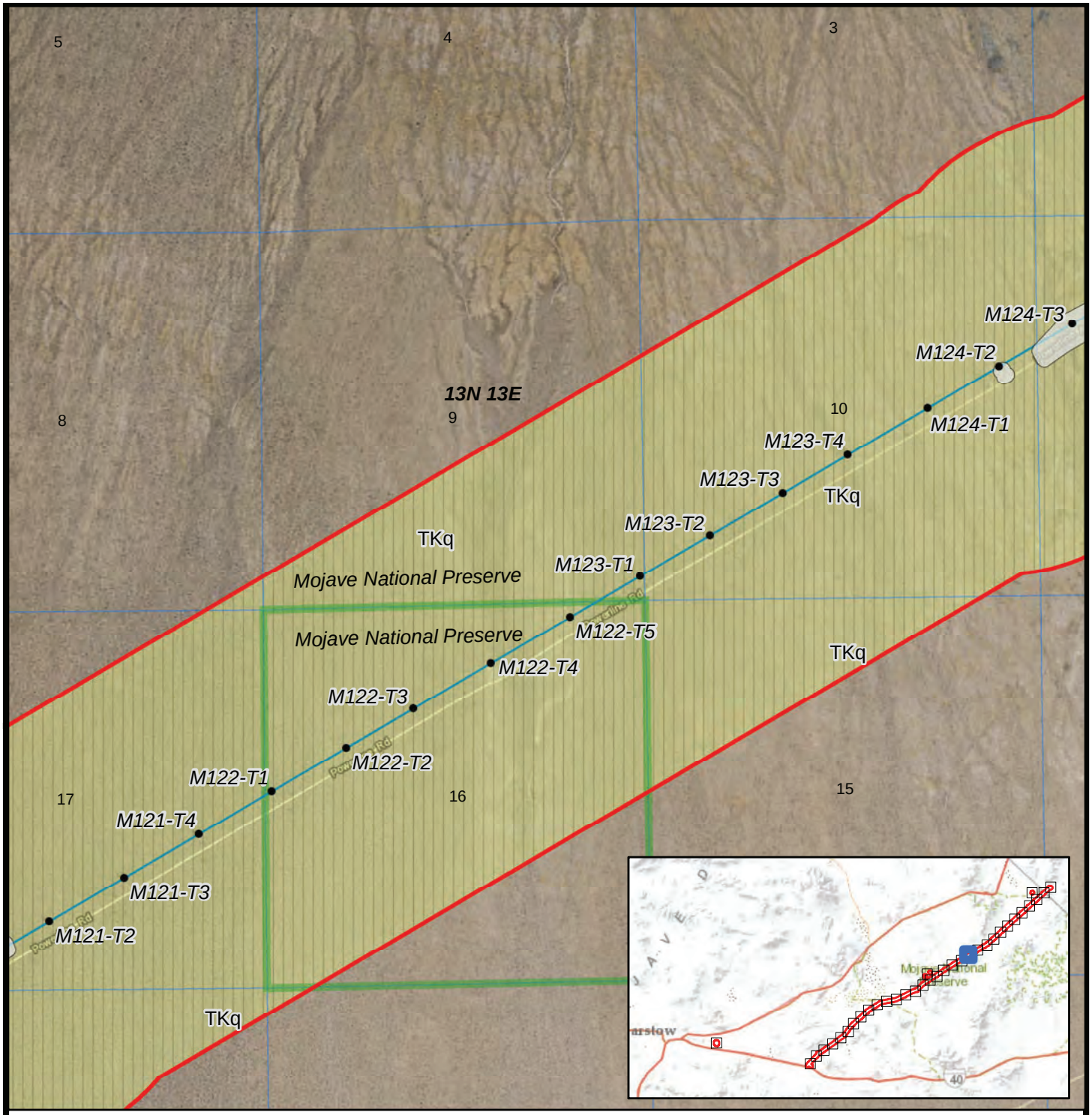
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 23

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

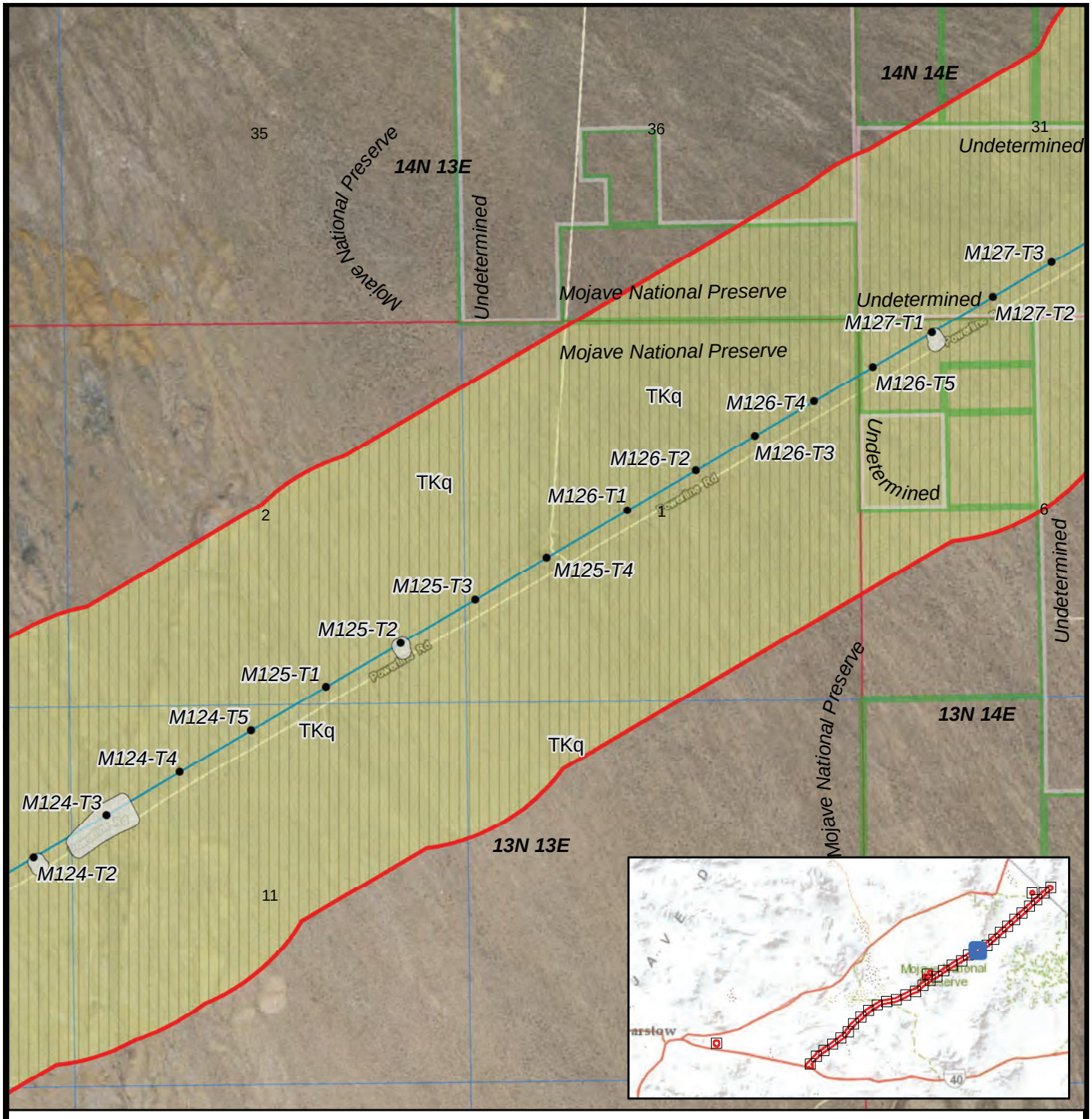
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 24

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low

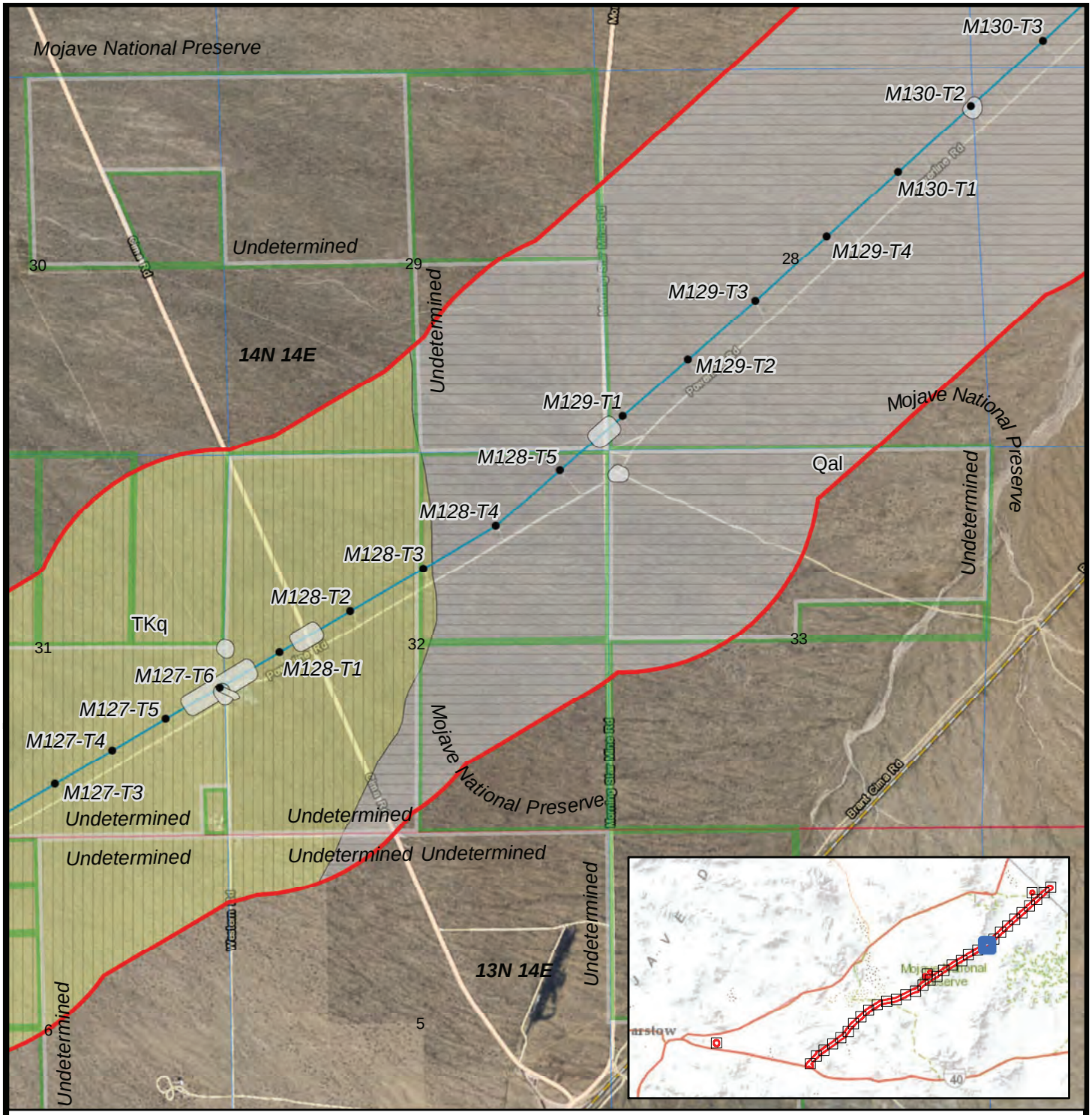
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 25

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

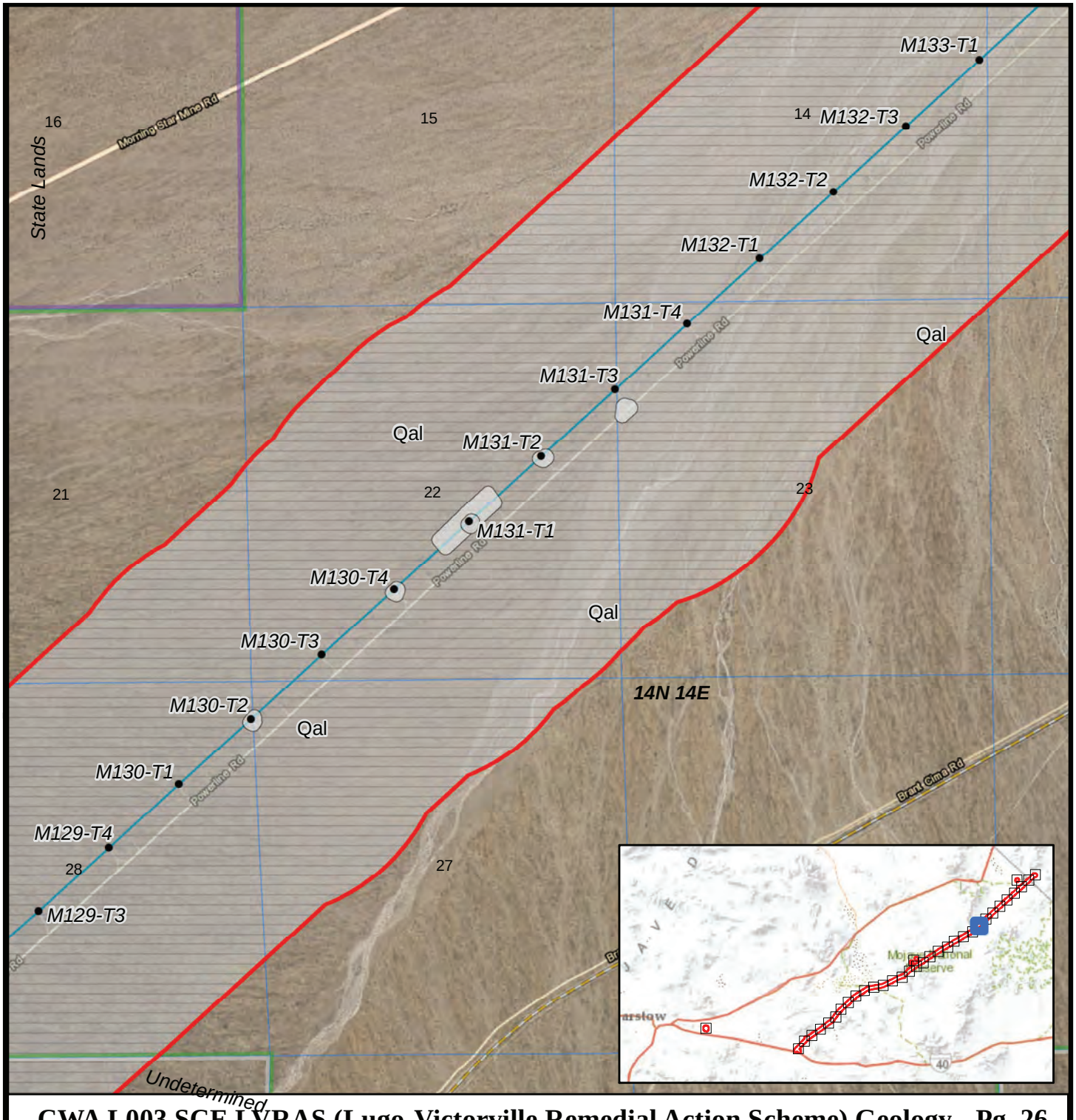
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 26

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

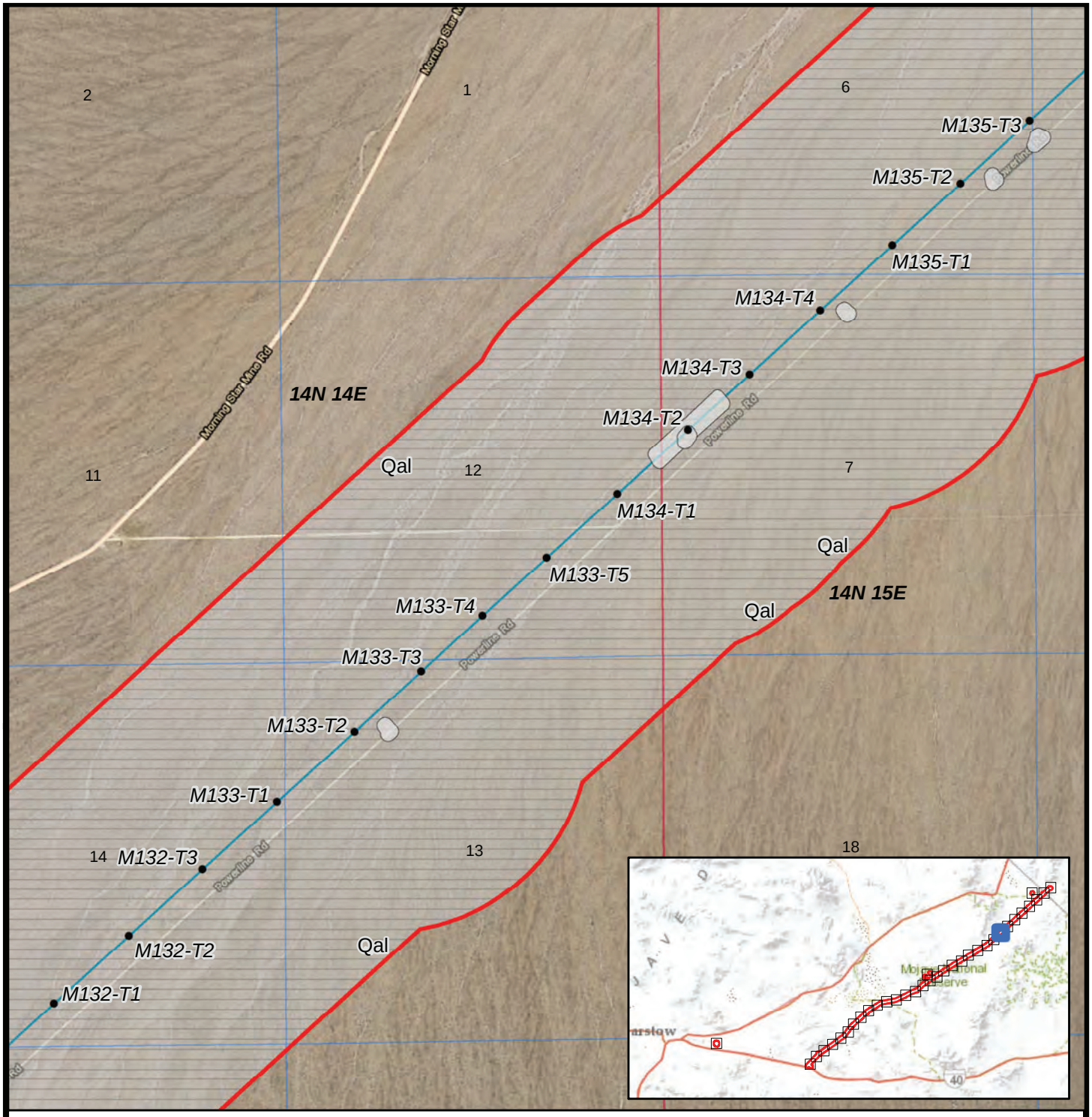
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 27

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

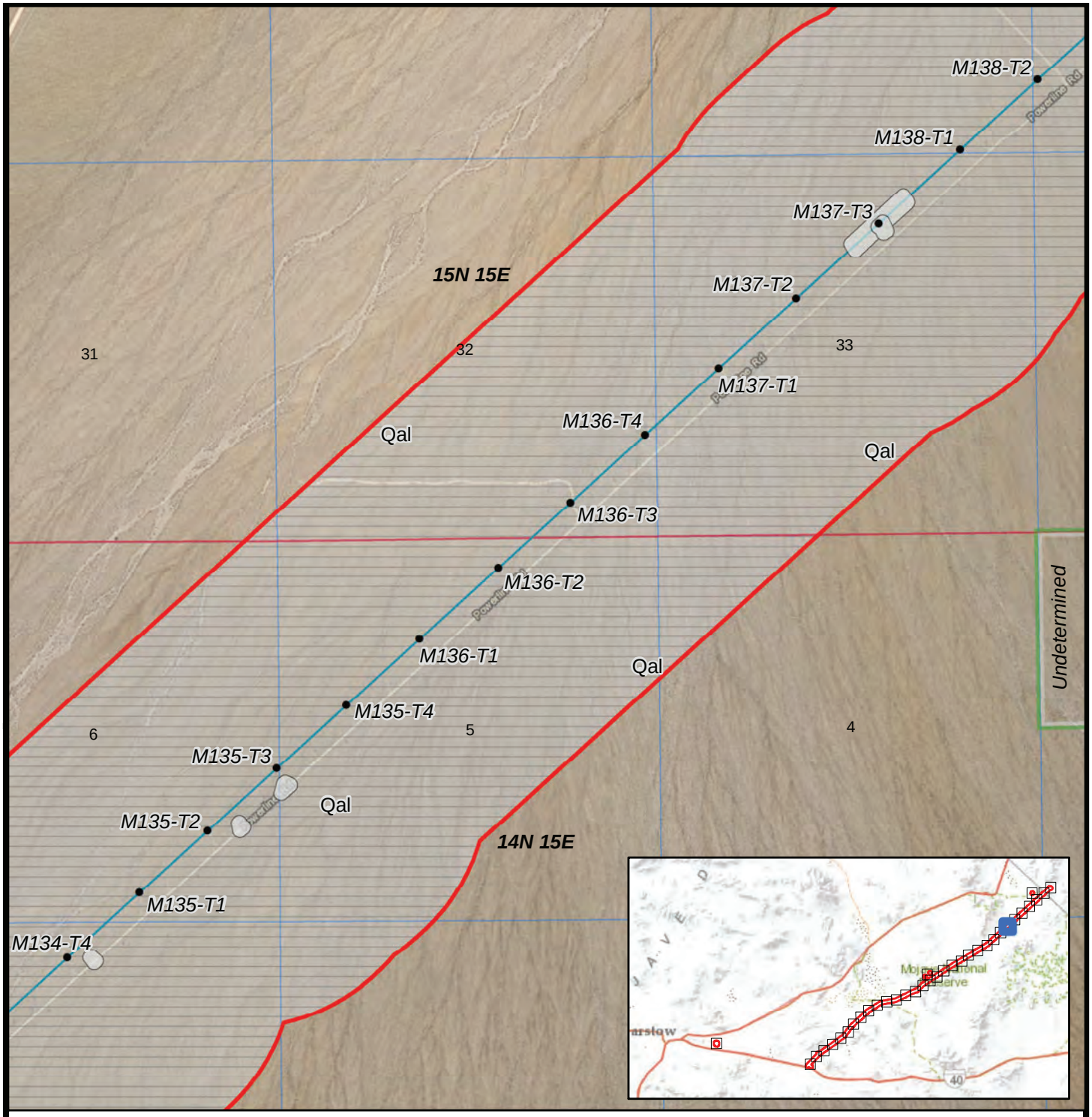
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 28

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

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Aerial Imagery & Transportation from
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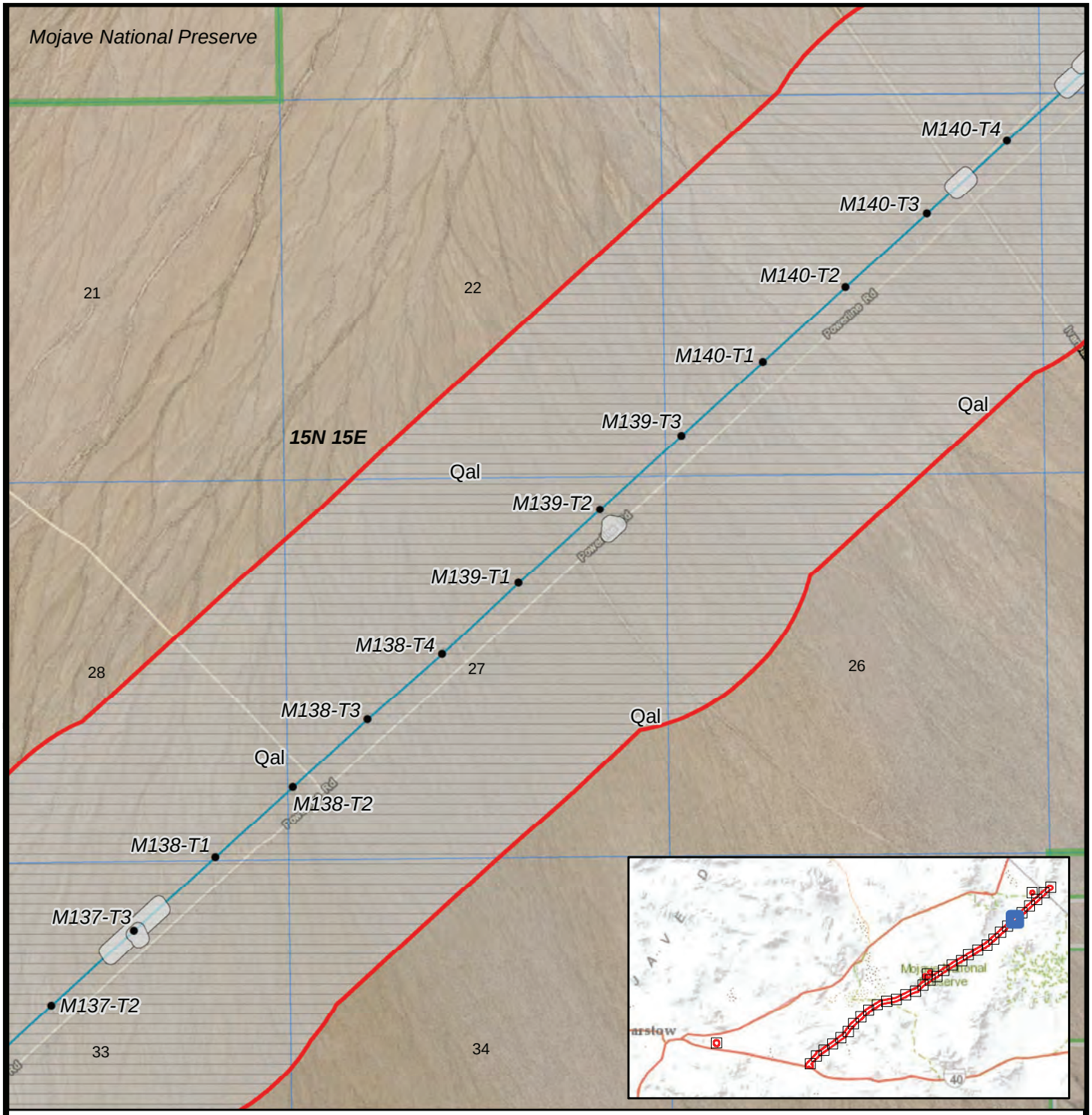


CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 29

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

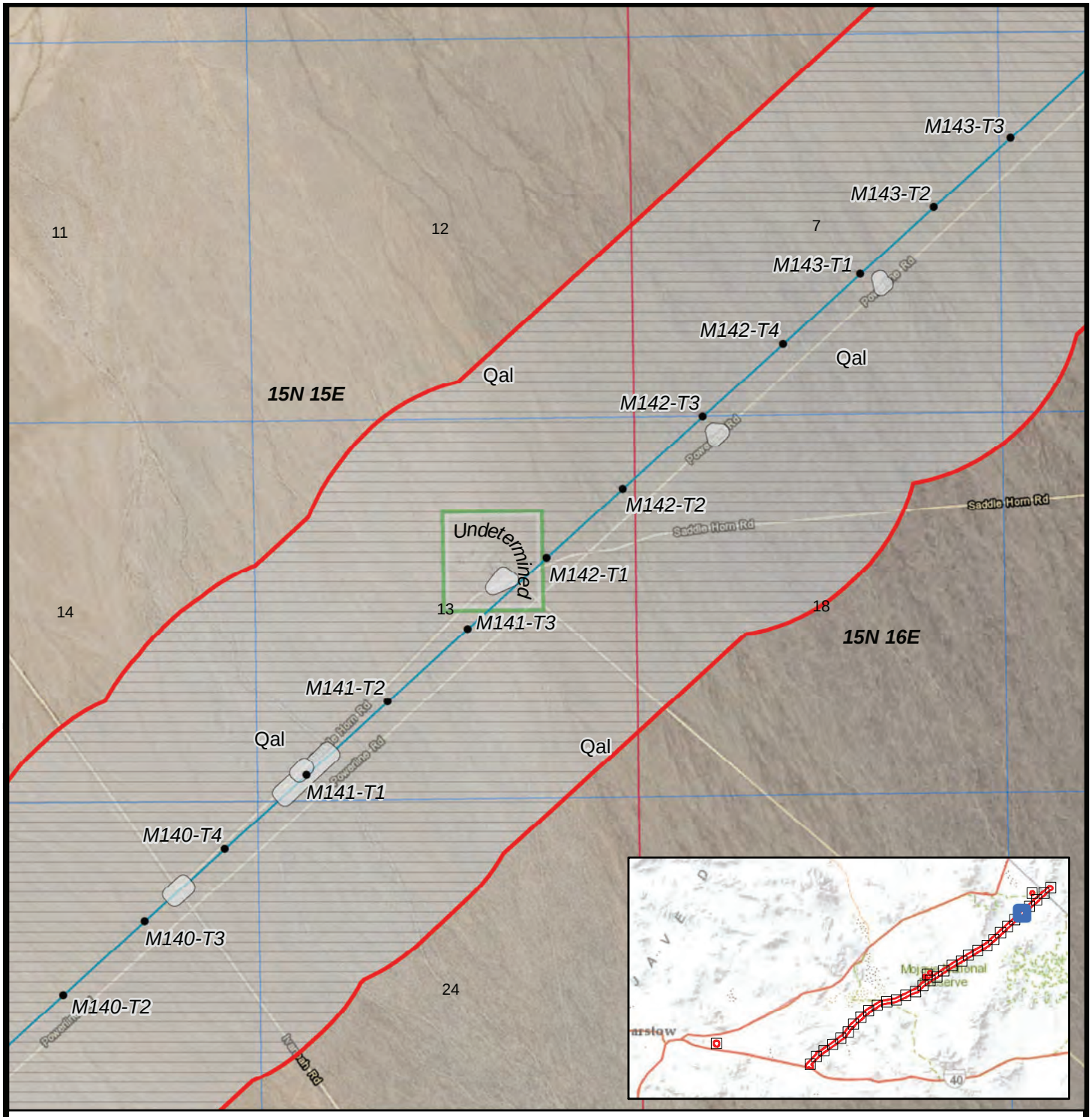
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 30

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

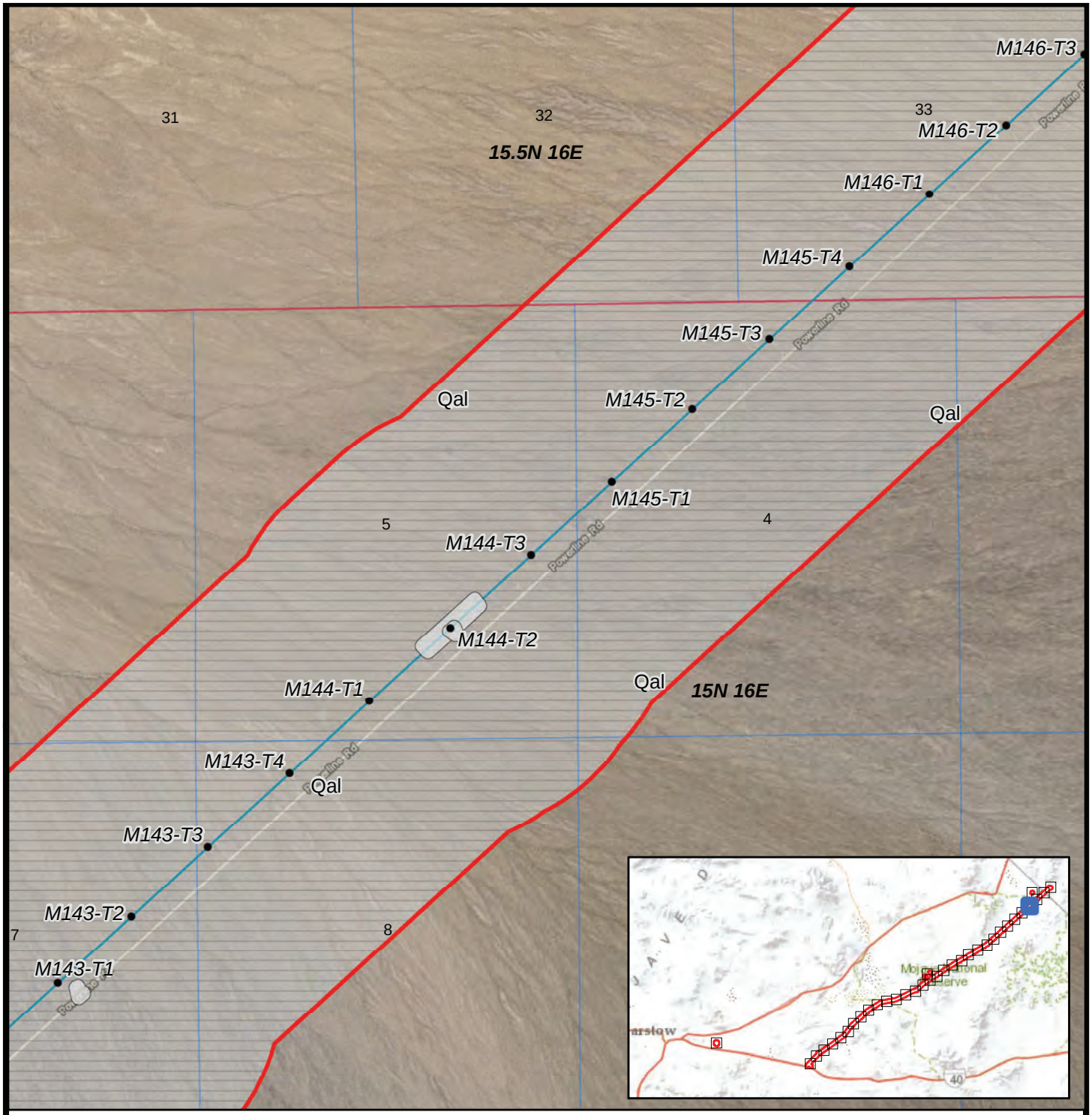
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 31

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)

Paleosensitivity

- 2 - Low

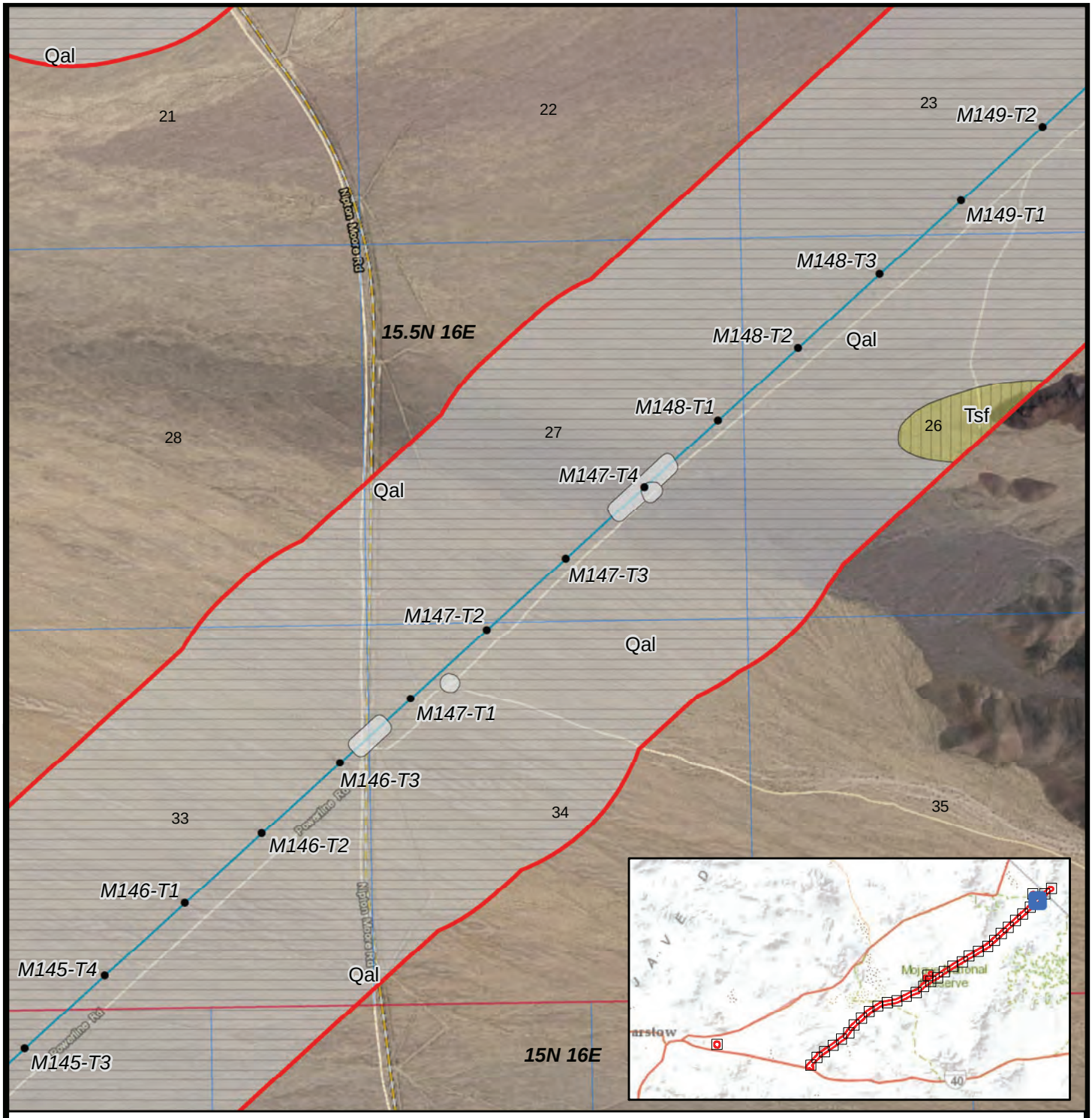
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 32

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)

Paleosensitivity

- 1 - Very Low
- 2 - Low

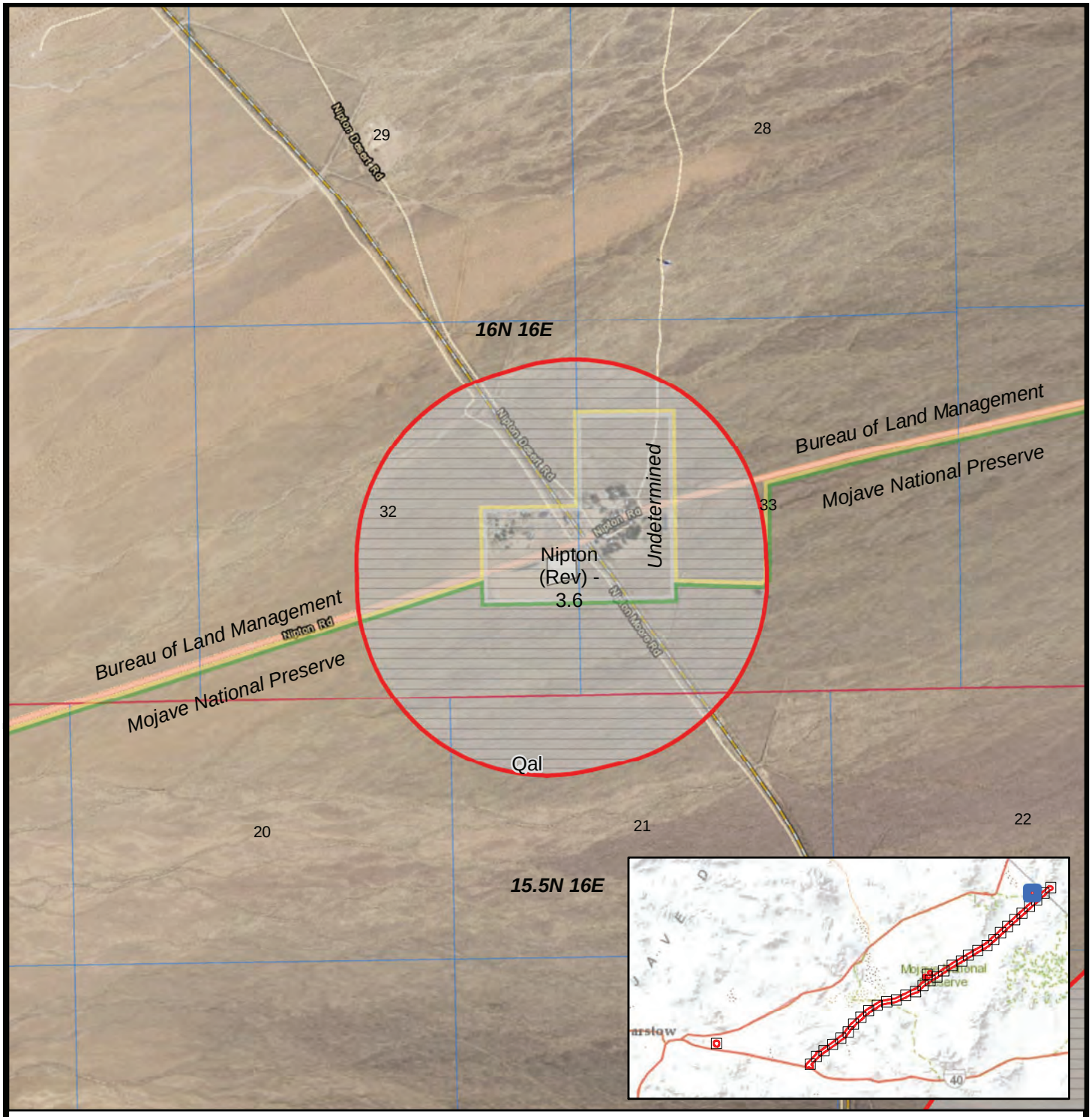
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 33

Material Laydown Yard

1/2 Mile Buffer

Geology

Qa/Qal: Alluvium (Holocene)

Paleosensitivity

2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS

EST. 2004

PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
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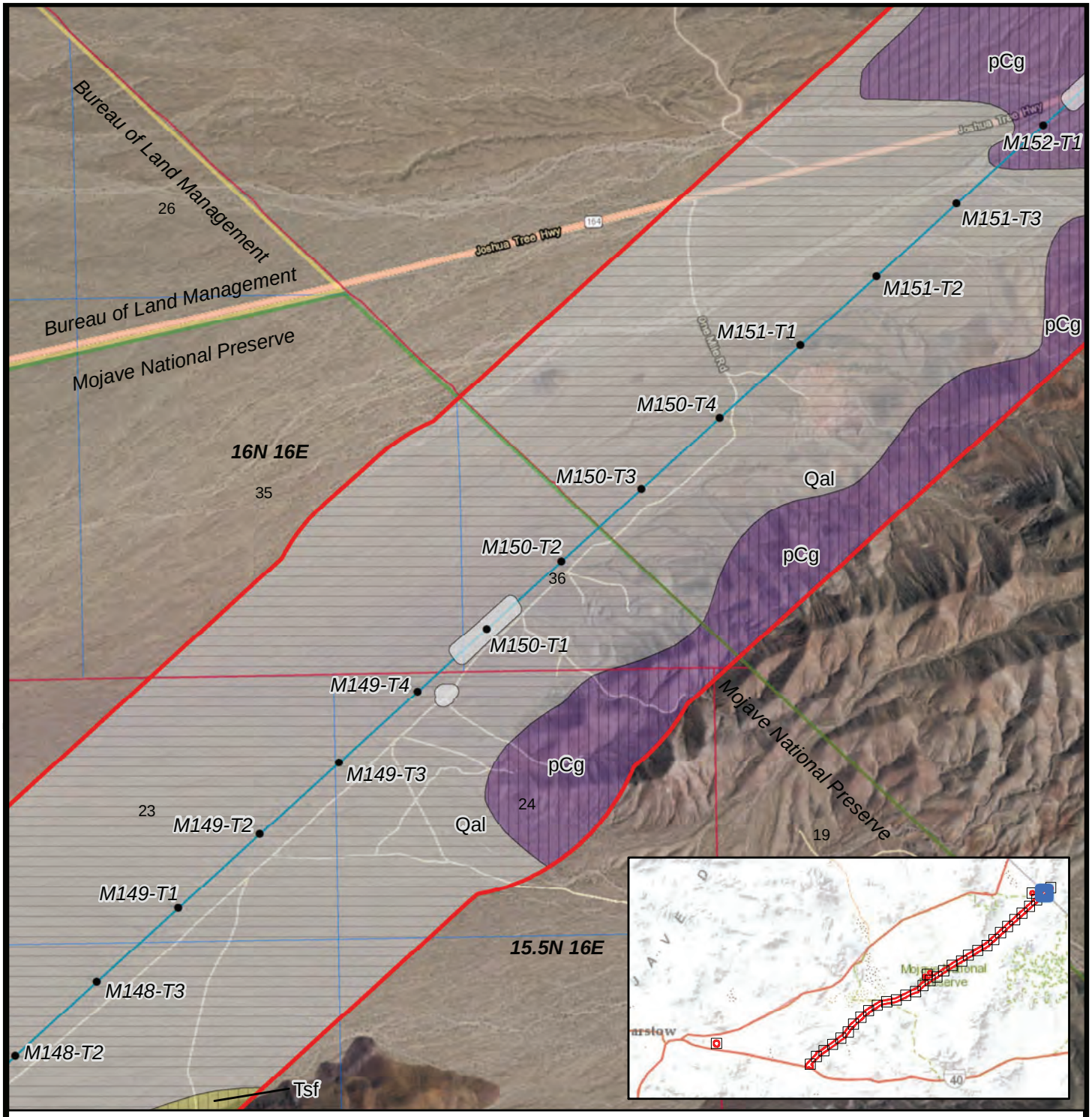
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 34

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

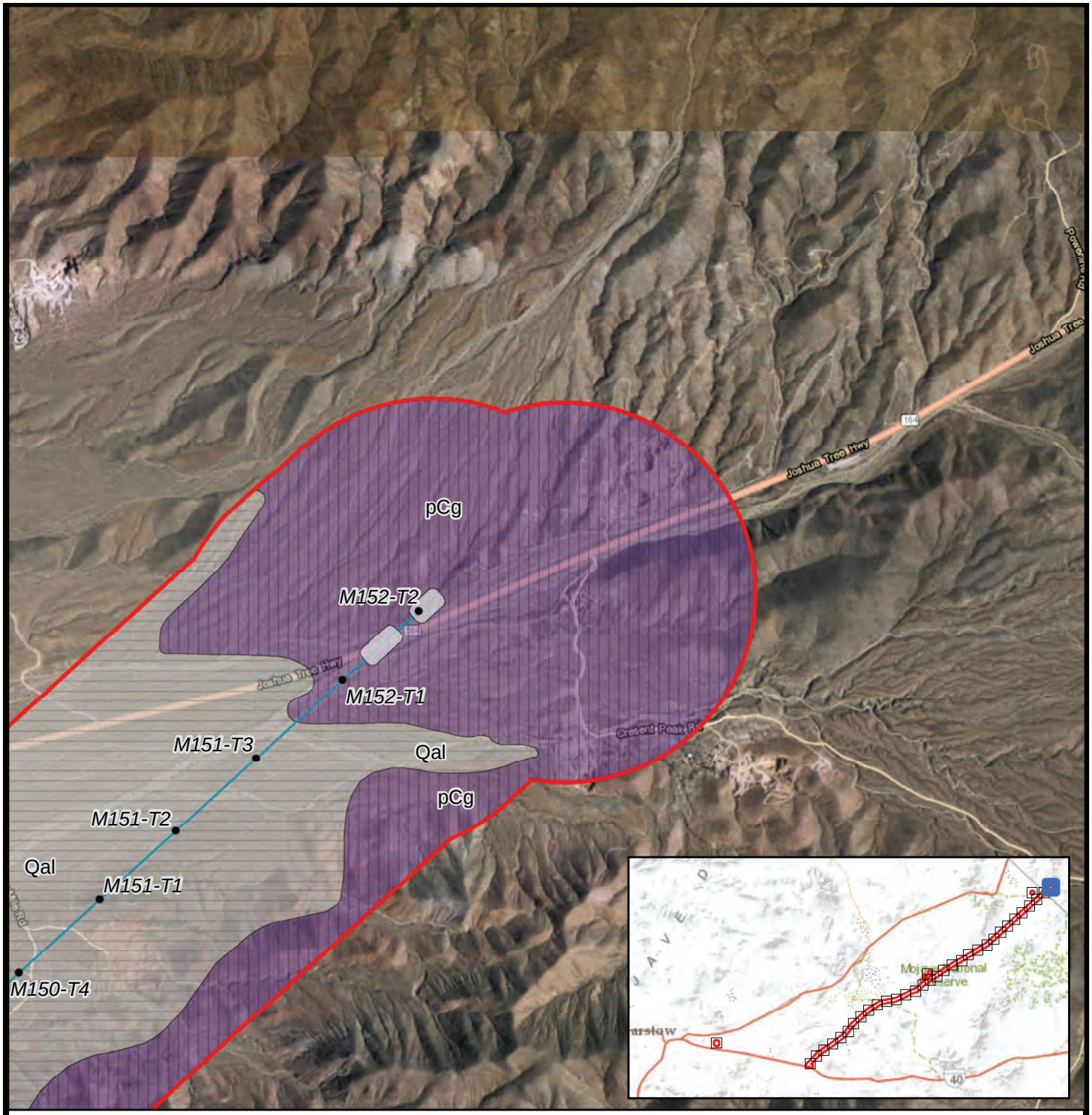
0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 35

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1

Miles

N

PALEO SOLUTIONS
EST. 2004
PALEONTOLOGICAL AND CULTURAL RESOURCES CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada

APPENDIX B. BLM PERMITS AND FIELDWORK AUTHORIZATIONS

United States Department of the Interior
BUREAU OF LAND MANAGEMENT

California State Office
2800 Cottage Way, Suite W1623
Sacramento, CA 95825
www.blm.gov/ca

March 16, 2016

In Reply Refer To:
CA930 8151(P)

Geraldine Aron
Paleo Solutions, Inc.
911 S. Primrose Ave, Unit N
Monrovia, CA 91016

Dear Ms. Aron:

The Bureau of Land Management (BLM) is pleased to issue a 3-year Scientific Paleontological Permit (*CA-16-03P*) to Paleo Solutions, Inc. for use on Public Lands managed by California BLM as specified in your permit. This permit is issued under the authority of the Federal Land Policy and Management Act (FLPMA) and the Antiquities Act of 1906. Keep a copy with you at all times in the field.

This permit authorizes the permit holder to conduct and collect paleontological resources pertaining to both scientific research and commercial projects. BLM would like to emphasize a few points. First, this permit assigns to your firm the responsibility to submit reports and other documents in a timely fashion and such submittal will be a major point of review of your firm's performance under this permit. Second, you are required to contact the appropriate Field Office to obtain a Field Use Authorization before you begin any fieldwork. Please allow the Field Office sufficient lead-time to process your application for a Field Use Authorization. The Field Office may impose additional conditions and stipulations at that time. Third, please be mindful that it is your firm's responsibility to ensure assignment of supervisory field personnel (crew chiefs) to projects that have at least four months' local experience and who otherwise meet the standards of the Bureau.

Our office is enclosing a map of California BLM Field Offices with phone numbers of cultural heritage staff and a copy of your permit with attached National special permit conditions. BLM draws your attention to these stipulations and encourages you to read and understand them. Please sign page 5, as indicated, and **return a copy of this signature page to the California BLM State Office within 30 days of your receipt of the permit**. Your permit will be valid after your signature is received.

Should you have any questions contact James Barnes at email jjbarnes@blm.gov or by phone 916-978-4676.

Sincerely,

Tom Pogacnik
Deputy State Director
Natural Resources Division

Enclosures as stated

DI Form 1991 (Rev Sept 2004)
OMB No. 1024-0037
Exp. Date (01/31/2008)

United States Department of the Interior

PERMIT FOR PALEONTOLOGICAL INVESTIGATIONS

To conduct archeological work on Department of the Interior lands and Indian lands under the authority of:

- ☐ The Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm) and its regulations (43 CFR 7).
- ☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).
- ☐ Supplemental regulations (25 CFR 262) pertaining to Indian lands.
- ☒ Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit
No.: CA-16-03P

1. Permit issued to Paleo Solutions, Inc.	2. Under application dated January 21, 2016
3. Address 911 S. Primrose Ave., Unit N, Monrovia, CA 91016	4. Telephone number(s) (562) 818-7713
	5. E-mail address(es) geraldine@paleosolutions.com

6. Name of Permit Administrator Geraldine Aron Telephone number(s): (562) 818-7713 Email address(es): geraldine@paleosolutions.com	7. Name of Principal Investigator(s) Geraldine Aron, Paul Murphy, Jennifer Kelly, Courtney Richards Telephone number(s): GA: (562) 818-7713, PM: (303) 514-1095, JK: (714) 206-5433, CR: (626) 716-2000 Email address(es): geraldine@paleosolutions.com, pmurphy@paleosolutions.com, jkelly@paleosolutions.com, crichards@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects	Telephone number(s): Email address(es):
9. Activity authorized Survey and limited surface collection	
10. On lands described as follows All lands managed by the Bureau of Land Management-California	
11. During the duration of the project From March 16, 2016 To March 16, 2019	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of approving official Tom Pogacnik, Deputy State Director, Natural Resources Division	15. Date 03/17/2016

15. Standard Permit Conditions

a. This permit is subject to all applicable provisions of 43 CFR Part 3, 43 CFR 7, and 25 CFR 262, and applicable departmental and bureau policies and procedures, which are made a part hereof.

b. The permittee and this permit are subject to all other Federal, State, and local laws and regulations applicable to the public lands and resources.

c. This permit shall not be exclusive in character, and shall not affect the ability of the land managing bureau to use, lease or permit the use of lands subject to this permit for any purpose.

d. This permit may not be assigned.

e. This permit may be suspended or terminated for breach of any condition or for management purposes at the discretion of the approving official, upon written notice.

f. This permit is issued for the term specified in 11 above.

g. Permits issued for a duration of more than one year must be reviewed annually by the agency official and the permittee.

h. The permittee shall obtain all other required permit(s) to conduct the specified project.

i. Archeological project design, literature review, development of the regional historic context framework, site evaluation, and recommendations for subsequent investigations must be developed with direct involvement of an archeologist who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation; fieldwork must be generally overseen by an individual who meets the Secretary of the Interior's Standards for Archeology and Historic Preservation.

j. Permittee shall immediately request that the approving official (14. above) make a modification to accommodate any change in an essential condition of the permit, including individuals named and the nature, location, purpose, and time of authorized work, and shall without delay notify the approving official of any other changes affecting the permit or regarding information submitted as part of the application for the permit. Failure to do so may result in permit suspension or revocation.

k. Permittee may request permit extension, in writing, at any time prior to expiration of the term of the permit, specifying a limited, definite amount of time required to complete permitted work.

l. Any correspondence about this permit or work conducted under its authority must cite the permit number. Any publication of results of work conducted under the authority of this permit must cite the approving bureau and the permit number.

m. Permittee shall submit a copy of any published journal article and any published or unpublished report, paper, and manuscript resulting from the permitted work (apart from those required in items q. and s., below), to the approving official and the appropriate official of the approved curatorial facility (item 12 above).

n. Prior to beginning any fieldwork under the authority of this permit, the permittee, following the affected bureau's policies and procedures, shall contact the field office manager responsible for administering the lands involved to obtain further instructions.

o. Permittee may request a review, in writing to the official concerned, of any disputed decision regarding inclusion of specific terms and conditions or the modification, suspension, or revocation of this permit, setting out reasons for believing that the decision should be reconsidered.

p. Permittee shall not be released from requirements of this permit until all outstanding obligations have been satisfied, whether or not the term of the permit has expired. Permittee may be subject to civil penalties for violation of any term or condition of this permit.

15. Standard Permit Conditions (continued)

q. Permittee shall submit a preliminary report to the approving official within a timeframe established by the approving official, which shall be no later than 6 weeks after the completion of any episode of fieldwork, setting out what was done, how it was done, by whom, specifically where, and with what results, including maps, GPS data, an approved site form for each newly recorded archeological site, and the permittee's professional recommendations, as results require. If other than 6 weeks, the timeframe shall be specified in Special Permit Condition p. Depending on the scope, duration, and nature of the work, the approving official may require progress reports, during or after the fieldwork period or both, and as specified in Special Permit Condition r.

r. Permittee shall submit a clean, edited draft final report to the agency official for review to insure conformance with standards, guidelines, regulations, and all stipulations of the permit. The schedule for submitting the draft shall be determined by the agency official.

s. Permittee shall submit a final report to the approving official not later than 180 days after completion of fieldwork. Where a fieldwork episode involved only minor work and/or minor findings, a final report may be submitted in place of the preliminary report. If the size or nature of fieldwork merits, the approving official may authorize a longer timeframe for the submission of the final report as specified in Special Permit Condition q.

t. Two copies of the final report, a completed NTIS Report Documentation Page (SF-298), available at http://www.ntis.gov/pdf/rdpform.pdf, and a completed NADB-Reports Citation Form, available at http://www.cr.nps.gov/aad/tools/nadbform_update.doc, will be submitted to the office issuing the permit.

u. The permittee agrees to keep the specific location of sensitive resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

v. Permittee shall deposit all artifacts, samples and collections, as applicable, and original or clear copies of all records, data, photographs, and other documents, resulting from work conducted under this permit, with the curatorial facility named in item 12, above, not later than 90 days after the date the final report is submitted to the approving official. Not later than 180 days after the final report is submitted, permittee shall provide the approving official with a catalog and evaluation of all materials deposited with the curatorial facility, including the facility's accession and/or catalog numbers.

w. Permittee shall provide the approving official with a confirmation that museum collections described in v. above were deposited with the approved curatorial facility, signed by an authorized curatorial facility official, stating the date materials were deposited, and the type, number and condition of the collected museum objects deposited at the facility.

x. Permittee shall not publish, without the approving official's prior permission, any locational or other identifying archeological site information that could compromise the Government's protection and management of archeological sites.

y. For excavations, permittee shall consult the OSHA excavation standards which are contained in 29 CFR §1926.650, §1926.651 and §1926.652. For questions regarding these standards contact the local area OSHA office, OSHA at 1-800-321-OSHA, or the OSHA website at http://www.osha.gov.

z. Special permit conditions attached to this permit are made a part hereof.

16. Special Permit Conditions

☒ a. Permittee shall allow the approving official and bureau field officials, or their representatives, full access to the work area specified in this permit at any time the permittee is in the field, for purposes of examining the work area and any recovered materials and related records.

☒ b. Permittee shall cease work upon discovering any human remains and shall immediately notify the approving official or bureau field official. Work in the vicinity of the discovery may not resume until the authorized official has given permission.

☒ c. Permittee shall backfill all subsurface test exposures and excavation units as soon as possible after recording the results, and shall restore them as closely as reasonable to the original contour.

☒ d. Permittee shall not use mechanized equipment in designated, proposed, or potential wilderness areas unless authorized by the agency official or a designee in additional specific conditions associated with this permit.

☒ e. Permittee shall take precautions to protect livestock, wildlife, the public, or other users of the public lands from accidental injury in any excavation unit.

☒ f. Permittee shall not conduct any flint knapping or lithic replication experiments at any archeological site, aboriginal quarry source, or non-site location that might be mistaken for an archeological site as a result of such experiments.

☒ g. Permittee shall perform the fieldwork authorized in this permit in a way that does not impede or interfere with other legitimate uses of the public lands, except when the authorized officer specifically provides otherwise.

☒ h. Permittee shall restrict vehicular activity to existing roads and trails unless the authorized officer provides otherwise.

☒ i. Permittee shall keep disturbance to the minimum area consistent with the nature and purpose of the fieldwork.

☒ j. Permittee shall not cut or otherwise damage living trees unless the authorized officer gives permission.

☒ k. Permittee shall take precautions at all times to prevent wildfire. Permittee shall be held responsible for suppression costs for any fires on public lands caused by the permittee's negligence. Permittee may not burn debris without the authorized officer's specific permission.

☒ l. Permittee shall conduct all operations in such a manner as to prevent or minimize scarring and erosion of the land, pollution of the water resources, and damage to the watershed.

☒ m. Permittee shall not disturb resource management facilities within the permit area, such as fences, reservoirs, and other improvements, without the authorized officer's approval. Where disturbance is necessary, permittee shall return the facility to its prior condition, as determined by the authorized officer.

☒ n. Permittee shall remove temporary stakes and/or flagging, which the permittee has installed, upon completion of fieldwork.

☒ o. Permittee shall clean all camp and work areas before leaving the permit area. Permittee shall take precautions to prevent littering or pollution on public lands, waterways, and adjoining properties. Refuse shall be carried out and deposited in approved disposal areas.

☐ p. Permittee shall submit the preliminary report within _____ days/weeks of completion of any episode of fieldwork..

☐ q. Permittee shall submit the final report within _____ days/weeks/months after completion of fieldwork..

☐ r. Permittee shall submit progress reports every _____ months over the duration of the project.

☒ s. California special permit conditions are attached.

Special Permit Conditions Continuation Sheet: California Conditions

- a. Work under this permit is limited to specific service approved for each permit. This may consist of non-collection survey, limited testing to determine site content and limits or extensive testing emergency excavation and/or salvage projects. Testing/ excavation projects may be conducted under the authority of this permit only upon completion of ARPA consultation with Native American Groups and written approval from the Bureau for such work. (CARIDAPs for the purpose of the identification of archaeological resources are authorized under a FLPMA/ARPA Permit).
- b. Permittees shall verbally and subsequently in writing contact the appropriate BLM Field Manager prior to the beginning of each of his field operations (with follow-up written notification) to inform the BLM of specific work to be conducted. At this time, the BLM Field Manager may impose additional stipulation as deemed necessary to provide for the protection and management of resource values in the general site or project area.
- c. All cultural artifacts and other related materials such as notes, photographs, etc., acquired under the provisions of this permit **remain the property of the United States Government and may be recalled at any time for the use of the Department of the interior or other agencies of the Federal Government.** Cultural materials collected under the provisions of this permit must be curated at a repository approved by the BLM. Curation shall be at a local qualified repository, if feasible, and an approved curation facility shall be designated prior to all field projects. An itemized list of all materials with accession numbers, curated at the repository will be submitted to the State Office and to the appropriate Field Office within 180 days of the completion of individual field projects. A copy of a receipt from the curation facility must be submitted with the list or catalogue.
- d. Permittees shall acquire a primary number from the appropriate Information Center for each cultural resource documented while undertaking work authorized by this permit.
- e. The BLM Field Manager or authorized representative may require a monthly letter progress report outlining what was accomplished. This report, if required, is due by the fifth day of the following month, unless different arrangements are approved.
- f. The individual(s) in direct charge must be academically qualified and possess adequate field experience. At least two weeks prior to initiation field work, the permittees must provide the BLM Field Manager with the vitae of individuals proposed to be in direct charge if not approved at the time of permit issuance. A list of field crew members should be submitted at the same time. Only the individual(s) listed in Item No. 8 of the permit is/are authorized to be in direct charge of field work conducted under this permit.
- g. The person(s) in direct charge of field work, shall be on site at all times when work is in progress. Failure to comply with permit stipulations will result in removal of subject's name(s) from the approved list of person-in-direct-charge.
- h. Care should be exercised to avoid directly or indirectly increasing access or potential vandalism to sensitive sites.
- i. All National Permit Stipulations are binding. The authority for issuing permits in the Bureau of Land Management rests solely with the State Director as Delegated by the Secretary of the Interior and all further delegation is prohibited by Secretarial Order. No Modification of National Permit Conditions 8 or 9 or of the California Special Permit Conditions may occur except by written decision of the State Director.
- j. The Bureau of Land Management shall be cited in any report of work done under this permit, including publications such as books, news articles and scientific publications, as well as oral reports, films, television programs, and presentations in other media.

By signing below, I, the Principal Investigator, acknowledge that I have read and understand the Permit for Archeological Investigations and agree to its terms and conditions as evidenced by my signature below and initiation of work or other activities under the authority of this permit.

Signature and title:	Date:
	03/17/2016

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Nevada State Office
1340 Financial Blvd.
Reno, Nevada 89502-7147
http://www.nv.blm.gov

In Reply Refer To:
N-91420
8270 (NV-930)

Jennifer Kelly
Paleo Solutions, Inc.
911 South Primrose Ave., Unit N
Monrovia, CA 91016

Dear Ms. Kelly:

The modified Paleontological Resources Use Permit No. N-91420 is enclosed, reflecting the requests received April 6 and 14, 2016. As requested, Jen DiCenzo and Kate Zubin-Stathopolos have been added to your permit as field monitors. The request to add Mr. Dean Reed as a field monitor is denied. Mr. Reed does not demonstrate the education nor experience with paleontological resources to serve as a monitor.

All questions should be directed to me at (775) 861-6546, or you may reach me via email at b50hocke@blm.gov.

Sincerely,

Bryan Hockett, Ph.D.
Archaeologist
Resources, Lands, and Planning

Enclosure(s)
As Stated

cc: BLM Nevada Archaeologists
Nevada State Museum

Form 8270-2 (Temporary)
(December 1994)

United States
Department of the Interior
Bureau of Land Management

PERMIT NUMBER:
N– 91420

Paleontological Resources Use Permit

A copy of this permit must be carried by the individual(s)
named in Line 8 whenever fieldwork is in progress.

modified April 14, 2016

1a.Permittee: Geraldine Aron & Jennifer Kelly	1b. Affiliation: Paleo Solutions, Inc.
2. Mailing address Office: 911 South Primrose Ave., Unit N Monrovia, CA 91016 Field Party: Geraldine Aron, Paul Murphey, Courtney Richards, and Jennifer Kelly Field Monitor: Cecilio Garcia, Jen DiCenzo, Kate Zubin-Stathopolos	3. Telephone number Office: 562/818-7713 Fax: 626/359-0712 e-mail: jkelly@paleosolutions.com Field Party cell:
4. Nature of paleontological fieldwork proposed: a. Survey |X|	
5. Location of fieldwork proposed: This permit authorizes activities on public lands in Nevada administered by the State Office of the Bureau of Land Management, in relation to land use applications statewide.	
6. Authorized Start Date: September 23, 2015	7. Expiration Date: September 23, 2018
8. Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork: Geraldine Aron and Jennifer Kelly	
9. Repository Name and Address: Los Angeles County Museum of Natural History 900 Exposition Blvd. Los Angeles, CA 90007	
10. Special conditions are attached and must be adhered to.	

Area Manager — Date

Area Manager — Date

Bryan Hockett, Ph.D. — Date 4/14/2016
Archaeologist
Resources, Lands and Planning

United States Department of the Interior
FIELDWORK REQUEST AND AUTHORIZATION
PALEONTOLOGICAL INVESTIGATIONS

DI Form 1991
(BLM Rev July 2005)
OMB No. 1024-0037

Authorization to conduct Paleontological studies on public lands managed by the Bureau of Land Management under the authority of:

☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).
☒Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit

No.: CA-16-03P / CA690 - FA - 17 - 17P CDH

1. Applicant (Business/Firm) and BLM State Permit Number Paleo Solutions, Inc	**2. Application date**: 6/26/2017
3. Address 911 S Primrose Ave, Unit N Monrovia, CA 91016	**4. Telephone number(s)** 562-818-7713 **5. E-mail address(es)** geraldine@paleosolutions.com
6. Name of Permit Administrator Geraldine Aron **Telephone number(s):** 562-818-7713 **Email address(es):** geraldine@paleosolutions.com	**7. Name of Principal Investigator(s)** Geraldine Aron, Courtney Richards, and Paul Murphey **Telephone number(s):** 562-818-7713; 626-716-2000; 303-882-8048 **Email address(es):** geraldine@paleosolutions.com, crichards@paleosolutions.com; paul@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects Joey Raum, Jeff Hathaway	**Telephone number(s):** 240-446-8435; 714-305-3326 **Email address(es):** jraum@paleosolutions.com; jhathaway@paleosolutions.com

9. Nature of paleontological fieldwork proposed:

☒ **Survey and limited surface collection.** ☐ **Excavation**

Breifly describe: A paleontology survey is being recommend for SCE Lugo-Victorville Remedial Action Scheme Project: A field survey of paleontologically sensitive locations (PFYC U, 3, 4 or 5) within the Project area will be conducted as well as verification of geologic extents of PFYC 1 and PFYC 2 units and previously recorded fossil localities. The survey will occur in areas where scientifically significant fossils can be potentially expected to occur within the boundary and immediate vicinity of the anticipated disturbance, or where the probability of encountering fossils is unknown, and in locations where fossils have been recorded in the past. The survey corridor will be the impact area plus 100 feet on either side of the centerline.

The field survey will be conducted by a survey crew consisting of two paleontologists. The crew will complete a 100% pedestrian linear survey of all potentially fossiliferous bedrock outcrops and exposures of surficial sediments that occur on PFYC U, 3, 4, or 5 formations and verification of PFYC Class 1 and 2 extents (see Appendix A). Areas with very low to low sensitivity will not be intensively surveyed.

Paleo Solutions' Principal Investigator, Geraldine Aron, will oversee the paleontological field crew during all field survey activities. The field survey is anticipated to take a maximum of ten working days to complete (10 hours/day) based on the initial analysis of existing data, and the access roads mapped for the Project.

The project covers the jurisdiction of Barstow and Needles Field BLM Offices. We are submitting a FA request from Barstow and Needles for this project. A separate request will be submitted to the Southern District of Nevada.

Please see the attached map for Needles.

10. Location of proposed work (attach topographic map copy with project boundaries

Please see the attached map

11. Dates of proposed work: **From:** 6/26/17 **To:** 12/31/17	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County (LACM), 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of applicant:	**15. Date** 6/26/17
16. Signature and title of approving official:	**17. Date** 07/03/17

United States Department of the Interior
FIELDWORK REQUEST AND AUTHORIZATION
PALEONTOLOGICAL INVESTIGATIONS

DI Form 1991
(BLM Rev July 2005)
OMB No. 1024-0037

FA-680-17-27

Authorization to conduct Paleontological studies on public lands managed by the Bureau of Land Management under the authority of:

☒ The Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431-433) and its regulations (43 CFR 3).

☒ Bureau-specific statutory and/or regulatory authority: Federal Land Policy and Management Act of 1976 (Public Law 94-570), and Section 302 of Public Law 94-4579

Please use this number when referring to this permit

No.: CA-16-03P

1. Applicant (Business/Firm) and BLM State Permit Number Paleo Solutions, Inc	**2. Application date** 6/26/2017
3. Address 911 S Primrose Ave, Unit N Monrovia, CA 91016	**4. Telephone number(s)** 562-818-7713
	5. E-mail address(es) geraldine@paleosolutions.com
6. Name of Permit Administrator Geraldine Aron **Telephone number(s):** 562-818-7713 **Email address(es):** geraldine@paleosolutions.com	**7. Name of Principal Investigator(s)** Geraldine Aron, Courtney Richards, and Paul Murphey **Telephone number(s):** 562-818-7713; 626-716-2000; 303-882-8048 **Email address(es):** geraldine@paleosolutions.com, crichards@paleosolutions.com; paul@paleosolutions.com
8. Name of Field Director(s) authorized to carry out field projects Joey Raum, Jeff Hathaway	**Telephone number(s):** 240-446-8435; 714-305-3326 **Email address(es):** jraum@paleosolutions.com; jhathaway@paleosolutions.com

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The project covers the jurisdiction of Barstow and Needles Field BLM Offices, but we assume Barstow is overseeing this project. A separate request will be submitted to the Southern District of Nevada.

Please see the attached map.

10. Location of proposed work (attach topographic map copy with project boundaries

Please see the attached map

11. Dates of proposed work: From: 6/26/17 To: 12/31/17	
12. Name and address of the curatorial facility in which collections, records, data, photographs, and other documents resulting from work under this permit shall be deposited for permanent preservation on behalf of the United States Government. Natural History Museum of Los Angeles County (LACM), 900 Exposition Blvd., Los Angeles, CA 90007	
13. Permittee is required to observe the listed standard permit conditions and the special permit conditions attached to this permit.	
14. Signature and title of applicant:	**15. Date** 6/26/17
16. Signature and title of approving official:	**17. Date** 6/27/17

Form 8270-2 (Temporary)
(December 1994)

United States
Department of the Interior
Bureau of Land Management

PERMIT NUMBER:
N- 91420

Paleontological Resources Use Permit

A copy of this permit must be carried by the individual(s) named in Line 8 whenever fieldwork is in progress.

1a.Permittee: Geraldine Aron & Jennifer Kelly	1b. Affiliation: Paleo Solutions, Inc.
2. Mailing address Office: 911 South Primrose Ave., Unit N Monrovia, CA 91016 Field Party: Geraldine Aron, Paul Murphey, Courtney Richards, and Jennifer Kelly	3. Telephone number Office: 562/818-7713 Fax: 626/359-0712 e-mail: jkelly@paleosolutions.com Field Party cell:
4. Nature of paleontological fieldwork proposed: a. Survey |X|	
5. Location of fieldwork proposed: This permit authorizes activities on public lands in Nevada administered by the State Office of the Bureau of Land Management, in relation to land use applications statewide.	
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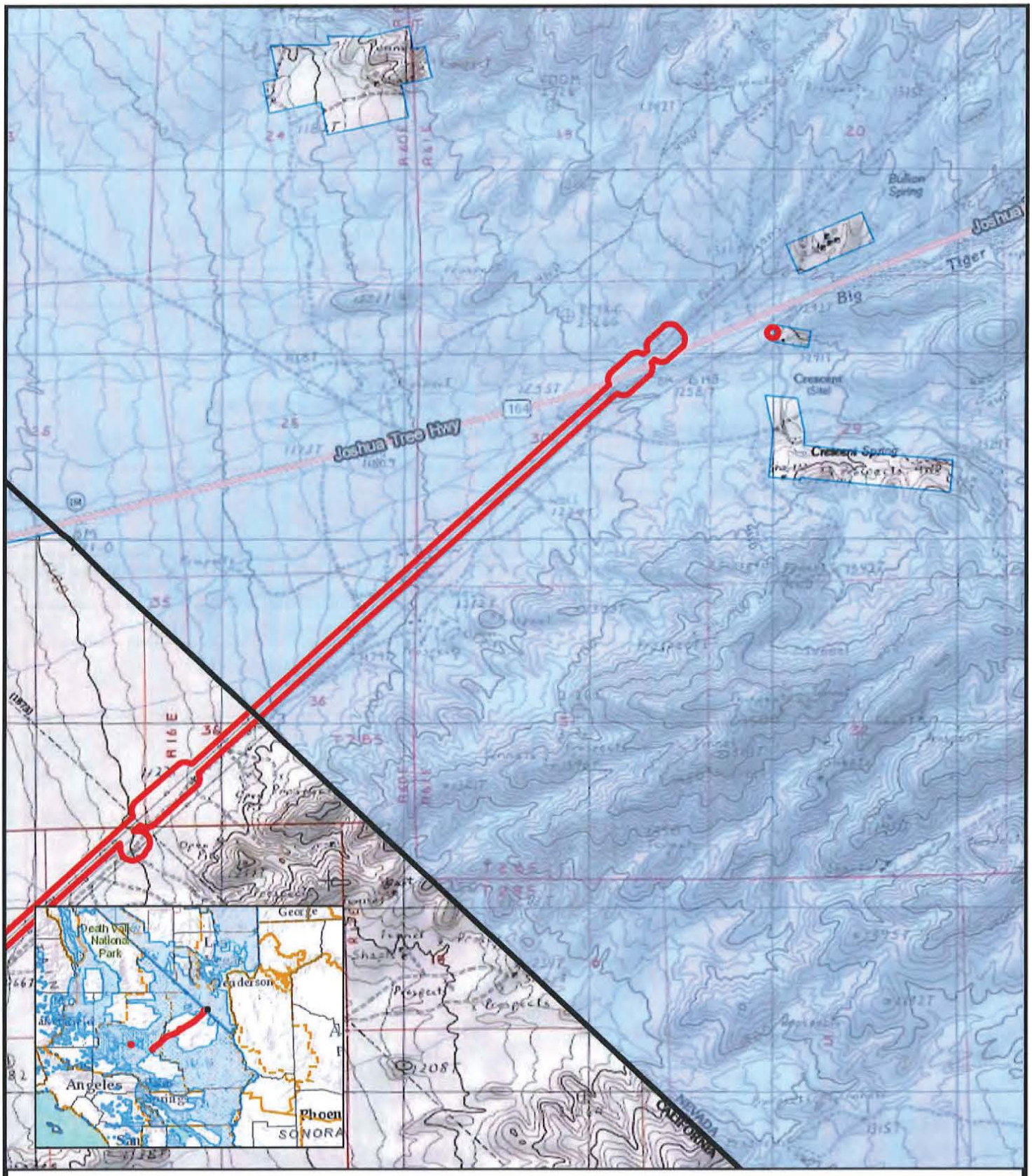
8. Name(s) of individual(s) responsible for planning, supervising, and carrying out fieldwork: Geraldine Aron and Jennifer Kelly	
9. Repository Name and Address: Los Angeles County Museum of Natural History 900 Exposition Blvd. Los Angeles, CA 90007	
10. Special conditions are attached and must be adhered to.	

Area Manager — Date 7/11/17

Area Manager — Date

Bryan Hockett, Ph.D.
Archaeologist
Resources, Lands and Planning — Date 9/23/2015



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Survey

BLM Administrative Unit Boundaries

Survey Area

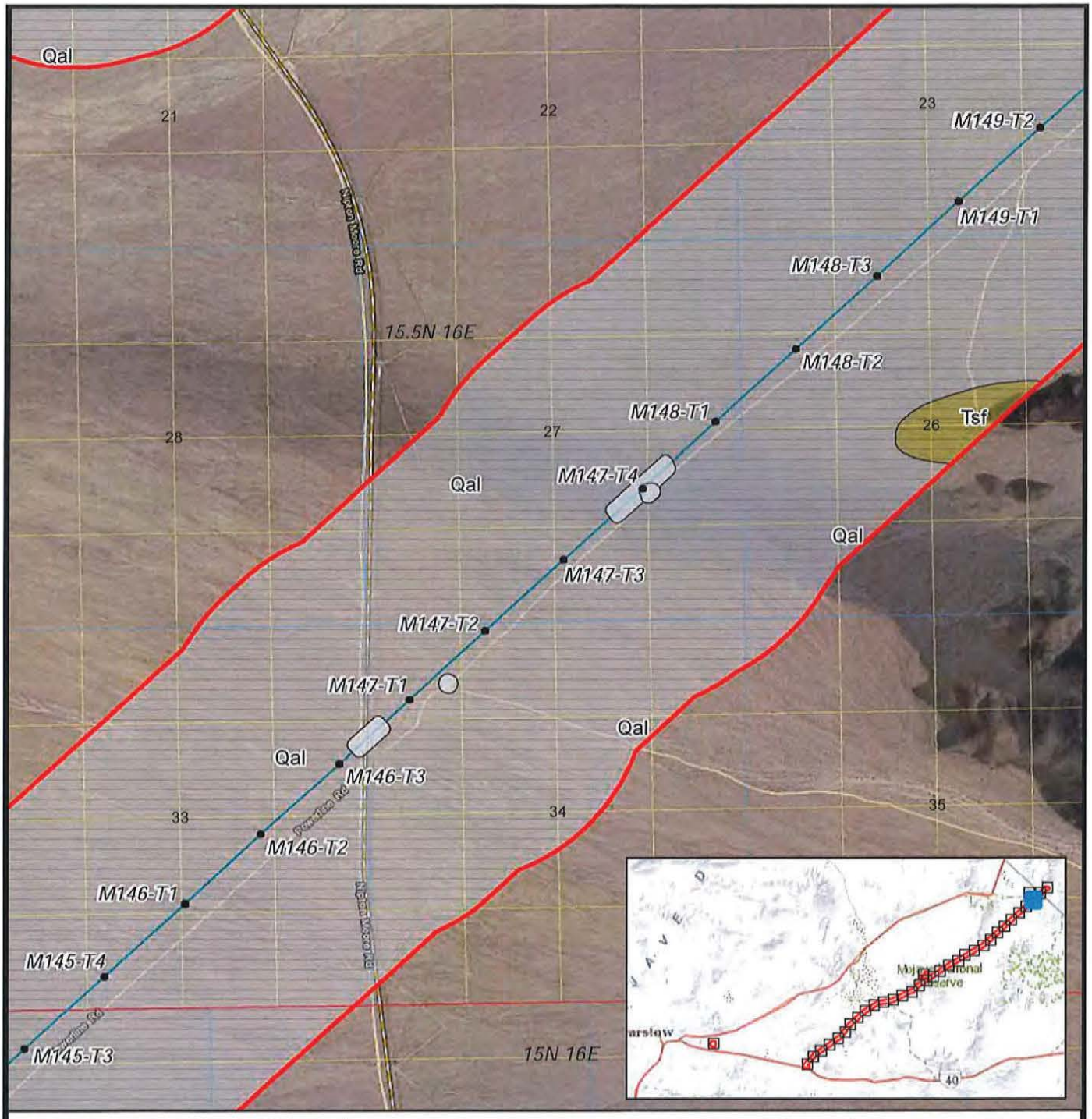
BLM

0 0.45 0.9 Miles

N

Sources:
Aerial Imagery & Transportation from ESRI Online Resource Center

PALEO SOLUTIONS EST. 2004



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 32

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)

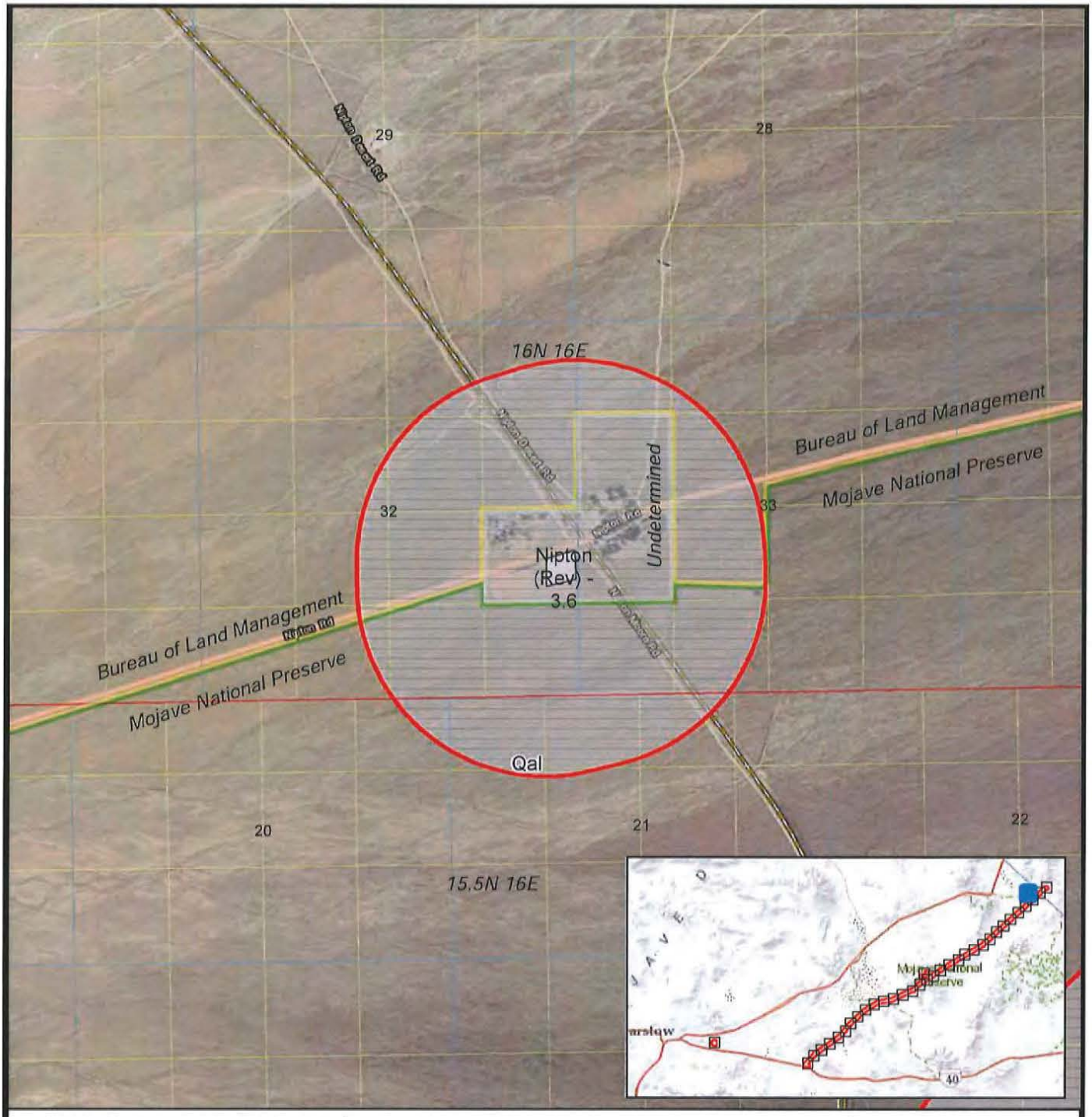
Paleosensitivity

- 2 - Low

0 ¼ ½ 1
Miles

PALEO SOLUTIONS
EST 2004
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 33

Material Laydown Yard

1/2 Mile Buffer

Geology

Qa/Qal: Alluvium (Holocene)

Paleosensitivity

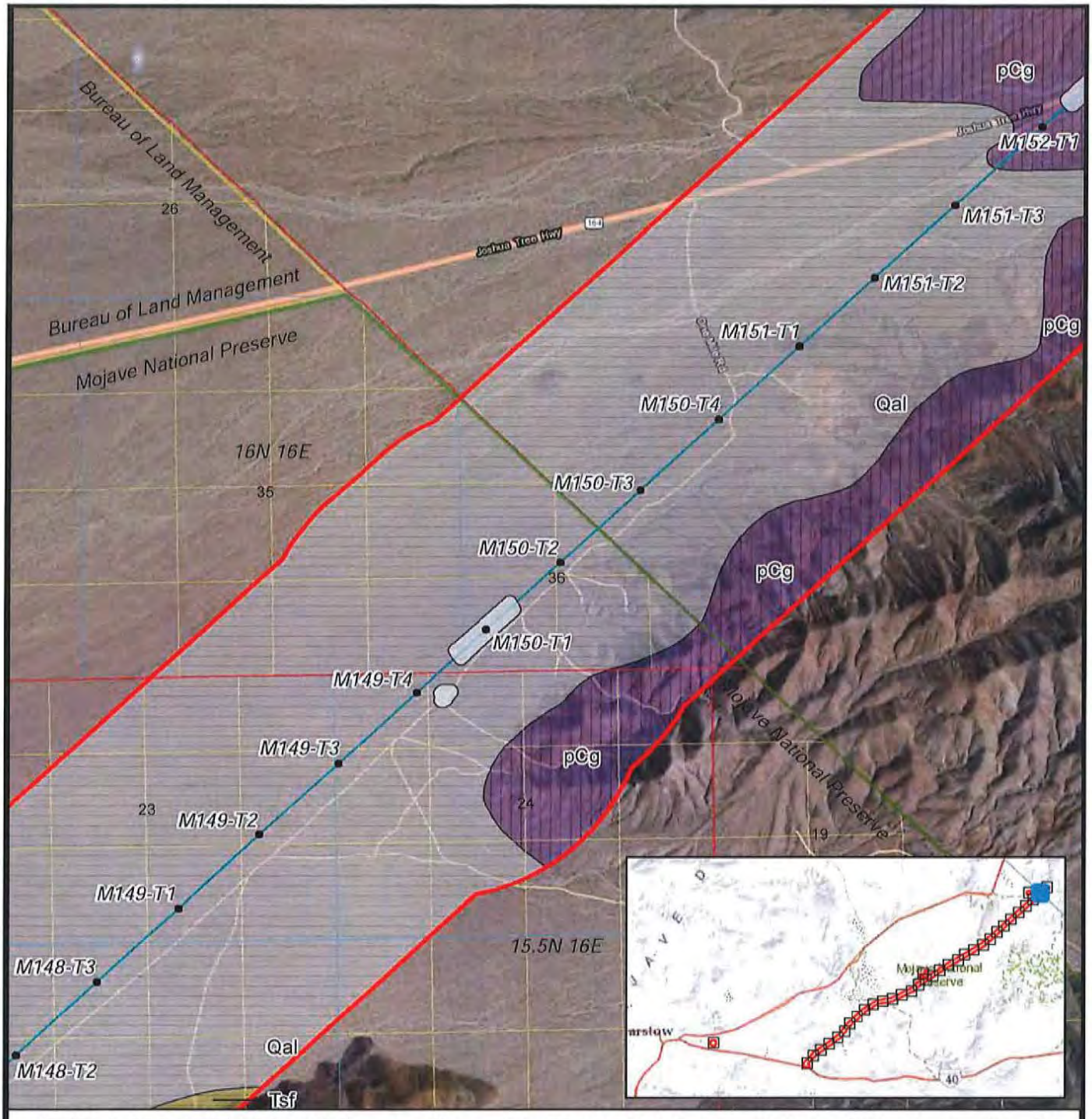
2 - Low

0 ¼ ½ 1

Miles

PALEO SOLUTIONS

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 34

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- Tsf: Sediments and Flows (Tertiary)
- pCg: Gneiss and Granite (Pre-Cambrian)

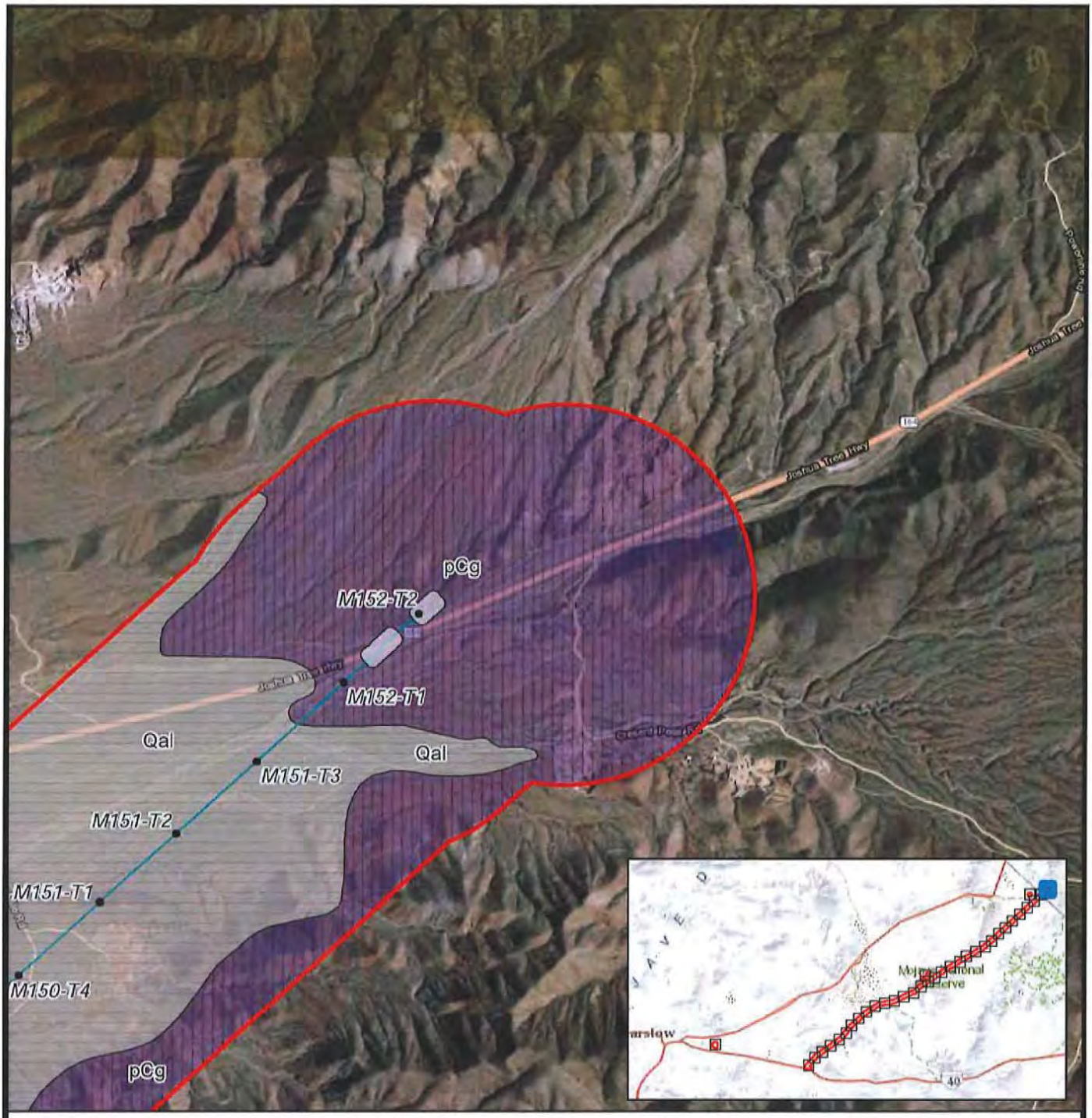
Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

PALEO SOLUTIONS
EST 2004
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada



CWA L003 SCE LVRAS (Lugo-Victorville Remedial Action Scheme) Geology - Pg. 35

- Transmission Structures
- Construction Areas
- Transmission Line
- 1/2 Mile Buffer

Geology

- Qa/Qal: Alluvium (Holocene)
- pCg: Gneiss and Granite (Pre-Cambrian)

Paleosensitivity

- 1 - Very Low
- 2 - Low

0 ¼ ½ 1
Miles

PALEO SOLUTIONS
PALEONTOLOGICAL AND CULTURAL RESOURCE CONSULTING SERVICES

Sources:
Aerial Imagery & Transportation from
Geologic Map and Sections of the Ivanpah
Quadrangle, California-Nevada

APPENDIX C. LOCATION (PLSS)

Quarter-Quarter	Section	Township	Range
L 5 L 8 NENE NWSE SENE SWNE SWSE	36	10N	7E
L 2 L 3 SESW SWSW	2	10N	8E
NENE NESW NWSE SENE SESW SWNE SWSW	10		
NWNW, SWNW	11		
NWNW	15		
NENE NESW NWNE NWSE NWSW SENE SENW SWNE SWSW	16		
SESE	17		
L 7	19		
NENE NESW NWNE NWSW SENW SWNE SWSW	20		
L 3 L 4 NENE NESW NWNE SENW SESW SWNE	30		
L 1	31	10N	8E
L 1, L 2	1	11N	10E
L 1 L 2 NESW NWSE NWSW SWSW	2		
NESE, SESE, SESW, SWSE	3		
SESE, SESW, SWSE	8		
NENE, NESW, NWSE, NWSW, SENE, SWNE, SWSW	9		
NENW, NWNE, NWNW, SWNW	10		
NENW, NWNE, NWNW	17		
L 1, L2, NENE, NWNE, SENE, SWNE	18		
L 1, L 3, L 4, L 6, L 7	25	11N	8E
L 1, L 4, L 6, L 7	30		
NESE, NWSE, SENE, SESW, SWSE	35		
L 2, NENW, NWNW, NWSW, SENW, SWNW	36		
NESW, NWSE, NWSW, SENE, SENW, SWNE, SWNW	13	11N	9E
NESE, NESW, NWSE, NWSW, SWSW	14		
NESE, SESE, SESW, SWSE, SWSW	15		
SESE	16		
NESE, NWSE, SENE, SESW, SWSE, SWSW	20		
NENE, NENW, NWNE, NWSW, SENW, SWNW	21		
L 1, L 4, L 6, L 7	25		
NENW, NWNW	29		
L 1, L 4, L 5, L 6, L 7, NENE, SENE, SWNE	30		
SESE, SESW, SWSE	36	12N	10E
NESW, NWSW	2	12N	11E
NESE	9		
NESE, NWSE, SENE, SESW, SWSE, SWSW	12		
NWNW	13		
NENE, NESW, NWNE, NWSW, SENE, SENW, SWNE, SWNW, SWSW	14		
NESE, SESE, SWSE	15		
NESE, NWSE, SENE, SESW, SWSE, SWSW	21		
NENW, NWNE, NWNW, SENW, SWNW	22		
NENW, NWNW	28		
NENE, NESE, NWSE, SENE, SESW, SWSE	29		
L 1, L 2, NESE, NWSE, SENE, SWNE	31		
NENW, NWNW, SWNW	32		
L 2	4	12N	12E
L 1, L 2, NESW, NWSE, NWSW, SWSW	5		
SESE	6		
L 1, L 2, NENE, NWNE	7		
NESE, SESE, SESW, SWSE	24	13N	12E
NENW, NWNE, NWNW, SWNW	25		
NENE, NESW, NWSE, NWSW, SENE, SWNE, SWSW	26		
SESE	27		
NESE, NWSE, SENE, SESW, SWSE, SWSW	33		
NENE, NENW, NWNE, NWSW, SENW, SWNW	34		
L 1, L 2, NESW, NWSW, SWSW	1		

NESE, SESE, SWSE	2	13N	13E
SESE	9		
NESE, NESW, NWSE, SENE, SESW, SWNE, SWSW	10		
NENW, NWNE, NWNW, SWNW	11		
NENE, NENW, NWNE, NWSW, SENW, SWNW	16		
NESE, NWSE, SENE, SESW, SWSE, SWSW	17		
L 1, L 2, NENE, NWNE, SENE, SWNE	19		
NWNW	20		
L 2	6	13N	14E
NESE, NWSE, SENE, SESW, SWSE	12	14N	14E
NENW, NWNW, SWNW	13		
NESE, NWSE, SENE, SESW, SWSE, SWSW	14		
NENE, NESW, SWSE, SENE, SESW, SWNE, SWSW	22		
NENW, NWNW, SWNW	23		
NWNW	27		
NENE, NESW, NWSE, NWSW, SENE, SENW, SESW, SWNE, SWSW	28		
SESE	29		
NESE, SWSE, SENE, SESE, SESW, SWSE	31		
NENE, NESW, NWNE, NWSW, SENW, SWSE, SWNW	32		
NWNW	33		
L 2, L 2, NWSW	5	14N	15E
NESE, SESE, SWSE	6		
L 1, L 2, NWNE	7		
L 3, SWSW	4	15N	16E
L 3, SWSW	33		
NENE, NESW, NWSE, SENE, SESW, SWNE, SWSW	13	15N	15E
SESE	22		
NENE, NESW, NWNE, NWSE, NWSW, SENE, SENW, SWNE, SWSW	23		
NWNW	24		
NENE, NESW, NWNE, NWSW, SENW, SWNE, SWSW	27		
SESE	28		
NESE, SESE, SWSE	32		
NENE, NENW, NESW, NWNE, NWSW, SENW, SWNE, SWNW	33		
L 1, L 2, L 3, SWSW	4	15N	16E
L 1, NESE, NWSE, SESW, SWSE	5		
L 1, L 2, NESE, NWSE, SENE, SWSE	7		
NENW, NWNW, SWNW	8		
L 1, L 2	18		
L 1	20		
L 2, L 3, L 4, NESW, NWSW	21		
NESE, NWSE, SESE, SESW, SWSE	23		
L 3, L 4, NWSW	24		
NENW, NWNE, NWNW, SWNW	26		
NESE, NWSE, SENE, SESW, SWSE	27		
L 3, NENE, NESE, NESW, NWSE, SENE, SESW, SWNE, SWSE, SWSW,	33		
NENW, NWNW, SWNW	34		
NENE, NESE, NESW, NWNE, NWSE, SENE, SENW, SESE, SESW, SWNE, SWSE	32	16N	16E
NENW, NESW, NWNW, NWSW, SENW, SESW, SWNW, SWSW	33		
SESE	35		
L 2, L 3, SESW, SWSW	36		
L 1, L 2	3	8N	6E
L 1, NESE, NWSE, SESE, SESW, SWSE	4		
NESE, NWSE, SENE, SESE, SESW, SWSE	8		
NENW, NWNE, NWNW, NWSW, SENW, SWNW	9		
NENW, NWNE, NWNW, NWSW, SENW, SWNW	17		
NESE, SENE, SESE, SWSE	18		
NWNE	20		

SESE, SWSE	11	9N	1E
SESE, SESW, SWSE, SWSW	12		
NENE, NENW, NESE, NESW, NWNE, NWNW, NWSE, NWSW, SENE, SENW, SESE, SESW, SWNE, SWNW, SWSE, SWSW	13		
NENE, NESE, NESW, NWNE, NWSE, SENE, SENW, SESE, SESW, SWNE, SWSE	14		
NENE, NWNE, SENE	23		
NENE, NENW, NESW, NWNE, NWNW, NWSE, NWSW, SENE, SENW, SWNE, SWNW	24		
L 1, L 2, NESW, NWNE, NWSW, SENW, SWNE, SWSW	25	9N	6E
SESE, SWSE	26		
L 2, L 3, NESE, NWSE, SENE, SWNE	34		
NENW, NWNE, NWSW, SENW, SWNW	35		
L 1, L 2, NWSW	1	9N	7E
L 1, L 12, L 13, L 14, L 7, L 8	2		
L 10	9		
L 1, L 7, L 8, NESW, NWSE, NWSW, SESW, SWSW	10		
L 3, L 4	11		
NENE, NESW, NWNE, NWSW, SENW, SWNE, SWSW	16		
NESE, SESE, SWSE	17		
L 1, L 2, NESE, NWSE, SENE, SWSE	19		
NENW, NWNE, NWNW, SENW, SWNW	20		
L 2	30		

APPENDIX D. RECORD SEARCH RESULTS

Confidential Appendix Removed

APPENDIX E. MAPPED GEOLOGY BY CONSTRUCTION AREA

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_69	Helicopter Landing Zone	M68-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_70	Helicopter Landing Zone	M68-T1	Qb: Basalt (Pleistocene)	1 - Very Low
LZ_70	Helicopter Landing Zone	M68-T1	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T1	Qa: Alluvium (Holocene)	2 - Low
TBD	Wire Setup (Telecommunication)	M68-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_71	Helicopter Landing Zone	M68-T2	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M68-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M68-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M68-T3	Qa: Alluvium (Holocene)	2 - Low
TBD	Telecommunication	M68-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M68-T3	Qa: Alluvium (Holocene)	2 - Low
TBD	Wire Setup (Telecommunication)	M68-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_68	Helicopter Landing Zone	M68-T4	Qa: Alluvium (Holocene)	2 - Low
LZ_67	Helicopter Landing Zone	M69-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_66	Helicopter Landing Zone	M71-T3	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Wire Setup	M71-T3	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Guard Pole	M72-T1	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
n/a	Guard Pole	M72-T1	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Guard Pole Area	M72-T1	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
n/a	Guard Pole Area	M72-T1	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
LZ_65	Helicopter Landing Zone	M72-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_65	Helicopter Landing Zone	M72-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_64	Helicopter Landing Zone	M72-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_64	Helicopter Landing Zone	M72-T4	gqm: Granite or Quartz Monzonite (Late Jurassic to Early Cretaceous)	1 - Very Low
LZ_64	Helicopter Landing Zone	M72-T4	Tt: Tuff Breccia (Oligocene or Miocene)	U - Unknown
LZ_63	Helicopter Landing Zone	M73-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_62	Helicopter Landing Zone	M74-T1	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_62	Helicopter Landing Zone	M74-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_61	Helicopter Landing Zone	M74-T4	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
n/a	Wire Setup	M74-T4	Qf: Alluvial Fan Gravel (Holocene)	2 - Low
LZ_60	Helicopter Landing Zone	M78-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
n/a	Wire Setup	M78-T1	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
n/a	Wire Setup	M78-T2	Ta: Andesite (Oligocene or Miocene)	1 - Very Low
LZ_59	Helicopter Landing Zone	M81-T1	Qa: Alluvium (Holocene)	2 - Low
LZ_58	Helicopter Landing Zone	M81-T3	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M81-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_57	Helicopter Landing Zone	M82-T5	Qf: Fanglomerate (Pleistocene)	3 - Moderate
LZ_57	Helicopter Landing Zone	M82-T5	Qa: Alluvium (Holocene)	2 - Low
LZ_56	Helicopter Landing Zone	M84-T2	Qf: Fanglomerate (Pleistocene)	3 - Moderate
LZ_55	Helicopter Landing Zone	M84-T3	Qf: Fanglomerate (Pleistocene)	3 - Moderate

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_54	Helicopter Landing Zone	M84-T6	Qa: Alluvium (Holocene)	2 - Low
LZ_54	Helicopter Landing Zone	M84-T6	Qf: Fanglomerate (Pleistocene)	3 - Moderate
n/a	Wire Setup	M84-T6	Qf: Fanglomerate (Pleistocene)	3 - Moderate
n/a	Wire Setup	M84-T6	Qa: Alluvium (Holocene)	2 - Low
LZ_53	Helicopter Landing Zone	M87-T5	Qa: Alluvium (Holocene)	2 - Low
LZ_52	Helicopter Landing Zone	M88-T2	Qa: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M88-T2	Qa: Alluvium (Holocene)	2 - Low
LZ_51	Helicopter Landing Zone	M88-T3	Qa: Alluvium (Holocene)	2 - Low
LZ_50	Helicopter Landing Zone	M90-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_49	Helicopter Landing Zone	M91-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_48	Helicopter Landing Zone	M91-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M91-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_47	Helicopter Landing Zone	M92-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_46	Helicopter Landing Zone	M93-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_45	Helicopter Landing Zone	M94-T6	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M94-T6	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M97-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_44	Helicopter Landing Zone	M97-T2	Qal: Alluvium (Holocene)	2 - Low
PD1	General Disturbance	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
LZ_43	Helicopter Landing Zone	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
LZ_43	Helicopter Landing Zone	M98-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M98-T2	Js: Sands Granite (Jurassic)	1 - Very Low
n/a	Wire Setup	M98-T2	Qal: Alluvium (Holocene)	2 - Low
PD2	General Disturbance	M101-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_42	Helicopter Landing Zone	M101-T5	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M101-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_41	Helicopter Landing Zone	M104-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_40	Helicopter Landing Zone	M105-T1	Pbs: Bird Spring Formation (Pennsylvanian)	3 - Moderate
n/a	Wire Setup	M105-T1	Pbs: Bird Spring Formation (Pennsylvanian)	3 - Moderate
LZ_39	Helicopter Landing Zone	M105-T3	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
LZ_38	Helicopter Landing Zone	M107-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_37	Helicopter Landing Zone	M108-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M108-T2	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
n/a	Wire Setup	M108-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_36	Helicopter Landing Zone	M108-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
LZ_35	Helicopter Landing Zone	M109-T4	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
Old Dad Base Camp	Helicopter Landing Zone	M109-T5	Qoa: Older Alluvium (Pleistocene)	3 - Moderate
Old Dad Base Camp	Helicopter Landing Zone	M109-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_34	Helicopter Landing Zone	M110-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_33	Helicopter Landing Zone	M111-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M111-T5	Qal: Alluvium (Holocene)	2 - Low
LZ_32	Helicopter Landing Zone	M112-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M113-T3	Qal: Alluvium (Holocene)	2 - Low

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
n/a	Guard Pole Area	M113-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_31	Helicopter Landing Zone	M113-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M115-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_30	Helicopter Landing Zone	M116-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_29	Helicopter Landing Zone	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
M118-T1	General Disturbance	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M118-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole	M119-T4	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole Area	M119-T4	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_28	Helicopter Landing Zone	M120-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_27	Helicopter Landing Zone	M121-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M121-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_26	Helicopter Landing Zone	M124-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
PD3	General Disturbance	M124-T3	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M124-T3	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_25	Helicopter Landing Zone	M125-T2	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_24	Helicopter Landing Zone	M127-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_22	Helicopter Landing Zone	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_23	Helicopter Landing Zone	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Wire Setup	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
TBD	Wire Setup (Telecommunication)	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
TBD	Telecommunication	M127-T6	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole	M128-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
n/a	Guard Pole Area	M128-T1	TKq: Teutonia Quartz Monzonite (Cretaceous or Tertiary)	1 - Very Low
LZ_21	Helicopter Landing Zone	M128-T5	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M129-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M129-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_20	Helicopter Landing Zone	M130-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_19	Helicopter Landing Zone	M130-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_18	Helicopter Landing Zone	M131-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M131-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_17	Helicopter Landing Zone	M131-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_16	Helicopter Landing Zone	M131-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_15	Helicopter Landing Zone	M133-T2	Qal: Alluvium (Holocene)	2 - Low

Construction Area Name	Construction Area Type	Nearest Transmission Structure	Geology (Age)	Paleo Potential
LZ_14	Helicopter Landing Zone	M134-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M134-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_13	Helicopter Landing Zone	M134-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_12	Helicopter Landing Zone	M135-T2	Qal: Alluvium (Holocene)	2 - Low
LZ_11	Helicopter Landing Zone	M135-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_10	Helicopter Landing Zone	M137-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M137-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_9	Helicopter Landing Zone	M139-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M140-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M140-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_8	Helicopter Landing Zone	M141-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M141-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_7	Helicopter Landing Zone	M142-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_6	Helicopter Landing Zone	M142-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_5	Helicopter Landing Zone	M143-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_4	Helicopter Landing Zone	M144-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M144-T2	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M146-T3	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole Area	M146-T3	Qal: Alluvium (Holocene)	2 - Low
LZ_3	Helicopter Landing Zone	M147-T1	Qal: Alluvium (Holocene)	2 - Low
LZ_2	Helicopter Landing Zone	M147-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M147-T4	Qal: Alluvium (Holocene)	2 - Low
LZ_1	Helicopter Landing Zone	M149-T4	Qal: Alluvium (Holocene)	2 - Low
n/a	Wire Setup	M150-T1	Qal: Alluvium (Holocene)	2 - Low
n/a	Guard Pole	M152-T1	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole Area	M152-T1	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Guard Pole Area	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
n/a	Wire Setup	M152-T2	pCg: Gneiss and Granite (Pre-Cambrian)	1 - Very Low
Nipton (Rev) - 3.6	Material Laydown Yard	n/a	Qal: Alluvium (Holocene)	2 - Low
Daggett training and storage yard	Material Laydown Yard	n/a	Qa: Alluvium (Holocene)	2 - Low