APPENDIX F
PALEONTOLOGICAL RESOURCES TECHNICAL MEMORANDUM

TETRA TECH

Draft

Technical Memorandum

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To: Scott Schwartz, RWE Solar Development, LLC

From: Derrick Coleman, PhD, Senior Geomorphologist

Subject: Janus Solar Project Paleontological Resources
Colusa County, California

This technical memorandum evaluates the potential for paleontological resources (i.e., fossils) to occur at the proposed Janus Solar Energy project (Project) site in Colusa County, California. Paleontological resources are an important source of information on previous environments and conditions for most of the geologic record, and this technical memorandum also provides recommendations for management options based on such resources' sensitivity to Project-related disturbance.

1.0 Introduction

This technical memorandum describes the known geologic formations mapped within the Project site footprint and surrounding area, including both surface and subsurface formations. It describes the likelihood for these formations to contain paleontological resources, and where applicable, includes the type of fossils associated with each. Various activities related to construction have the potential to affect paleontological resources. These activities include grading, excavation, drilling, trenching, or tunneling (generally, any kind of surface-disturbing activity). A framework is presented for evaluating paleontological resource sensitivity, which is applied to the appropriate formations with potential to be encountered.

1.1 Project Location and Setting

The Project is proposed for an area of agricultural land in unincorporated Colusa County, California. The nearest city is Williams, located approximately 6.5 miles northeast of the Project site, and the community of Arbuckle is located more than 11 miles to the southeast of the Project site (see Figure 1). The Tehama-Colusa Canal, which provides irrigation water to the west side of the Sacramento Valley, is within 1 to 2 miles of the Project boundary to the north and east. The Project generation tie (gen-tie) line crosses the canal north of the Project site.

The Project is located within Township 14 North, Range 4 West, Sections 1, 2, and 3, and Township 15 North, Range 3 West, Sections 29 and 30. The coordinates of the Project centroid is north latitude 39.093° and west longitude 122.251°.

1.2 Project Description

Janus Solar PV, LLC is proposing to construct a photovoltaic solar power-generating facility of sufficient size and configuration to produce 80 megawatts of electricity and provide up to 80 megawatts of battery energy storage. The Project would include a photovoltaic solar energy generating facility and Project-related operational support facilities. This operational infrastructure would include on-site underground electrical collection lines, substation, battery energy storage system, operations and

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maintenance facility, internal service roads, security fencing, gates, and lighting, along with a site-external 60-kilovolt transmission line to the Pacific Gas & Electric Cortina substation. During construction, a laydown yard and other temporary use areas would be developed.

2.0 Regulatory Context

The following sections provide summaries of federal, state, and local regulations pertaining to the protection of paleontological resources.

2.1 Federal Regulations

Federal protection of paleontological resources applies if a project overlaps or crosses federally owned or managed lands, or if a federal license, permit, approval or funding is required. The current Project boundary, including grid connection, would cross U.S. Bureau of Reclamation lands where the gen-tie line crosses the Tehama-Colusa Canal; however, no ground-disturbing activities would occur on federal land, such that there would be no impacts to paleontological resources on federal lands.

2.2 State Regulations

California state regulations provide guidance with respect to paleontological resources under the California Environmental Quality Act. Appendix G, Section V.c of the CEQA Guidelines requires that a project proponent determine whether the proposed project would directly or indirectly destroy a unique paleontological resource or site or a unique geological feature. Should an impact be established as significant, CEQA Guidelines require reasonable or feasible measures be applied to limit or minimize significant adverse impacts (State CEQA Guidelines § 15126.4). In addition, CEQA Guidelines (§15370) describe mitigation options to avoid, minimize, rectify, reduce, or compensate for impacts to paleontological resources.

2.3 Regional/Local Regulations

Under the Conservation Element of the 2013 General Plan for Colusa County (Objective CON-3A, Conserve Important Cultural Resources and the County's Heritage; and Policy CON 3-2, Inadvertent Discovery), paleontological resources are protected during "all development, infrastructure, and other ground-disturbing projects," per the following requirement:

> *If construction or grading activities result in the discovery of significant historic or prehistoric archaeological artifacts or unique paleontological resources, all work within 100 feet of the discovery shall cease, the County Department of Planning and Building shall be notified, the resources shall be examined by a qualified archaeologist, paleontologist, or historian for appropriate protection and preservation measures; and work may only resume when appropriate protections are in place and have been approved by the County Department of Planning and Building.*

3.0 Project Environment

The Project site is situated along the western side of the Sacramento Valley, as it rises from the alluvial bottomlands of the great valley, in the southwestern quadrant of Colusa County. The Project site is within the lower one-third of the valley, at about the latitude where the Sacramento River swings from a mostly north-south orientation to a south-southeasterly orientation, flowing toward the city of Sacramento. While the topography in the vicinity of the site is relatively flat, it is influenced by the slow increase in elevation further to the west.

3.1 Physiographic Setting

The central valley of California is classified as the Great Valley geomorphic province. This province is a long (approximately 450 miles) and comparatively narrow lowland (with a width averaging about 50 miles) that has a central drainage outlet through Suisun Bay and into San Francisco Bay. The northern half of the province (the Sacramento Valley) and the southern half (the San Joaquin Valley) meet at the Sacramento-San Joaquin Delta, which is tidally influenced and therefore essentially at sea level. The Project area is on ground that sits at elevations from 280 feet to 360 feet above mean sea level, though most is between 300 feet and 320 feet above mean sea level.

The Great Valley geomorphic province is a mostly intact (i.e., with limited deformation) asymmetric structural trough that has been filled with a thick layer of sediment that ranges in age back to the Jurassic period. The Sacramento Valley portion of this geomorphic province is bounded on the west by the Coast Ranges, on the east by the Sierra Nevada Mountains, and to the north by the Klamath Mountains. The southern end is the Sacramento-San Joaquin Delta. The thickest sequence of Mesozoic age sediment (roughly between 66 and 250 million years ago) occurs in the southern end of the Sacramento Valley, and on the western side, within about 25 miles of the Project site (Hackel 1966).

3.2 Local Geology

Because the Great Valley is a depositional trough, most of the local geologic formations in the Project area are sedimentary rocks, formed from alluvial deposits into either marine or non-marine environments. These sediments are deposited on a basement of Franciscan Formation rocks to the west (including igneous, sedimentary, and metamorphic rocks) and Sierran Formation rocks on the east side (mostly igneous, granitic rock). The contact between the two basement formations is concealed underneath the Great Valley deposits. Even though it is not visible, it is presumed to be a subduction zone or fault-related contact. Much of the Great Valley had active tectonism throughout the Cenozoic, creating unconformities among sedimentary units. Deposition in much of the center of the Great Valley appears to provide an unbroken record through the Cenozoic. Along the margins of the Great Valley, deposition appears to have been frequently disrupted by tectonic activity and erosion (Norris and Webb 1990).

Geologic mapping of the Sacramento Valley has been documented by a number of researchers, including Irwin (1960), Jennings and Strand (1960), Helley and Harwood (1985), and Jennings, et al. (2010). The current interpretation of the local geology of the Project area has not changed drastically over the past several decades, and it indicates that the Project site is located in an area of alluvial rocks with an age of Pliocene to Pleistocene (see Figure 3 and Table 1). East of the Project site on the floor of the Sacramento Valley, the underlying materials are primarily the youngest alluvial sediments, Quaternary age, unconsolidated to semi-consolidated, and mostly non-marine (Q). The Project site sits on older materials (QPc), Pliocene to Pleistocene in age, slightly more consolidated than the younger materials, and deposited into both non-marine and marine environments. These sedimentary materials have been exposed due to uplift of the Coast Ranges to the west, and subsequent erosion of the overlying younger materials. West of the Project includes exposures of yet older sedimentary materials (Ku, Kl, KJf, and J), with ages from Cretaceous to Jurassic, and exhibiting greater consolidation of materials. Topographically, these older sedimentary formations are found at higher elevations than the Project site, which also resulted from the Coast Range orogeny. One of the primary causes of the Coast Range uplift is plate tectonic activity along the Pacific Coast, and a significant marker of this activity is the intrusion of ultramafic plutonic rock, with associated metamorphic rock, which are

ultimately exposed at the surface due to erosion. Such geologic materials are found to the west of the Project, and are labeled as Mesozoic in age.

4.0 Paleontological Resources

Since paleontological resources are limited and nonrenewable and provide scientific and educational value, they are protected under both state and county laws and regulations. The evaluation of paleontological resources by this technical memorandum follows guidelines of significance criteria specified by the U.S. Bureau of Land Management (BLM) in their Paleontological Fossil Yield Classification (PFYC) system (BLM 2016).

Surface and subsurface geologic units in the Project vicinity were identified through a review of published maps and literature. In the absence of specific scientific studies of the paleontology of the area, geologic units provide an indication of paleontological sensitivity and the potential for impacting non-renewable paleontological resources by Project development. The reviewed geologic literature and maps included Irwin (1960), Jennings and Strand (1960), Helley and Harwood (1985), and Jennings, et al. (2010), as noted earlier.

4.1 Database Search

A records search was performed by the University of California Museum of Paleontology (UCMP) for records of fossil localities occurring within local geologic units in Colusa County (Holroyd 2021). The record collection search objective was to identify known fossil localities in or near the Project site, or regionally within the identified geologic formation present at the Project site. The searches performed covered all fossil types (vertebrate, invertebrate, plant, microfossils, and trace fossils).

Limiting the search to records of localities found in Colusa County, the UCMP database contains 186 records of invertebrate fossils, 19 microfossils, 6 vertebrate fossils, and 1 plant fossil (UCMP 2021). None of these records were of fossil localities directly within the Project site. However, two fossil localities were within 5 miles of the Project: one is an invertebrate fossil (UCMP locality IP3326), and the other a vertebrate fossil (UCMP locality V5249). The invertebrate locality is about 3 miles to the northwest of the Project area, and also has a U.S. Geological Survey locality identifier (Mesozoic M4098). This fossil was found in Cretaceous rock (Ku) along Freshwater Creek Road. The latter locality is approximately 4 miles southeast of the Project site along Cortina Creek. This is a vertebrate fossil identified in the Pliocene-Pleistocene age Tehama Formation (QPc), the same materials underlying the Project site. The fossil collected at this location (UCMP specimen 42890) were identified as limb bone fragments of a peccary (Holroyd 2021).

4.2 Resource Assessment

Based on known land histories and a review of aerial imagery from 1985 through 2018, the Project site has been used for cultivation at various times throughout this period. However, this has been limited to the western parcel, and the southwestern half of the central parcel. The northeastern half of the central parcel, and the eastern parcel do not appear to have had significant ground disturbance over this period. Use for much of this area was likely limited to livestock grazing. The aerial images show that the land maintains some limited natural vegetation. The U.S. Geological Survey 7.5 Minute “Salt Canyon” quadrangle shows the western half of the Project site is within a relatively flat portion of Spring Valley, while the eastern half is within a portion of the valley with subdued, but hilly relief that slopes gently toward the southeast. No reconnaissance field surveys were conducted of the local geology, geomorphology, or paleontology.

4.3 Paleontological Resource Sensitivity

The classification of paleontological resources applied here follows the PFYC system developed by the BLM (2016) for use on public lands. The BLM system classifies geologic units into one of five broad categories (some with sub-classes) that have an increasing likelihood for containing paleontological resources from PFYC-1 to PFYC-5 (see Table 2). Rating the sensitivity of these geological formations was based on the record search, literature review, and professional judgement. Results of the analysis have been used to develop recommendations for this Project. All of the Project site and most of the gen-tie line occur on Plio-Pleistocene (QPc) alluvial rock formations.

Plio-Pleistocene Alluvium (QPc). These sediments are likely derived from the Coast Range to the west. This unit is known to contain widely scattered and scientifically significant paleontological resources. An example of this resource is the UCMP vertebrate fossil locality (V5249) described above, and located about 4 miles to the southwest. Because of the variability of fossil resource significance, abundance, and predictability in this unit, they are considered to have a moderate paleontological sensitivity (PFYC-3a).

Quaternary Alluvium (Q) and Older Alluvium (Qoa). A portion of the gen-tie line would be located on Quaternary alluvium (Q) or Older alluvium (Qoa). These units present a smaller probability of encountering fossils, and the gen-tie line requires very little surface disturbance during construction. The Pleistocene- to Holocene-aged sediments of Quaternary alluvium (Q) are too young to contain scientifically significant paleontological resources and are therefore considered to have low paleontological sensitivity (PFYC-2). The Older alluvium (Qoa) sediments can contain scattered paleontological resources, but have a low probability of containing fossils, and are therefore considered to have a low to moderate paleontological sensitivity in this area (PFYC-2 to PFYC-3a).

5.0 Evaluation Of Paleontological Resources

The surface geologic unit mapped within the Project site is Plio-Pleistocene alluvium (QPc). This unit is assessed as PFYC-3a (having moderate paleontological sensitivity), and therefore, has a moderate probability of containing fossils. The local geologic unit that stratigraphically underlies the QPc surface unit is Cretaceous sedimentary rock (Ku), which also is considered to have moderate (though little known) paleontological sensitivity (PFYC-3b). This unit has contained fossils at other locations, including the previously discussed UCMP locality IP3326 that is only 3 miles from the Project.

Only the upper of these two units (QPc) is likely to be impacted by Project activities because excavations and other surface-penetrating actions are not expected to be deep enough to reach the older unit. The depth of the QPc surface unit is not known, but may be better defined through geotechnical investigation. However, since both the QPc and Ku units have similar sensitivity classifications, the potential for encountering fossils with ground-disturbing activities is assumed to be moderate. As a result, Project development activities must anticipate the possibility of impacting scientifically significant paleontological resources.

6.0 Resource Protection

Paleontological resources are finite and nonrenewable. Fossils are important because they can provide significant information to advance our understanding of past environments, climates, species occurrence and diversity, and species response to climate change. These resources are vulnerable to impacts from ground-disturbing activities associated with development projects. Possible impacts to fossils and fossil sites due to development or other site-disturbing activities could result in a direct loss of scientific data or research potential. On-site construction activities associated with site development

could impact previously undisturbed and paleontologically rich geologic deposits that may be present; in such case, potentially significant paleontological resources could be destroyed.

However, potential impacts can be evaluated by (a) assessing the likelihood that important paleontological resources will be found within the development site, and (b) considering whether protective measures are available and necessary. We have established that the Plio-Pleistocene-aged sediments found at the surface within the Project boundaries have potential for containing paleontological resources, and thus, there is potential for Project construction activity to encounter paleontological resources. Therefore, the following management and mitigation measures are recommended.

6.1 Management and Mitigation Measure Recommendations

Due to the potential for encountering paleontological resources on the Project site, the proposed mitigation measures would elevate worker awareness of paleontological resources to increase the likelihood a fossil would be recognized if unearthed.

Construction crews must be informed of the potential to encounter paleontological materials (fossils). Mitigation measures to be implemented during Project development and construction include the following:

A. ***Paleontological Worker Education and Awareness Program:*** Before starting construction activities, on-site personnel should be trained in basic recognition of fossils and appropriate procedures to notify management in order to engage a qualified paleontologist in the event that fossils are discovered during construction activities. If potential paleontological resources are unearthed while conducting construction activities for the Project, all construction work occurring within 100 feet of the find shall immediately stop.

B. ***Unanticipated Find Contingency:*** A qualified specialist, meeting the Secretary of the Interior's Professional Qualification Standards for the Society of Vertebrate Paleontology (SVP 2010), must be brought on-site to evaluate the significance of any unanticipated discovery of paleontological resources (an Unanticipated Find) and determine if additional study is warranted. If the significance of the find under CEQA or California Public Resources Code, Section 21082, does not warrant such study, the qualified paleontologist may decide to just record the find and allow work to continue. If the discovery proves significant under CEQA, additional work will be prescribed, such as preparation of a paleontological treatment plan, testing, or data recovery.

7.0 References

BLM (U.S. Bureau of Land Management). 2016. Potential Fossil Yield Classification System for Paleontological Resources on Public Lands. BLM Instruction Memorandum No. 2016-124, July 8, 2016.

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Helley, E. J. and Harwood, D. S. 1985. Geologic map of late Cenozoic deposits of the Sacramento Valley and northern Sierran foothills, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1790, 5 plates, scale 1:62,500, 1 pamphlet, 24 p. URL: http://pubs.usgs.gov/mf/1985/ 1790/.

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Jennings, C. W. and Strand, R. G. 1960. Geologic Map of California, Olaf P. Jenkins Edition, Ukiah Sheet. 1:250,000. California Geological Survey. https://www.conservation.ca.gov/cgs/maps-data/rgm.

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Norris, R. M., and Webb, R.W. 1990. Geology of California. 2d ed. New York: John Wiley & Sons.

SVP (Society of Vertebrate Paleontology). 2010. Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. Society of Vertebrate Paleontology, 1– 11.

UCMP (University of California Museum of Paleontology). 2021. UCMP Online Database. URL: http://ucmpdb.berkeley.edu/loc.html. Accessed June 16, 2021.

8.0 ATTACHMENTS

Figure 1. Project Location

Figure 2. Project Site

Figure 3. Geology Map

Table 1. Geologic Time and Rock Formations in the Project Area

Table 2. Paleontological Resource Sensitivity and Management

Attachments

Janus Solar Project

Colusa County, CA

Paleontology Technical Memorandum
Figure 1: Project Location

Project Site

County Boundary

Transportation

Interstate

State Highway

Hydrology

Major River or Creek

0 5 10 Miles

Scale is 1:400,000 when printed at 11"x17"

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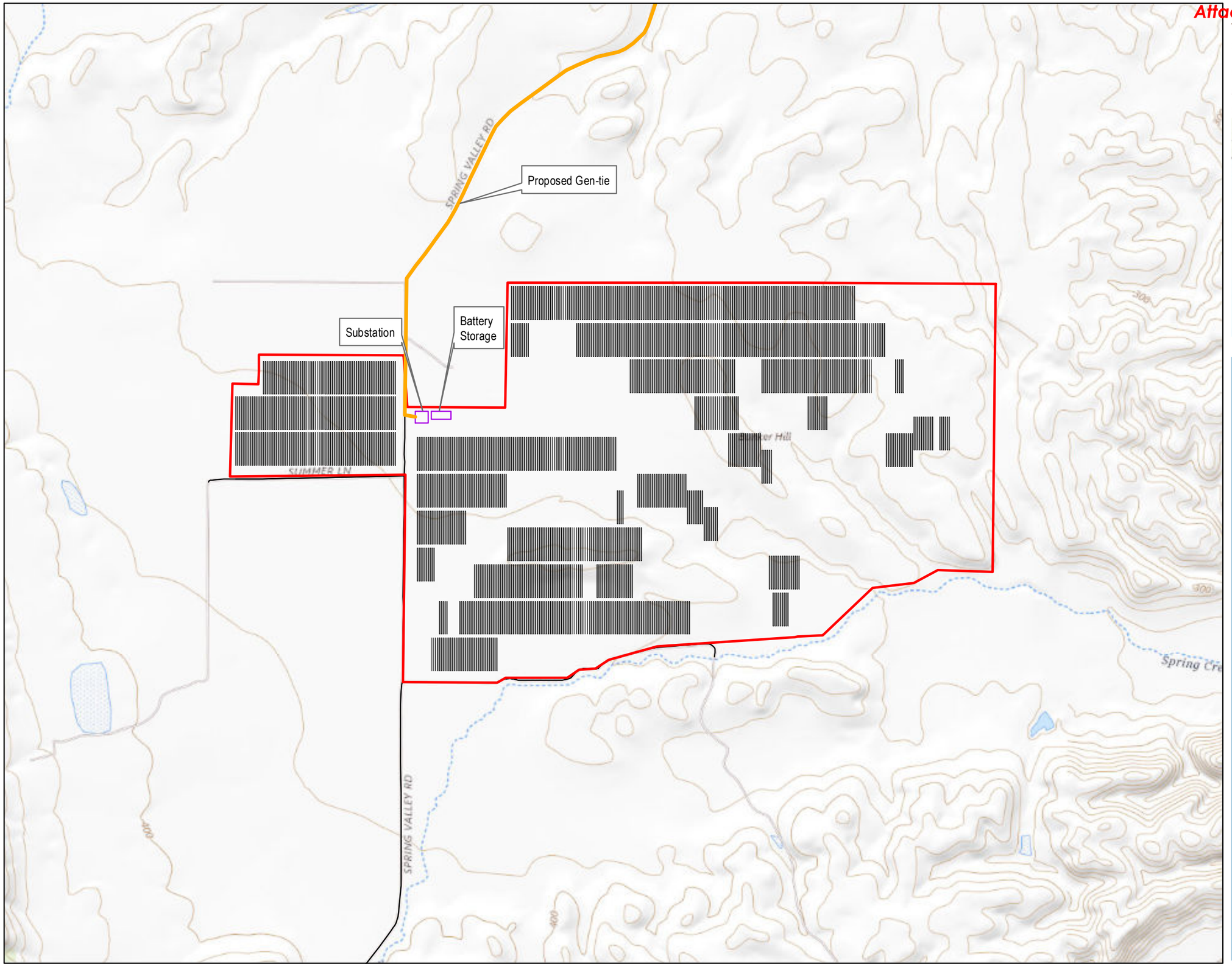
Janus Solar Project

Colusa County, CA

Paleontology Technical Memorandum

Figure 2: Project Site



- Project Area
- Solar Array
- Substation and Battery Storage
- Proposed Gen-tie

0 0.25 0.5 Miles

Scale is 1:15,000 when printed at 11"x17"

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Janus Solar Project

Colusa County, CA

Paleontology Technical Memorandum

Figure 3: Geology Map

Project Area

Geologic Map Units

- Q – Quaternary alluvium
- Qoa – Older alluvium
- QPc – Plio-Pleistocene alluvium
- Ku – Cretaceous sedimentary rock
- Kl – Lower Cretaceous sedimentary rock
- KJf – Franciscan Complex
- J – Jurassic Marine Sedimentary Rock
- Um – Mesozoic plutonic rock

Geologic Map Source: Jennings, et al. 2010

0 1 2 4 Miles

Scale is 1:100,000 when printed at 11"x17"

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TABLE 1. Geologic Units Represented in the Project Area

Eon	Era	Period	Epoch	Time Range (mya)			Present in Project Area Alluvial	Plutonic
Phanerozoic	Cenzoic	Quaternary	Holocene	0.00	to	0.01	Q	
			Pleistocene	0.01	to	2.58	Qoa	
		Neogene	Pliocene	2.58	to	5.33	QPc	
			Miocene	5.33	to	23.03		
		Paleogene	Oligocene	23.03	to	33.90		
			Eocene	33.90	to	56.00		
			Paleocene	56.00	to	66.00		
	Mesozoic	Cretaceous	Upper	66.00	to	100.50	Ku	um
			Lower	100.50	to	145.00	Kl, KJf	um
		Jurassic	Upper	145.00	to	163.50	KJf, J	um
			Middle	163.50	to	174.10	J	um
			Lower	174.10	to	201.30	J	um
		Triassic	Upper	201.30	to	237.00		
			Middle	237.00	to	247.20		
			Lower	247.20	to	251.90		
	Paleozoic	Permian		251.90	to	298.90		
		Cabiniferous		298.90	to	358.90		
		Devonian		358.90	to	419.20		
		Silurian		419.20	to	443.80		
		Ordovician		443.80	to	458.40		
		Cambrian		458.40	to	541.00		
Proterozoic	Neoproterozoic			541.00	to	1000.00		
	Mesoproterozoic			1000.00	to	1600.00		
	Paleoproterozoic			1600.00	to	2500.00		
Archean	Neoarchean			2500.00	to	2800.00		
	Mesoarchean			2800.00	to	3200.00		
	Paleoarchean			3200.00	to	3600.00		
	Eoarchean			3600.00	to	4000.00		
Hadean				4000.00	to	4600.00		

Q	**Quaternary alluvium (Pleistocene-Holocene).** Marine and non-marine (i.e. continental) sedimentary rocks - Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly non-marine.
Qoa	**Older alluvium (Pleistocene).** Marine and non-marine (i.e. continental) sedimentary rocks - Older alluvium, lake, playa, and terrace deposits.
QPc	**Plio-Pleistocene alluvium.** Non-marine (i.e. continental) sedimentary rocks (Pleistocene-Holocene) - Pliocene and/or Pleistocent sandstone, shale, and gravel deposits; mostly loosely consolidated.
Ku	**Sedimentary rock (Upper Cretaceous)**. Marine sedimentary and metasedimentary rocks - sandstone, shale, and conglomerate.
Kl	**Sedimentary rock (Lower Cretaceous).** Marine sedimentary and metasedimentary rocks - sandstone, shale, and conglomerate.
KJf	**Franciscan complex (Cretaceous-Jurassic).** Marine sedimentary and metasedimentary rocks - sandstone with smaller amounts of shale, chert, limestone, and conglomerate. Includes Franciscan melange, except where separated.
J	**unspecified (Jurassic).** Marine sedimentary and metasedimentary rocks - Shale, sandstone, minor conglomerate, chert, slate, limestone; minor pyroclastic rocks.
um	**Plutonic rock (Mesozoic).** Plutonic rocks - Ultramafic rocks, mostly serpentine. Minor peridotite, gabbro, and diabase.

TABLE 2. Paleontological Resource Sensitivity and Management

Sensitivity Class	Description	Management Considerations
Class 1 – Very Low (PFYC-1)	Includes geologic units that are not likely to contain recognizable fossil remains. • Units that are igneous or metamorphic, excluding reworked volcanic ash units. • Units that are Precambrian in age or older. The probability for impacting any fossils is negligible.	1) Concern for paleontological resources is usually negligible or not applicable. 2) Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances. 3) Assessment or mitigation of paleontological resources is usually unnecessary. 4) The occurrence of significant fossils is non-existent or extremely rare.
Class 2 – Low (PFYC-2)	Includes sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. • Vertebrate or significant invertebrate or plant fossils not present or very rare. • Units that are generally younger than 10,000 years before present. • Recent aeolian deposits. • Sediments that exhibit significant physical and chemical changes (i.e., diagenetic alteration). The probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low.	1) Concern for paleontological resources is generally low. 2) Assessment or mitigation is usually unnecessary except in rare or isolated circumstances. 3) Assessment or mitigation of paleontological resources is not likely to be necessary. 4) Localities containing important resources may exist but would be rare and would not influence the classification. 5) These important localities would be managed on a case-by-case basis.
Class 3 Moderate	Includes fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictability; or sedimentary units of unknown fossil potential.	1) Concern for paleontological resources is moderate; or cannot be determined from existing data. 2) Surface-disturbing activities may require field assessment to determine appropriate course of action. 3) This classification includes geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils. 4) Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. 5) Surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether the action could affect the paleontological resources. 6) These units may contain areas that would be appropriate to designate as hobby collection areas due to the higher occurrence of common fossils and a lower concern about affecting significant paleontological resources.
a – Moderate ***(PFYC-3a)***	Includes units that are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil locality is low but is somewhat higher for common fossils. • Often marine in origin with sporadic known occurrences of vertebrate fossils. • Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently; predictability known to be low.	
b – Unknown ***(PFYC-3b)***	Includes units that exhibit geologic features or indicate conditions suggesting significant fossils could be present, but little information about the paleontological resources of the unit or the area has been recorded. This may indicate the unit or area is poorly studied, and field surveys may uncover significant finds. The units in this Class may eventually be placed in another Class when sufficient survey and research is performed. The unknown potential of the units in this Class should be carefully considered when developing any mitigation or management actions. • Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	

TABLE 2. Paleontological Resource Sensitivity and Management

Sensitivity Class	Description	Management Considerations
Class 4 - High	Includes geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.	1) Management concern for paleontological resources is moderate to high, depending on the proposed action. 2) A field survey by a qualified paleontologist is often needed to assess local conditions. 3) Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. 4) Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. 5) Resource assessment, mitigation, and other management considerations are similar at this level of analysis and impacts and alternatives can be addressed at a level appropriate to the application. 6) Mitigation considerations must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access resulting in greater looting potential. 7) If impacts to significant fossils can be anticipated, on-the-ground surveys prior to authorizing the surface disturbing action will usually be necessary. 8) On-site monitoring or spot-checking may be necessary during construction activities.
a – Exposed ***(PFYC-4a)***	Includes units that are exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two acres. Paleontological resources may be susceptible to adverse impacts from surface disturbing actions. Illegal collecting activities may impact some areas.	
b – Covered ***(PFYC-4b)***	Includes areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity. • Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted. • Areas of exposed outcrop are smaller than two contiguous acres. • Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions. • Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources. The probability for impacting significant paleontological resources is moderate to high and is dependent on the proposed action.	
Class 5 – Very High	Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation. The probability for impacting significant fossils is high.	1) Management concern for paleontological resources is high to very high. 2) A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions. 3) Official designation of areas of avoidance, special interest, and concern may be appropriate. 4) Vertebrate fossils or scientifically significant invertebrate fossils are known or can reasonably be expected to occur in the impacted area. 5) On-the-ground surveys prior to authorizing any surface disturbing activities will usually be necessary. 6) On-site monitoring may be necessary during construction activities.
a – Exposed ***(PFYC-5a)***	Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than two contiguous acres. Paleontological resources are highly susceptible to adverse impacts from surface disturbing actions. Unit is frequently the focus of illegal collecting activities.	
b – Covered ***(PFYC-5b)***	Areas underlain by geologic units with very high potential but lower risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. Bedrock unit has very high potential, but protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to the bedrock resulting from the activity. • Extensive soil or vegetative cover; bedrock exposures limited or not likely impacted. • Areas of exposed outcrop are smaller than two contiguous acres. • Exposure impacts are minimized by topographic conditions. • Other characteristics lower vulnerability of known/unidentified paleontological resources.	