Estrella Substation and Paso Robles Area Reinforcement Project Paleontological Resources Technical Report for the Templeton Route Alternatives San Luis Obispo County, California

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EXECUTIVE SUMMARY

A Paleontological Resources Technical Report (PRTR) has been prepared for the Paso Robles-Templeton Existing 70 kilovolt (kV) Route Alternative, the Paso Robles-Templeton South River Route Alternative, and the Paso Robles-Templeton Creston Route Alternative (hereinafter collectively referred to as the "Templeton Route Alternatives") for the Estrella Substation and Paso Robles Area Reinforcement Project (project) proposed jointly by Pacific Gas and Electric Company (PG&E) and NextEra Energy Transmission West, LLC (NEET West). PG&E and NEET West prepared and filed a Proponent's Environmental Assessment (PEA) with the California Public Utilities Commission (CPUC) in May 2017 for the project (SWCA 2017). The CPUC issued a PEA deficiency letter (Deficiency Letter No. 4, dated February 27, 2018) requiring that PG&E and NEET West evaluate alternatives to the project. This PRTR provides a technical environmental analysis of paleontological resources associated with the Templeton Route Alternatives.

The Templeton Route Alternatives are located within and adjacent to the Templeton and Paso Robles area of San Luis Obispo County. The Paso Robles-Templeton Existing 70 kV Route Alternative involves the reconstruction and conversion of an existing 4.9-mile 70 kV single-circuit power line into a double-circuit power line. The Paso Robles-Templeton South River Route Alternative involves the construction of a new, approximately 5.2-mile-long double-circuit 70 kV power line. The Paso Robles-Templeton Creston Route Alternative involves the construction of a new, approximately 6.1-mile-long double-circuit 70 kV power line.

This report is intended to assess the paleontological sensitivity of the Templeton Route Alternatives and analyze impacts to paleontological resources that may occur as a result of the Templeton Route Alternatives. 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 un-mineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. This report presents the results of the paleontological records search, literature review, resource assessment, and field investigation completed for the Templeton Route Alternatives. These data sources were used to assign a paleontological sensitivity ranking from the Bureau of Land Management's Potential Fossil Yield Classification to each of the geologic units present in the vicinity of the Templeton Route Alternatives.

Geologic mapping by Dibblee and Minch (2004) indicates that the Templeton Route Alternatives are underlain by three geologic units: Holocene (recent)-aged younger alluvium, Pleistocene-aged older alluvium, and the Pliocene/Pleistocene-aged Paso Robles Formation. An additional unit, the Miocene-aged Monterey Formation, may be present in the subsurface of the Templeton Route Alternatives. Museum collections records maintained by the Natural History Museum of Los Angeles County (LACM) and the University of California Museum of Paleontology (UCMP) indicate that 10 fossil localities have been recorded within a 15-mile radius of the Templeton Route Alternatives, one of which is located on the Paso Robles-Templeton Creston Route Alternative. No fossils were discovered during the field investigation. The combined results of the museum records searches, literature review, and field investigation indicate that geologic units underlying the Templeton Route Alternatives have the following Potential Fossil Yield Classifications: younger alluvium, Low (2) overlying High (4); older alluvium, High (4); and Paso Robles Formation, High (4).

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Acronyms and Abbreviations

BLM	Bureau of Land Management
CEQA	California Environmental Quality Act
County	County of San Luis Obispo, agency
CPUC	California Public Utilities Commission
HOA	Homeowners Association
kV	kilovolt
LACM	Natural History Museum of Los Angeles County
LCSLO	Land Conservancy of San Luis Obispo
NEET West	NextEra Energy Transmission West, LLC
PEA	Proponent's Environmental Assessment
PFYC	Potential Fossil Yield Classification
PG&E	Pacific Gas and Electric Company
PRC	California Public Resources Code
project	Estrella Substation and Paso Robles Area Reinforcement Project
PRTR	Paleontological Resources Technical Report
SR-	State Route
substation alternative	Templeton Substation Alternative
SVP	Society of Vertebrate Paleontology
UCMP	University of California Museum of Paleontology

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1 INTRODUCTION

Pacific Gas and Electric Company (PG&E) and NextEra Energy Transmission West, LLC (NEET West) propose to construct the Estrella Substation and Paso Robles Area Reinforcement Project (project) in the Paso Robles area of San Luis Obispo County, California. In May 2017, PG&E and NEET West jointly prepared and filed a Proponent's Environmental Assessment (PEA) with the California Public Utilities Commission (CPUC) for the project (SWCA 2017). The CPUC issued a series of PEA deficiency letters, in which Deficiency Letter No. 4, dated February 27, 2018, required that PG&E and NEET West evaluate additional route alternatives to the project. In response to the CPUC's Deficiency Letter No. 4, PG&E identified the following three power line route alternatives, collectively referred to as the "Templeton Route Alternatives."

- **Paso Robles-Templeton Existing 70 kilovolt (kV) Route Alternative** involves the reconstruction and conversion of an existing approximately 4.9-mile 70 kV single-circuit power line route into a double-circuit power line. The existing power line connects Paso Robles Substation to Templeton Substation.
- **Paso Robles-Templeton South River Route Alternative** involves the construction of a new, approximately 5.2-mile double-circuit 70 kV power line that will connect Paso Robles Substation to Templeton Substation.
- **Paso Robles-Templeton Creston Route Alternative** involves the construction of a new approximately 6.1-mile double-circuit 70 kV power line that will connect Paso Robles Substation to Templeton Substation.

This Paleontological Resources Technical Report (PRTR) has been prepared to document existing paleontological resources in the vicinity of the Templeton Route Alternatives. The location of the Templeton Route Alternatives is depicted in Figures 1 and 2. A similar report has been prepared for the substation component of the alternatives analysis, referred to as the "Templeton Substation Alternative," and the results of that effort are presented under separate cover.

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 un-mineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. This report presents the results of the paleontological records search, literature review, resource assessment, and field investigation completed for the project substation site. These data sources were used to assign a paleontological sensitivity ranking from the Bureau of Land Management's (BLM) Potential Fossil Yield Classification to each of the geologic units present in the vicinity of the Templeton Route Alternatives.

Figure 1. General Vicinity Map

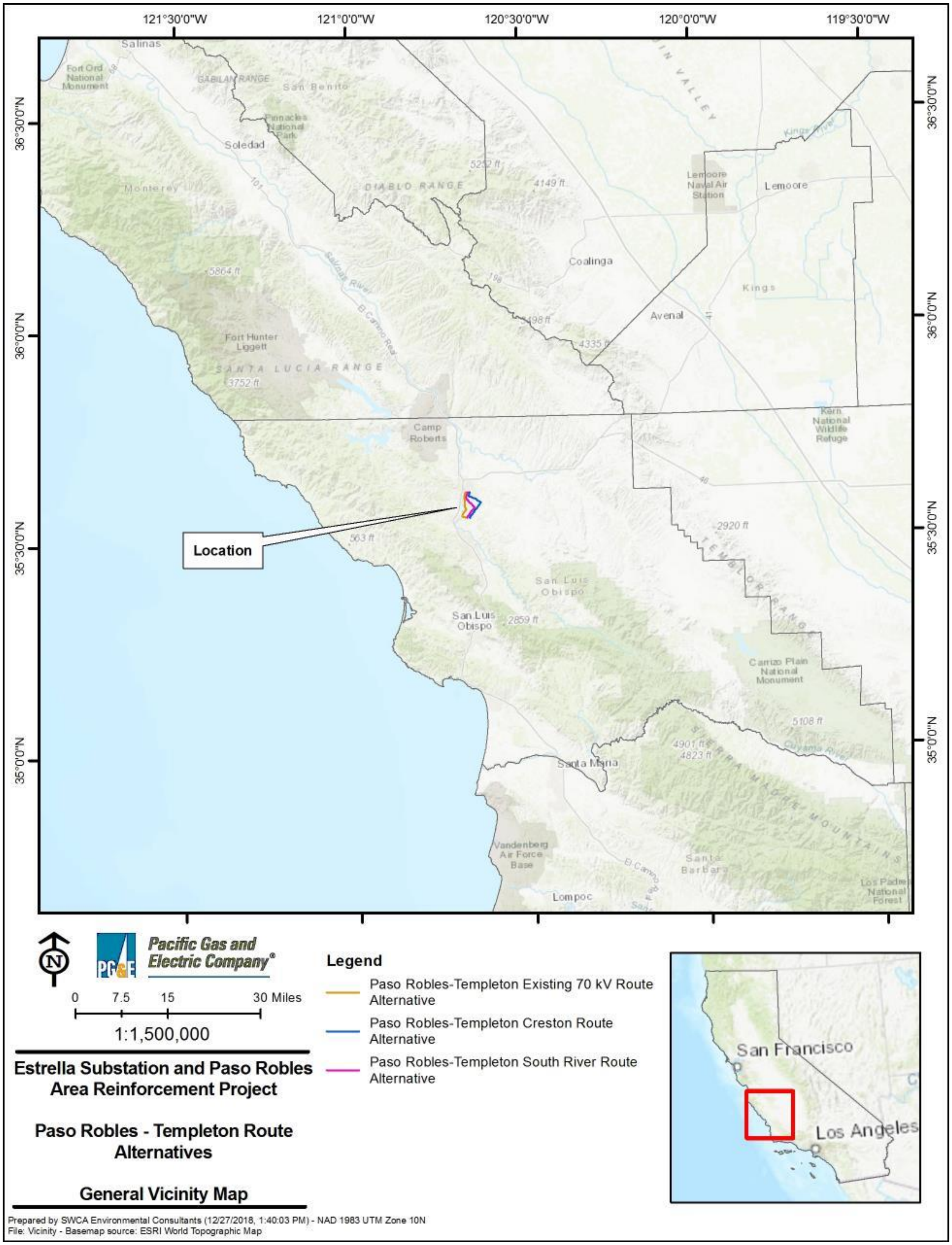
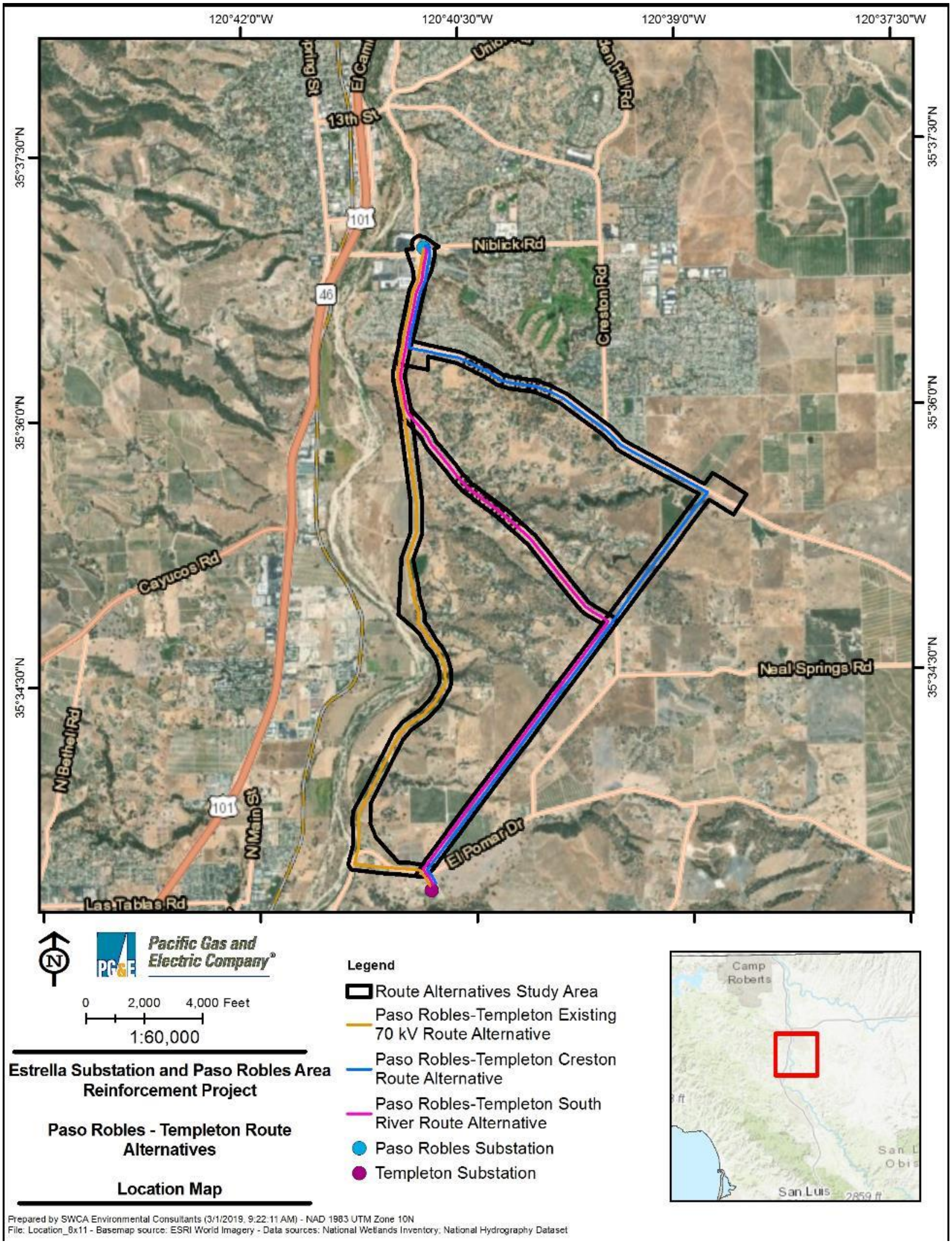


Figure 2. Location Map



1.1 Paso Robles-Templeton Existing 70 kV Route Alternative

The Paso Robles-Templeton Existing 70 kV Route Alternative is in the north-central portion of San Luis Obispo County, east of the unincorporated town of Templeton and within and around the city of Paso Robles (Figures 1 and 2). The line begins by traveling west out of Templeton Substation for approximately 0.6 mile, then heads north generally paralleling Vaquero Drive for 0.7 mile before traveling adjacent to rural single-family residential homes and across undeveloped land for approximately 1.7 miles. The line then generally follows Santa Ysabel Avenue north for 0.8 mile and South River Road for an additional 1.1 miles before tying into Paso Robles Substation. Land uses primarily consist of rural residential developments and agricultural areas with more dense urban developments along the northern end of the alignment. This alternative route is located on a combination of PG&E easements and privately owned parcels.

1.2 Paso Robles-Templeton South River Route Alternative

The Paso Robles-Templeton South River Route Alternative is in the north-central portion of San Luis Obispo County, within and around the city of Paso Robles and east of the unincorporated town of Templeton. A new 70 kV power line would follow the existing 500 kV and 230 kV transmission line corridor northeasterly out of Templeton Substation for approximately 2.1 miles to where it intersects with South River Road. The route would then follow South River Road generally northwest for 3.1 miles before tying into Paso Robles Substation. Land uses consist of agricultural areas, rural residential areas, and areas of urban development. This alternative route is located on a combination of PG&E easements and privately owned parcels, including the Spanish Lakes and Santa Ysabel Ranch Homeowners Associations (HOAs).

1.3 Paso Robles-Templeton Creston Route Alternative

The Paso Robles-Templeton Creston Route Alternative is in the north-central portion of San Luis Obispo County, within and around the city of Paso Robles and east of the unincorporated town of Templeton (Figures 1 and 2). A new 70 kV power line would follow the existing 500 kV and 230 kV transmission line corridor northeasterly out of Templeton Substation for approximately 3.2 miles to where it intersects with Creston Road. At Creston Road, the line would head northwest for approximately 2.2 miles along Creston Road and Charolais Road, then continue north for approximately 0.7 mile along South River Road before tying into Paso Robles Substation. Land uses primarily consist of agricultural and rural residential areas, with areas of urban development. This alternative route is located on a combination of privately owned and city of Paso Robles-owned parcels, PG&E easements, and a Land Conservancy of San Luis Obispo (LCSLO) conservation easement.

2 REGULATORY BACKGROUND

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under federal (Paleontological Resources Preservation Act), state (California Environmental Quality Act [CEQA]); California Public Resources Code [PRC]), and county (*County of San Luis Obispo General Plan*) laws, ordinances, and regulations. This study satisfies project requirements in accordance with CEQA (Title 14, Division 6, Chapter 3, California Code of Regulations [CCR] 15000 et seq.), and PRC (Chapter 1.7) Sections 5097.5 and 30244. The Society of Vertebrate Paleontology (SVP) (1995, 2010) has established professional standards for the assessment and mitigation of adverse impacts to paleontological resources. The following sections describe specific laws, ordinances, and regulations that are applicable to the Templeton Route Alternatives.

2.1 Federal

A federal agency is not approving, implementing, or funding the project or any element of it; therefore, federal ordinances and regulations would not apply to the Templeton Route Alternatives.

2.2 State

2.2.1 California Environmental Quality Act

State guidelines for the implementation of the California Environmental Quality Act (CEQA), as amended March 29, 1999 (14 CCR Division 6, Chapter 3, 15000 et seq.) define procedures, types of activities, persons, and public agencies required to comply with CEQA. The guidelines include the following question among those to be answered in the Environmental Checklist (Appendix G, Section V, Part c): "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

CEQA includes in its definition of historical resources, "any object [or] site …that has yielded or may be likely to yield information important in prehistory" (14 CCR 15064.5[3]), which is typically interpreted as including fossil materials and other paleontological resources. More specifically, destruction of a "unique paleontological resource or site or unique geologic feature constitutes a significant impact under CEQA" (State CEQA Guidelines Appendix G). CEQA does not provide an explicit definition of a "unique paleontological resource," but a definition is implied by comparable language within the act relating to archeological resources: "The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in: Guidelines for the Implementation of CEQA, as amended March 29, 1999" (14 CCR Chapter 3, 15000 et seq.).

CEQA encourages the protection of all aspects of the environment by requiring state and local agencies to prepare multidisciplinary analyses of the environmental impacts of a proposed project, and to make decisions based on the findings of those analyses. Treatment of paleontological resources under CEQA is generally conducted according to guidance from the SVP or agencies such as the BLM and typically includes identification, assessment, and development of mitigation measures for potential impacts to significant or unique resources.

Appendix G (Part V) of the State CEQA Guidelines provides guidance relative to significant impacts on paleontological resources, which states, "a project will normally result in a significant impact on the environment if it will … disrupt or adversely affect a paleontological resource or site or unique geologic feature, except as part of a scientific study."

2.2.2 California Public Resources Code

The California Public Resources Code (PRC) (Chapter 1.7, Section 5097.5) includes additional state-level requirements for the management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on public lands, define the removal of paleontological sites or features from public lands as a misdemeanor, and prohibit the removal of any paleontological site or feature from state land without permission of the applicable jurisdictional agency.

PRC Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands. Further, the California Penal Code Section 622.5 sets the penalties for damage or removal of paleontological resources.

2.3 Local

Because the CPUC has exclusive jurisdiction over the siting, design, and construction of transmission facilities in California, the Templeton Route Alternatives are not subject to local discretionary regulations.

3 METHODOLOGY

3.1 Professional Standards

While there is no professional certification for the practice of mitigation paleontology, multiple agencies, professional organizations, and individual paleontologists have developed guidelines for best practices in mitigation paleontology.

The SVP is the largest professional organization of paleontologists and has established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation (1995, 2010). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as described in the standard guidelines of the SVP. Typically, state regulatory agencies accept and use the professional standards set forth by the SVP.

The BLM has also developed a comprehensive set of guidelines for the protection of fossil resources in land use planning, analysis of potential impacts to fossil resources, development of sensitivity rankings, mitigation and monitoring, and permitting (BLM, 2007). Furthermore, a small but significant body of scientific literature exists regarding best practices in paleontological mitigation (Knauss et al., 2014; Murphey et al., 2014) and case studies of successful mitigation projects (for example, see Benson 1998; Haasl et al., 2009; Dundas et al., 2013; Tomassi et al., 2015).

3.1.1 Paleontological Significance and Sensitivity

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under federal and state laws and regulations. The State CEQA Guidelines (Title 14, Chapter 3 of the PRC, Section 15000 et seq.) are prescribed by the Secretary of Resources to be followed by state and local agencies in California in their implementation of CEQA. Appendix G of the State CEQA Guidelines includes an Environmental Checklist Form with questions that may be used by public agencies in their assessment of impacts on the environment. The question within Appendix G that relates to paleontological resources states: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?"

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or

5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

Furthermore, both the SVP (1995, 2010) and the BLM (2009, 2016) have established standard guidelines that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological laws, ordinances, regulations, and standards accept and use the professional standards set forth by the SVP, as to meeting the requirements of CEQA, while the BLM's paleontological guidelines are designed to meet federal standards and regulations.

As defined by the SVP (2010:11), significant paleontological resources are:

> …fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).

As defined by the BLM (2009:19), significant paleontological resources are:

> …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 scientifically important because 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 identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of 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.

These definitions of significance are similar in that both recognize that any type of fossil (invertebrate, vertebrate, plant, or trace fossils) can be scientifically significant if it is identifiable or well preserved and contributes scientifically valuable data.

3.1.2 Potential Fossil Yield Classification System

The BLM devised a system for evaluating the paleontological resource potential of geologic formations. The Potential Fossil Yield Classification (PFYC) system ranks deposits on a 1 to 5 scale, with 5 having the highest potential, and uses geologic mapping as a predictive tool to identify areas of paleontological sensitivity.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The PFYC system is based on the "relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential" (BLM 2007). This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. PFYC classification does not reflect rare or isolated occurrences of significant fossils or individual localities, only the relative occurrence on a formation or member-wide basis. Any rare occurrences will require additional assessment and mitigation if they fall within the area of anticipated impacts.

The PFYC system is not intended to be applied to specific paleontological localities or small geographic areas within geologic units. Although significant localities may occasionally occur in a geologic unit, the existence of a few important fossils or localities widely scattered over a large area does not necessarily indicate a higher classification for the unit. The relative abundance of significant localities is intended to serve as the major determinant for the class assignment. The PFYC system is intended to provide baseline guidance for predicting, assessing, and mitigating impacts on paleontological resources.

Guidelines from the BLM describe the PFYC system as follows:

Class 1 – Very Low. Geologic units that are not likely to contain recognizable paleontological resources. Units assigned to Class 1 typically have one or more of the following characteristics:

- Geologic units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
- Geologic units are Precambrian in age.

Class 2 – Low. Geologic units that are not likely to contain paleontological resources. Units assigned to Class 2 typically have one or more of the following characteristics:

- 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 aeolian deposits.
- Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.

Class 3 – Moderate. Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Units assigned to Class 3 have some of the following characteristics:

- Marine in origin with sporadic known occurrences of paleontological resources.
- Paleontological resources may occur intermittently, but abundance is known to be low.
- Units may contain significant paleontological resources, but these occurrences are widely scattered.
- The potential for an authorized land use to impact a significant paleontological resource is known to be low to moderate.

Class 4 – High. Geologic units that are known to contain a high occurrence of paleontological resources. Units assigned to Class 4 typically have the following characteristics:

- 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.

Class 5 – Very High. Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources. Units assigned to Class 5 have some or all of the following characteristics:

- 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.

Class U – Unknown Potential. Geologic units that cannot receive an informed PFYC assignment. Characteristics of Class U may include:

- 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 known.
- Geological 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.

3.2 Literature Review and Records Search

The location of the Templeton Route Alternatives was the subject of thorough background research and analysis, including review of the scientific literature and geologic mapping and records searches from the University of California Museum of Paleontology (UCMP) (Finger, 2016) and the Natural History Museum of Los Angeles County (LACM) (McLeod, 2016). The purpose of the literature review was to evaluate the paleontological sensitivity of the Templeton Route Alternatives in order to identify known fossil localities within the routes or nearby in the same geologic formations. The records searches were requested for any previously recorded fossil localities in the vicinity of the Templeton Route Alternatives. These data were combined to assign paleontological sensitivity rankings to the geologic units present in and around the Templeton Route Alternatives.

3.3 Field Inspection

The field inspection was designed to determine the presence of paleontologically-sensitive geologic units at or in the vicinity of the Templeton Route Alternatives, both on the land surface and, if possible, in the subsurface. Paleontological surveys are largely dependent on local environmental factors, including topography, erosion, vegetation cover, and human development. Typically, survey routes follow the landscape, with focus given to areas where washes and channels dissect surface deposits and expose layered strata. Because washes collect and concentrate fossils eroded from channel banks, it is more likely they will be observed in these areas, which are also generally free of the soils that may cover fossils. Therefore, the field survey was limited to areas with potential exposure of fossiliferous deposits in and around the Templeton Route Alternatives.

The field survey was conducted by paleontologists between October 1 and 2, 2018 and expanded upon an initial paleontological field survey conducted in May 2016 for the Estrella, Creston, and 70 kV power line routes that were evaluated as part of the PEA. The surveyed area covered the Templeton Route Alternatives study areas (Figure 2), as well as potentially informative outcrops in the near vicinity, and did not discover any new paleontological localities. This survey was focused on identifying: 1) surface fossils, 2) exposures of potentially fossiliferous rock, and 3) areas in which fossiliferous rock may be exposed or otherwise impacted during construction. Due to the current agricultural development over large portions of the Templeton Route Alternatives study areas, localities nearby that exposed the surface and subsurface geology of the area were also examined.

4 EXISTING CONDITIONS

The Templeton Route Alternatives are located between the Temblor Range and the Santa Lucia Coastal Range, at the southern end of the Salinas River Valley, within the Coast Ranges Geomorphic Province. The Coast Ranges Geomorphic Province is bounded to the north by the Klamath Mountains, to the east by the Great Valley, and to the south by the Transverse Ranges (Norris and Webb, 1990). The Coast Ranges occupy the Pacific Coast of California from the northern border with Oregon to a point just north of Santa Barbara, a distance of around 590 miles (Norris and Webb 1990). Mountains in the Coast Ranges vary from 2,000 to 6,000 feet above sea level and trend north-west, roughly following the San Andreas Fault (Norris and Webb, 1990).

The rocks of the Coast Ranges province are a thick series of Mesozoic and Cenozoic sedimentary strata overlying either the bedrock granites in the Salinian block or the metamorphosed Franciscan complex (Harden, 2004). The Franciscan subduction complex consists of metamorphosed sedimentary rocks derived from the rapid erosion of volcanic uplands and their subsequent deposition in deep marine basins during the middle Jurassic (150–165 million years ago [Ma]) (Wakabayashi, 2011). The Franciscan is on average 7,600 meters thick and is exposed over an area of around 190,000 square kilometers (Norris and Webb, 1990). The Salinian block represents a magmatic arc and consists of metamorphic rocks and granitic plutons varying from granodiorite and quartz monzonite to quartz diorite dating from the Late Cretaceous (69–110 Ma) (Barbeau et al., 2005). After Mesozoic deposition shifted to continental shelf origins, a thick series of Cenozoic sedimentary rocks were deposited in the Coast Ranges, the largest of which is the Miocene Monterey formation (approximately 13–15 Ma), a marine unit characterized by organic deposits (Follmi et al., 2005). During the Pliocene (2.6–5.3 Ma), the sea had withdrawn from most of the Coast Ranges and erosion of the uplands onto valley floors was prominent by the Pleistocene (2.6 Ma) and continues today (Norris and Webb, 1990). Coincident with the withdrawal of the sea was the initiation of the Coast Ranges orogeny, creating the topography observed today (Harden, 2004).

According to mapping by Dibblee and Minch (2004), the Templeton Route Alternatives are underlain by three different geologic units: Holocene (recent)-aged younger alluvium, Pleistocene-aged older alluvium, and the Pliocene/Pleistocene-aged Paso Robles Formation. An additional unit, the Miocene-aged Monterey Formation, may be present in the subsurface of the Templeton Route Alternatives. These geologic units and their paleontological sensitivity are discussed below and summarized in Tables 1 and 2.

Table 1. Geologic Units along the Templeton Route Alternatives

Geologic Unit	Age	Lithology
Younger Alluvium (Qa)	Recent – early Holocene (0.01 Ma)	Unconsolidated silt, sand, and gravel
Older Alluvium (Qoa)	Pleistocene (2.6 – 0.01 Ma)	Dissected alluvial gravels and sands
Paso Robles Formation (Qtp)	Pleistocene – late Pliocene (3.6 – 2.6 Ma)	Weakly indurated clays-gravels of marine and nonmarine origins
Monterey Formation (Tm)	Late Miocene (15 – 3 Ma)	White siliceous shale

4.1 Geology and Paleontology

4.1.1 Younger Alluvium

Younger alluvial sediments are found underlying the majority of the Paso Robles-Templeton Existing 70 kV Route Alternative, the northern half of the Paso Robles-Templeton Creston Route Alternative, and the northernmost extent of the Paso Robles-Templeton South River Route Alternative (mapped as Qa in Figure 3). These sediments consist of unconsolidated silt, sand, and gravel; and date from modern times to the Holocene, with an undetermined depth in the vicinity of the Templeton Route Alternatives (Dibblee and Minch, 2004). These sediments are too young to preserve fossil resources in the upper layers (i.e., under 5,000 years, as per the SVP [2010]); however, they increase in age with depth such that fossil resources may be encountered in the deeper levels of this unit. Additionally, this unit likely overlays older alluvium or the Paso Robles Formation, both of which have high paleontological sensitivity (see below).

4.1.2 Older Alluvium

Older alluvial sediments are found scattered across the Templeton Route Alternatives: at the southernmost end of the Paso Robles-Templeton Existing 70 kV Route Alternative, along the southern half of the Paso Robles-Templeton Creston Route Alternative, and the southernmost end of the Paso Robles-Templeton South River Route Alternative (mapped as Qoa in Figure 3). These sediments are Pleistocene (0.01–2.6 Ma) in age and consist of dissected terraces of gravel and sand (Dibblee and Minch, 2004). A number of fossil finds have been reported in the literature from the older alluvial sediments in San Luis Obispo County, including mammoths, camel, horse, bison, rodents, ground sloth, and others (Jefferson et al., 1992; Smith, 1979). Older alluvium has a rich fossil history in California, where these sediments preserve fossils of iconic Ice Age animals (Graham and Lundelius, 1994; Jefferson, 1991a and b). In addition to illuminating the striking differences between Southern California in the Pleistocene and today, this abundant fossil record has been vital in studies of extinction (e.g., Sandom et al., 2014; Scott, 2010), ecology (e.g., Connin et al., 1998), and climate change (e.g., Roy et al., 1996).

4.1.3 Paso Robles Formation

The Paso Robles Formation underlies fragmented portions of the Templeton Route Alternatives: along the central portion of the Paso Robles-Templeton Existing 70 kV Route Alternative, scattered across the length of the Paso Robles-Templeton Creston Route Alternative, and across the central portion of the Paso Robles-Templeton South River Route Alternative (mapped as Qtp in Figure 3). The Paso Robles Formation dates from the Pleistocene to the latest Pliocene (3.6–2.6 Ma) and consists of weakly indurated pebble, gravel, sand, and clay (Dibblee and Minch, 2004). Facies-level studies have not been conducted to date on the Paso Robles Formation, and so the level of detail at which this unit is discussed, including the discussion of fossil resources, must remain at the formation level. The Paso Robles Formation unconformably overlies the Monterey Formation and is exposed almost continuously throughout the upper Salinas Valley (Addicott and Galehouse, 1973), including the area around Paso Robles where the Templeton Substation Alternative is located. The Paso Robles Formation contains facies of both marine and nonmarine origins (Woodring and Bramlette, 1950). Significant fossils were first found in the Paso Robles Formation in 1921 with the discovery of a marine mammal identified as an undescribed seal (pinniped) (Kellogg, 1921). Additionally, a large number of marine bivalves including *Ostrea vespertina*, *O. atwoodi*, *Nettastomella rostrata*, and *Hinnites giganteus* (Addicott and Galehouse, 1973), as well as smaller numbers of freshwater gastropods and ostracodes (Woodring and Bramlette, 1950), have been reported from the Paso Robles Formation. These finds indicate that throughout its occurrence, the Paso Robles Formation may preserve significant fossil resources because the same basic formation processes and paleoenvironmental conditions are present throughout, creating similar conditions for the potential presence of fossils.

4.1.4 Monterey Formation

The Monterey Formation does not occur at the surface of the Templeton Route Alternatives, but may be present in the subsurface. This is particularly likely for the southern halves of the Paso Robles-Templeton Creston Route Alternative and the Paso Robles-Templeton South River Route Alternative, where surface outcrops of the Monterey Formation are found very near to the Templeton Route Alternatives. The Monterey Formation consists of a white siliceous shale that records the filling of a deep basin formed by tectonism along the California margin (Pisciotto and Garrison, 1981) and constitutes one of the major elements of California geology (Bramlette, 1946). The Monterey ranges in age from 3 to 15 Ma (Obradovich and Naeser, 1981), and preserves a diverse fauna consisting of mollusks (Bramlette, 1946), fish (Bramlette, 1946; Dibblee, 1973), and the remains of larger marine macrofauna such as whales (Pyenson and Haasl, 2007) and the giant extinct *Desmostylus* (Hannibal, 1922), as well as birds (Warheit, 1992), crocodiles (Barboza et al., 2017), and rare land organisms such as horse and land plants (Bramlette, 1946). These finds indicate that throughout its occurrence the Monterey Formation may preserve significant fossil resources, because, as noted in 4.1.3, similar paleoenvironmental conditions and similar depsotional processes throughout the formation produce similar paleontological sensitivity.

4.1.5 Records Search Results

A records search request was submitted to the UCMP and the LACM for the vicinity of the Templeton Route Alternatives. There are 10 fossil localities that have been recorded within a 15-mile radius of the Templeton Route Alternatives.

The UCMP has one recorded fossil locality in the Paso Robles-Templeton Creston Route Alternative study area, where a cetotherid whale (Cetacea: Cetotheriidae), a type of extinct baleen whale, was collected from rocks ascribed to the Miocene-aged Monterey Formation (Finger, 2016; UCMP, 2018). The area is mapped at the surface as younger alluvium adjacent to the Paso Robles Formation (Dibblee and Minch, 2004), and so it is likely that the Monterey Formation is present in the subsurface.

The LACM has records of three additional localities roughly 1 mile from the Templeton Route Alternatives. The nearest LACM fossil locality to the Templeton Route Alternatives is in a wash off Dry Canyon between State Route (SR-) 46 and Union Road, approximately one mile northeast of Paso Robles Substation, where the LACM recovered fossil specimens of stickleback fish (*Gasterosteus*), giant tortoise (*Geochelone*), and horse (Equidae) in the Paso Robles Formation (McLeod, 2016). Two other fossil localities are just over 1 mile away from the Templeton Route Alternatives (McLeod, 2016). Both sites occur in older alluvium. One of these sites produced fossil specimens of mammoth (*Mammuthus*), horse (*Equus occidentalis*), and bison (*Bison antiquus*), while the other produced lizard (Lacertilia) and mammoth (*Mammuthus*) (McLeod, 2016).

Both the UCMP (Finger, 2016; see also Appendix A) and the LACM (McLeod, 2016; see also Appendix B) have records of an additional six localities within a 15-mile radius of the Templeton Route Alternatives. All of these localities occur in either older alluvium or the Monterey Formation, which does not occur at the surface along the Templeton Route Alternatives.

4.1.6 Field Inspection

The field inspection on October 1 and 2, 2018 did not identify any new geologic outcrops in or around the Templeton Route Alternatives that were not surveyed during the previous survey in May 2016. Neither survey identified any fossil resources.

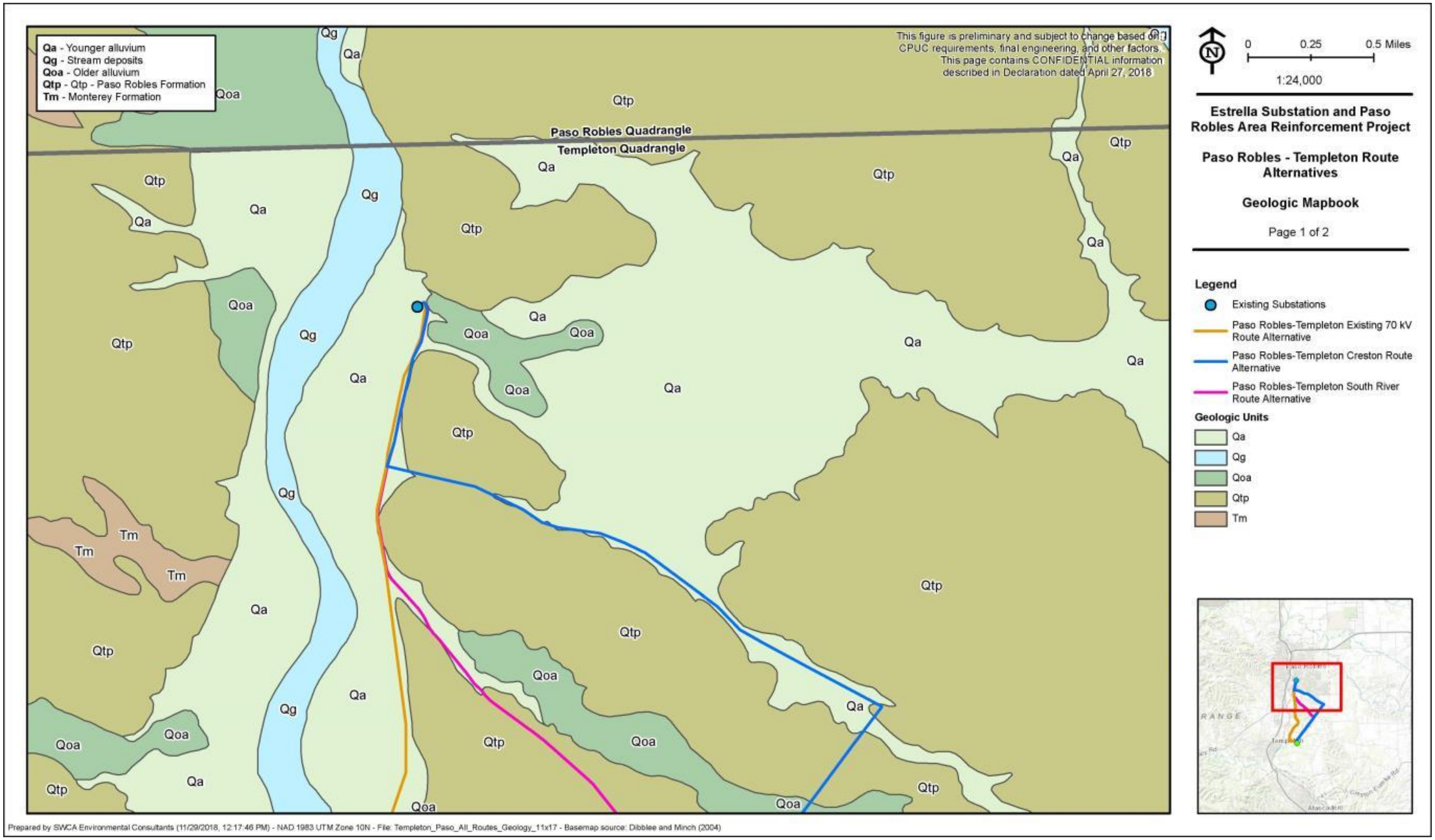
4.2 Paleontological Sensitivity

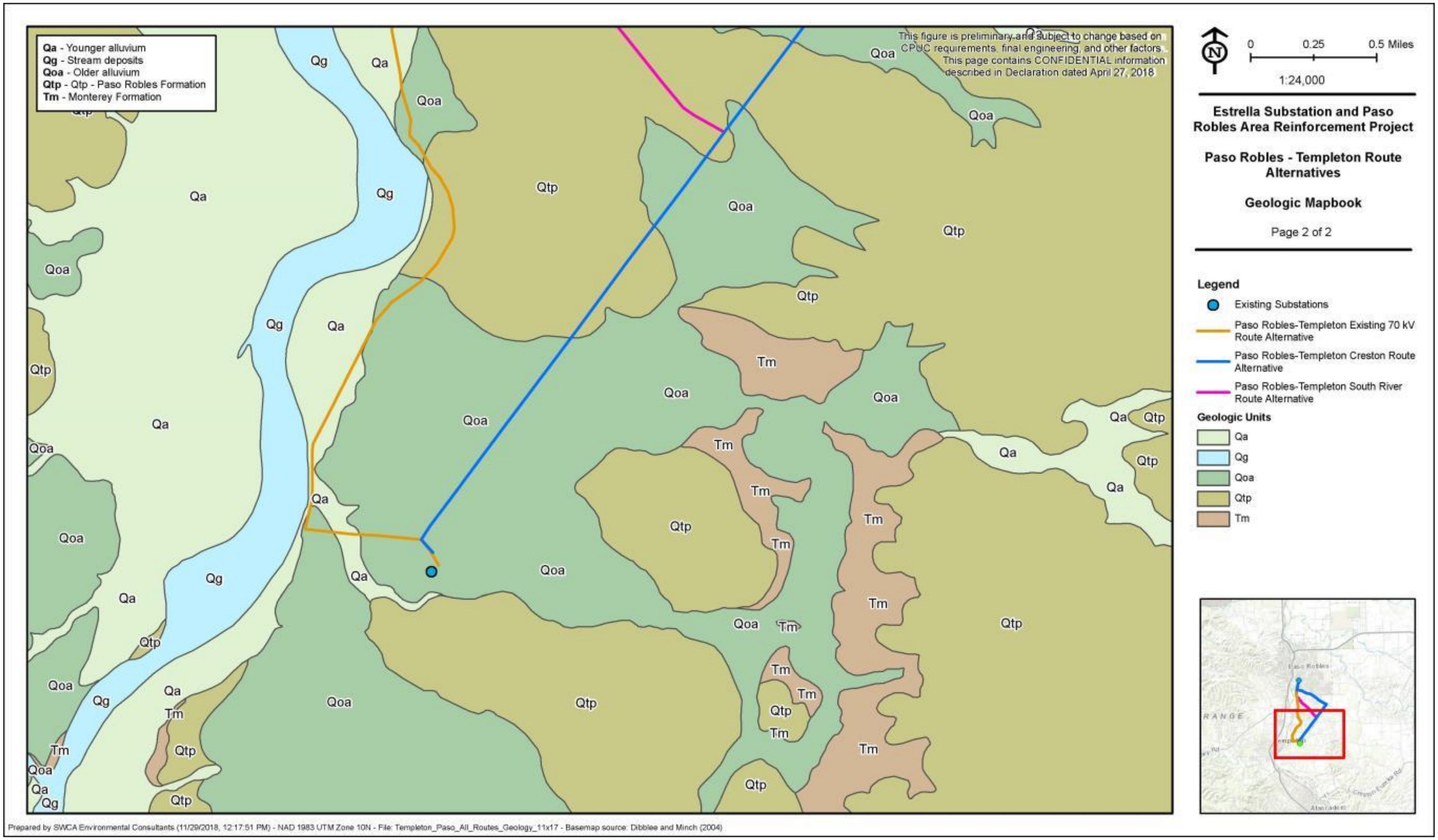
The data collected from the literature review and museum records searches was used to assign BLM PFYC rankings to the geologic units present at the surface or in the subsurface along the Templeton Route Alternatives. These classifications are shown in Table 2. Younger alluvium (Qa) is recent to early Holocene in age and therefore too young to preserve fossils in the upper layers, resulting in a PFYC ranking of Low (Class 2). However, it should be noted that this unit likely overlies older, high sensitivity sediments at an undetermined depth, and so ground disturbance that exceeds the depth of the Low (Class 2) sensitivity upper layers may impact fossil resources. Both the older alluvium (Qoa) and the Paso Robles Formation are known to be fossiliferous and have produced scientifically significant localities in the past. This is indicated by numerous papers published in the scientific literature on fossils from those units (e.g., Addicott and Galehouse, 1973; Jefferson et al. 1992; Kellogg, 1921; Woodring and Bramlette, 1950) as well as the records search results from both the UCMP (Finger, 2016) and the LACM (McLeod, 2016). Therefore, based on the PFYC system developed by BLM (2016), both these units should be classified as High sensitivity, Class 4 (Figure 4). While not present at the surface of the Templeton Route Alternatives, the Monterey Formation also has an extensive record of fossil preservation and so should also be considered to have a PFYC ranking of High, Class 4. A summary of the geologic units present at the surface and likely present in the subsurface in vicinity of the Templeton Route Alternatives is presented in Table 2, and shown in Figure 4.

Table 2. Paleontological Sensitivity of Geologic Units in the Vicinity of the Templeton Route Alternatives

Geologic Unit	Potential Fossil Yield Classification	Occurrence along Alternative Routes
Alluvial gravel, sand, and clay (Qa)	Low – Class 2	Surface
Quaternary older alluvium (Qoa)	High – Class 4	Surface & Subsurface
Paso Robles Formation (Qtp)	High – Class 4	Surface & Subsurface
Monterey Formation (Tm)	High – Class 4	Subsurface

Figure 3. Geology Map




Qa - Younger alluvium
Qg - Stream deposits
Qoa - Older alluvium
Qtp - Qtp - Paso Robles Formation
Tm - Monterey Formation
This figure is preliminary and subject to change based on CPUC requirements, final engineering, and other factors.
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Estrella Substation and Paso Robles Area Reinforcement Project
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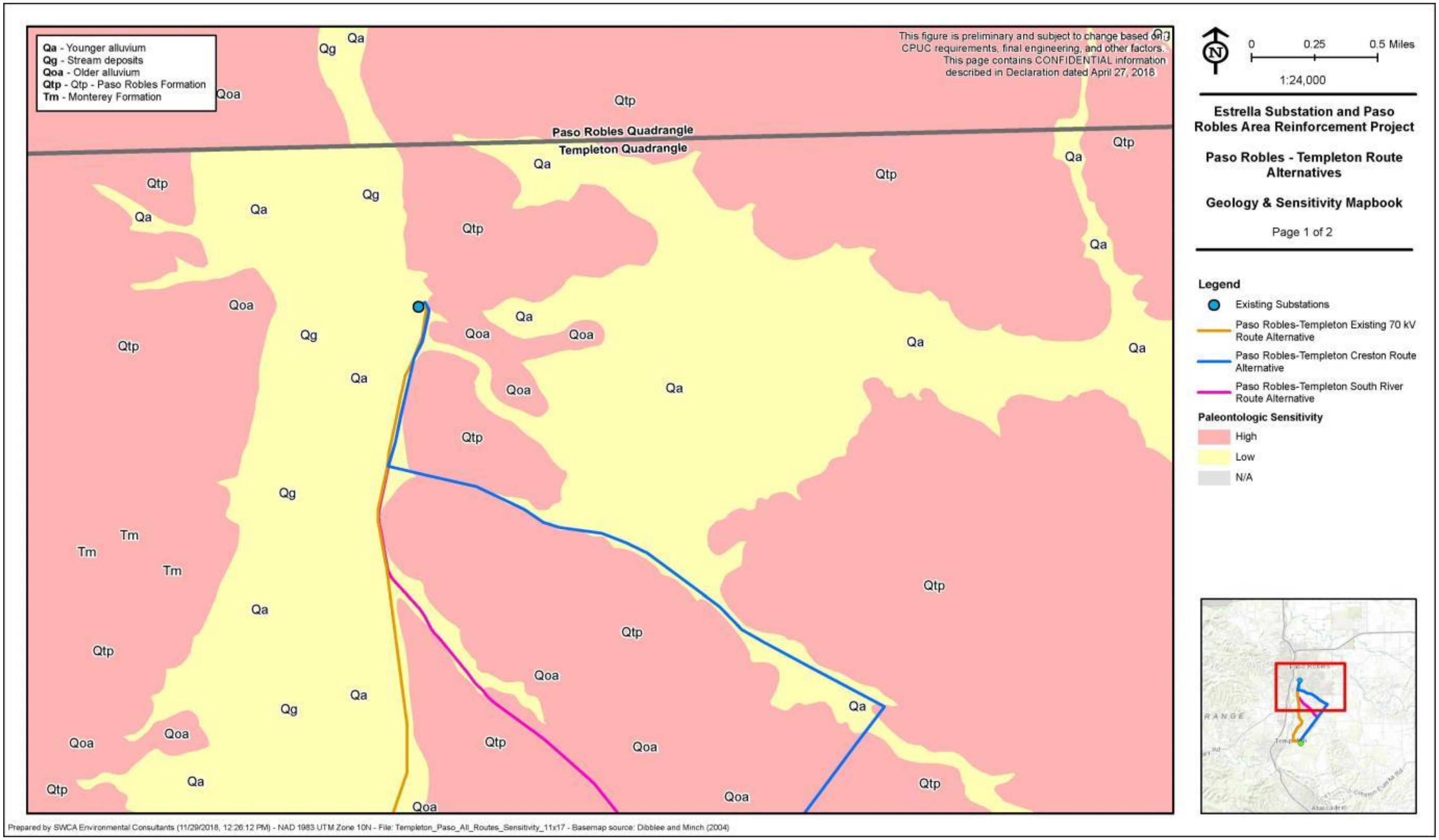
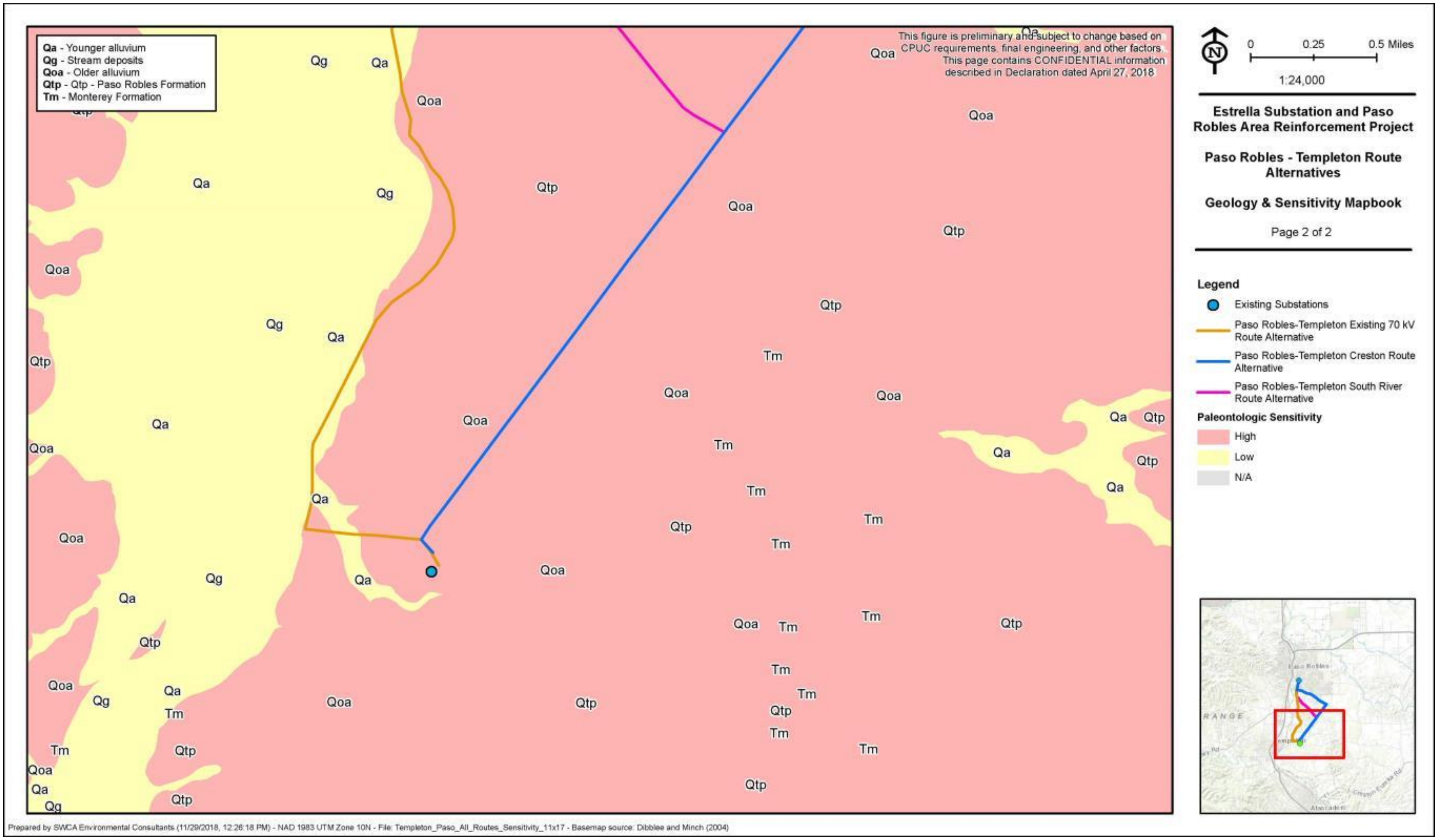
Legend
Existing Substations
Paso Robles-Templeton Existing 70 kV Route Alternative
Paso Robles-Templeton Creston Route Alternative
Paso Robles-Templeton South River Route Alternative
Geologic Units
Qa
Qg
Qoa
Qtp
Tm
Prepared by SWCA Environmental Consultants (11/29/2018, 12:17:51 PM) - NAD 1983 UTM Zone 10N - File: Templeton_Paso_All_Routes_Geology_11x17 - Basemap source: Dibblee and Minch (2004)

Figure 4. Paleontological Sensitivity Map




Qa - Younger alluvium
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Qoa - Older alluvium
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Estrella Substation and Paso Robles Area Reinforcement Project
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Geology & Sensitivity Mapbook
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Legend
Existing Substations
Paso Robles-Templeton Existing 70 kV Route Alternative
Paso Robles-Templeton Creston Route Alternative
Paso Robles-Templeton South River Route Alternative
Paleontologic Sensitivity
High
Low
N/A
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5 DISCUSSION

Based on an in-depth literature review and museum records searches, three geologic units are identified at the surface of the Templeton Route Alternatives: younger alluvium, older alluvium, and the Paso Robles Formation, with an additional unit, the Monterey Formation, likely present at an undetermined depth in the subsurface. This depth may be better characterized with the use of geotechnical studies; however, it is likely to vary from place to place across the study areas. Of these formations, younger alluvium is too young to preserve fossil resources in the upper layers and is assigned PFYC Class 2, Low sensitivity. The other geologic units present (older alluvium, Paso Robles Formation, and Monterey Formation) have a record of significant fossil preservation and are therefore assigned a PFYC of Class 4, High paleontological sensitivity. These units may be found at the surface or in the subsurface underlying the younger alluvium.

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Appendix A.
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Records Search Results – University of California Museum of Paleontology

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Appendix B.
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Records Search Results – Natural History Museum of Los Angeles County

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