SECTION 15 PALEONTOLOGICAL RESOURCES

This section presents the potential adverse impacts of the Water Authority's Proposed Project on paleontological resources. This section begins with a description of the regional paleontological setting, followed by a discussion of applicable Federal, State and local paleontological regulations. Analysis of potential paleontological-related effects associated with the Proposed Project facilities is provided in Section 15.3. Mitigation measures to avoid, eliminate or reduce effects to a less than significant level are provided where appropriate. Section 15.4 identifies paleontological-related effects found not to be significant.

For this report, paleontological resources (i.e., fossils) are defined as the remains and/or traces of prehistoric plant and animal life exclusive of those of human origin. Fossil remains such as non-human bones and teeth, shells, and wood are found in the geologic deposits (rock formations) in which they were originally buried. Fossils generally occur only in areas of sedimentary rock (e.g., sandstone, mudstone, shale, unconsolidated deposits).

15.1 REGIONAL SETTING

Fossils are intimately related to the surrounding geology. Paleontological resources considered herein include not only actual fossil remains, but also the collecting localities and the geologic formations that encompass the collecting localities.

The association between fossils and geology allow the paleontological resource sensitivity (i.e., fossil productivity) of specific rock formations to be assessed. Regional geology as it relates to paleontological resources within the area is presented below. A complete discussion of geology is presented in Section 12, Soils and Geology.

Western San Diego County lies within the Peninsular Ranges Geomorphic Province, which is distinguished from surrounding provinces by its northwest-trending mountains. The eastern one-third of the County lies within the Salton Trough Geomorphic Province. This portion of the County is in a different hydrologic region and outside the Water Authority's sphere of activities, and therefore, will not be addressed here. In the context of this report the term "region" will refer to the western two-thirds of San Diego County.

The region encompasses two distinct geomorphic regions within this province: the Coastal Plains region west of the Peninsular Ranges, and the Peninsular Ranges region itself. Mesozoic metavolcanic, metasedimentary, and plutonic rocks are predominate in the Peninsular Ranges, and Cenozoic sedimentary rocks are predominate to the west and east of the Central Mountain Range. Fossils contained in these rock formations document the biological evolution of this part of western North America.

15.1.1 Resource Sensitivity

Geologic formations in western San Diego County are listed in **Table 15-1**, along with their propensity to yield fossils. These ratings of potential fossil productivity, or the sensitivity of the

formations to paleontological impacts, are described in **Table 15-2**. General productivity of geomorphic regions in the project area are also described in this section.

Table 15-1
Paleontological Sensitivity of Geologic Formations in Western San Diego County

Geometric Region	Formation / Lithology	Age	Sensitivity
Coastal Plains	"Unnamed formation"	early Eocene	high
	Ardath Shale	middle Eocene	
	Bay Point Formation	late Pleistocene	
	Capistrano Formation	late Miocene	
	Delmar Formation	middle Eocene	
	Friars Formation	middle Eocene	
	Mission Valley Formation	Eocene	
	Otay Formation	late Oligocene	
	Point Loma Formation	late Cretaceous	
	San Diego Formation	late Pliocene	
	San Mateo Formation	late Pliocene/late Miocene	
	Santiago Formation, member "B"	Eocene	
	Santiago Formation, member "C"	Eocene	
	Scripps Formations	middle Eocene	
	Stadium Conglomerate, Cypress Canyon member	middle Eocene	
	Stadium Conglomerate, lower member	middle Eocene	
	Sweetwater Formation	middle Eocene	
	Cabrillo Formation	late Cretaceous	moderate
	Lindavista Formation	early Pleistocene	
	Lusardi Formation	late Cretaceous	
	Mount Soledad Formation	Eocene	
	Pomerado Conglomerate	middle Eocene	
	San Onofre Breccia	middle Miocene	
	Santiago Formation, member "A"	Eocene	
	Stadium Conglomerate, upper member	middle Eocene	
	Torrey Sandstone	middle Eocene	
	Unnamed marine terrace deposits	late Pleistocene	
	Unnamed river terrace deposits	late Pleistocene	
	Later Quaternary alluvium	>10,000 years	low
Peninsular Ranges	Table Mountain Gravels	middle Miocene	high
	Temecula Arkose	Pleistocene	
	Jacumba Volcanics	middle Miocene	moderate
	Older Quaternary alluvial fan deposits	late Pleistocene	
	Pauba Formation	late Pleistocene	
	Alluvial deposits of mountain valleys	early Holocene	low
	Later Quaternary alluvial fan deposits	Pleistocene/ Holocene	
	Older metasedimentary rocks	Jurassic, Triassic, Ordovician	marginal
	Santiago Peak Volcanics	early Cretaceous	
	Peninsular Ranges Batholith	late Jurassic/late Cretaceous	zero

Source: Deméré and Walsh 1993.

Table 15-2
Sensitivity Ratings for Paleontological Resources

Sensitivity	Definition
High	High sensitivity is assigned to geologic formations known to contain paleontological localities with rare, well-preserved, and/or critical fossil materials for stratigraphic or paleoenvironmental interpretation, and fossils providing important information about the paleobiology and phylogeny (evolutionary history) of animal and plant groups. Generally speaking, highly sensitive formations are known to produce vertebrate fossil remains or are considered to have the potential to produce such remains.
Moderate	Moderate sensitivity is assigned to geologic formations known to contain paleontological localities with moderately preserved, common elsewhere, or stratigraphically long-ranging fossil material. The moderate sensitivity category is also applied to geologic formations that are judged to have a strong, but unproven potential for producing important fossil remains (e.g., Pre-Holocene sedimentary rock units representing low to moderate energy, marine to non-marine depositional settings).
Low	Low sensitivity is assigned to geologic formations that, based on their relatively recent formation or high-energy depositional history, are judged unlikely to produce important fossil remains. Low sensitivity formations may produce a low abundance of invertebrate fossil remains.
Marginal	Marginal sensitivity is assigned to geologic formations that are composed of pyroclastic volcanic rocks or metasedimentary rocks, but which nevertheless have a limited potential to yield fossil remains from certain sedimentary lithologies at localized outcrops.
Zero	Zero sensitivity is assigned to geologic formations that are entirely plutonic in origin and therefore have no potential for producing fossil remains.

Source: Deméré and Walsh 1993.

15.1.2 Coastal Plains Region

The extensive "layer cake" sequence of marine and non-marine sedimentary rock units in the Coastal Plains region has numerous formations that record portions of the last 140 million years of earth history (Gastil and Higley 1977). Large fluctuations in sea level over this period left marine deposits up to 900 feet above sea level and river deposits as high as 1,200 feet. Faulting related to the local La Nacion and Rose Canyon Fault zones has broken these strata into a number of distinct fault blocks in the southwestern portion of the County. Faulting is less intense north of La Jolla and rock units here are relatively undeformed. **Table 15-1** summarizes the age and stratigraphic position of rock units found in the Coastal Plains region.

In general, the Coastal Plains region is a production area for fossils. The majority of strata in the Coastal Plains region are Eocene, but most other epochs across the Cenozoic Era are also represented. Of the 29 formations in western San Diego County and listed in **Table 15-1**, 17 were rated with high paleontological sensitivity, 11 were rated moderate, and 1 was rated low. Types of fossils discovered in marine deposits include marine invertebrates (e.g., mollusks, clams, snails, crabs, barnacles) and vertebrates (e.g., sharks, rays, and bony fishes, sea birds, dolphins, whales, seals, walruses), and various microfossils (e.g., foraminifers). Fossil teeth and bones preserved in terrestrial sediments like the rich Otay, Santiago, and Sweetwater Formations include assemblages from tortoises, lizards, snakes, birds, shrews, rodents, rabbits, dogs, foxes, rhinoceros, camels, mice, deer, opossums, and extinct creatures such as oreodonts, brontotheres, and artiodactyls. Fossils remains of plants have also been found. Note that these listings are just samples of the array of fossil groups discovered in the region.

Recent significant fossil finds in San Diego County include two baleen whale skeletons and a partial skeleton of a Columbian mammoth. The whale specimens were discovered in the Pliocene marine sandstones of the San Diego Formation at Otay Ranch, and are approximately 3.5 million years old. Both whale skeletons belong to a fossil species that is new to science.

The remains of a Columbian mammoth were discovered in Oceanside in the San Luis Rey River Valley in October 2001. The mammoth fossils were found in Pleistocene soil that formed 100,000 to 300,000 years ago in the floodplain of the ancestral San Luis Rey River. A complete 7-foot tusk, numerous molar teeth, portions of several ribs, and partial limb bones were found. This specimen represents the most complete fossil mammoth found in the coastal area of San Diego County.

15.1.3 Peninsular Ranges Region

Lithology in the Peninsular Range Batholith is primarily crystalline rock that includes metasedimentary rocks that occur as roof pendants in the western, central, and eastern parts of the Batholith; metavolcanic and associated metasedimentary rocks that occur as roof pendants in the western foothills of the Batholith; and the Batholith itself, composed of many plutons of varying, granitic composition.

15.1.3.1 Metasedimentary Rocks

The majority of the metasedimentary rocks of the central and eastern Peninsular Ranges in San Diego County have zero paleontological resource sensitivity. However, a small proportion of these rocks, in localized areas, can be assigned a low paleontological resource sensitivity based upon fossil discoveries discussed below.

Ordovician marine microfossils (conodonts) have been found in the metasedimentary rocks in the eastern part of the County in the Coyote Mountains (Miller and Dockum 1983) and the Santa Rosa Mountains (Gastil and Miller 1984).

Because Triassic fossils have been collected from metasedimentary rocks of the central Peninsular Ranges in Riverside County, and Ordovician fossils have been collected from metasedimentary rocks in Baja California (Gastil and Miller 1984), it is possible that fossils will eventually be discovered in the metasedimentary rocks in the central part of the Peninsular Ranges in San Diego County. Metasedimentary rocks in northwestern San Diego County have not yet produced any fossil remains, but there is a potential that fossils will eventually be found.

As a whole, the metasedimentary rocks of San Diego County can be assigned marginal resource sensitivity.

15.1.3.2 Santiago Peak Volcanics

Slightly to moderately metamorphosed volcanic rocks occur in a discontinuous belt along the western edge of the Peninsular Ranges region, from the Santa Ana Mountains of Orange and

Riverside Counties, to well south of Baja California, Mexico (Larsen 1948). In San Diego County, these rocks are referred to the Santiago Peak Volcanics.

The molten origin of the Santiago Peak Volcanics generally precludes the possibility of fossil remains. However, some of the volcanic breccias contain petrified wood, as in Mira Mesa and near Rancho Santa Fe (D'Vincent 1967). In addition, certain exposures of the metasedimentary portion of this formation have produced important remains of siliceous microfossils and marine macroinvertebrates including belemnites and clams (Jones and Miller 1982).

The metasedimentary rocks of the Santiago Peak Volcanics can be assigned a high paleontological resource sensitivity. The bulk of this formation (i.e., the metavolcanic portion) is assigned a marginal paleontological resource sensitivity.

15.1.3.3 Southern California Batholith

Plutonic rocks in San Diego County comprise part of the northern end of the Peninsular Ranges Batholith that extends for several hundred miles south into Baja California, Mexico. These late Jurassic to late Cretaceous (90 to 140 million years old) plutons range in composition from granite to gabbro. No fossils are known from these rocks and they have been assigned zero paleontological resource sensitivity.

15.2 REGULATORY SETTING

Paleontological resources represent a non-renewable, limited, and sensitive scientific and educational resource, which are protected under various Federal, State, and local regulations. The following sections discuss the related laws, ordinances, regulations, and standards applicable to the Water Authority's Proposed Project.

15.2.1 Federal

The Water Authority's Proposed Project would not be located on Federal land and, therefore, is not subject to specific Federal laws or regulations.

15.2.2 State

State laws and regulations applicable to paleontological resources for the Water Authority's Proposed Project are presented below.

15.2.2.1 California Environmental Quality Act

CEQA requires that project proponents assess potential impacts to paleontological resources, including whether the project would directly or indirectly destroy a unique paleontological resource. With few exceptions, CEQA requires the mitigation of all project impacts to less than significant levels. Standards of significance for paleontological resource impacts are described in Section 15.3.

15.2.2.2 California Public Resources Code (5097-5097.6)

This State law applies to land owned by or under the jurisdiction of the State or any state agency. The law specifies that the State agency responsible may undertake surveys, excavations, or other operations necessary to preserve or record any paleontological features.

15.2.3 Local

San Diego County, and the cities of Carlsbad and Lemon Grove have local policies regarding paleontological resources. These policies are embodied in the General Plan Conservation and/or Open Space elements for those cities. Generally the objective or policy of those local jurisdictions includes the preservation of historical, cultural, archaeological, and paleontological resources where possible and protection of those resources from development impacts.

Other cities within the service area do not have specific ordinances or policies related to paleontological resources.

15.3 IMPACTS AND MITIGATION

15.3.1 Standards of Significance

According to the CEQA Guidelines, a project would result in significant paleontological impacts if it were to:

- Directly or indirectly destroy a unique paleontological resource or site.

Additionally, based on the City of San Diego Significance Determination Guidelines Under CEQA, impacts to paleontological resources are considered significant if the proposed project:

- Grades more than 2,000 cubic yards at a depth greater than 10 feet in "moderately sensitive" (see **Table 15-2**) geologic formations known to contain paleontological resources.

15.3.2 Impacts and Mitigation Measures

This section identifies the potentially significant adverse program-level impacts and required mitigation measures for the Proposed Project. **Table 15-3** presented at the end of this section identifies the potential program-level impacts of each of the Proposed Project facilities. This program-level analysis is not intended to describe or address the impacts in detail; detailed evaluations of the impacts of specific projects will be conducted as part of a site-specific CEQA review.

Unless otherwise noted, all identified impacts are considered to be potentially significant adverse impacts. Corresponding mitigation measures, unless otherwise noted, are expected to be sufficient to reduce impacts to a less than significant level.

Paleontological Resources Impact 1: *Construction of the Proposed Project could directly or indirectly destroy unique paleontological resources or sites due to site grading or other ground disturbing activities.*

Of the various Proposed Project facilities, there is the potential that some would be constructed on sites featuring moderate- or high-sensitivity geologic formations that could bear unique paleontological resources. In the absence of mitigation, Proposed Project-related excavations in moderate- and high-sensitivity geologic formations could result in significant adverse paleontological resource impacts.

Paleontological Mitigation Measure 1:

In order to mitigate potential impacts, the following measures shall be implemented in the event project construction will occur on geologic formations of moderate to high sensitivity for paleontological resources. These activities will be carried out by a qualified professional paleontologist.

- Existing bedrock outcrops and (possibly) excavation of test trenches will be inspected for fossil remains;
- Surface collection of discovered fossil remains will be conducted via simple excavation or exposed specimens and possibly plaster-jacketing large and/or fragile specimens or more elaborate quarry excavations of richly fossiliferous deposits;
- Stratigraphic and geologic data will be recovered to provide context for recovered fossil remains. These data will typically include a description of lithologies of fossil-bearing strata, measurement and description of the overall stratigraphic section, and photographic documentation of the setting;
- Laboratory preparation of collected fossil remains will be conducted for potentially significant or unique finds;
- Prepared significant or unique fossil remains will be cataloged and identified;
- Cataloged fossil remains will be transferred for storage to an accredited institution; and
- A final report summarizing the findings from the laboratory and field, stratigraphic units inspected, typed of fossils discovered, and the significance of the curated collection will be prepared.

15.4 EFFECTS FOUND NOT TO BE SIGNIFICANT

Operation of the Proposed Project facilities could have an effect on paleontological resources.

Effects on paleontological resources could occur in the initial construction stages of Proposed Project facilities only. Once construction is completed and the facilities are operational, there would be no further disturbance of fossil bearing formations and no additional significant effects on paleontological resources.

Table 15-3
Potential Program-Level Paleontological Resources Impacts of Proposed Project Facilities

#	Project	Impact 1[a]
Expand Internal System Capacity		
	Flow Regulatory Storage	
1	Hubbard Hill FRS	**X**
2	Slaughterhouse Terminal Reservoir	**X**
3	North County Distribution Pipeline FRS	**X**
4	Mission Trails FRS II	**X**
	➢ Mission Trails Tunnel Pipeline and Vent Demolition	**X**
	Projects to Increase Regional Untreated Water Conveyance Capacity	
5	Restore Untreated Water Delivery in La Mesa-Sweetwater Extension	
6	Second Crossover Pipeline	**X**
7	San Diego 24/25/26 FCF	**X**
8	San Diego 12 FCF Expansion	
9	Lower Otay Pump Station	
10	Convert Pipeline 3 to Untreated Water from Crossover to Miramar	
Additional Water Treatment Capacity		
	Projects to Supplement Treated-Water Aqueducts	
11	Padre Dam Pump Station Expansion	
12	Pipeline from Otay FCF 14 to Regulatory Reservoir	**X**
13	Poway Pump Station and Treated Water Connection	
14	Escondido-Vista WTP Connection	
	a) Escondido-Vista Pipeline Conversion	
	b) Escondido-Vista Pump Station	**X**
	c) Escondido-Dixon Pipeline	**X**
	Projects to Expand Regional Water Treatment Capacity	
Options for Expanding Regional Treatment Capacity		
15a	Olivenhain WTP – 50 mgd Expansion	**X**
15b	Weese WTP – 50 mgd Expansion	**X**
15c	Red Mountain WTP – new 50 mgd plant	**X**
15d	Diversion Structure WTP – new 100 mgd plant	**X**
Additional Seasonal/Carryover Storage		
16	Additional San Vicente Dam Raise Beyond ESP	**X**
New Conveyance and Supply		
17	Phase I – Seawater Desalination: Project at Encina (50 mgd)	
	➢ Desalination Plant	**X**
	➢ Desalinated Water Conveyance Facilities	**X**
18	Expand Existing or Site New Seawater Desalination Plant*	
	Phase II – Seawater Desalination: Expand Capacity up to 100 mgd	
	Phase III – Seawater Desalination: Expand Capacity up to 150 mgd	
Seawater Desalination Site Options for Phases II and III:		
	a) San Onofre – at San Onofre Nuclear Generating Station	**X**
	b) Carlsbad – at Encina Power Station	**X**
	c) South Bay – at South Bay Power Plant	**X**
	d) Encina Water Pollution Control Facility	**X**
	e) South Bay Ocean Outfall Site	**X**

Table 15-3 (continued)
Potential Program-Level Paleontological Resources Impacts of Proposed Project Facilities

* The ultimate level of seawater desalination development in the region would depend largely upon actual regional population growth, economics, availability of other high quality water sources, as well as an evaluation of the performance of the Encina seawater desalination facility, should it be approved and constructed.

[a] Construction of the Proposed Project could directly or indirectly destroy unique paleontological resources or sites due to site grading or other ground disturbing activities.