Salton Sea Species Conservation Habitat Project

Paleontological Resources Monitoring and Mitigation Plan

Prepared for
California Department of Water Resources
1416 Ninth Street, Room 452-1
Sacramento, CA 95814

July 2019

ESA

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SALTON SEA SPECIES CONSERVATION HABITAT PLAN PROJECT

Paleontological Resources Monitoring and Mitigation Plan

1.0 Introduction

Environmental Science Associates (ESA) has been retained by the California Department of Water Resources (DWR) to prepare a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) for the Salton Sea Species Conservation Habitat Plan Project (SCH Project or Project). The Project would restore shallow water habitat lost due to the Salton Sea's ever-increasing salinity and reduced area as the sea recedes. This is a design/build project, so plans have been evolving, and specific plans are not available at this time. DWR and the California Department of Fish and Game (CDFW) prepared the Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) on behalf of the U.S. Army Corps of Engineers (federal lead agency) and California Natural Resource Agency (state lead agency). It was certified on August 5, 2013.

This PRMMP provides guidance for the monitoring and protection of paleontological resources during ground-disturbing activities for the SCH Project and has been prepared in compliance with Mitigation Measures PALEO-1, PALEO-2, and PALEO-3 listed in the Mitigation Monitoring and Reporting Program (MMRP) of the FEIS/EIR.

> **Mitigation Measure PALEO-1: Prepare and implement a survey plan and a paleontological monitoring plan.** A plan for the survey of SCH Project areas will be prepared to facilitate identification of paleontological resources prior to initiation of ground-disturbing activities. Additionally, prior to construction, a certified paleontologist retained by the lead agencies will supervise monitoring of construction excavations and produce a Paleontological Resource Management Recovery Plan. Paleontological monitoring will include inspection of exposed rock units and microscopic examination of matrix to determine if fossils are present. The monitor will have authority to temporarily divert grading away from exposed fossils to recover the fossil specimens. Monitoring will take place on a full-time basis when construction occurs at depths greater than 5 feet, part-time (4 hours a day) when excavations exceed 2 feet, and on a spotcheck basis on excavations less than 2 feet. The paleontologist will document interim results of the construction monitoring program with monthly progress reports. Additionally, at each fossil locality, field data forms will record that locality, stratigraphic columns will be measured, and appropriate scientific samples will be submitted for analysis.

Mitigation Measure PALEO -2: Conduct worker training. Construction supervisors and crew will receive training by a certified paleontologist in the procedures for identifying and protecting paleontological resources, as well as procedures to be implemented in the event fossil remains are encountered during ground-disturbing activities.

Mitigation Measure PALEO -3: Prepare and implement a paleontological resource data recovery plan. If fossils are encountered during construction, construction activities will be temporarily diverted from the discovery, and the monitor will notify all concerned parties and collect matrix for testing and processing as directed by the Project paleontologist. To expedite removal of fossil-bearing matrix, the monitor will be empowered to request heavy machinery to assist in moving large quantities of matrix out of the path of construction to designated stockpile areas. Construction will resume at the discovery location once all the necessary matrix is stockpiled, as determined by the paleontological monitor. Testing of stockpiles will consist of screen washing small samples to determine if important fossils are present. If such fossils are present, the additional matrix from the stockpiles will be water screened to ensure recovery of a scientifically significant sample. Samples collected will be limited to a maximum of 6,000 pounds per locality. The Project paleontologist will direct identification, laboratory processing, cataloguing, analysis, and documentation of the fossil collections. When appropriate, splits of rock or sediment samples will be submitted to commercial laboratories for microfossil, pollen, or radiometric dating analysis. Prior to construction, the lead agencies will enter into a formal agreement with a recognized museum repository and will curate the fossil collections, appropriate field and laboratory documentation, and the final Paleontological Resource Recovery Report in a timely manner following construction. A final technical report will be prepared to summarize construction monitoring and present the results of the fossil recovery program. The report will be prepared in accordance with SVP guidelines and lead agency requirements. The final report will be submitted to the lead agency and the curation repository.

1.1 Personnel

ESA personnel involved in the preparation of this PRMMP include: Candace Ehringer, M.A., RPA, ESA Task Order Manager; Joe Stewart, Ph.D., Paleontological Principal Investigator and author; and Jessie Johnston, GIS Specialist. Dr. Stewart meets the Society of Vertebrate Paleontology (SVP) (SVP, 2010) criteria for Qualified Professional Paleontologist (Principal Investigator, Project Paleontologist).

Role titles used in this report are Qualified Professional Paleontologist and Paleontological Resource Monitor, as defined by the SVP. The criteria for these two roles are provided in Section 4 of this plan.

1.2 Project Location

The SCH Project is located in the southern extremity of the Salton Sea in Imperial County, California. It consists of a larger area of shoreline and shallow water to the west of the New River delta, and a smaller area of delta, shoreline, and shallow water to the east of the New River. **Figure 1** depicts the SCH Project location and incorporates modifications to the locations of Project components as outlined in the Addendum to the Final EIS/EIR dated April 10, 2014.

SOURCE: ESRI

Salton Sea Paleo Resources Mitigation and Monitoring Plan

Figure 1
Project Location

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1.3 Project Description

The following is a brief summary of the SCH Project description from the Final EIS/EIR for the SCH Project (DWR and CDFW, 2013). The reader is referred to the Final EIS/EIR and its addendum dated April 10, 2014 for a complete description of the SCH Project and modifications, as well as additional figures depicting the SCH Project.

CDFW, on behalf of the California Natural Resources Agency, proposes to construct and operate the SCH Project, which would restore shallow water habitat lost due to the Salton Sea's ever-increasing salinity and reduced area as the Salton Sea recedes. The SCH ponds would use available land at elevations less than -228 feet mean sea level (msl) (the former sea level in June 2005).

The SCH Project is designed as a proof-of-concept project in which several Project features, characteristics, and operations could be tested under an adaptive management framework for approximately 10 years after completion of construction (until 2025). By then, managers would have had time to identify those management practices that best meet the Project goals. After the proof-of-concept period, the Project would be operated until the end of the 75-year period covered by the Quantification Settlement Agreement (2078), or until funding was no longer available.

The SCH Project would use the large bay to the northeast of the New River (East New), the shoreline to the southwest (West New), and the shoreline continuing to the west (Far West New). Cascading ponds would be attached to each of the pond units. The ponds would be constructed in a manner that would allow for the management of water into and through the SCH Project area. The newly created habitat would be contained within low-height berms. The water supply for the SCH Project ponds would be a combination of brackish river water and saline water from the Salton Sea, blended to maintain an appropriate salinity range for target biological benefits.

The SCH ponds would be constructed on recently exposed playa following the existing topography (ground surface contours) where possible using a range of design specifications. The ground surface within the SCH ponds would be excavated with a balance between cut and fill to acquire material to build the berms and habitat islands. Specifically, the SCH water depth at the exterior berms would range between 0 and 6 feet (measured from the water surface to the Sea-side toe of the berm); the maximum depth within the SCH ponds would be up to 12 feet in excavated holes, and the maximum water surface elevation would be at -228 feet msl.

2.0 Regulatory Framework

2.1 Federal

A variety of federal statutes specifically address paleontological resources, which according to Title 40 Code of Federal Regulations (C.F.R.) Section 1508.2, are considered a subset of scientific resources. These statutes are applicable to a project if that project includes federally owned or federally managed lands. Some statues also apply to projects that involve a federal agency license, permit, approval, or funding.

The first of these statutes to be enacted is the Antiquities Act of 1906 (54 U.S.C. 320301-320303 and 18 U.S.C. 1866(b)), which calls for protection of historic landmarks, historic and prehistoric structures, as well as other objects of historic or scientific interest on federally administered lands, the latter of which would include fossils. The Antiquities Act both establishes a permit system for the disturbance of any object of antiquity on federal land and also sets criminal sanctions for violation of these requirements. The Antiquities Act was extended to specifically apply to paleontological resources by the Federal-Aid Highways Act of 1958.

More recent federal statutes that address the preservation of paleontological resources include the National Environmental Policy Act (NEPA), enacted in 1970. NEPA requires the consideration of important natural aspects of national heritage when assessing the environmental impacts of a project (P.L. 91-190, 31 Stat. 852, 42 U.S.C. 4321-4327).

The Federal Land Policy Management Act of 1976 (P.L. 94-579; 90 Stat. 2743, U.S.C. 1701-1782) requires that public lands be managed in a manner that will protect the quality of their scientific values, and as noted above, paleontological resources are considered scientific resources.

The Paleontological Resources Preservation Act, part of the Omnibus Land Management Act enacted in 2009 (Title VI, Subtitle D), furthers the protection of paleontological resources on federal lands by criminalizing the unauthorized removal of fossils.

2.2 State

2.2.1 California Environmental Quality Act

The CEQA Guidelines (Title 14, Chapter 3 of the California Code of Regulations, Section 15000 *et seq*.), define the procedures, types of activities, individuals, and public agencies required to comply with CEQA. As part of CEQA's Initial Study process, one of the questions that must be answered by the lead agency relates to paleontological resources: "Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (CEQA Guidelines Appendix G, Section VII, Part f).

The CEQA threshold of significance for a significant impact to paleontological resources is reached when a project is determined to "directly or indirectly destroy a significant paleontological resource or unique geologic feature."

In general, ground disturbance for projects that are underlain by paleontologically sensitive geologic units have the potential to result in significant impacts to paleontological resources. Ground disturbance for projects that are underlain by geologic units with no paleontological sensitivity have no potential to result in significant impacts to paleontological resources unless ground disturbance extends into any sensitive geologic units that may underlie the non-sensitive units.

2.2.2 Public Resources Code Section 5097.5 and Public Resources Code Section 30244

Other state requirements for paleontological resource management are included in Public Resources Code Section 5097.5 and Public Resources Code Section 30244. Section 5097.5 states that "a person shall not knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands." Section 5097.5 also states that "a violation of this section is a misdemeanor, punishable by a fine not exceeding ten thousand dollars ($10,000), or by imprisonment in a county jail not to exceed one year, or by both that fine and imprisonment." This section defines public lands as "lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof."

Section 30244 states that "where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required."

2.3 Local

The general plan of the County of Imperial (County of Imperial, 1993) makes no specific references to paleontological resources.

2.4 Professional Standards

The following section provides a discussion of the professional standards employed by practicing paleontologists in determining the paleontological potential of geologic units and in assessing the significance of discovered fossils.

2.4.1 Society of Vertebrate Paleontology Guidelines

The SVP Guidelines (SVP, 2010) outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological resource-specific Laws, Ordinances, Regulations, and Standards (LORS) accept and use the professional standards set forth by the SVP. The SVP Guidelines were used to inform the Mitigation and Monitoring Plan in Section 4 of this PRMMP.

2.4.2 Paleontological Resources Significance Criteria

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

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

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

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or
5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

In summary, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important (Murphey and Daitch, 2007; Scott and Springer, 2003). Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer, 2003; Scott et al., 2004).

2.4.3 Paleontological Potential

Paleontological potential is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, the past history of the geologic unit in producing significant fossils, and the fossil localities recorded from that unit. Paleontological potential is derived from the known fossil data collected from the entire geologic unit and not just from one specific survey. In its "Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources," the SVP (2010) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential.

- **High Potential.** Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.).
- **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e. g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.
- **Undetermined Potential.** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.
- **No Potential.** Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources. [SVP, 2010; 1-2]

3.0 Project Impacts

3.1 Construction Methods

This is a design/build project, so specific plans are not available at this time. In general, the SCH Project will consist of creating shallow ponds along the existing shoreline. Berms will close off the existing bays. The total length of seaward berms will be up to 5.5 miles in the vicinity of the New River. The water depths within the ponds will typically be 6 feet or less. The following description of construction techniques and equipment is taken from Section 2.4.2 of the Final EIS/EIR. SCH Project construction would be extensive, involving earthwork, concrete placement, electrical, and structural processes. The general construction activities are summarized below. The Project would be constructed over a 2-year period. Most construction would take place during the 5 daytime, but dredging could take place 24 hours a day.

3.1.1 Pond Construction Techniques

Construction activities would occur in both wet and dry areas of the proposed pond sites. The dry areas (exposed playa) would be those areas between the Sea's elevation at the time of construction (estimated to be about -233.9 feet msl) and the -228-foot contour. This construction would be accomplished with land-based equipment. The wet areas would be those portions of the Sea that were inundated at the time of construction. Construction in these areas would be accomplished with floating equipment. Transition areas may start dry but become wet during construction. These areas would become wet because Project-related excavation may expose shallow groundwater or because of the presence of soft soils. The soft soil areas may appear dry but typically have water less than 2 feet below the surface and the soils lack the structural capability to support construction equipment. In these areas, low-ground pressure vehicles, construction mats, or constructing temporary elevated roadbeds could be used to move equipment through these areas.

Excavation equipment and techniques would vary depending on soil and water conditions at the time and location of the activity. Excavation activities would produce channels that allow for easier water-borne excavation, swales in the newly constructed habitat that would not be adjacent to berms, and widespread shallow borrow areas. Barge-mounted equipment would be used to construct borrow channels and berms in areas that would be flooded at the time of construction. The barge would operate from the channel it was constructing while excavating and piling material for a berm. Swales would be constructed with scrapers and excavators, and achieve 2- to 4-foot or potentially deeper water depths. These would ultimately serve as habitat features that connect shallow and deep areas of a pond. Shallow borrow areas would be taken from the highest and driest ground, and would provide approximately 2-foot-deep water depths in areas that would otherwise have very shallow water (less than 1 foot deep). Scrapers or excavators would be used to accomplish this recontouring.

3.1.2 Land-Based Equipment

The equipment used to construct in the dry would include scrapers, bulldozers, excavators, front loaders, and dump trucks. Scrapers are effective in excavating soil and moving it to a placement site, while bulldozers, excavators, and front loaders are useful in excavating and piling the soil in the same area. Excavators and front loaders could be paired with a dump truck to move the excavated material to a different location. The objective of the dry construction would be to minimize the distance that excavated material is moved. The land-based equipment would be used for earthmoving activities such as shaping the ponds, constructing the berms, and constructing the habitat features. An additional piece of land-based equipment that could be used is a pile driver to place piles for the inlet and outlet works. The land-based equipment would use, if needed, equipment with low-ground pressure tires.

3.1.3 Floating Equipment

Floating equipment would be used in the inundated areas and would consist of a barge-mounted excavator or clamshell dredge. The dredge would require a water depth of between 5 and 10 feet deep to operate, depending on the size of the barge. However, a clamshell dredge could also work from the channel it excavated. Floating equipment would be used to construct the exterior berms of the ponds.

3.1.4 Construction Staging Areas

A central construction staging area would be used to store construction equipment and supplies. The staging area would be located adjacent to the SCH ponds at about the -228-foot contour. The area would be about 2 acres and would be designed to avoid any off-site movement of spilled fluids or stormwater. After construction, the staging area would be restored to the condition prior to construction or incorporated into the Project. Additional staging areas located outside the public right-of-way would be established near the upstream diversion under Alternatives 1 and 4 through easements with the landowner.

3.1.5 Inlet and Outlet Works

Facilities such as outlet and inlet works located in the pond area would be constructed with land-based equipment. Equipment such as front loaders could be used to move precast structures to the site and an excavator or small crane rig could be used to place piles to support the structures. These piles would be driven into the playa until solid material (typically the clay layers that are present) is encountered. Depending on the timing of the installation of these structures relative to berm placement, the outlet works may be constructed from the top of the berm.

3.1.6 Pumping Plants

The pumping plant for the river diversion would be constructed using land-based equipment kept at the main staging area. The equipment would include excavators to excavate the diversion bay and a small crane rig to place sheet pile to separate the construction area from the river. Temporary pumps would be used to dry out the inlet to the river diversion. The pumped water would be stored in a temporary basin to settle the suspended material and then returned to the river downstream of the excavation.

The saline pumping station would be constructed from a floating barge. Equipment on the barge would drive piles into the seabed to support the pumping facility. Temporary framework would be placed to allow for a concrete deck to be poured above the current Sea elevation. The pipeline to convey the saline water to the SCH would be placed in a trench on the seabed or on piles, depending on the soil conditions. The electrical wiring for the power supply would be placed in conduit alongside the pipeline. The design may also include a 4-inch brackish water pipeline that would convey river water out to the pumping plant as a non-saline water supply for maintenance flushing of the saline water pumps. The seawater pump station would be above the Sea elevation and accessed by boat. The facility may include deterrents to prevent birds from roosting or nesting on the structure.

Alternatively, the saline pumping station may be constructed at the outer perimeter of the SCH ponds. Construction would involve similar methods as those for the river diversion pump station and would occur from the completed berm top.

3.1.7 Gravity Diversion

The gravity diversion from the river would take place several miles upstream of the SCH ponds and would operate from a secondary staging area. The equipment would include excavators to excavate the diversion bay and a small crane rig to place sheet pile to separate the construction area from the river. Additional excavation would be needed for the brackish water pipeline corridor and the sedimentation basin.

3.1.8 Brackish Water Pipeline Construction

Excavation of the sedimentation basin and brackish water pipeline corridor would occur with excavators, bulldozers, scrapers and dump trucks. The sides of the trench could be laid back to avoid side wall collapse but this design specification would require additional excavation and right-of-way. As an alternative, the trench could be shored to minimize the construction area. Brackish water pipeline testing would be conducted prior to its operation. The brackish water pipeline would be cleaned, filled with river water, and checked for leakage. The water would be discharged into the SCH ponds or sedimentation basin once the test was completed.

3.1.9 Power Line Construction

Three-phase power would be required to operate the river or saline pumps. In both instances, power would have to be extended from 1 to 2 miles from the current locations to supply the pumps. Extension of the power lines would occur using aboveground power lines and require the placement of power poles. The extension would be similar to what is currently found in the area. The required equipment includes an auger, small crane, and a power line machine. Provision of the power and connecting into the existing system would require coordination with Imperial Irrigation District (IID). Power lines for the saline pumps would be provided in underwater conduit. Aboveground electrical power lines extended as a result of the SCH Project would be modified to prevent bird collisions and electrocutions (e.g., bird deterrents).

3.1.10 Interaction with Existing Facilities

Numerous public and private improvements in the Project area could be encountered during construction. The most common would be related to agricultural land uses and include IID and private irrigation ditches and pipelines, IID drains, and private drains. Other facilities include pipelines for geothermal operations, power lines, roadways, and existing NWR wildlife structures. Alignments that conflicted with existing facilities would either be rerouted or the

Project engineer would work with the facility owner to minimize the effects. For example, if the gravity brackish water pipeline were to intersect an agricultural drain, the drain would be rerouted to bypass the work area until the brackish water pipeline was placed and backfilled. The drain would then be restored to the pre-Project condition.

3.2 Paleontological Resource Potential

3.2.1 Geology

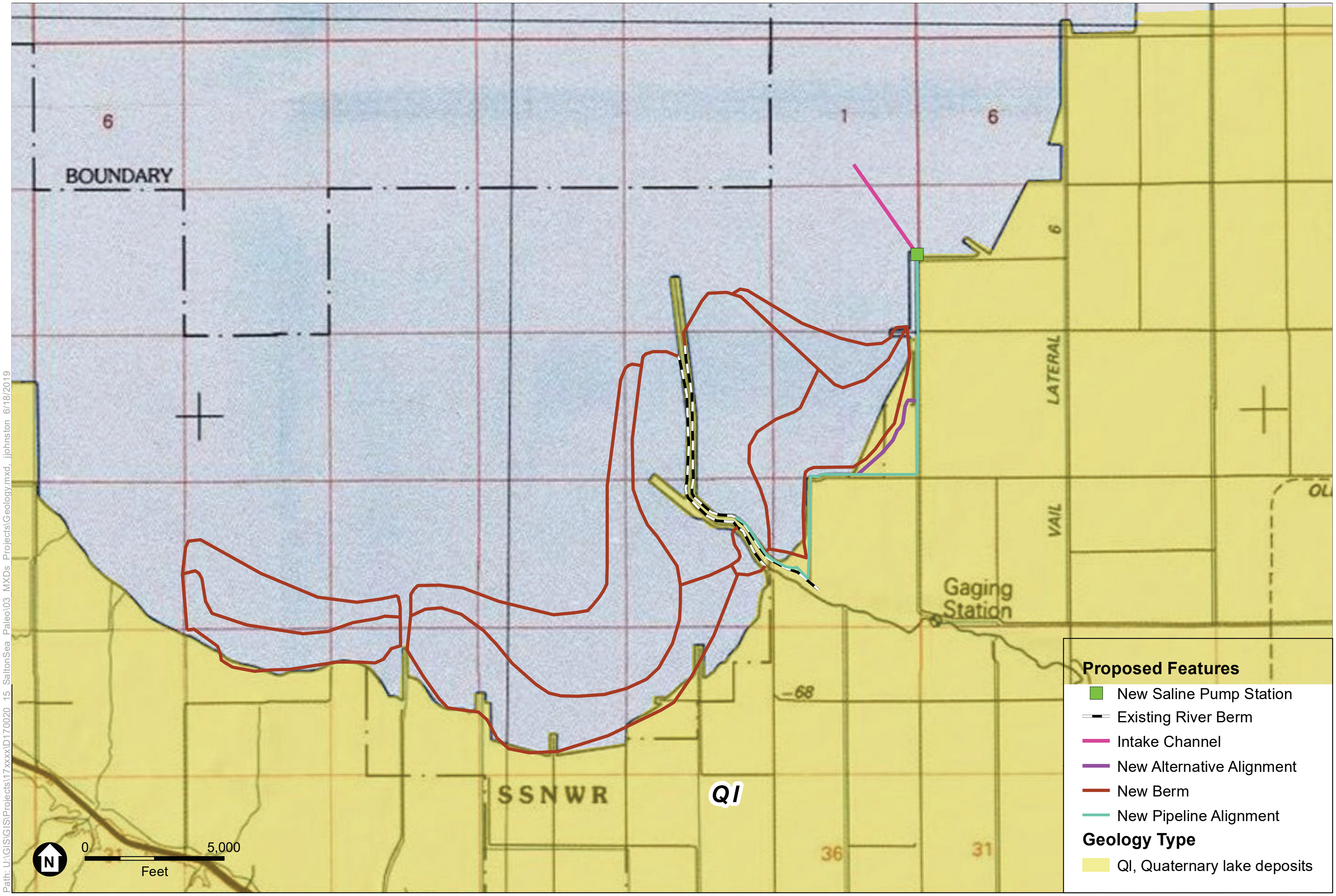
The Project vicinity is underlain by Lake Cahuilla deposits. Lake Cahuilla sediments are those sediments laid down by natural invasions of the Colorado River in the Salton Basin from late Pleistocene through Holocene epochs. As the Salton Sea is within the very center of Lake Cahuilla, one might expect Lake Cahuilla sediments to be exposed in the SCH Project area. The most detailed mapping of the SCH Project footprint is at a scale of scale 1:125,000 (Morton, 1977), which shows Quaternary lake sediments (*Ql*) throughout the SCH Project footprint (**Figure 2**). Quaternary lake sediments are equivalent to Lake Cahuilla deposits, which have a high sensitivity or potential for paleontological resources (DWR and CDFW, 2013).

3.2.2 Geotechnical Testing Results

Geotechnical testing of the Project footprint showed up to 8 feet of grayish "recent sea sediments," which were thought to have accumulated in the last 60 years (Hultgren – Tillis Engineers, 2014). Below that was a sand/silty sand unit that probably accumulated in the last 60 years. Below those sediments, red-brown clay and silt were found in some augerings and vibracores. They interpreted this unit to be 1905-1907 flood alluvium and Holocene lacustrine deposits. Reddish clay and silt would most likely indicate extensive oxidation of iron minerals.

A second geotechnical investigation was done by TetraTech (2018), which had similar findings. The analysis classified the sediments into four strata (from youngest to oldest): very soft to soft recent sea sediments, very soft to firm lacustrine deposits, stiff to very stiff lacustrine deposits, and medium dense to dense alluvial deposits. TetraTech interpreted the first category of sediments to have been formed by lacustrine and deltaic environments within the last 15 to 20 years. No age assignment was made for the second unit. Tetratech assigned the third unit to Holocene lacustrine deposition. No age interpretation was ventured for the fourth (lowest) unit.

A red-brown fossil soil in Lake Cahuilla sediments was noted and dated with radiocarbon at a solar project site (Imperial Solar Energy Center) 26 miles south of the SCH Project (Dudek, 2016). The repeated phases of prehistoric Lake Cahuilla sediments covered both the SCH Project and the solar project site. The radiocarbon date for the fossil soil at that solar project was 18,286 radiocarbon years before present, and was based on caliche, a pedogenic carbonate generated within soils. In desert areas of California, caliche seems to take at least 10,000 years to form (Schlesinger, 1985; PaleoResource Consultants, 2004; Stewart and Hakel, 2017; Stewart et al., 2012). The presence of caliche deposits in the SCH red clay and silt would demonstrate that it is of Pleistocene age (greater than 10,000 radiocarbon years). Furthermore, the caliche could produce a radiocarbon date to test this hypothesis. Excavations into the red-brown clay have the potential to impact fossil-bearing sediments that could provide information on its age and depositional environment.



SOURCE: Morton (1977); California Geological Survey Publications Salton Sea sheet (1967)

Salton Sea Paleo Resources Mitigation and Monitoring Plan

Figure 2
Geology

ESA

3.2.3 Anticipated Fossil Types

The types of significant discoveries that could be recovered during excavations related to the SCH Project would be expected to be similar or the same as those from nearby discoveries. Significant discoveries made in Lake Cahuilla sediments north of the Salton Sea include the La Quinta Site, which yielded specimens of freshwater bivalves and snails, minnows, suckers, lizards, snakes, birds, cottontail rabbits, ground squirrels, kangaroo rats, pocket mice, and woodrats (Whistler et al., 1995). These vertebrate species were identified on the basis of small parts, rather than partial skeletons. In the area south of the Salton Sea, the Imperial Solar Energy Center Site yielded specimens of bivalves, snails, fish, snake, tortoise, and rodent fossils have been found (Dudek, 2016). These two sites are depicted on **Figure 3**.

3.2.4 Material Types

A potentially significant discovery could be wood, a bone, a tooth, an eggshell of a vertebrate animal, a bivalve or snail shell, or a soil horizon/sediments that might contain fossils.

4.0 Mitigation and Monitoring Plan

This section describes the requirements of the PRMMP including: descriptions of the qualified personnel charged with carrying out the PRMMP; the actions that have to take place prior to construction; how monitoring will be conducted; laboratory procedures; and reporting and curation requirements. These requirements constitute the scope of work for implementation of the PRMMP.

4.1 Qualified Personnel

All mitigation will be carried out by individuals meeting the SVP (2010) criteria for Qualified Professional Paleontologist (Principal Investigator, Project Paleontologist) or Paleontological Resource Monitors.

4.1.1 Qualified Professional Paleontologist

According the guidelines of the SVP (2010), a Qualified Professional Paleontologist (Principal Investigator, Principal Paleontologist) is a practicing scientist who is recognized in the paleontological community as a professional and can demonstrate familiarity and proficiency with paleontology in a stratigraphic context. A Qualified Professional Paleontologist will have the equivalent of the following qualifications (SVP, 2010: 10):

1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.
2. At least two full years professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contracts.
3. Proficiency in recognizing fossils in the field and determining their significance.
4. Expertise in local geology, stratigraphy, and biostratigraphy.
5. Experience collecting vertebrate fossils in the field.

SOURCE: ESRI

Salton Sea Paleo Resources Mitigation and Monitoring Plan

Figure 3
Project Vicinity Fossil Sites

ESA

4.1.2 Paleontological Resource Monitors

Paleontological Resources Monitors will have the following qualifications (or equivalent) (SVP, 2010: 10-11):

1. BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
2. AS or AA in geology, paleontology, or biology and demonstrated two years' experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.
4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques.

4.2 Preconstruction Survey

Final EIS/EIR Mitigation Measure PALEO-1 requires that prior to the start of ground disturbance, the Qualified Professional Paleontologist conduct a preconstruction survey for paleontological resources and geologic indicators that might shed light on paleontological resources that could be encountered during excavations. The Principal Paleontologist will prepare a report documenting the methods and results of the survey and submit it to DWR for distribution to the lead agencies prior to the start of ground disturbance. If observations necessitate modifications to this PRMMP, the Qualified Professional Paleontologist will modify this PRMMP and provide the revised PRMMP to DWR for distribution to the lead agencies no later than 10 days prior to the SCH Project construction kickoff meeting.

4.3 Construction Worker Training

Final EIS/EIR Mitigation Measure PALEO-2 requires that the Qualified Professional Paleontologist conduct paleontological resource training for all construction personnel and administrators. The training will include instruction on recognition of the types of paleontological resources that could be encountered during SCH Project construction activities; the role and authority of the Paleontological Resources Monitors and safety precautions to be taken when a monitor is present; the procedures to be implemented in the event paleontological resources are encountered during ground-disturbing activities; and the LORS that protect and guide recovery of paleontological resources. This presentation will be given to all persons present at the SCH Project kickoff meeting, and to any construction personnel that join the SCH Project after the kickoff meeting. Subsequent training may be administered via a video presentation. A list of persons receiving this training will be maintained by DWR and provided to the Qualified Professional Paleontologist and lead agencies.

4.4 Monitoring Requirements

A Paleontological Resources Monitor will be present during all movement of previously undisturbed sediment during SCH Project construction in accordance with the following stipulations from Mitigation Measure PALEO-1:

- Full-time monitoring is required for all excavations that exceed 5 feet in depth
- Part-time monitoring (4 hours per day) is required for all excavations between 2 and 5 feet in depth
- Spotchecking (once per week) is required for all excavations less than 2 feet in depth

The intention of these requirements is to focus on monitoring the deepest sediments, as they are the oldest (particularly the reddish alluvium below the "sea sediments"). Whenever there is a choice between focusing on the gray or the reddish sediments, the latter will always have priority. It should be noted that both geotechnical reports indicate that the younger sediments are up to 10 feet thick in some areas, and thin in other areas. Thus, the monitoring requirements should be adapted to the area being monitored.

The monitor will have authority to temporarily divert grading away from exposed fossils to recover the fossil specimens. Additionally, to expedite removal of fossil bearing matrix (or sediments), the monitor will have the authority to request heavy machinery for assistance. The monitor will notify all concerned parties in accordance with the notification procedures outlined in Section 5 of this PRMMP. The monitor will prepare daily monitoring logs detailing soil observations and any discoveries.

4.5 Inadvertent Discoveries

4.5.1 Macrofossil Discoveries

Should fossils of moderate or large size be discovered during construction activities, all ground-disturbing work within 50 feet of the discovery will be halted, and the 50-foot buffer area secured by stakes and flagging. The Paleontological Resources Monitor and/or Qualified Professional Paleontologist will remove the resource as quickly as possible while preserving the integrity of the resource and pertinent data. For larger fossils, this may involve making ridged plaster field jackets to protect the fossil while being removed from the site and while being transported to the laboratory. Construction work within that buffer area will not resume until the Qualified Professional Paleontologist gives permission. All sediment samples and larger fossils will be documented spatially with a GPS device and/or program linking smartphones/tablets to mapping programs. Stratigraphic notes and other information will be recorded in a field notebook.

4.5.2 Microfossil Discoveries

If smaller fossils are encountered (e.g., microvertebrates or mollusks) they will be removed using hand tools along with sediment samples. If needed, construction equipment operators will assist the paleontological resource monitor in moving sediment samples out of the path of construction. A "standard sample" may be required from each geologic unit encountered, but likely not from each locality. The sample may be stockpiled in a spot agreeable to the construction supervisor.

Testing of stockpiles will consist of screen washing up to 200 pounds per stockpile to determine if significant fossils are present. The contractor will be responsible for supplying a tank of non-potable water or other acceptable source for processing/screening samples. Samples collected will be limited to a maximum of 6,000 pounds per locality, as stipulated in Final EIS/EIR Mitigation Measure PALEO-3.

4.6 Laboratory Procedures

Laboratory procedures will include preparation, identification, cataloging, and analysis of recovered fossils.

4.6.1 Preparation

Salvaged specimens must be prepared for identification and curation (not exhibition). This means removal of all or most of the enclosing sediment to reduce the specimen volume, increase surface area for the application of consolidants/preservatives, provide repairs and stabilization of fragile/damaged areas on a specimen, and allow for identification of the fossils.

Larger bones having been removed in plaster field jackets will be prepared in a laboratory with appropriate tools and preservatives. They will be stabilized and prepared to the point of identification.

Microvertebrate and/or microinvertebrate fossils will be recovered by wet screening of sediments. It is often necessary to give a final rinse to sediment concentrate in lab, as conditions in the field and temporal limitations in the field rarely permit such a thorough treatment. The concentrate from such wet screening will be sorted with the aid of a binocular microscope.

4.6.2 Identification, Cataloging, and Analysis

Fossils will be identified to the lowest possible taxonomic level. Ideally, identification of individual specimens will be to genus and species and to skeletal element. Specimens will be cataloged and a complete list of specimens to be accessioned into the collection will be prepared. The Qualified Professional Paleontologist will also assess the significance of recovered fossils using the significance criteria outlined in Section 2.4.3 of this PRMMP.

4.6.3 Carbon-14 Dating

If wood, organic sediment, caliche, mollusk shells, or vertebrate remains appropriate for radiocarbon dating are recovered, the Qualified Professional Paleontologist will submit a few most informative specimens to a laboratory providing dating services, as indicated in PALEO-3. The resulting dates will be reported. If appropriate materials for radiocarbon dating are not recovered, or if samples are beyond the range of radiocarbon dating, electron spin resonance dating may be employed.

4.7 Reporting

Reporting will include monthly progress reports and final reporting to demonstrate compliance with the monitoring program and document any discoveries and will follow the SVP Guidelines (SVP, 2010).

4.7.1 Monthly Progress Reports

The Qualified Professional Paleontologist will prepare a monthly progress report documenting monitoring activities and any discoveries for the duration of ground disturbance. Monthly progress reports will summarize any fossil discoveries, note areas where monitoring occurred and fossils were collected, and identify additional tasks that will be required (such as preparation, identification, and curation of any recovered significant fossils).

The monthly progress reports will be submitted to the DWR Project Manager for distribution to the lead agencies by the fifteenth of each month following a month in which monitoring of ground disturbance occurred (e.g., by June 15th for monitoring activities that occurred in May). Daily monitoring logs will be appended to the monthly progress reports.

4.7.2 Final Report

A final report documenting the results of the monitoring program and any fossils recovered will be prepared in a timely manner following construction, which will be no later than 120 days from completion of analysis and cataloging of discoveries, or 30 days from completion of ground disturbance if no discoveries occur. The final report will include: a summary of the field and laboratory methods; site geology and stratigraphy; precise locality data for each specimen or sample; any radiocarbon dating results; and a statement of the significance and relationship of the fossils discovered to similar fossils found elsewhere. The final report will emphasize the discovery of any new or rare taxa, or emphasize any paleoecological or taphonomic significance. A complete set of field notes, geologic maps, stratigraphic sections, and a list of identified specimens will be appended to the report.

Copies of the final report will be provided to the lead agencies and curation repository. If no significant paleontological resources are recovered, the final report will demonstrate compliance with the monitoring program. Acceptance of the final report by the lead agencies will signify completion of the mitigation program of mitigation for the SCH Project. Any locality data contained in the report should remain confidential and not made available to the general public.

4.8 Curation

Prior to the start of construction, the Qualified Professional Paleontologist will identify a suitable California repository for permanent curation of any significant paleontological resources that are recovered as a result of SCH Project construction activity and t will develop a curation agreement between the lead agencies and the identified repository. The lead agencies will be signatories to the agreement. Specific requirements of the designated repository will be established prior to the start of monitoring. The paleontological repository will meet the criteria outlined in the SVP Guidelines:

> *A Paleontological Repository is a not-for-profit museum or university approved by the lead agency and employing a permanent curator responsible for paleontological records and specimens. Such an institution assigns accession, locality, and/or catalog numbers to individual specimens that are stored and conserved to ensure their preservation under adequate security against theft, loss, damage, fire, pests, and adverse climate conditions. Specimens will be stored in a stable environment away from flammable liquids, corrosive chemicals, organic materials subject to mildew, and sources of potential water damage. Specimens must have all modifications, preparation techniques, etc. documented and linked with the specimen. The repository will also archive lists of collected specimens, and any associated field notes, maps, photographs, diagrams, or other data. The repository must have procedures for tracking specimens removed from storage for study, preparation, exhibit, or loan. The repository must make its collections of cataloged specimens available for study by qualified researchers* (SVP, 2010).

Should any significant fossils be recovered, they will be presented to the designated paleontological curation repository along with GPS data, field notes, photographs, locality forms, stratigraphic sections, and a copy of the final report. The SCH Project lead agencies will ensure that adequate funding is available for curatorial supplies and curation fees.

5.0 Notification Procedures

5.1 Chain of Command

In the event of a discovery, the following notification procedures will be followed. Construction may not resume in the area until the Qualified Professional Paleontologist, ESA Task Order Manager, and DWR Project Manager have conferred on the discovery and the Qualified Professional Paleontologist gives permission to proceed.

- If a Paleontological Resources Monitor is present, the monitor will contact the Qualified Professional Paleontologist, who will then contact the ESA Task Order Manager. The ESA Task Order Manager will then notify the DWR Project Manager.
- If a monitor is not present onsite, the construction supervisor or foreman responsible for the construction activity at the area of discovery is responsible for making the notifications as outlined above.
- In all instances, the Project Qualified Professional Paleontologist, ESA Task Order Manager, and DWR Project Manager will be notified of a discovery.

5.2 Contact Information

- **Qualified Professional Paleontologist:** Joe Stewart (c. 626.710.7817); fossil50@pacbell.net
- **ESA Task Order Manager:** Candace Ehringer (c. 831-737-7438); cehringer@eassoc.com
- **DWR Project Manager:** Gina Radieve (c. 916-712-6873); Gina.Radieve@water.ca.gov

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