

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

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1.0 Introduction

This technical memorandum describes the potential for encountering paleontological resources and potentially impacting paleontological resources during construction of the Bright Star Canyon Wind (BSCWP) Project (project). The proposed project is to construct and operate a wind energy generation facility on approximately 19,367 acres of land under Kern County permitting jurisdiction. The maximum overall net generating capacity is anticipated to be up to 310 megawatts (MW) using up to 129 wind turbine generators (WTGs). The project also includes internal collector lines, access roads, construction staging areas, a temporary concrete batch plant, a collector substation, and other ancillary support facilities. In addition, the project also includes two transmission line options, with the final selection to be determined prior to detailed design and construction. The project layout is shown in Figure 1 and the geology of the area and study area (defined as a 1-mile buffer around the project area) is shown in Figure 2.

The environmental setting for paleontological resources, including discussion of the geologic setting, is presented in Section 2.0. A description of the laws, ordinances, regulations, and standards applicable to paleontological resources in the project area is presented in Section 3.0. Section 4.0 provides a discussion of the project impacts and associated mitigation measures. References are provided in Section 5.0.

2.0 Environmental Setting

The project is located on an approximately 19,367-acre site on land controlled by the City northeast of the Tehachapi Valley and 17 miles north of the crossroads of Mojave. The project area lies within the southernmost Sierra Nevada range, and includes Kelso Valley and Jawbone Canyon (Dibblee and Minch, 2008). The project area is primarily comprised of private land controlled by the City in Kelso Valley with limited proposed access roads on U.S. Bureau of Land Management (BLM) lands.

2.1 Regional Geology

The project area is located predominantly within the southernmost portion of the Sierra Nevada range. Project linears (predominantly transmission lines and associated access roads) extend southwest into the Tehachapi Mountains and through the Tehachapi Valley, as well as south to Jawbone Canyon (Figure 2). The Antelope Valley lies to the south of the project area on the other side of the Garlock Fault Zone and beyond the end of the Sierra Nevada in the Mojave Desert. The Fremont and Indian Wells Valleys lie to the east, and the

San Joaquin and Tehachapi Valleys to the southwest and west. Numerous active faults, including the Garlock and the Sierra Nevada faults, lie to the south and east of the project area. The Kelso Valley to the north, and Jawbone Canyon to the southeast, provide access through the mountainous terrain of the southern Sierra Nevada to the project vicinity.

The Sierra Nevada is a geologically young, seismically active, and rugged mountain range. Elevations within the project area range from 2,500 to 7,000 feet above mean sea level (amsl). The geology of these mountains is complex, reflecting active tectonic processes and rapid erosion associated with crustal movement and uplift along the Garlock, and other, now dormant Tertiary fault systems. These mountains are dominated by Mesozoic plutonic rocks (Smith, 1964; Ross, 1987; Dibblee and Louke, 1970), which represent the roots of an Andean-like magmatic arc created by subduction along the continental margin (Wood, 1997). Collectively, these rocks are often termed the Sierra Batholith comprise the granites of the Sierra Nevada. Many of the igneous and younger sedimentary units have undergone subsequent metamorphism due to subsequent tectonic activity, as well as Cenozoic volcanic activity (Ross, 1987). This volcanic activity includes Miocene and Pliocene volcanism around Emerald Mountain and Cache Peak, and the later emplacement of tertiary dike swarms to the east of the project area (Smith, 1964). Quaternary deposits dominate the low-lying areas, including the valleys within the Sierra Nevada and the river channels at the edges of the range (Dibblee and Minch, 2008; Smith, 1964).

There are numerous large valleys in the southern Sierra Nevada, including Kelso Valley, Butterbrecht Canyon to the east of the project area, Jawbone Canyon to the southeast, and Walker Basin to the west (Smith, 1964). Lake Isabella dominates the middle reaches of the Kern River Valley to the north. Many of these valleys appear to have been formed by faults associated with Late Pliocene to Early Pleistocene crustal extension (Niemi, 2003). In the Pleistocene period, the region was much less arid than it is today, as evidenced by numerous ancient lakes in the region (Orme, 2008), paleospring deposits to the south and east of the project area (Quade et al., 1995), and plant fossil records (Mead et al., 2006; Woolfenden, 1996). Although closed basins such as the Fremont Valley contain evidence of dry Pleistocene lakes, lake sediments have not been mapped in Kelso Valley or Butterbrecht Canyon, the largest valleys near the project area (Smith, 1964; Dibblee and Minch, 2008). This is likely because these valleys were connected to the drainage basin feeding Lake Thompson, which dominated Antelope Valley to the south (Orme, 2008). Smaller valleys, as well as valleys to the west of the project area, also show evidence of lake deposits (Smith, 1964; Dibblee and Minch, 2008).

2.2 Local Geology

The local geology of a project area determines the paleontological potential of the sediments that will be affected by that project. The study area (defined as the project area plus a buffer zone of one mile) is dominated by rugged topography dominated by crystalline Mesozoic and Paleozoic rocks of the Sierra Nevada, while the valleys of the region are relatively flat and contain deep quaternary alluvial sequences (Dibblee and Minch, 2008; DWR, 2008). The geologic units crossed by the northern portions of the project linears are generally the same as those in the project area, while in the south they encounter tertiary sedimentary units in the southern portions of the ROWs (Dibblee and Louke, 1970).

The majority of the maps of the southern Sierra Nevada have focused on the nature and timing of the emplacement of the Sierra Nevada Batholith itself; however, because igneous

rocks do not generally contain fossils, they are treated as a single geologic unit in this report. The older crystalline (igneous and metamorphic) and tertiary sedimentary units throughout much of this region have been subject to detailed mapping (Dibblee and Minch, 2008; Smith, 1964; Wood, 1997; Ross, 1987, 1989). However, the quaternary and surface sediments in this area have not been mapped in detail. Quaternary sediments can be paleontologically important in valley-bottom settings, where low-gradient streams promote the aggradation of fine-grained sediments that may preserve fossil material.

For the purpose of this assessment, the study area is divided into two segments: the project area itself, and the project linears.

Project Area: The project area forms a rough inverted U-shape in plan view and at small scale, with Kelso Valley in the apex of the “U” and the legs extending south towards the Tehachapi Valley and Jawbone Canyon. The granites of the Sierra Nevada Batholith extend throughout this rugged mountainous region, with the schists and marble pendants of the Kernville Series mantling the granites south of Kelso Valley. The Quaternary alluvial units are limited to the valleys of the region, the largest of which are Kelso Valley and Butterbredt Canyon, formed due to extensional faulting in the southern Sierra Nevada (Niemi, 2003). These deposits also include small lake deposits near Jawbone Canyon. The project area includes the following geologic units, shown in Figure 1.

- **Recent Alluvium:** Holocene alluvial sediments (Qa) are extensive in the bottomlands, and include numerous depositional settings and lithologies. In this region, Recent Alluvium consists of unconsolidated or poorly consolidated sediments composed of angular fragments (Dibblee and Minch, 2008) formed by the weathering of the surrounding mountains. In the study area, these sediments form broad alluvial fans. Recent Alluvium is also present in the southeastern portion of the study area, within canyons on the eastern edge of the Sierra Nevada Batholith, and represents Holocene stream deposits grading into the colluvial mantle of the lower mountain slopes.
- **Older Alluvium:** These units (Qoa) consist of alluvium derived from the surrounding mountains, deposited in the Pleistocene, including those resulting from the “terminal Pleistocene stripping event” postulated by some authors (e.g. Bull, 1991). Older Alluvium dominates the valleys within the southern Sierra Nevada, forming broad alluvial flats floored by fine-grained sediments often over 100 feet thick (DWR, 2008). During the Late Pleistocene, the Kelso Valley was part of the Cottonwood Creek drainage (Orme, 2008), and may well have been a perennial stream draining south and east to pluvial Lake Thompson. This is not an unlikely scenario given the 250-mile long ice sheet that rested on the Sierra Nevada at that time (Porter et al., 1983). The other large valleys in the region may have followed similarly robust drainages during the Late Pleistocene.
- **Older Lake Deposits:** These deposits (Qol) are limited to small (less than 1 square mile) lake deposits underlain by the Kernville Series metamorphic rocks and, further south, by Mesozoic granite rocks (Dibblee and Minch, 2008). These ancient lake deposits have not been extensively studied, and often do not even appear on geologic maps of the area (Smith, 1964; Ross, 1987). They are found in upland settings in relative narrow drainages, near the heads of canyons in some cases. Their presence suggests older lakes created by tectonic or land-slide damming of Plio-Pleistocene drainages that may have been

disrupted by further uplift, and therefore not entirely accord with current drainage patterns.

- **Igneous Basement Rocks:** The southern Sierra Nevada is dominated by Mesozoic granitic rocks, chiefly quartz monzonite, and associated metamorphic suites. Within the project area, the igneous units are limited to Mesozoic quartz monzonite (qm). The depositional and tectonic history of these igneous rock formations is complex and well-studied (for example, Wood, 1997; du Bray and Dellinger, 1988). Discussion of the emplacement and subsequent deformation of these bodies is beyond the scope of this report. The metamorphic units are discussed below.
- **Mesozoic to Paleozoic Metamorphic Units:** Several metamorphic units have been described in the southern Sierra Nevada (Dibblee and Minch, 2008; Ross, 1987; Ross, 1989). South of the Garlock Fault these comprise the Bean Canyon Formation (Ross, 1989); while north of the fault they are termed the Kernville Series (Dibblee and Minch, 2008). These Paleozoic units include schist (sc), narrow bands of limestone and dolomite marbles (ml), and gneiss with associated quartz diorite (gn-qd). The limestone and dolomite marbles may include caves and shelters, which may contain more-recent (Pleistocene) sediments and organic material (Cole, 1983).

Project Linears: The project linears, including the transmission line alternatives, extend south of the project area towards Jawbone Canyon and the Tehachapi Valley (Dibblee, 1967; Dibblee and Louke, 1970). The proposed transmission line routes cross similar units to those underlying the project area in the north: the granites and metamorphic units associated with the Sierra Nevada Batholith and in low-lying regions Quaternary alluvium. Further south, the proposed transmission line routes cross sediments of the Kinnick, Bopesta, and Witnet Formations. The western linears also cross the Miocene volcanic formations associated with Emerald Mountain. In addition to the units listed above, the project linears will cross the following geologic units:

- **Miocene Volcanic Units:** These units are associated with a large Miocene igneous body to the southwest, and consist of rhyolite (Tva) and intrusive felsites (Tvr) deposits (Dibblee and Minch, 2008). While pyroclastic deposits have been mapped as part of the Miocene volcanic units in the region (Smith, 1964), near the project area, pyroclastic deposits are limited to the lower members of the Kinnick Formation (Dibblee and Minch, 2008) and are discussed as part of that unit.
- **Bopesta Formation:** The Upper Miocene Bopesta Formation (Tbo) consists of fluvial and lacustrine deposits of the late Miocene (Kelly, 1998). The lower unit is composed of olive-grey and tan sandstones interbedded with white tuff, while the upper portion of this unit consists of light grey sandstone interbedded with greenish to pinkish siltstone and clays (Kelly, 1998). The Bopesta Formation can be identified in available remote imagery, likely due to the presence of high-albedo tuffs, as narrow bands of highly reflective sediment.
- **Kinnick Formation:** This Middle Miocene Kinnick formation (Tk) lies immediately south of the project area. The Kinnick Formation is divided into an upper and a lower unit. The lower unit is characterized by pyroclastic flows and igneous rock fragments (listed as part of the Miocene volcanic units in Smith, 1964), while the upper unit is characterized by interbedded sedimentary rocks and volcanic igneous rocks

(Smith, 1951). The igneous components of the formation generally form white to greenish-white tuffs (Buwalda and Lewis, 1955). The upper portion of the Kinnick Formation also includes freshwater diatomaceous beds and cherts (Buwalda and Lewis, 1955). The deposits within the Kinnick Formation are lenticular and lateral correlation of individual units within the formation between outcrops is often difficult if not impossible (Smith, 1951).

- **Witnet Formation:** This Lower Tertiary formation (Tw and Twc) lies within the southeastern most portion of the study area. The Witnet Formation is a stream deposited sedimentary unit of relatively limited regional extent (DeBusk and Corsetti, 2008). This formation consists of light grey to olive-tan, fine- to medium-grained sandstone interbedded with brown to black “shaley layers” and lenses of conglomerate (Wood, 1997). The upper portion of the formation is dominated by sandstone, while the lower portion is dominated by siltstone in the region (Dibblee and Minch, 2008). Due to the paucity of fossils from this unit, the age of the Witnet Formation is more poorly constrained than that of the more fossiliferous Paleocene to Eocene Goler Formation (Wood, 1997), which several authors have correlated with the Witnet Formation (Dibblee, 1967; DeBusk and Corsetti, 2008). Regionally, portions of this unit are folded and, in places, overturned (Wood, 1997).

Because igneous and highly metamorphosed rocks generally do not preserve paleontological resources, they are not discussed in detail, nor are the relationships between the igneous units considered. These include the Miocene volcanic units, the Sierran granites (quartz monzonite), and the metamorphic rocks. Consideration of special circumstances which can preserve fossils will be made of course, such as the presence of bedded airfall tuff (volcanic ash) units, or where marble outcrops can host caves or rock shelters, which in turn may contain Pleistocene deposits.

A review of available remote imagery of the project area failed to identify any features such as spring mounds that might indicate the presence of paleospring, which have been found in the Mojave Desert to the south and east deposits (Quade et al., 1995). Exposures of high-albedo materials, which often indicate paleospring deposits in the Mojave Desert, were noted in the study area; however, these rocks are attributed to metasedimentary units in the project area, and in particular, to limestone and dolomite marbles or the tuff-rich Kinnick Formation (Smith, 1964; Dibblee and Minch, 2008).

The metasedimentary units in the region, which typically form narrow bands running north-south throughout the site, include common marble pendants (Ross, 1987). These pendants (as they are called because they are draped on the flanks of much larger granitic bodies) can host caves and rock shelters suitable for the preservation of Late Quaternary organic materials, including mummified packrat middens (e.g., Cole, 1983). Therefore, it is possible that Pleistocene packrat middens may be found in undisturbed cavities developed within the marble facies of this Paleozoic metamorphic unit. However, limited field work in the region south of the Kern River Canyon, Cole’s (1983) collecting area, has failed to locate any.

2.3 Paleontological Records Search Results

Several standard paleontological records databases, discussed as follows, were consulted for this analysis. Fossil records associated with a number of formations within the study area

were found, and these records are included in Appendix A. However, no fossil sites were identified in the project area.

The San Bernardino County Museum (SBCM) database (2011) did not include records for any of the formations underlying the project area. However, it was noted that the SBCM database has no paleontological localities at all recorded for Kern County, which indicates that it may not be updated for this county. Querying the University of California Museum of Paleontology online database (UCMP, 2011) yields 1,620 fossil locality records for Kern County. Many of these are far from the current project area, including such famous locales as Shark Tooth Hill near Bakersfield and the McKittrick Tar Pits on the other side of the Central Valley. However, this database also includes records of fossil sites within the Bopesta and Kinnick Formations, which are found within the study area. The PaleoBiology Database (2011) lists 152 fossil sites recorded in Kern County; however, no records of fossil sites were found listed within the study area. The database included a number of records for the Bopesta Formation, which will be encountered during construction of the transmission lines.

The Bopesta Formation has yielded many Barstovian age fossils, including the Cache Creek Fauna (Buwalda and Lewis, 1955). While at least one fossil is described as coming from an “ashy sandstone” (UCMP, 2011) and the Cache Creek Fauna came from the sedimentary beds above the basal tuffs of this unit (Buwalda and Lewis, 1955), most fossil site records accessed do not describe a detailed lithologic context. Fossils from this formation include horses (*Merychippus*, *Archaeohippus*, *Hypohippus*, *Acritohippus*, *Parapliohippus*), camels (*Protolabis*), peccaries (*Cynorca*), and other herbivores (*Brachycrus laticeps*, *Dromomeryx*, *Merycochoerus*) (UCMP, 2011). For the Bopesta Formation, the PaleoBiology Database (2011) includes records of camels (*cf. Protolabis sp.*, *cf. Stenymylus sp.*, *Miolabis sp.*), canines (*Paracynarctus kelloggi*), hedgehog-like organisms (*Lanthanotherium sawini*), extinct oreodonts (pig-like herbivores; *Brachycrus buwaldi*, *Brachycrus cf. buwaldi*, *Cynorca cf. occidentale*, *Cynorca sociale*, *Merychys elegans*), horses and their relatives (*Acritohippus cf. stylodontus*, *Acritohippus stylodontus*, *Archaeohippus ultimus*, *Arcitohippus quinni*, *cf. Archaeohippus sp.*, *Hypohippus sp.*, “*Merychippus*” *brevidentus*, *Parapliohippus carrizoensis*, *Scaphohippus intermontanus*, *Scaphohippus sumani*), archaic hares (*Archaeolaginae*), tortoises (*Gopherus mohavetus*), and rodents (*Copemys cf. russeli*).

The Hemingfordian age Kinnick Formation is divided into a lower unit dominated by igneous facies, particularly tuff, and an upper unit dominated by sedimentary facies. While the UCMP database (2011) does not differentiate between the two, one fossil site (V3635) is attributed to andesitic tuffs, likely from the lower portion of this unit, and includes records of one horse fossil. The upper portion of the Kinnick Formation has also produced a number of mammal fossils (Buwalda and Lewis, 1955; UCMP, 2011). These include horses (*Merychippus tehachapiensis*, *M. carrizoensis*), artiodactyls (*Dromomeryx*), and carnivores (*Amphicyon*) (UCMP, 2011). No records for this formation exist in the PaleoBiology Database (2011).

Queries of the SBCM, UCMP, and PaleoBiology databases did not yield any records of fossil sites attributed to the Witnet Formation, and no published fossil records for fossil sites within this formation were found during the inventory review; however, a private collection of mollusk shells tentatively attributed to the Witnet Formation has been noted (Wood, 1997). A subsequent literature review has failed to find any additional fossil records attributed to this formation (Wood, 1997).

No records were available for other sedimentary units in the project area in the databases used. This lack of paleontological site records may in part be due to the generic terms applied to younger sediments in the geologic maps for this area (Dibblee and Minch, 2008; Smith, 1964). Names such as “Older Alluvium” and “Older lake deposits” do not lend themselves to records reviews of this type because they are not formally defined geological units. A lack of attention paid to the region by paleontologists may also play a part in the absence of records; several of these units are relatively small and lie within low-sensitivity igneous rocks, and often are not even included in geologic maps of the region. A literature review for the study area, which is more likely to include generic references, yielded few reports of fossil finds relevant to the study area. Cole (1983) has found important paleobotanical records from caves within marble pendants, such as those found in the project area, and north of the project area a large limestone cave has yielded a wealth of vertebrate fossils (Mead et al., 2006). Wollfenden (1996) described pollen studies conducted in lake sediments throughout the Sierra Nevada range; neither study included finds from the project area or its linears.

3.0 Regulatory Setting

Potentially applicable laws, ordinances, regulations, and standards (LORSs) governing paleontological resources are discussed as follows, and are summarized in Table 2.

TABLE 2
Potentially Applicable LORS Governing Paleontological Resources
Bright Star Canyon Wind Project

LORS	Remarks	Project Applicability
Antiquities Act of 1906	Protects prehistoric structures and objects of scientific interest	Applicable
Federal Land Management and Policy Act, 1962	Protects scientific resources	Applicable
National Historic Preservation Act, 1966	Provides for the survey, recovery, and preservation of significant paleontological data on federal land	Applicable
<i>Code of Federal Regulations</i> Title 43, Section 8365.1-5	Prohibits collection of scientific resources, including vertebrate fossils, without a permit.	Applicable
National Environmental Policy Act of 1969	Federal lands are involved in this project	Applicable
Omnibus Public Land Act of 2009	Federal lands are involved in this project	Applicable
BLM Informational Memorandum 2008-009	Details monitoring procedures for paleontological resources on land managed by the BLM	Applicable
CEQA, Appendix G	Compliance achieved via implementation of the requirements of the Kern County General Plan	Applicable
Kern County General Plan	Preservation is feasible	Applicable

3.1 Federal Regulations

Paleontological resources are protected by federal regulations, most of which apply only to excavations and construction on federal land. Since the project includes components that cross BLM lands, these federal LORSs are applicable to the project area.

Paleontological resources were first protected by the Federal Antiquities Act of 1906 (PL 59-209; 16 United States Code [USC] 431 et seq.; 34 Stat. 225), which calls for the protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Fossils, as prehistoric structures and objects of scientific interest, are therefore protected by this act.

Further federal protection of paleontological resources is provided by the Federal Land Management and Policy Act (43 USC 1712[c], 1732[b]); sec. 2, Federal Land Management and Policy Act of 1962 [30 USC 611]; Subpart 3631.0 et seq.), Federal Register Vol. 47, No. 159, 1982. This regulation charges federal agencies to manage public lands in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, archaeological, and water resources and, where appropriate, preserve and protect certain public lands in their natural condition (Section 102[a][8][11]); periodically inventory public lands so that the data can be used to make informed land-use decisions (Section 102[a][2]); and regulate the use and development of public lands and resources through easements, licenses, and permits (Section 302[b]). While paleontological resources are not specifically mentioned, significant fossils are understood to be scientific resources.

The National Historic Preservation Act of 1966 includes more-specific regulations protecting paleontological resources. The statute provides for the survey, recovery, and preservation of significant paleontological data when such data may be destroyed or lost due to a federal, federally licensed, or federally funded project (Pub. L. 89 665; 80 Stat. 915, 16 USC 470 et seq.)

The *Code of Federal Regulations* Title 43, Section 8365.1-5 prohibits the collection of scientific resources, including vertebrate fossils, without a permit, as well as the use of fossils found on federal land for commercial purposes.

Recently, the Omnibus Public Land Act of 2009 was passed. This statute includes many protections for historic and prehistoric resources on public lands and bans the destruction or removal of paleontological resources from public lands. Specific regulations for the implementation of these requirements have not yet been implemented.

In addition to these measures, the BLM has issued requirements for collecting paleontological resources on BLM land and for projects that impact BLM land, including requiring a paleontological resource use permit for excavation work performed on BLM lands. These requirements were recently updated with the BLM *Informational Memorandum* 2008-009, which established the BLM Potential Fossil Yield Classification System (PFYC) as the current standard for determining paleontological sensitivity for individual geologic units within BLM land (BLM, 2008). This memorandum further requires field surveys of all areas underlain by geologic units of high paleontological sensitivity, and outlines standard practices for paleontological resources monitoring and for mitigating any impacts to paleontological resources which must be followed on all projects which disturb sediment within land managed by the BLM (BLM, 2008). These standards are largely followed by practicing paleontologists both on and off BLM land.

3.2 State of California

While state regulations are not generally applicable to private land, Kern County requires compliance with the California Environmental Quality Act (CEQA), and this statute is applicable to the project. At the state level, CEQA (Public Resources Code [PRC] Sections 21000 et seq.) requires public agencies and private interests to identify the environmental

consequences of their proposed projects on any object or site of significance to the scientific annals of California (Division I, PRC: 5020.1[b]). Although CEQA does not define what is “a unique paleontological resource or site,” Section 21083.2 defines “unique archaeological resources” as “any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information
2. It has a special and particular quality such as being the oldest of its type or the best available example of its type
3. Is directly associated with a scientifically recognized important prehistoric or historic event

With only slight modification, this definition is equally applicable to recognizing “a unique paleontological resource or site.” Additional guidance is provided in CEQA Section 15064.5(a)(3)(D), which indicates “Generally, a resource shall be considered historically significant if it has yielded, or may be likely to yield, important information in prehistory or history.”

Most state statutes protecting paleontological resources in California are applicable only to projects that include state land. As the project does not include state land, these statutes are not applicable to the project.

3.3 Kern County

Kern County is the CEQA lead agency for this project. The Kern County General Plan (Section 1.10.3.25.M) (County of Kern, 2007) requires compliance with CEQA and, specifically, the preservation of paleontological resources where feasible.

3.4 Professional Standards and Guidelines

The Society of Vertebrate Paleontology (SVP), an international scientific organization of professional paleontologists, has established guidelines that outline acceptable professional practices in the conduct of paleontological resource assessments and surveys, monitoring and mitigation, data recovery, specimen preparation, analysis, and curation (SVP, 1995). Most practicing professional paleontologists follow the SVP guidelines, with appropriate accommodations for the last 16 years of advancements in the field. The BLM PFYC also is used as a professional standard by many professional paleontologists conducting paleontological studies on federal lands and elsewhere.

4.0 Environmental Impacts and Recommendations

The potential effects from construction and operation of the project and transmission corridor on paleontological resources are assessed in the following sections. These potential impacts consist of damage or destruction of fossils, improper removal of fossils from the sediments they are found in, or any other activities that compromise the scientific or educational value of the fossils.

4.1 Sensitivity Criteria

In its guidelines for assessment and mitigation of adverse impacts to paleontological resources, the SVP (1995) established the following three categories of paleontological sensitivity of geologic units: high, low, and undetermined. BLM guidelines provide a more-detailed analysis in the form of the BLM PFYC system, as can be seen in Table 3. In both cases, the paleontological sensitivity of a geologic unit reflects both its potential paleontological productivity and the scientific significance of the fossils it has produced.

TABLE 3
BLM Potential Fossil Yield Classification System Classes
Bright Star Canyon Wind Project

Class	Sensitivity	Description
Class 1	Very Low	Geologic units (often igneous or metamorphic) not likely to yield paleontological remains
Class 2	Low	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils
Class 3a	Moderate	Units that contain widely scattered vertebrate fossils or scientifically significant invertebrate fossils
Class 3b	Unknown	Units that exhibit geologic features and preservational conditions that suggest fossils could be present, but for which little information is available
Class 4a	High	Units with a high occurrence of significant fossils and with little vegetation cover
Class 4b	High	Units with a high occurrence of significant fossils, but has lower risk of human-caused impacts due to some mitigating factor
Class 5a	Very High	Highly fossiliferous geologic units with little or no soil or vegetation cover
Class 5b	Very High	Highly fossiliferous geologic units, which have lower risk of human-caused impacts due to some mitigating factor

The potential paleontological productivity of a geologic unit exposed in the project area is inferred from the abundance of fossil specimens and/or previously recorded fossil sites in exposures of the unit, or of similar units in similar geological settings. The underlying assumption of this assessment method is that a stratigraphic unit is mostly likely to yield fossil remains in a quantity and of a quality similar to those previously recorded from the unit elsewhere in the region.

During construction monitoring, an individual fossil specimen is considered scientifically important and therefore significant if it is identifiable, complete, well preserved, age diagnostic, useful in paleoenvironmental reconstruction, a member of a rare species, and/or a skeletal element different from, or a specimen more complete than, those now available for the species (SVP, 1995). For example, vertebrate remains are comparatively rare in the fossil record and most identifiable vertebrate remains are therefore scientifically significant. Invertebrate fossils, in contrast, are frequently part of a paleontologically significant fauna represented by many collections, but are individually common and of low scientific significance.

4.2 Significance Criteria

Applicable state statutes and professional standards agree that the damage or destruction of a scientifically significant paleontological resource or site is a significant and adverse impact to paleontological resources (CEQA Section 3.1.2; SVP, 1995; BLM, 2008). This is most typically thought of as occurring as a result of heavy equipment damage to fossils, but may also occur when fossils are looted, improperly removed from the surrounding sediment, or otherwise lost to the scientific world. Because fossils are a non-renewable resource (SVP, 1995), all impacts to paleontological resources are considered adverse and potentially significant, unless they result in recovery of the scientific and educational values of the resource.

Generally, the probability of adverse impacts during excavations within a geologic unit is proportionate to the paleontological sensitivity of the unit. While it is theoretically possible to adversely affect paleontological resources in low-sensitivity geologic units (BLM PFYC Class 1 or Class 2), it would be remote because the units are not known to contain fossils or are deposited in such a manner as to prevent fossils from forming. Significant impacts are more likely from excavation in moderate-sensitivity units (BLM PFYC Class 3a); however, they are less likely than in high-sensitivity units, as fossil sites in these units either tend to be widely scattered or consist predominantly of non-significant fossils, such as common invertebrate fossils (BLM, 2008). The highest probability of significant adverse effects to paleontological resources results from disturbance of stratigraphic units with high paleontological sensitivity (BLM PFYC Class 4 or Class 5), which have produced scientifically significant fossils, and recorded fossil localities are sufficiently frequent to anticipate encountering more (SVP, 1995). In some cases, there is not enough data to determine the paleontological sensitivity of a particular geologic unit, either because of a lack of study in that unit or because of high variability in the unit's lithology; these are considered to be of unknown paleontological sensitivity (BLM PFYC Class 3b). The site-specific sensitivity of these units will be determined during field surveys.

Paleontological resources that remain undisturbed in the sediment are considered to be unaffected by the project and are considered adequately protected. Because fossils are likely to be exposed only during the excavation phase of construction, operation of the project is expected to have little potential to impact paleontological resources. The impacts are limited to potentially increased looting, as the project will make formerly remote areas more accessible.

4.3 Sensitivity of Geologic Units

Following is a summary of the paleontological sensitivity of the geologic units in the project area, based on the literature and records review.

Project Area: The project area is predominantly underlain by low-sensitivity igneous units. Higher-sensitivity alluvium may be encountered in the valleys, and marbles which can potentially include caves capable of preserving organic material for thousands of years underlie the southern portions of the project area.

- **Recent Alluvium:** These sediments do not include scientifically significant paleontological resources. Fossils may be eroded out of the overlying units, but any fossils would be out of stratigraphic context and therefore less than significant. This unit is therefore of low paleontological sensitivity (PFYC Class 2).

- **Older Alluvium:** Pleistocene alluvial fans are generally not known to be fossiliferous; these units therefore have a low paleontological sensitivity (PFYC Class 2). However, Pleistocene fluvial deposits in the Kelso Valley, which may have a higher paleontological sensitivity than the surrounding sediments, may be encountered.
- **Older Lake Deposits:** Little paleontological information is available for the lakes in the southern portion of the project area, or for Procter Dry Lake; these units therefore have an undetermined paleontological sensitivity (PFYC Class 3b). In the Mojave Desert, large lakes of the late Pleistocene, such as Lake Thompson and Lake Lahontan, have produced numerous fossil faunas (Orme, 2008; Adams and Wesnousky, 1998); it is therefore possible that the small lakes within the project area will produce similar paleontological remains. Smaller lakes found throughout the Sierra Nevada range have produced detailed pollen records, which have been used to determine the climate changes experienced by this range throughout the Holocene (Woelfendend, 1996). While the lake sediments in the project area and study area may include such fossils, pollen is generally not considered scientifically significant.
- **Igneous Basement Rocks:** Paleontological resources do not generally survive the formation of intrusive igneous rocks. This unit therefore has a low paleontological sensitivity (PFYC Class 1).
- **Mesozoic to Paleozoic Metamorphic Units of the Kernville Series:** Paleontological resources do not generally survive the formation of metamorphic rocks. Therefore, the schist and gneiss units of this formation have a low paleontological sensitivity (PFYC Class 1). However, the marble pendants assigned to this unit may contain caves or rock shelters and their interiors, sheltered from the elements, can preserve pockets of more-recent Pleistocene sediments, including packrat middens (Cole, 1983). Therefore, undisturbed marble pendants (“ml” in Figure 1) in the project vicinity possess moderate paleontological sensitivity (PFYC Class 3b).

Project Linears: In the northern portions, the project linears cross the same units as underlie the project area. To the south and southwest, the project linears will cross high-sensitivity sedimentary rock units.

- **Miocene Volcanic Units:** In the project area, these units are limited to intrusive rhyolites (Dibblee and Minch, 2008; Smith, 1964). Igneous formations, such as rhyolite, generally do not preserve organic material; therefore, crystalline volcanic units have a low to negligible paleontological sensitivity (PFYC Class 1).
- **Bopesta Formation:** This formation, and in particular the upper sedimentary units within the formation, has produced numerous fossil sites, including the Cache Creek Fauna (Buwalda and Lewis, 1955; Kelly, 1998). While igneous rocks generally do not preserve paleontological resources, the tuffs found in the lower Bopesta Formation are deposited in a manner similar to sedimentary rocks, and can preserve organic material. At least one fossil site has produced fossils from strata which include volcanic ash (UCMP, 2011). This entire formation therefore has a high paleontological sensitivity (PFYC Class 4b).
- **Kinnick Formation:** This formation has produced numerous vertebrate fossil sites, including the Phillips Ranch Vertebrate Fauna, from both the upper sedimentary and the lower igneous units (Buwalda and Lewis, 1955; Smith, 1951; UCMP, 2011). The main

vertebrate fossils found in this formation are horse fossils, though other mammals have been discovered (UCMP, 2011). This entire formation therefore has a high paleontological sensitivity (PFYC Class 4b).

- **Witnet Formation:** The fine-grained texture and depositional setting of this unit make it suitable for the preservation of fossils. However, only one private collection of fossil mollusks has been tentatively attributed to this formation to date (Buwalda and Lewis, 1955; Wood, 1997); no other fossils have been attributed to this unit. The nearby Goler Formation, which is lithologically similar to and deposited at the same time as the Witnet Formation, has produced a number of age-diagnostic fossils (Buwalda and Lewis, 1955; McKenna, 1960; UCMP, 2011), including shells similar to those attributed to the Witnet Formation (Wood, 1997). It is therefore possible that the lack of fossils from the Witnet Formation is a function of a lack of interest in the unit and/or suitable exposures, rather than a lack of fossils or preservation potential. In places, the Witnet Formation is folded, and even overturned (Wood, 1997), which may locally lower the potential for fossils to be preserved. Therefore, the Witnet Formation is considered to be of unknown paleontological sensitivity (PFYC Class 3b) and the local paleontological sensitivity should be determined by a site-specific analysis.

4.4 Impacts

4.4.1 Activities that can Impact Fossils

The potential for construction activities to cause significant adverse impacts (damage or destroy scientifically significant paleontological resources) is dependent on the type of activity and the paleontological sensitivity of each unit. Excavations in geologic units of high paleontological sensitivity have a relatively high chance of encountering significant fossils, while excavations in geologic units of low sensitivity have little to no chance of encountering significant fossils. The impacts of excavation on paleontological resources can be avoided by relocating the excavation, or mitigated by scientifically recovering the fossil(s). Because proper excavation and removal of paleontological resources do not lessen the scientific value of the resources, excavation is the recommended method of mitigating impacts to paleontological resources resulting from project-related excavations, and would mitigate any impacts to non-significant levels.

Activities that do not involve excavations or other subsurface disturbance will not affect fossils buried in the sediments. Fossils not impacted by excavations are considered to be preserved; therefore, impacts to paleontological resources during the operation or maintenance of wind turbines is not expected. The following mitigation measures are applicable only to the construction phase of the project where adverse impacts are possible.

In addition to the potential of impacts from mechanical disturbance during construction, there is also the possibility of impacts due to increased access to formerly remote areas. Caves or rock shelters in undisturbed marble pendants would be more likely to be vandalized with increased access.

4.4.2 Areas of Potential Impact

As previously stated, the potential for impacting paleontological resources is correlated to the paleontological sensitivity of the units being excavated. A preliminary assessment of the areas where adverse impacts to paleontological resources may occur, based on available

geologic maps, is outlined below. This assessment is in no way final, and is subject to revision during and after the field survey.

The majority of the project area (Figure 1; this excludes off-site linears which are discussed separately) is underlain by low-sensitivity (PFYC Class 1) igneous and metamorphic units, and therefore excavations in these units have little potential to impact paleontological resources. The northernmost portion of the project area is underlain by low-sensitivity (PFYC Class 2) Older Alluvium, which may include lenses of higher-sensitivity sediment such as river deposits. The highest potential to impact paleontological resources in the project area is in areas underlain by marbles, which in the geologic maps consulted appear as thin lenses of marble scattered throughout the central and western portion of the site. The unknown-sensitivity (PFYC Class 3b) Witnet Formation and the high-sensitivity (PFYC Class 4b) Kinnick Formation lie near the project area's southeastern boundary, but do not appear to lie within the site on the geologic maps consulted.

4.5 Recommendations to Reduce Impacts

The results of this records search and literature review indicate that, in the absence of mitigation, this project may have significant impacts to non-renewable paleontological resources. The following mitigation measures should be refined and spelled out in greater detail once field survey results are available, and facility design is at about the 30 percent stage.

4.5.1 Field Survey

A reconnaissance-level field survey is recommended for project areas underlain by paleontologically sensitive sediment, or sediment that may be paleontologically sensitive (PFYC Class 3 and 4). It would include the portions of the project area and offsite laterals underlain by the Kinnick, Bopesta, and Witnet Formations, as well as any areas underlain by Pleistocene lake sediment, Pleistocene-age Older Alluvium, and metamorphosed limestones. This pedestrian survey would be to identify any surface evidence of fossils and to gain other information to better inform on the paleontological sensitivity of these rocks in the project area.

Field survey methods will conform to BLM guidelines. Where possible, the field survey would consist of walking transects 30 m apart covering the entire area underlain by paleontologically sensitive sediment (PFYC Class 4 or 5). These transects would include judicious meandering, when potentially informative outcrops or formations are found. Where safety concerns do not allow such a transect, or when the high-sensitivity formation is covered by low-sensitivity sediment, dense ground cover, or is otherwise obscured by outcrops, road cuts, and other potentially informative features will be inspected, based on the judgment of the field team (which will include at least one qualified paleontologist). The marble pendants and other areas of unknown sensitivity (PFYC = 3b) will be spot-checked for caves or other features that have the potential to preserve ancient organic material, based on the judgment of the field crew. Field surveys would not be conducted in areas underlain by low-sensitivity sediment (PFYC Class 1 or 2).

Subsequent to the field survey, a final paleontological resource technical report would be developed providing updated paleontological sensitivity assessments based on in-field observations. This final technical report will also provide an updated impacts assessment, including a final assessment of where adverse impacts to paleontological resources are most

likely to occur, and final mitigation recommendations addressing those and other potential impacts.

4.5.2 Develop Paleontological Resource Monitoring and Mitigation Plan (PRMMP)

After developing the final impacts assessment, BSCWP will prepare and submit to Kern County and the BLM for approval a plan to mitigate any identified and/or potential impacts to paleontological resources. The PRMMP will identify construction impact areas where significant paleontological resources may be encountered and the depths at which those resources are likely to be discovered. The PRMMP will stipulate the frequency of monitoring, and other appropriate procedures. It will also detail the significance criteria to be used to determine which resources will be recovered for their data potential, as well as the coordination strategy to ensure adequate monitoring.

In the event that paleontological resources are encountered during construction, the PRMMP will detail methods of recovery, post-excavation preparation and analysis of specimens, final curation of specimens at an accredited facility, data analysis, and reporting. The PRMMP will specify that all paleontological work undertaken by qualified professionals. Mitigation through specimen and data recovery realizes the scientific value of fossils, and therefore recovery of these values mitigates impacts to a level below that of significant.

4.5.3 Worker Awareness Training

All construction will be trained regarding the recognition of possible buried paleontological resources and protection of paleontological resources during construction, prior to the initiation of construction or ground-disturbing activities. Training will inform construction personnel of the procedures to be followed upon the discovery of paleontological materials. All personnel will be instructed that unauthorized collection or disturbance of fossils is unlawful.

5.0 References

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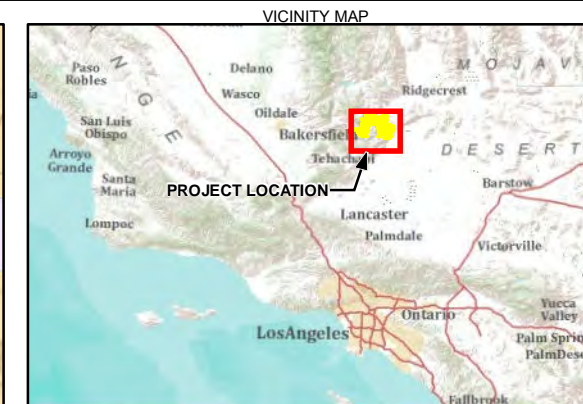
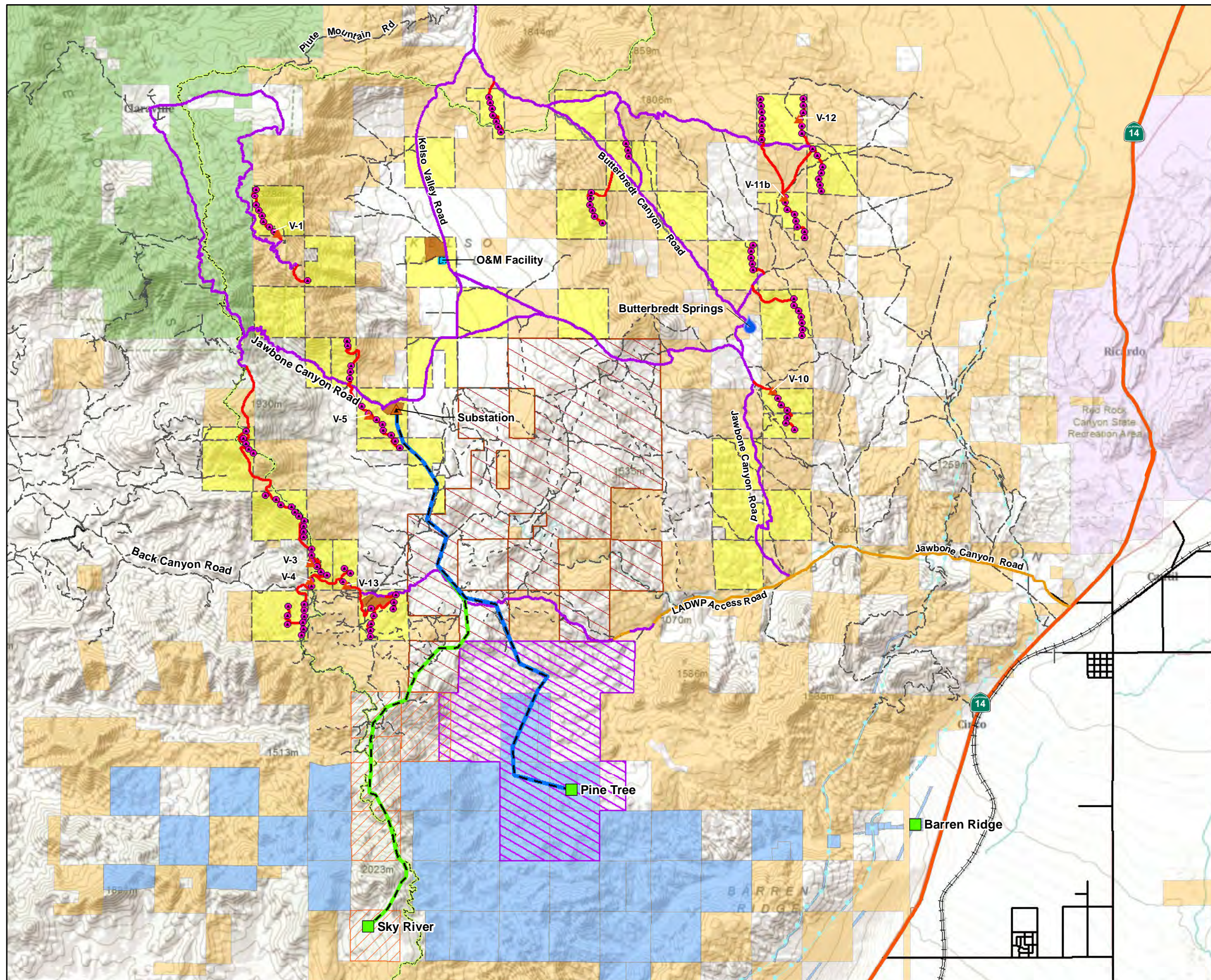
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Figures



- LEGEND**
- Proposed Bright Star Canyon Project Elements**
- Bright Star Canyon Project Boundary
 - Construction Staging Areas
 - O&M Facility
 - WTG (V-Bar Data, 6/2009 confirmed 4/2011)
 - Met Tower (V-Bar Data, 5/2011)
 - Substation
 - Existing Substation
 - Gen-tie Line Option 1 (LADWP)
 - Gen-tie Line Option 2 (CAISO)
- Proposed Site Access Route**
- Existing Dirt Road to be Improved
 - Existing Paved Road to be Improved
 - New Access Roads
- Existing Roads**
- Paved Road
 - Dirt Road (may require 4-wheel drive)
 - No Access – Trail or Accessible by ATV
- Land Ownership**
- CA Department of Parks and Recreation
 - Bureau Of Land Management
 - USDA Forest Service
 - North Sky River (NSR) Project Boundary
 - Pine Tree Wind Development Project
 - Sky River Wind Development Project
 - Los Angeles Department of Water and Power
 - Railroad
 - Pacific Crest Trail
 - Los Angeles Aqueduct

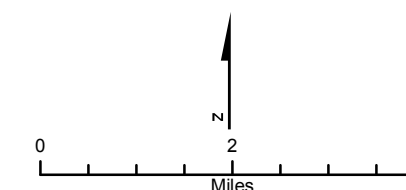
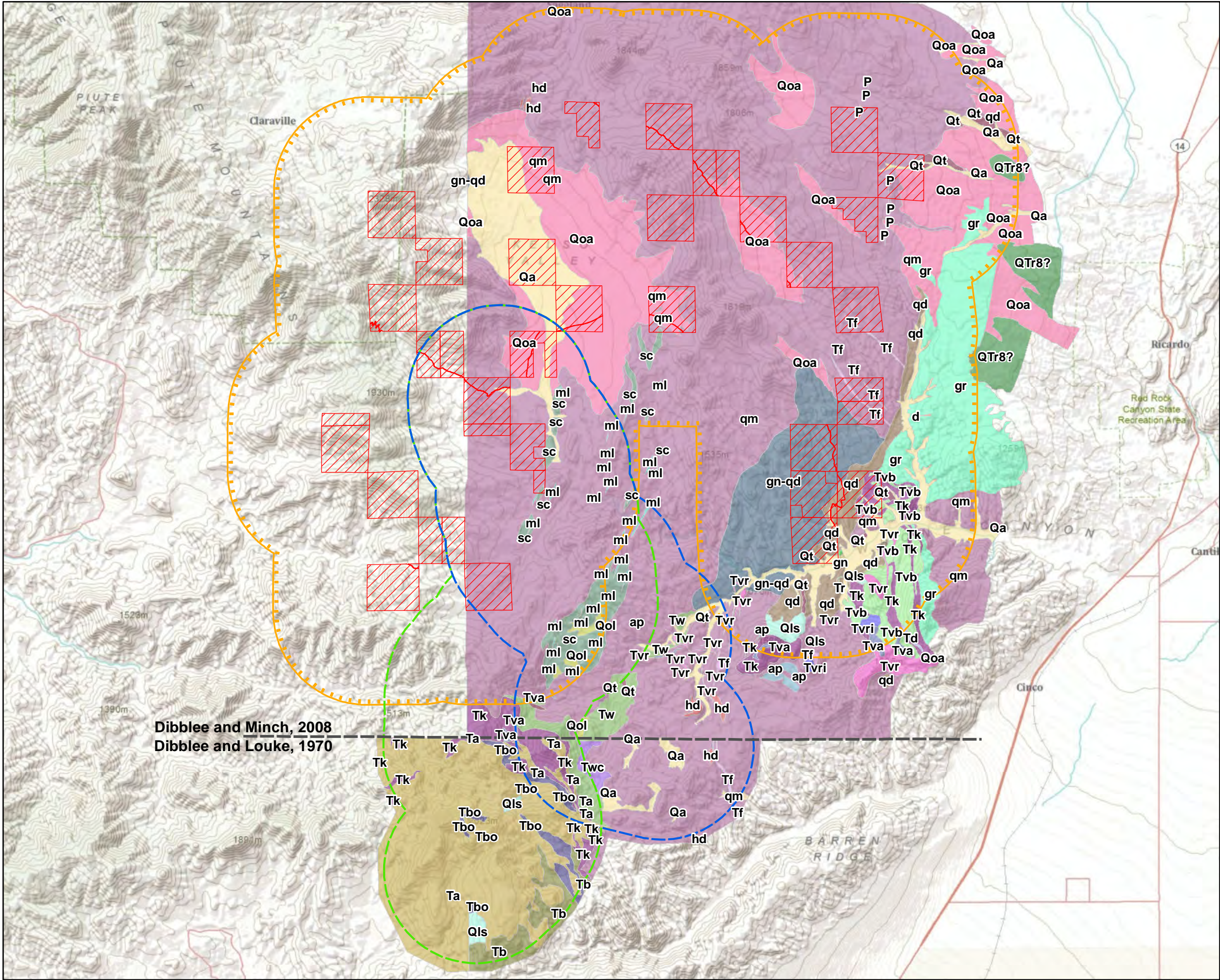


FIGURE 1
Project Layout
 Bright Star Canyon Wind Project
 Fall 2011



LEGEND

- Bright Star Canyon Project Boundary
- 2 mile buffer of BSCWP
- 2 mile buffer of T-Line Option 1
- 2 mile buffer of T-Line Option 2

Geology

- P - Pegmatite swarm
- QTr8? - Terrestrial gravel
- Qa - Alluvial gravel and sand
- Qls - Landslide Rubble
- Qoa - Older alluvium
- Qol - Older lake deposits
- Qt - Terrace gravels
- Ta - White to greenish-white tuff, tuffaceous sandstone, and tuff breccia
- Tb - Basalt
- Tbo - Bopesta Formation
- Td - Dacite
- Tf - Fiss Fanglomerate
- Tk - Kinnick Formation
- Tr - Tertiary Rhyolite
- Tva - Hornblende andesite
- Tvb - Basalt dikes and flows
- Tvr - Intrusive felsite and extrusive flow-breccias
- Tvri - Rhyolite-Dacite
- Tw - Sandstone
- Twc - Witnet Formation
- ap - Aplite dikes
- d - Dacite dikes
- gn - Gneiss
- gn-qd - Gneiss and Quartz diorite
- gr - granite
- hd - Hornblend Diorite
- ml - Marble
- qd - Quartz diorite
- qm - Quartz monzonite
- sc - Schist

Sources:
Dibblee, T. W. and Minch, J. A., 2008, Geologic map of the Cross Mountain and Saltdale 15 minute quadrangles, Kern County, California. Dibblee Geological Foundation, Dibblee Foundation Map DF-399, Scale 1:62,500.
Dibblee, T.W., Jr. and Louke, G. P. 1970. Geologic Map of the Tehachapi quadrangle, Kern County, California. U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-607, scale 1:62,500.
Note: No geology data available for western portion of project area.

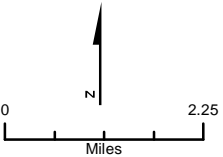


FIGURE 2
Geologic Map
Bright Star Canyon Wind Project
Fall 2011

Appendix A

Paleontological Resource Inventory Review

Appendix 1

UCMP Database Search Results, Bopesta Formation

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

Loc ID	Coll	Locality Name	County	Epoch	Formation	Member	Storage Age	Flora/Fauna
-2734	v	Cache Peak 1	Kern County	Miocene	Bopesta		Barstovian	
-2735	v	Cache Peak 2	Kern County	Miocene	Bopesta		Barstovian	
-2736	v	Cache Peak 3	Kern County	Miocene	Bopesta		Barstovian	
RV7335	v		Kern County	Miocene	Bopesta		Barstovian	
RV8201	v		Kern County	Miocene	Bopesta		Barstovian	
RV8202	v		Kern County	Miocene	Bopesta		Barstovian	
RV8203	v		Kern County	Miocene	Bopesta		Barstovian	
RV8204	v		Kern County	Miocene	Bopesta		Barstovian	
RV8205	v		Kern County	Miocene	Bopesta		Barstovian	
RV8206	v		Kern County	Miocene	Bopesta		Barstovian	
RV8207	v		Kern County	Miocene	Bopesta		Barstovian	
RV8208	v		Kern County	Miocene	Bopesta		Barstovian	
RV8209	v		Kern County	Miocene	Bopesta		Barstovian	
RV8210	v		Kern County	Miocene	Bopesta		Barstovian	
RV8211	v		Kern County	Miocene	Bopesta		Barstovian	
RV8212	v		Kern County	Miocene	Bopesta		Barstovian	
RV8213	v		Kern County	Miocene	Bopesta		Barstovian	
RV8214	v		Kern County	Miocene	Bopesta		Barstovian	
RV8215	v		Kern County	Miocene	Bopesta		Barstovian	
RV8216	v		Kern County	Miocene	Bopesta		Barstovian	
RV8217	v		Kern County	Miocene	Bopesta		Barstovian	
RV8218	v		Kern County	Miocene	Bopesta		Barstovian	
RV8219	v		Kern County	Miocene	Bopesta		Barstovian	
RV8220	v		Kern County	Miocene	Bopesta		Barstovian	
RV8224	v		Kern County	Miocene	Bopesta		Barstovian	
RV8225	v		Kern County	Miocene	Bopesta		Barstovian	
RV8228	v		Kern County	Miocene	Bopesta		Barstovian	
RV8229	v		Kern County	Miocene	Bopesta		Barstovian	
RV8230	v		Kern County	Miocene	Bopesta		Barstovian	
RV8231	v		Kern County	Miocene	Bopesta		Barstovian	
RV8232	v		Kern County	Miocene	Bopesta		Barstovian	
RV8233	v		Kern County	Miocene	Bopesta		Barstovian	
RV8234	v		Kern County	Miocene	Bopesta		Barstovian	
RV8235	v		Kern County	Miocene	Bopesta		Barstovian	
RV8236	v		Kern County	Miocene	Bopesta		Barstovian	
RV8237	v		Kern County	Miocene	Bopesta		Barstovian	
RV8238	v		Kern County	Miocene	Bopesta		Barstovian	
RV8239	v		Kern County	Miocene	Bopesta		Barstovian	
RV8240	v		Kern County	Miocene	Bopesta		Barstovian	
RV8241	v		Kern County	Miocene	Bopesta		Barstovian	
RV8242	v		Kern County	Miocene	Bopesta		Barstovian	
RV8243	v		Kern County	Miocene	Bopesta		Barstovian	
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RV8246	v		Kern County	Miocene	Bopesta		Barstovian	
RV8247	v		Kern County	Miocene	Bopesta		Barstovian	
RV8248	v		Kern County	Miocene	Bopesta		Barstovian	
RV8249	v		Kern County	Miocene	Bopesta		Barstovian	
RV8250	v		Kern County	Miocene	Bopesta		Barstovian	
RV8251	v		Kern County	Miocene	Bopesta		Barstovian	
RV8252	v		Kern County	Miocene	Bopesta		Hemingfordian	
RV8253	v		Kern County	Miocene	Bopesta		Hemingfordian	
RV8254	v		Kern County	Miocene	Bopesta		Barstovian	

Appendix 1

UCMP Database Search Results, Bopesta Formation

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

Loc ID	Coll	Locality Name	County	Epoch	Formation	Member	Storage Age	Flora/Fauna
RV8255	v		Kern County	Miocene	Bopesta		Barstovian	
RV8256	v		Kern County	Miocene	Bopesta		Barstovian	
RV8257	v		Kern County	Miocene	Bopesta		Barstovian	
RV200103	v	Phillips Ranch	Kern County	Miocene	Bopesta		Hemingfordian	

Appendix 1

PaleoBiology Database Search Results, Bopesta Formation

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

Collection	Authorizer	Collection Name	Reference
19197	J. Alroy	Cache Peak (LACM(CIT) 498) (coll. Tedford, Schultz) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19198	J. Alroy	Cache Peak (LACM(CIT) 499) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19199	J. Alroy	Cache Peak (LACM(CIT) 500) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19200	J. Alroy	Cache Peak (LACM(CIT) 501) (= RV-8256) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19201	J. Alroy	Cache Peak (LACM(CIT) 502) (= RV-8225) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19202	J. Alroy	Cache Peak (LACM(CIT) 517) (= RV-8237) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19203	J. Alroy	Cache Peak (LACM 1546) (= RV-8210) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19204	J. Alroy	Cache Peak (LACM 4894) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19205	J. Alroy	Cache Peak (LACM(CIT) 4900) (= RV-8240) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19206	J. Alroy	Cache Peak (P-3643) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19207	J. Alroy	Cache Peak (RV-8201) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19208	J. Alroy	Cache Peak (RV-8204) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19209	J. Alroy	Cache Peak (RV-8205) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19210	J. Alroy	Cache Peak (RV-8206) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19211	J. Alroy	Cache Peak (RV-8208) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19212	J. Alroy	Cache Peak (RV-8212) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19213	J. Alroy	Cache Peak (RV-8214) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19214	J. Alroy	Cache Peak (RV-8220) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19215	J. Alroy	Cache Peak (RV-8224) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19216	J. Alroy	Cache Peak (RV-8228) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19217	J. Alroy	Cache Peak (RV-8229) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19218	J. Alroy	Cache Peak (RV-8230) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19219	J. Alroy	Cache Peak (RV-8232) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19220	J. Alroy	Cache Peak (RV-8234) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19221	J. Alroy	Cache Peak (RV-8235) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19222	J. Alroy	Cache Peak (RV-8241) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19223	J. Alroy	Cache Peak (RV-8242) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19224	J. Alroy	Cache Peak (RV-8244) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19225	J. Alroy	Cache Peak (RV-8247) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)

Appendix 1

PaleoBiology Database Search Results, Bopesta Formation

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

Collection	Authorizer	Collection Name	Reference
19226	J. Alroy	Cache Peak (RV-8248) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19227	J. Alroy	Cache Peak (RV-8249) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19228	J. Alroy	Cache Peak (RV-8250) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19229	J. Alroy	Cache Peak (RV-8251) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19230	J. Alroy	Cache Peak (RV-8252) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19231	J. Alroy	Cache Peak (RV-8253) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19232	J. Alroy	Cache Peak (RV-8257) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)
19478	J. Alroy	Phillips Ranch (= CIT 503; UCMP V-2577) <i>Hemingfordian/Barstovian - Cenozoic 5 - California</i>	Quinn (1987)

Appendix 1

UCMP Database Search Results, Kinnick Formation

Bright Star Canyon Wind Project – Initial Paleontological Resources Assessment

Loc ID	Coll	Locality Name	County	Epoch	Formation	Member	Storage Age	Flora/Fauna
-2577	v	Phillips Ranch 1	Kern County	Miocene	Kinnick		Hemingfordian	
-2608	v	Phillips Ranch 2	Kern County	Miocene	Kinnick		Hemingfordian	
V3635	v	Phillips Ranch 3	Kern County	Miocene	Kinnick		Hemingfordian	
V68109	v	Phillips Ranch 4	Kern County	Miocene	Kinnick		Hemingfordian	