4.5 Cultural Resources

This section identifies cultural and paleontological resources along the IC Project Alignment, identifies applicable significance thresholds, assesses the IC Project's impacts to these resources and their significance, and recommends measures to avoid or substantially reduce any effects found to be potentially significant.

Cultural resources are defined as any object or specific location of past human activity, occupation, or use that is identifiable through historical documentation, inventory, or oral evidence. Cultural resources can be separated into three categories: archaeological, building/structural, and traditional resources. Archaeological resources include prehistoric and historic remains of human activity. Prehistoric resources can be composed of lithic scatters, ceramic scatters, quarries, habitation sites, temporary camps/rock rings, ceremonial sites, and trails. Historic-era resources are typically those that are 50 years or older. Historic archaeological resources can consist of structural remains (e.g., concrete foundations), historic objects (e.g., bottles and cans), features (e.g., refuse deposits or scatters), and sites (e.g., resources that contain one or more of the aforementioned categories). Built environment resources range from historic buildings to canals, historic roads and trails, bridges, ditches, cemeteries, and electrical infrastructure, such as transmission lines, substations, and generating facilities. A traditional cultural resource is a resource associated with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. They are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. See Section 4.18, Tribal Cultural Resources, for a discussion on cultural resources of potential importance to California Native American tribes.

A paleontological resource is a locality containing vertebrate, invertebrate, or plant fossils (e.g., fossil location, fossil-bearing formation, or a formation with the potential to bear fossils). Paleontology is the study of life from the geologic past that involves the analysis of plant and animal fossils, including those of microscopic size, and their relationships to existing environments and the chronology of the earth's history.

4.5.1 Cultural Resources Environmental Setting

The IC Project APE/API is situated along approximately 358 miles (576 km) of existing transmission line starting southwest of Bishop, California, and extending into Inyo, Kern, and San Bernardino Counties. Elevation of the project area ranges from 920–4,813 feet (280–1,467 m) above mean sea level (msl). The APE/API spans two U.S. Environmental Protection Agency (USEPA)-designated Level III Ecoregions: Central Basin and Range, and Mojave Basin and Range. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components (Omernik and Griffith 2014).

4.5.1.1 Physical Setting

The project area spans two geographical regions of California with distinct environmental settings: the Central Basin and Range and the Mojave Basin and Range.

4.5.1.1.1 Central Basin and Range

Generally, the northern portion of the APE/API falls within the Central Basin and Range Ecoregion. However, the setting detailed will describe a more specific and accurate area within the ecoregion, the Owens Valley. Owens Valley is one of the most conspicuous geologic features in California. It contrasts sharply with the prominent Sierra Nevada Range to the west, and the White and Inyo Mountains to the east. The long narrow intermountain valley stretches from its northern extent on the California–Nevada line east of Mono Lake, approximately 180 miles to its southern terminus at the Coso Range. Precipitation throughout the Owens Valley is strongly influenced by the large elevational gradient ranging from the Sierra Crest to the valley floor and back up the eastern slope of the White and Inyo Ranges. Roughly 70 percent of the annual precipitation in this region falls as snow or rain in the Sierra Nevada Range. The resulting rain shadow creates annual precipitation of only 4 to 6 inches within the Owens Valley. Accordingly, the climate in the valley is arid to semi-arid with abundant sunshine, frequent winds, and moderate to low humidity (Danskin 1998).

The valley floor is composed of mostly unconsolidated alluvial fan, transition-zone, glacial and talus, and fluvial and lacustrine deposits, termed "valley fill." The valley fill also contains recent volcanic and pyroclastic rocks (Hollett et al. 1991). Consequently, native plant communities found in the Owens Valley range from intolerant to highly tolerant of alkalinity and salinity in the soil. Plant communities within the gently sloping alluvial fans bordering the valley are likely comprised of big sagebrush (*Artemisia tridentata*), California buckwheat (*Eriogonum fasciculatum*), and antelope brush (*Purshia tridentata* var. *glandulosa*). Plant communities in the highly alkaline areas are likely comprised of rubber rabbitbrush (*Ericameria nauseosa*), greasewood (*Sarcobatus vermiculatus*), or *Juncus* spp. in the meadows (Sorenson et al. 1991). Common wildlife species include mule deer, coyote, bobcat, and black-tailed jackrabbit. Endemic fishes in this region include Lahontan cutthroat trout, White River springfish, Pahranagat roundtail chub, Monitor Valley speckled dace, and Independence Valley tui chub.

4.5.1.1.2 Mojave Basin and Range

Due south of the Central Basin and Range lies the Mojave Basin and Range Ecoregion. This ecoregion extends from Death Valley National Park southward to Joshua Tree National Park, and east to the California–Nevada state line. Elevation ranges from 279 feet (85 m) below msl to over 10,827 feet (3,300 m) above msl. This region can be characterized as a dry, subtropical desert climate. Accordingly, average annual precipitation is approximately 6.6 inches (167 millimeters [mm]), ranging from only 2 inches (50 mm) in the lowest elevations to over 35 inches (900 mm) on the highest peaks. This region contains scattered north-south trending mountain ranges, with large basins, valleys, lake beds, and alluvial fans occurring between. The APE/API passes through these large gently sloping valley floors and alluvial fans, where deep Quaternary alluvial deposits yield Aridisols and Entisols with aridic soil moisture regimes (Bailey et al. 1994).

Vegetation is largely sparse within this ecoregion. Major vegetation communities include creosote bush (Larrea tridentata), white bursage (ambrosia dumosa), Joshua tree (Yucca brevifolia), saltbush (Atriplex spp.), and big sagebrush on mountain slopes. Common wildlife species include desert bighorn sheep (Ovis canadensis nelsoni), coyote (Canis latrans), kit fox, black-tailed jackrabbit (Lepus californicus), desert cottontail rabbit, desert tortoise (Gopherus spp.), sagebrush lizard (Sceloporus graciosus), desert horned-lizard (Phrynosoma platyrhinos), rattlesnakes, hawks, owls, and many neotropical migrants.

4.5.1.2 Prehistoric Background

Although the IC Project Alignment spans three geographic regions (the eastern Sierra Nevada, southwestern Great Basin/Mojave Desert, and eastern California High Desert), the cultural setting of the IC Project Alignment can be described through attributes and chronology relevant to the Great Basin and Mojave Desert cultural area.

4.5.1.2.1 Overview of the Great Basin/Mojave Desert Cultural Area

The prehistory of the Great Basin area is varied and rich, encompassing a period of more than 12,000 years before present (BP). Numerous chronological sequences have been devised to explain cultural changes for areas within the eastern California segment of the Western Great Basin (Basgall and Giambastiani 1995; Basgall and McGuire 1988; Bettinger 1976, 1991; Bettinger and Taylor 1974; Delacorte 1990). Further study is needed to account for a varied and somewhat complicated archaeological record, but differences between these classifications are based primarily on terminology, and there is general agreement on the timing of transitions established through the association of radiocarbon dates and projectile point types (Halford 2008). Following Giambastiani (2004) and consistent with Mojave Desert culture history presented by Sutton et al. (2007), the following sequence uses geologic periods—Late Pleistocene, Early Holocene, Middle Holocene, and Late Holocene—to capture changes in cultural complexes, whereas more local sources (Bettinger and Taylor 1974) are also incorporated where possible. The regional prehistoric cultural chronology is summarized below in Table 4.5-1 and described in more detail below.

Table 4.5-1: Prehistoric Cultural Chronology

Period	Key Characteristics	Date Range
Late Pleistocene	Fluted projectile point technology Focus on hunter-gatherer subsistence strategies	ca. 12,000– 10,000 years BP
Early Holocene	Subsistence strategies become more diverse Heavy stemmed projectile points Broad-ranging subsistence strategies	10,000–7,500 years BP
Middle Holocene/ Little Lake	Diversified tool kit marked by emergence of Pinto complex Exploitation of high- and low-ranked resources Lower population densities	7,500–5,500 years BP
Late Holocene/ Newberry, Haiwee, and Marana	Increased use of bow and arrow Newberry period marked by higher mobility and extensive trade networks Haiwee period marked by increased sedentism and sociopolitical elaboration Marana period indicated by the introduction of pottery, reflecting the intensive exploitation of micro-habitats	5,500 years BP–Contact

4.5.1.2.2 Late Pleistocene (ca. 12,000–10,000 Years BP): Paleoindian or Mohave Period

Most of the earliest evidence for human presence in this region is found further south in the Mojave Desert, Owens Lake, and western Nevada (Giambastiani 2004:32). A firm date for the initial human occupation of the Mojave Desert has not yet been established. Although there have been several controversial claims of Pleistocene-age (pre-Clovis) finds such as the Early Man Site of Calico Hills (Leakey et al. 1968, 1972), most archaeologists remain unconvinced by available data. The growing acceptance of evidence for pre-Clovis occupations elsewhere in the Western Hemisphere, however, suggests the possibility that such evidence may yet be found in this region as well.

The earliest broadly accepted cultural complex in the Mojave Desert is the Clovis complex (Sutton et al. 2007:233). The hallmark artifacts of this complex are large, lanceolate bifaces with distinctive fluting, used to thin and flatten the base for hafting. Other tools associated with the Clovis complex were large side scrapers, blades struck from prepared cores, and a mixture of expedient flaked tools (Justice 2002:73). Paleoindian populations associated with fluted point technology consisted of small, mobile groups who hunted and gathered near permanent sources of water such as pluvial lakes. In the vicinity of the project's area of potential effect/area of potential impact (APE/API), Basgall (1988) reported one Paleoindian site in west-central Long Valley to the northwest, whereas Hall (1991) reported two sites on the northwestern margin of the Mono Basin. These sites are typically identified by the presence of fluted point base and stemmed points that tend to occur as small surface scatters surface finds (Elston and Budy 1986), which Delacorte et al. (1995) speculate is related to specific taphonomic processes. Where more diverse assemblages are associated with sites in this time period, bifaces and formally shaped unifacial flaked tools are often found (Giambastiani 2004:34). These associations generally support the characterization of early hunter-gatherer populations as highly mobile and small groups ranging over large areas with specialized tool kits (Delacorte et al. 1995; Kelly and Todd 1988), further evidenced by the distance and source variation in tool stone (Basgall 1989). Milling implements are rarely found, which further supports the conclusion that groups of this period were focused on hunting (or at least scavenging). Others have suggested the diverse resource base in the Great Basin would have resulted in greater variability in resource acquisition and adaptive strategies (Fowler and Fowler 1990), although still falling within the general pattern of the mobile hunter-gatherer (Halford 2008:22).

4.5.1.2.3 The Early Holocene (10,000–7,500 Years BP): Mohave Period

The communities living in the western Great Basin witnessed and were profoundly affected by great environmental changes during the gradual Pleistocene–Holocene transition. Temperatures became warmer but remained cooler and moister than today. The Mojave Desert became marked by shallow lakes and marshes that were biologically very productive. These were surrounded by desert vegetation typical of later time periods, most prominently the white bursage and later the creosote bush (Grayson 1993:199–200). Some low-elevation locales retained juniper and sagebrush habitats. By the Early Holocene, warmer temperatures, reduced precipitation, and the eventual dehydration of the pluvial lakes are believed to have led to irregularities in the distribution and abundance of resources (Sutton et al. 2007:237). These climatic changes created the need for a more diversified subsistence strategy; the archaeological pattern associated with this adaptation is known as the Mohave period or Lake Mojave complex, and it is recognized by the heavy, stemmed projectile points of the Great Basin Stemmed series such as Lake Mojave and Silver Lake. Other tools include bifaces, steep-edged unifaces, crescents, the occasional cobble-core tool, and, rarely, ground stone implements (Justice 2002:91). This tool kit represents a generalized adaptation to highly variable terrain. For example, the crescent likely served multiple functions, including use as a spear tip to hunt waterfowl (Justice 2002:116). Work at Fort Irwin in the central Mojave Desert with sites containing stemmed points has shown a significant variety of material sources, bifaces and formed flake tools appear to have increased the range of uses, and ground stone appears regularly (Basgall 1991, 1993; Giambastiani 2004:36).

Although the tool kit for groups of this time period were considered an adaptation to lacustrine subsistence strategies, this conclusion was based on several sites discovered near extinct shorelines (Moratto 2004:93). Many of the lakes were no longer constant sources of water during the Holocene, and recent studies have revealed that the people actually occupied terrain outside the margins of the extinct shorelines (Giambastiani and Berg 2008:14). Sutton et al. (2007:237) have noted that the Lake Mojave assemblages included tools that are "consistent with long-term curation and transport." Moreover, it is not uncommon to find exotic materials, such as stone artifacts and marine shell beads, in Lake Mojave cultural deposits, suggesting that Lake Mojave people were either highly mobile or interacted with groups over long distances.

The changing climate, distribution of occupational sites, and the all-terrain tool kit suggest that the inhabitants of the western Great Basin during the Early Holocene developed a broad-ranging subsistence strategy based on patterns of "intensive environmental monitoring" (Sutton et al. 2007:237): the people monitored the seasons and moved in the direction of known resource patches. This includes a focus on hunting small game and a shift away from large mammals (Basgall 1991).

4.5.1.2.4 The Middle Holocene (7,500–5,500 Years BP)

The Middle Holocene climate, although more arid than previous and subsequent periods, was still highly variable, with multiple oscillations between wetter and drier conditions occurring throughout. In addition, although the lakes and marshes of the Early Holocene dried up, streams and springs in the Mojave Desert may have still maintained water flow from nearby ranges, at various times and places, providing suitable water sources to sustain human activity, albeit at low densities (Aikens 1978; Basgall 2000; Cleland and Spaulding 1992; Sutton 1996; Warren 1984). Between 7,000 and 5,000 years BP, temperatures appear to have risen and aridity appears to have increased, peaking between around 6,000 years BP. Lowland ephemeral lakes and streams began to dry up, and vegetation communities capable of supporting large game animals became limited to a few isolated contexts. Settlement patterns adapted, shifting to upland settings where sources of water still existed (Sutton 1996). This change in land use also correlated with adjustments in tool assemblage content and diversity, resulting in the emergence of the Pinto complex.

Many interpret these diverse artifact assemblages as a response to the climatic shift to more arid conditions. The presence of both hunting tools and milling equipment appears to represent a move from the strict exploitation of high-ranked food items, such as large animals, to a more diversified subsistence strategy that also includes low-ranked resources such as seeds. Near the end of the Middle Holocene the climate became hotter and drier, marked by a period of expanded diet breadth and generally low population densities between 7,500 and 4,500 years BP (Giambastiani 2004:37–38).

4.5.1.2.5 The Late Holocene (5,500 Years BP‑Contact): Newberry, Haiwee, and Marana Periods

The climate of the Late Holocene approximates that of today, with cooler and moister conditions than the Middle Holocene, but not as cool and moist as the Early Holocene. As with the Middle Holocene, the climate was highly variable. Many lakes once again rose to high stands, and plant communities took on their modern distribution; however, these lake levels fluctuated, at times dramatically, throughout the period. At least two major themes are drawn from this period: population expansion and intensification and diversification of indigenous adaptive strategies (Giambastiani 2004:38). Native subsistence organization diversifies to include increased use of lower-ranked plant and animal resources; these changes in subsistence strategies are associated with organizational changes in technology, including innovation and diversification. Late Holocene changes in adaptive strategies are also reflected in temporal and spatial shifts in archaeological patterning, as well as increases in the frequency of archaeological sites (Giambastiani 2004:38). These changes in subsistence, mobility, and technological organization are correlated with adjustments in artifact or tool assemblage content and diversity, resulting in the emergence of three widely recognized cultural historical periods within the Late Holocene, referred to as the Newberry, Haiwee, and Marana periods (Eerkens and Spurling 2008:112–113; Halford 2008:21).

The Newberry period is characterized by higher mobility, extensive trade networks, the use of longer-term residential base camps with substantial structures, and marked increases in obsidian extraction from major regional obsidian quarries, primarily for the production of bifaces and trade (Eerkens and Spurling 2008:112). Production of bifaces appears to have been related to the use of the bow and arrow, in lieu of the atlatl and dart (Giambastiani 2004:38). Shifts in subsistence and settlement appear to correlate with increased exploitation of desert scrub habitats, with more seasonal use of riparian zones (Halford 2008:23). Other evidence for shifting settlement and mobility organizational strategies include higher curation of lithic tools, such as obsidian bifaces and milling equipment (Halford 2008:23). Later in the Newberry period evidence suggests decreases in mobility, along with marked settlement and sociopolitical reorganization becoming more defined in later temporal phases (i.e., Haiwee and Marana periods).

Archaeological patterning during the Haiwee period (1,350–650 years BP) reflects marked increases in sedentism, sociopolitical elaboration, increased use of the bow and arrow and expedient simple flaked tools, subsistence intensification (particularly of small seeds and nuts) and use of micro-habitats and high-altitude sites, and a noted decrease in the exploitation of obsidian quarries (Eerkens and Spurling 2008:113; Halford 2008:23). These notable adaptive changes may have been influenced by the expansion of Uto-Aztecan speakers throughout the Great Basin (Halford 2008:23). During the Marana period (650 years BP to Historic Contact), apparent decreases in residential mobility appear to correspond with shifting technological patterns. Overall reduction in obsidian source variability correlates with changing technological strategies, including decreases in formal biface and tool production, increases in expedient tool production and use, and tool stone scavenging (Halford 2008:23). The production of projectile points, for example, included using flake-core (as opposed to biface-core) reduction strategies to produce flake blanks. A major technological shift during the Marana period included the introduction of pottery (e.g., Owens Valley brownware), reflecting the intensive exploitation of micro-habitats where the focus was on small seed procurement and processing (Eerkens and Spurling 2008:113; Halford 2008:24). Increased densities of ground stone and elaboration of residential structures is also detected during the Marana period. According to Halford (2008:24), evidence indicates an increase in “trans-Sierran sociopolitical interaction,” reflected in the presence of marine shell ornaments. The archaeological patterns of the Marana period appear to correspond well with the ethnographic pattern of Numic speakers (Halford 2008:24).

4.5.1.3 Ethnographic Background

The IC Project Alignment is located within the traditional territory of five ethnographically distinct Native American groups: the Owens Valley Paiute, Western Shoshone, Kawaiisu, Serrano/Vanyume, and Southern Paiute. A brief discussion of each group is presented below; additional detail is provided in the Tribal Cultural Resources section (Section 4.18) of this document.

4.5.1.3.1 Owens Valley Paiute

Prior to the colonization of the Americas by Europeans, the Owens Valley Paiute lived in a narrow valley along the eastern slope of the southern Sierra Nevada. They established settlements along the Owens River and developed a degree of stability and sedentism unparalleled in the Great Basin in pre-Contact times, due ostensibly to the favorable environment that they occupied. They spoke dialects of Mono, which along with Northern Paiute made up the Western Numic segment of the Numic branch of Uto-Aztecan.

The seasonal food-gathering endeavors of the Owens Valley Paiute depended heavily upon the ripening of wild seed and root crops that provided food year-round. They moved as gatherers in the lowlands in spring and summer in large villages. In years with an ample supply of pine nuts many would venture to the uplands during the winter, occupying log dwellings scattered throughout the highlands east and northeast of the valley, where the piñon and Indian ricegrass seed were cached. Steward (1933) lists some 40 plants harvested in Owens Valley, including five species of roots and bulbs, six species of berries, and pine nuts and acorns, as well as other seed crops. The pine nut, which the Owens Valley Paiute called tiba, was an important subsistence resource to this group. Acorns, a more reliable food resource than pine nuts, were even more important, and the Paiute regularly shared in the trans-Sierran acorn economy (Stewart 1941:374, 427). Within this trade economy, the Owens Valley Paiute traded salt and pine nuts for acorns and acorn flour (Gayton 1948:258–259). Hunting, when possible, was fortuitous, especially for individual hunters. Communal hunting was restricted to the home district or to the territorial boundaries of the band. Teams of hunters hunted in the high Sierra, sometimes crossing the summit into Miwok territory (Muir 1916). Occasionally communal drives for mountain sheep or deer with participation from multiple villages occurred in the Sierra and the White Mountains. Antelope were caught in corrals in open areas east of Owens River. As elsewhere in the Great Basin, the rabbit was the most common game. These were taken individually with bow and arrow or traps, as well as in rabbit drives with nets, usually in connection with a fall festival.

Though pottery was a relatively recent technology to the Owens Valley Paiute (about 200 years later than among the Southern Paiute and Western Shoshone [Steward 1933]), a great variety of shape and utility purposes developed, all modeled on previously existing types of basketry. Most pots had flat bottoms with straight or flaring sides and ranged from small, pan-shaped, low-walled vessels, to medium-sized bowls used as dippers and for keeping food to large cooking vessels with a rim diameter of 20 centimeters (7.9 inches) or more (Liljeblad and Fowler 1986:421). The local pottery type, Owens Valley Brown, was limited to the Sierra piedmont and adjacent regions. Basketry was a much more common and ancient technology among the Owens Valley Paiute. A common and ancient feature was the twined, necked, and small-mouthed water container. The twined conical carrying baskets made by the Owens Valley Paiute occurred in various sizes and tightness (Steward 1933:272). A coarse, open twine, cone-shaped burden basket was used for gathering firewood. A smaller, tightly woven basket with a cloth-covered bottom was used for seed gathering. Winnowing trays were made with tightly woven twill twine, but the parching trays—for use with live coals—were made of open plain twine.

The Owens Valley Paiute used manos and metates to process wild seeds, including pine nuts. In certain localities of the Sierra piedmont, however, the mortar and pestle had replaced the metate as the most important tool for milling due to participation in the California acorn complex, which was associated with the use of bedrock mortars.

Four types of structures were built and used by the Owens Valley Paiute. The most durable building was the communal assembly lodge, or sweat lodge. These were relatively spacious, nearly circular semi-subterranean structures, heated by a fire built immediately inside the low entrance. The building, ownership, and maintenance of the lodge were the responsibility of the village chief, and he sponsored and supervised the erection of such a structure. The second type of structure was a cone-shaped house which ranged from 4.5 to 6 meters (15to 20 feet) in diameter and was built around a central smokehole on a frame of high poles over an excavation about 2 meters (6.5 feet) deep (Steward 1933:264). The roof consisted of mats of tule overlapping like shingles. Such houses were used throughout the year as a men’s meeting house (Driver 1937:114). The third structure type used by the Owens Valley Paiute was a dome-shaped thatch or mat-covered dwelling. The framework consisted of bent willow posts brought together at the top. The fourth was a crudely shaped circular wooden structure, a conical pole lodge composed of timber built on a four-pole foundation. This was considered a winter house used primarily in the Sierra highlands and for pine nut gathering at high elevations from late October to the end of winter.

Discovery of gold and silver in the Sierra Nevada and Inyo Mountains brought a flood of prospectors to the region in the 1860s. Open conflicts between the settlers and the Paiute over food scarcity led to military intervention in 1863, forcibly relocating 1,000 Paiute to Fort Tejon in the mountains south of Bakersfield. By the late 1860s, many Paiute returned to Owens Valley and became indispensable to the region’s agricultural economy by integrating farm labor with their traditional food gathering techniques (National Park Service 2015). Today, the Owens Valley Paiute are federally recognized as the Big Pine Paiute Tribe, residing on their reservation in Big Pine, California (Big Pine Paiute Tribe of the Owens Valley 2018).

4.5.1.3.2 Western Shoshone (Timbisha and Koso Shoshone)

The IC Project Alignment traverses the western edge of the territory of the Western Shoshone, whose ancestral lands extended from Death Valley across central Nevada, and into northwestern Utah and southern Idaho. These groups were Shoshone speakers, a central Numic language (Thomas et al. 1986). The Western Shoshone lived in small groups composed of an extended or nuclear family. Western Shoshone subsistence was heavily influenced by the seasonal availability of resources, moving from area to area within the valley and mountains as food became available (Steward 1970).

The Western Shoshone of Death Valley, known collectively as the Timbisha, refer to themselves as the Nümü TimbishaTümpisattsi Shoshone Tribe, meaning "people of the red rock face paint" (tim-, "rock"; -pisa, "paint") in reference to a source of red ochre south of Furnace Creek that was used in ceremonies. The Koosotsi, or Koso Shoshone, are a group of Timbisha Shoshone historically associated with the Coso Hot Springs area. Both groups spoke versions of the Panamint language—a western version around Owens Lake, Coso Mountains, and Panamint Valley; another variation that was spoken in Death Valley; and an eastern variation common in Grapevine Canyon, the Funeral Range, and the Beatty, Nevada area. Ancestors of the Timbisha Shoshone Tribe occupied Death Valley for at least 1,000 years. Like other Great Basin groups, the Timbisha Shoshone maintained small bands of related kin who changed residence as the seasons offered various resources (White 2006). In this hostile environment, the people relied on mesquite beans and pine nuts, hunted big game such as bighorn sheep, and procured small game like rabbits and chuckwalla lizards (NPS 2019). They utilized resources in ecological zones at dramatically varied elevations. These native residents of Death Valley modified their environment and encouraged plant growth, as with pruning of mesquite and the use of controlled fires. The dispersed Timbisha people would gather to celebrate their strong tradition of verbal storytelling and their religious traditions, which include dances to influence health and the weather (NPS 2019).

With the establishment of Euro-American ranching and mining operations in the 1850s, indigenous food sources such as pine and mesquite were logged for firewood; as a result, the Timbisha Shoshone were pressed into taking up wage labor jobs (Miller 2008, NPS 2019). In 1866, Congress ratified the Treaty of Ruby Valley, giving the federal government right-of-way access through Shoshone lands. When Death Valley became a national monument in 1933, several Timbisha were dislocated from Grapevine Canyon, Wildrose Canyon, and Furnace Creek. Forty acres of land were set aside for the Timbisha in 1936—this land became the location of the Indian Village of Death Valley.

The Timbisha became a federally recognized tribe in 1983 and in 1990 established a formal reservation after initiating the effort in the 1960s. The passing of the California Desert Protection Act (CDPA) in 1994 established Death Valley as a national park and required a study to be conducted to identify Timbisha aboriginal lands (see Theodoratus et al. 1998). The process to identify traditional Timbisha lands after the signing of CDPA brought tension between tribal members and the National Park Service and Department of the Interior because the federally recognized tribe remained landless in their own territory. Timbisha representatives partnered with the Alliance to Protect Native Rights in National Parks and organized a protest. On Memorial Day 1996, they walked in solidarity from the village entrance at State Route 190 toward the Furnace Creek Visitor Center (Catton 2009:5). This peaceful protest received national news coverage, which led to a restructured dialogue between the parties. A new initiative was drafted and later passed as the Timbisha Shoshone Homeland Act of 2000, establishing 7,753.99 acres of ancestral homelands, including 313.99 acres at Furnace Creek (U.S. Senate Reports No.106-327, 2000). Today there is a tribal government maintained through the election of a council, which upholds a tribal constitution.

4.5.1.3.3 Kawaiisu

The Kawaiisu were mobile hunter-gatherers who primarily resided in a core area in the southern Sierra Nevada and Tehachapi Mountains and made frequent forays into the Mojave Desert to exploit seasonal resources (Zigmond 1986). Linguistically, Kawaiisu has been identified as a part of the Southern Numic branch of the extensive Uto-Aztecan language family, which includes most languages of the Great Basin, extending south from southern Idaho into Mexico and east into Arizona (Mithun 2001:539).

Although there is general agreement about the location of the Kawaiisu core area, the extent of their territory in the Mojave Desert is less clearly understood. Zigmond (1986:399) depicts an area of seasonal use that extends east of the Granite Mountains, in present-day Fort Irwin. Kroeber (1976:602) cites an account of a Kawaiisu group on the upper Mojave River and in the southern Panamint Range. Steward (1970:71, Figure 1) also places the Kawaiisu in the southern Panamint Valley, the Argus Range, the town of Trona, and an undetermined area to the south and west. He notes further that although the Shoshone occupied the northern Panamint Valley, the Kawaiisu and Shoshone were mixed in the southern part of the valley and perhaps near Trona.

Dietary staples for the Kawaiisu included piñon, juniper, yucca, chia, wild rice, sunflower, buckwheat, and screwbean. Zigmond (1981) identifies 233 plant species the Kawaiisu used, of which 112 were used for food and beverages. Deer were a major source of meat when populations were residing in the mountainous core area, supplemented by small game. Hunters exploited antelope and bighorn sheep on the desert floor. Salt was also important in their diet and was collected from Koehn Lake or from Proctor Lake in the Tehachapi Valley when water levels at Koehn Lake were high.

Pottery is rare in sites attributed to the Kawaiisu and was probably primarily acquired through trading. Basket making was an important tradition among the Kawaiisu, who used numerous types of baskets for food collecting, processing, and storing, such as seedbeaters, burden baskets, containers, winnowers, trays, and hoppers (Zigmond 1986:401). Raw lithic material for tool making, such as chert, was likely obtained from areas near Red Rock Canyon, whereas obsidian was acquired through trade with groups from the Coso Volcanic Field (east of the Sierra Nevada). Long-distance exchange with coastal areas is also evident, with the presence of marine shell artifacts in some sites attributed to the Kawaiisu.

During the winter months, the Kawaiisu lived in tomo-kahni, circular, aboveground structures with vertical and transverse poles bound together and covered with brush, bark, and tule mats (Zigmond 1986:401). Other structures included open, flat-roofed shade houses (havakahni) used for summer habitation, sweathouses (tivikahni), circular brush enclosures, and small granaries.

The Kawaiisu practiced a distinctive style of polychromatic (multicolored) rock art that shares many attributes with that of the Chumash (Lee and Hyder 1991). The best-studied Kawaiisu rock art site is Teddy Bear Cave (CA-KER-508), located along the western edge of Sand Canyon, approximately 19 kilometers (12 miles) northeast of Tehachapi. Teddy Bear Cave is one site within Nettle Spring, an archaeological complex that also includes a large habitation area (CA-KER-230) along with numerous other localities. CA-KER-230 is characterized by numerous rock rings, more than 400 bedrock mortars, and rock art. Nearby sites include small camps, additional rock art localities, and a cremation site, all of which are potentially related to the Nettle Spring complex. Teddy Bear Cave is important in the oral history of the Kawaiisu people as the place where their people and the world were created (Sutton 2001).

Today, the Kawaiisu indigenous tribe consists of approximately 250 members living in California's Sierra Nevada foothills. They are not federally recognized. The remaining Kawaiisu speakers are elders who have been working to keep their culture alive with language and cultural revitalization programs. The

Kawaiisu Language and Cultural Center was established as a 501(c)3 nonprofit organization in September 2007. The center's mission is to have the Kawaiisu native language spoken in their native communities once again (Kawaiisu Language and Cultural Center 2018).

4.5.1.3.4 Serrano/Vanyume

The Serrano people once occupied the Mountain, North Desert, and East Desert Regions of San Bernardino and Los Angeles counties. The Serrano language is part of the Serran division of a branch of the Takic family of the Uto-Aztecan linguistic stock (Mithun 2001:539, 543). The two Serrano languages, Kitanemuk and Serrano, are closely related. Kitanemuk ethnographic lands were located to the northwest of the Serrano. The Kawaiisu and Chemehuevi, located north and east of the Serrano, respectively, spoke languages that belong to the Numic branch of the Uto-Aztecan family. A relatively small group located within the San Bernardino Mountains and the Sierra Madre originally spoke Serrano (Kroeber 1925:611). The Vanyume, who lived along the Mojave River and associated Mojave Desert areas and are also referred to as the Desert Serrano, spoke either a dialect of Serrano or a closely related language (Mithun 2001:543).

According to the records by Fr. Francisco Garcés, the first European to travel in this region in 1776, the name "Vanyume" is derived from the term for them (Beñeme) used by the Mojave (Coues 1900: Vol. 1:240). Very little is known of the Vanyume-speaking people because the Spanish missionaries greatly disrupted the group between the early 1820s and 1834. By the 1900s, the group was considered extinct (Kroeber 1925:614; Bean and Smith 1978:570). Kroeber (1925:614–615) does make distinction between the Serrano and Vanyume by reporting that the Vanyume were friendly with the Chemehuevi and Mohave to the east, whereas the Serrano maintained animosity with these groups. The area of combined Serrano/Vanyume occupation—the San Bernardino Mountains, the southwestern portions of the Mojave Desert, and the Mojave River area—has become known as the Serrano area.

Most Serrano lived in small villages located near water sources (Bean and Smith 1978:571). Kroeber (1925:617–618) considered the organization of Serrano lineage sets similar to that of political groups. He defined a lineage set as occupying one village, representing at least two moieties, and coordinating its hunting and gathering activities per the religious deliberations and scheduling determined by two leaders (one from each of the moieties), with one leader occupying the ceremonial house and the other possessing the ceremonial bundle. Often, a lineage set had the exclusive power to forge and maintain economic ties to other villages of neighboring Serrano, Cahuilla, Chemehuevi, Gabrielino, and Cupeño. Desert Serrano villages are mentioned in the 1776 account of the Spanish Franciscan missionary Fr. Francisco Garcés and in the records dating to the early 1800s by Fr. Joaquín Nuez. Fr. Garcés mentions villages along the Mojave River near today's cities of Barstow and Daggett (Coues 1900: Vol. 1:241–248). Beattie (1955) suggests the average village population was 70, and that these settlements were generally spaced at 10-mile (16-kilometer) intervals along the river.

The fundamental economy of the Serrano was one of subsistence hunting and collecting plant goods, with occasional fishing (Bean and Smith 1978:571). Serrano territory was a trade nexus between inland tribes and coastal tribes, and trade and exchange were important aspects of the Serrano economy. Those living in the lower-elevation desert floor villages traded foodstuffs with people living in the foothill villages who had access to a different variety of edible resources. In addition to intervillage trade, ritualized communal food procurement events, such as rabbit and deer hunts and piñon, acorn, and mesquite nut-gathering events, integrated the economy and helped distribute resources that were available in different ecozones.

A variety of materials were used for hunting, gathering, and processing food, many of which were also used for shelter, clothing, and ceremonial items. Shell, wood, bone, horn, stone, plant materials, animal skins, and feathers were used for making money, baskets, blankets, mats, nets, and bags. The Serrano made pottery and used it daily to carry and store water or foodstuffs; ceramics were also used as ceremonial objects. They also made awls, sinew-backed bows, arrows, arrow straighteners, throwing sticks (for hunting), traps, fire drills, stone pipes, musical instruments of various types (rattles, rasps, whistles, bull-roarers, and whistles), yucca fiber cordage for snares, nets and carrying bags, and clothing (Bean and Smith 1978:571; Bean and Vane 2002). A strong tradition of basket weaving incorporated the use of juncus sedge, deergrass, and yucca fiber.

Mainly due to the inland territory that the Serrano occupied beyond Cajon Pass, contact between Serrano and Europeans was relatively minimal prior to the early 1800s. As early as 1790, however, the Serrano began to be drawn into mission life (Bean and Vane 2002). More Serrano were relocated to Mission San Gabriel in 1811 after a failed indigenous attack on that mission. In the 1860s, a smallpox epidemic decimated many indigenous southern Californians, including the Serrano (Bean and Vane 2002). Oral history accounts of a massacre in the 1860s at Twentynine Palms may have been part of a larger American military campaign that lasted 32 days (Bean and Vane 2002:10).

Surviving Serrano sought shelter at Morongo with their Cahuilla neighbors; Morongo later became a reservation (Bean and Vane 2002). Other survivors followed the Serrano leader Santos Manuel down from the mountains and toward the valley floors, and eventually settled what later became the San Manuel Band of Mission Indians Reservation. This reservation was established in 1891 (San Manuel Band of Mission Indians 2008). Although ethnographers considered the Vanyume extinct (Kroeber 1925:614; Bean and Smith 1978:570), recent genealogical research combined with mitochondrial DNA (mtDNA) analysis indicates three lineages from the Fort Tejon area were originally from the village of Topipabit downstream from Victorville (California Energy Commission 2008:4.3–11). These lineages are currently part of the San Fernando Band of Mission Indians, located in Newhall. This group, which includes Kitanemuk, Inland Chumash, Tataviam, and Vanyume, has applied for federal recognition.

4.5.1.3.5 Southern Paiute

The Southern Paiute belong to the Southern Numic branch of the Uto-Aztecan linguistic family and include 15 subgroups: Antarianunts, Kaiparaowits, San Juan, Kaibab, Shiwits, Uinkaret, Saint George, Gunlock, Cedar, Beaver, Panaco, Pahranagat, Moapa, Las Vegas (including Pahrump), and Chemehuevi (Kelly and Fowler 1986). Some ethnographers consider the Chemehuevi a separate group from the Southern Paiute, though the differences between them and other Southern Paiute are minimal and are generally attributed to environmental variation (Theodoratus et al. 1998). The traditional territory of the Southern Paiute is vast and the environmental variation of the lands occupied by the Southern Paiute is pronounced, ranging from the Colorado Plateau to the Mojave Desert, and including the Colorado River basin and numerous small mountain ranges (Kelly and Fowler 1986).

Southern Paiute subsistence was centered on gathering and hunting. The environmental differences of the territories of various Southern Paiute groups were reflected in the resources they exploited for subsistence as well as in the procurement strategies they employed (Theodoratus et al. 1998). Fauna used as food sources included small game such as rabbits and tortoises as well as fish and mountain sheep (Kelly and Fowler 1986). The Southern Paiute exploited a variety of flora, including piñon nuts and agave for food; some groups practiced agriculture, raising maize, squash, and winter wheat, among other things (Kelly and Fowler 1986). By the time of European contact, the Southern Paiute had optimal irrigation systems and had been farming for centuries along the Colorado River (Stoffle and Zedeno 2001:234). Southern

Paiutes were skilled basket weavers; their handwoven baskets were used to carry a wide variety of resources ranging from seeds and berries, to even carrying water in finely woven baskets sealed with pine pitch (National Park Service 2018). The basic socioeconomic unit of the Southern Paiute was the family household. No centralized political hierarchy has been recorded, though at times households would cooperate during hunting and gathering activities. Immediately after marriage, matrilocal residence was common, though in the longer term most would permanently settle near the husband's relatives (Kelly and Fowler 1986).

Several Southern Paiute tribes with reservations in Arizona, California, Nevada, and Utah are federally recognized. The federally recognized Colorado River Indian Tribes hold reservation land on both sides of the Colorado River (amounting to 270,000 acres) in an area granted in 1865 by the federal government (Colorado River Indian Tribes 2019). Original residents of the reservation included the Chemehuevi and Mohave, but they were later joined by people of relocated Hopi and Navajo tribes. The arduous process of federal recognition for the Chemehuevi, who lost their lands in 1853, ultimately resulted in the establishment of The Chemehuevi Valley Reservation. The first iteration was established in 1907, but the Chemehuevi were relocated to the Parker area and their status revoked (Chemehuevi Indian Tribe 2019). Congress authorized land acquisition in 1935 for the Parker Dam Project, which inundated traditional territory (Chemehuevi Indian Tribe 2019). The tribe achieved recognition in 1970. The current Reservation, in the Parker area, extends about 30 miles along the Colorado River and encompasses more than 30,000 acres of land.

Numerous linear travel routes have been documented for the Southern Paiute/Chemehuevi, including trade routes and sacred trails (Fowler 2009). Several major trade routes and trails developed over the past 5,000 years to facilitate trade between the Pacific Coast and interior locales (Harner 1957 in Fowler 2009; Heizer 1941, 1978), and the Chemehuevi still used this network during the Contact period (1770s; Davis 1961; Sample 1950 in Fowler 2009). Sacred trails, which can overlap with secular trade routes and other pathways, are connected to songs and stories and often contain place names for water sources and other geographic features across the landscape. These songs often recount epic journeys by ancestors and spiritual beings, connecting the ephemeral spiritual world with the physical landscape, and providing an important vehicle for the transmission of information about the landscape and how to move across it (Kelly 1932–1934; Laird 1976 in Fowler 2009).

One specific trail lies within approximately 1.6 km (1 mile) of the IC project, between Yermo and Baker in San Bernardino County. This trail, known as The Mojave Road or Old Government Road, extends from Fort Mojave on the Colorado River westward to Camp Cady, on the Mojave River. The route follows one of the pre-Contact trade routes (Farmer 1935; Johnston and Johnston 1957 in Fowler 2009) that extended further to the west, to the San Bernardino Mountains, and ultimately to the coast. Although likely modified to accommodate horses and wagons by the U.S. Army and other entities, who used it as a supply route in the 1860s, this route follows older Mohave/Chemehuevi trails and connects known Chemehuevi water sources (Kelly 1932–1934; Laird 1976 in Fowler 2009). The western portion of this route, along the Mojave River between Alvord Peak and the Cady Mountains is roughly 1.6 km (1 mile) south of the proposed project.

Numerous geoglyphs, including anthropomorphic and geometric designs, are found in the vicinity of the Colorado River, within the ethnographic region generally attributed to the Southern Paiute/Chemehuevi. One Chemehuevi informant interviewed in the 1930s stated that these features predated the Chemehuevi's arrival in the area (Kelly 1934 in Fowler 2009). Conversely, other Southern Paiute informants maintain that Numic-speaking peoples have occupied the region since time immemorial (Stoffle and Zedeño 2001).

Other places important to the Chemehuevi include caves, mountains, and mesas to the north, south, and southwest of the IC project alignment, well outside of the APE/API, including locations in Nevada and Arizona (see Byerly 2018).

The IC Project APE/API intersects the eastern Sierra Nevada and much of the southwestern Great Basin located in California (namely, the Mojave Desert). This area is the traditional homeland of five Native American groups (from north to south): the Owens Valley Paiute, the Western Shoshone, the Kawaiisu, the Serrano/Vanyume, and the Southern Paiute/Chemehuevi. Each of these groups are likely to have had habitation or temporary campsites within the APE/API. In addition, these groups certainly accessed resources (such as big horn sheep, pinyon nuts, rice grass, and fish) along the IC Project APE/API. Over time, the acquisition of these resources repeatedly may result in an archaeological signature in the form of a site. Such repeated use of an area also creates a social bond or place of importance for each tribe.

4.5.1.4 Historic Background

Post-Contact history for the state of California is generally divided into three specific periods: the Spanish period (1769–1822), the Mexican period (1822–1848), and the American period (1848–present). These time frames are discussed below, with additional histories about Inyo County, Kern County, San Bernardino County, and military installations intersected by the IC Project Alignment.

4.5.1.4.1 Spanish Period

Some of the first expeditions by Spanish explorers along the southern coast of California occurred between the mid-1500s and the mid-1700s. One explorer, Juan Rodríquez Cabríllo, was searching for the legendary Northwest Passage when he stopped in 1542 in what is known today as the San Diego Bay. Cabríllo explored the shorelines of present Santa Catalina Island and the San Pedro and Santa Monica bays, which were given their names by the next Spanish explorer, Sebastián Vizcaíno. Vizcaíno was a Spanish naval officer who mapped and recorded the coastlines of California and Oregon. Using the surveys conducted by Cabríllo and Vizcaíno, the Spanish crown laid claim to California (Bancroft 1886a:96–99; Gumprecht 1999:35). For the next 200 years, the Spanish did very little inland exploration and colonization in Alta California. The beginning of the Spanish period in California is marked by the overland expedition of Captain Gaspar de Portolá in 1769. Portolá led a group of 64 soldiers, missionaries, Baja California Native Americans, and Mexican civilians to the San Diego area, where they established the Presidio of San Diego, a fortified military outpost and the first Spanish settlement in Alta California. In addition to the Presidio, Franciscan missionary Fr. Junípero Serra established the Mission San Diego de Alcalá at Presidio Hill, following the directive of the King of Spain that the Franciscan Order would direct religious and colonial matters in the American territories. The Mission San Diego de Alcalá was the first of 21 missions established in Alta California between 1769 and 1823.

Captain Juan Bautista de Anza was the first to establish overland connections between California and Mexico. In 1774, he led a group of 34 padres, soldiers, and others across the Colorado River into the present-day Imperial Valley. Fr. Francisco Garcés charted the route in 1770 and led Anza through present-day Imperial County along the Alamo River drainage (National Park Service 2004). The expedition continued northwest, traveling into present-day Imperial County through the Cahuilla Valley, following the Santa Rosa Mountains and continuing through Coyote Canyon and San Jacinto Valley, eventually ending up in Monterey Bay (Brown 1985). Anza made another expedition along the same route in 1775 with a larger group and continued all the way to San Francisco Bay (Guerrero 2006).

After the expeditions of Anza, several missions were established in the 1770s as far north as San Francisco. The 21 missions were parallel to the California coastline between present-day San Diego and

Sonoma, with the coastline positions easy to defend and supply by ships. Similar to earlier Spanish exploration, no missions were placed inland. Only three fortified posts were established in Alta California in addition to the Presidio of San Diego: The Presidio of Monterey was established in 1770, the Presidio of San Francisco in 1776, and the Presidio of Santa Barbara in 1782. Incentives were also provided to bring settlers to pueblos or towns, but just three pueblos were established during the Spanish period, only two of which were successful and remain as California cities (San José and Los Angeles). Several factors kept growth within Alta California to a minimum, including the threat of foreign invasion, political dissatisfaction, and unrest among the indigenous population.

The first documented expedition into the IC Project Alignment area occurred in 1772, when Don Pedro Fages traveled from San Diego to San Luis Obispo via Cajón Pass, the Mojave Desert, Hughes Lake, Antelope Valley, Tejón Pass, Cañada de los Uvas (Grapevine Canyon), and Buena Vista Lake, all in pursuit of Spanish Army deserters (Hoover et al. 1990:126). Fages left the first written record of exploration in the south San Joaquin Valley (California OHP 2013). In 1776, Francisco Garces is reported to have explored the region, including the Cummings and Tehachapi valleys in the Tehachapi Mountains, when traveling from the San Joaquin Valley to the Mojave River near Barstow, naming a large river Río de San Felipe, now known as the Kern River. Historical accounts also indicate that Garces left traces of his visit at Willow Springs (near Rosamond) and on Castle Butte (near California City). After this time, little documentation exists for European explorations or visits to the Mojave Desert and beyond until the 1800s; however, it is certain that such contacts occurred. Native Americans residing in these areas were likely indirectly affected by disruptions in trade caused by the European occupation in the coastal areas.

In 1806, the Spanish visited the Southern San Joaquin Valley again during the expedition of Lieutenant Franscico Ruiz to find fugitive Indians, which was documented by Father Jose Maria de Zalvidea, who renamed the Río de San Felipe to La Porciuncula. Lieutenant Ruiz also named Tejon Pass, Tejon Creek, and Tejon Canyon during this expedition (Bancroft 1886b). Due to its distance from the missions and presidios, the region served as a haven for escaped fugitives, particularly Indians, and its exploration primarily came from expeditions sent after those fugitives, with the Grandos Expedition exploring the valley in 1815 (Bancroft 1886c). In the early 1800s, the Spanish increased their efforts to incorporate Native Americans into the mission system. Native Americans from interior tribes were either brought or came to the San Gabriel and San Fernando missions, established in 1771 and 1797, respectively, which may have exerted influence as far as the upper Mojave River. Although the Spanish were determined to gather all natives into the mission system, there are numerous examples of interior Native American villages not represented in the mission registers. As the Spanish presence in southern California increased, native neophytes attempted to escape missions by running away and seeking refuge with interior tribes, such as in the southern San Joaquin Valley or the Mojave Desert and adjacent mountains. This led to forays into these regions by Spanish soldiers who were attempting to recapture runaway neophytes, and the influx of natives from different tribal territories resulted in tribal intermixing and blurred territorial boundaries.

4.5.1.4.1.1 Old Spanish Trail

The first major non-Native American transportation route through southern California was the Old Spanish Trail (ca. 1829), a trade route stretching between Santa Fe, New Mexico, and the coastal missions in southern California. Both Mexicans and Americans used this route to travel to California in the early 1840s. A segment of the route between Salt Lake City, Utah, and San Bernardino became known as the Mormon Trail for the steady flow of Mormon settlers traveling back and forth. During the Gold Rush, thousands of people traveled the Gila Trail or Southern Overland Trail from Texas to Arizona, then crossed the Colorado River at present-day Yuma into California and proceeded across the Colorado

Desert to the San José Valley. The main trail continued from that point northward to Temecula and Los Angeles. Many left the main trail and traveled southward to San Diego, where they then journeyed via ship to San Francisco or took the inland coastal route to Los Angeles, rejoining the main trail to the goldfields. Thousands more traveled the Mojave River Trail, which Captain John C. Frémont named the Old Spanish Trail in 1844. Starting in Santa Fe and continuing through Utah and Arizona, the trail then crossed the Mojave Desert to reach the Mission San Gabriel Arcángel and the Pueblo de Los Ángeles. Northeast of Victorville near today's community of Daggett, a group of Native Americans told Frémont they had lived along the Mojave River and the mountains to the north and traded with other indigenous peoples in the region along the Mojave River Trail. Frémont's is the first account to use the name "Mojave River" (Frémont 1845:260).

4.5.1.4.2 Mexican Period

After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California ended isolationist policies designed to protect the Spanish monopoly on trade and opened California ports to foreign merchants. On July 25, 1826, Governor Jose Maria Echeandía issued a decree beginning the secularization of the California missions (Engstrand and Ward 1995). However, because many Native Americans failed to leave the missions, Echeandía issued a second decree on January 6, 1831, encouraging the Native Americans to leave the missions.

Secularization became official under Governor Jose Figueroa with the Secularization Proclamation of 1834. Secularization of the missions resulted in the subdivision of former mission lands and establishment of ranchos. In keeping with the coastal settlement patterns of the Spanish, these ranchos were centralized in the southwestern section of the county and never extended past the San Gabriel Mountain Range. As the influence of the California missions began to wane from the 1820s through the early 1830s, land grants were initiated in the interior regions, partly to increase the population away from the more settled coastal areas where the Spanish had concentrated their colonization efforts. During the Mexican period, the large ranchos became important economic and social centers, none of which were designated within the IC Project Alignment.

During the 1830s, most Spanish laws and practices continued, whereas economic activity in southern California centered on agriculture and livestock raising for subsistence and localized markets, as well as hide and tallow production for the international market. During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary southern California export, providing a commodity to trade for goods from the east and other areas in the United States and Mexico. The number of nonnative inhabitants increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population contributed to the introduction and rise of diseases foreign to the Native American population, who had no associated immunities.

Early maps of the Mexican territory (e.g., Tanner 1826) include portions of the IC Project area, but activity was primarily limited to travel. Beginning in 1827, fur trapper Jedediah Smith made multiple trips into California on the Mojave Trail and through Cajon Pass, both located to the south of the study area. Subsequent to Smith, Kit Carson and other trappers traveled the route. Around that time, the Mojave Trail became part of the Old Spanish Trial (or Santa Fe Road) between southern California and Santa Fe. By the end of the Mexican period in the late 1840s, travelers from Salt Lake City had also established the Mormon Trail into Southern California via Las Vegas and met up with the Old Spanish Trail (Bean and Rawls 2003:58–71; Hoover et al. 2002: 321–322). In addition to the Mojave River Trail (also Old

Spanish Trail; see above), other early routes through the California deserts included the southern Yuma route (Gila Trail, Southern Overland Trail, Butterfield Stage Route), Brown's Wagon Road, the Bradshaw Trail, and Brown and Frink's Road, all located south of the IC Project area.

4.5.1.4.3 American Period

War in 1846 between Mexico and the United States began at the Battle of Chino, a clash between resident Californios and Americans in the San Bernardino area. This battle was a defeat for the Americans and bolstered the Californios' resolve against American rule, emboldening them to continue the offensive in later battles at Dominguez Field and in San Gabriel. However, this early skirmish was not a sign of things to come, and the Americans were ultimately the victors of this two-year war. The Mexican–American War officially ended with the Treaty of Guadalupe Hidalgo in 1848, which resulted in the annexation of California and much of the present-day southwest, ushering California into its American period.

California officially became a state with the Compromise of 1850, which also designated Utah and New Mexico (with present-day Arizona) as U.S. territories. Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through 1850s. The Gold Rush began in 1848, and with the influx of people seeking gold, cattle were no longer desired mainly for their hides but also as a source of meat and other goods. During the 1850s cattle boom, rancho vaqueros drove large herds from southern to northern California to feed that region's burgeoning mining and commercial boom. Cattle were at first driven along major trails or roads such as the Gila Trail or Southern Overland Trail, then transported by trains when available. The cattle boom ended for southern California as neighbor states and territories drove herds to northern California at reduced prices. Operation of the huge ranchos became increasingly difficult, and droughts severely reduced their productivity (Cleland 1941). Although many of the ranchos in the area remained intact after the United States took possession of California, a severe drought in the 1860s resulted in many of the ranchos being sold or otherwise acquired by Americans. Most of these ranchos were subdivided into agricultural parcels or towns, but ranching was to retain its importance through the mid-nineteenth century (Dumke 1944).

During the Gold Rush, thousands of people traveled the Gila Trail or Southern Overland Trail from Texas to Arizona, then crossed the Colorado River at present-day Yuma into California and proceeded across the Colorado Desert to the San José Valley. The main trail continued from that point northward to Temecula and Los Angeles. Many left the main trail and traveled southward to San Diego, where they then journeyed via ship to San Francisco or took the inland coastal route to Los Angeles, rejoining the main trail to the gold fields. Thousands more traveled the Mojave River Trail/Old Spanish Trail.

American politics and the need for a mild-winter route to the west favored a southerly thoroughfare from the eastern United States to California in the 1850s. The U.S. Gadsden Purchase of 1854 secured more land from Mexico for this route, and by 1857, surveys established the current international boundary from New Mexico west to California (Walker and Bufkin 1986). Wagon roads and railroads constructed across California's Colorado and Mojave deserts from the 1840s to the 1870s connected coastal California with the rest of the county. These modes of transport served to carry mail, prospectors, miners, entrepreneurs, merchants, immigrants, laborers, muleteers, settlers, and military personnel, as well as civilian and military supplies, livestock, produce, timber, and minerals produced by desert mines, among other necessities.

Following the Civil War, overland stage services to and from southern California resumed in 1868 with the Holladay and Wells Fargo operations (Nevin 1974; Stein 1994). Railroad surveyors first visited the area in the 1850s, but it was not until 1868, after the Civil War, that congressional approval was given for a railroad charter. The pre–Civil War national initiative for a southern transcontinental railroad route resumed, as the Texas and Pacific (T&P) Railway Company in 1871 conducted transcontinental surveys to pursue the initiative. In 1873, however, the T&P's westerly construction stalled in north-central Texas. The resulting delay was critical, allowing San Francisco investors to extend their own Southern Pacific Railroad (SPRR) through Imperial Valley to the Colorado River in 1877, bridging the river at Yuma into Arizona along the T&P survey in 1878 (Yenne 1985). The Atlantic and Pacific Railroad (later the Atchison, Topeka, and Santa Fe [AT&SF] and currently the Burlington Northern Santa Fe) soon crossed the central part of San Bernardino County, linking the area with San Diego and the eastern states by 1887. The railroad activity led to the establishment of the city of Barstow in 1885, and the town continued to grow with additional rail lines and later the establishment of the interstate highway system in the 1920s and 1930s.

The construction of permanent roadways across the desert trails and wagon roads accompanied the increased use of the automobile at the turn of the twentieth century. The first highways across the Mojave Desert followed the Cajon Pass–Barstow–Needles route established by the Southern California Railway and the AT&SF. Established in 1912, the Ocean-to-Ocean Highway, now known as the National Old Trails Road, stretched from Baltimore, Maryland, to California. Established in 1926, most of U.S. Route 66 largely followed the Ocean-to-Ocean Highway, passing through the desert region south of Needles on its way across the country to Los Angeles. After U.S. Route 66 was decommissioned in 1985, parts of it became Interstate 40 as well as Interstate 15. Other important highways that crossed through the region included the Randsburg/San Bernardino Road, which was added to the state system of secondary highways in 1933 and designated State Route 145. The highway was designated U.S. Route 395 (US-395) two years later (Johnson 2005).

4.5.1.4.4 Regional and Local Histories

4.5.1.4.4.1 Inyo County and Owens Valley

Barricaded from the coastal settlements and missions of the Spanish by the Sierra Nevada, Inyo County remained unexplored throughout the Spanish period and most of the Mexican period. Though Peter Skeene Ogden, a Canadian fur trapper, is believed to be the first non–Native American to travel through Owens Valley (Cline 1963:8), the first recorded exploration of the area did not occur until 1833. Joseph Walker entered the Owens Valley on his return from the Bonneville trapping expedition along the path of what was to become the Walker Pass–Owens Valley Route (Bateman 1995). Walker later used this same route to guide the first American settlers, the Chiles group, into California to their eventual settlement in Gilroy in 1843. John C. Frémont would be the next to enter the region, along with Walker and Kit Carson, on his way to support the American forces fighting in the Mexican–American War in San Francisco and San José.

Euro-Americans did not begin to settle in the region in large numbers until the Gold Rush, though many of these early settlers were not miners but farmers and ranchers following the new markets created by miners; the town of Bishop is named after Samuel Bishop, the first person to raise cattle and sheep in the area (Eastern California Museum 2014). This sudden influx of Euro-American colonists took advantage of the existing indigenous water systems, which, along with their livestock, severely damaged the natural environment that the indigenous Paiute subsisted upon. This sparked conflict between the settlers and the Native Americans, known as the Owens Valley Indian War, resulting in the establishment of Fort Independence in 1862 (Macko 1986).

Settlement of the area was primarily due to the discovery and development of rich mineral resources, particularly silver. The early strikes were focused on silver in Owens and Panamint valleys in the late

1850s and early 1860s, which resulted in the establishment of the Potosi Mining District near Lone Pine (Chalfant 1933). In 1860, Dr. Darwin French discovered the Coso ledges, which began to draw in more miners, but the Owens Valley Indian War severely limited the amount of settlement (Bateman 1995). Most of the strikes and mines were small and of little significance, but in 1865 Pablo Flores struck a rich mine that he named Cerro Gordo, which resulted in the organization of the Lone Pine Mining District. This area was very productive, and by 1868 the Union Mine at Cerro Gordo was the most productive silver mine in the United States (Norwood et al. 1980). It was around this time in 1866 that Inyo County was formally designated out of what had been proposed as Coso County—a subdivision of Mono and Tulare counties—and later expanded in the early 1870s to include segments of Mono, Kern, and San Bernardino counties (Chalfant 1933).

Silver, lead, and zinc were the early metals mined in the area, but beginning in the early twentieth century, tungsten mining developed as an important industry. First discovered in 1913 in the Tungsten Hills west of the town of Bishop, tungsten mining took off with the construction of two mills in Round Valley in 1916. This industry remained economically important until the price of tungsten collapsed following World War I. At the end of the Great Depression into World War II, prices rebounded, and tungsten mining remained important in the area around Bishop until the end of the twentieth century, when mining effectively ceased (Meridian 2014).

In addition to gold and silver, salt was mined in the Saline Valley east of Independence. Salt mining began in 1864, but transportation costs kept the enterprise from growing into a major operation (Norwood et al. 1980). The Saline Valley Salt Company constructed the Saline Valley Salt Tram between 1911 and 1913 to transport salt over the Inyo Mountains to Owens Valley, where it was then shipped via railroad (Ver Planck 1957). It was the steepest tram in the United States, rising from 1,100 feet in the Saline Valley to 8,500 feet at the crest of the Inyo Mountains, and then dropping to 3,600 feet in Owens Valley. The tram is listed on the National Register of Historic Places (NRHP; No. 74000514; Conrad 1973). Salt mining by various companies continued on and off until 1930, when the Sierra Salt Company closed (Ver Planck 1957).

Mining in the Death Valley–Furnace Creek area was slow to develop due to transportation difficulties. The Telescope Mining District, organized in 1860, was located just west of Death Valley on a spur of the Panamint Range. Worked only marginally in the beginning, by the late 1860s a substantial mining district had developed (Greene 1981). Mormon immigrants traveling west discovered gold in 1854 and 1856 in the Amargosa River area (Norwood et al. 1980). Silver was found in the Panamint Range in 1858, and the area was worked with limited success in the 1860s. Beginning in the 1880s a revival of gold mining in the Panamint Mountains occurred, centered in the Tuber Canyon area (Greene 1981). The towns of Ballarat and Garlock developed as a result of the mining industry in the Panamints.

The discovery of borax in Death Valley in 1881 led to the development of this previously sparsely populated portion of Inyo County. One of the most successful mining operations in the area during the late 1800s was the Harmony Borax Works. In 1881, William T. Coleman formed the Greenland Salt and Borax Mining Company, which began operating the Harmony Borax works north of Furnace Creek in 1882 (Caltrans 2008; Greene 1981). The operation mined borate that formed on the surface of the salt flats, called “cottonballs.”

Coleman also ran another borate mining operation, the Amargosa Borax Works, near Resting Springs. The Amargosa Borax Works operated during the summer months when work in the valley was suspended because of extreme heat (Greene 1981). It was from the Amargosa Works that the famous 20-mule teams hauled the borate to the Daggett railhead, a 330-mile round trip (Zentner 2012). In 1883 a richer type of borate, occurring underground, was discovered south of Furnace Creek and subsequently southwest of Death Valley Junction. In 1890 Francis M. Smith acquired the borate mines in Death and Amargosa valleys, Furnace Creek, and Borate, consolidating them all under the Pacific Coast Borax Company (Caltrans 2008). Smith closed all the works except the Borate works, which could be worked most profitably (Greene 1981). Borate became the main producer of borax and boric acid in the United States between 1890 and 1907.

Numerous small railroads were constructed into Inyo County for the express purpose of servicing mining operations. The Carson and Colorado Railroad, incorporated in 1880, ran from Mound House, Nevada, to Keeler, California, below the Cerro Gordo Mines on the eastern side of Owens Valley. Much of the route paralleled US-395. The Southern Pacific Company bought the line in 1900, renamed it the Nevada and California Railway in 1905, and in 1912 was renamed again the Southern Pacific. Portions of the railway lines closed in the 1930s and 1940s. The final portion from Laws to Keeler was abandoned in 1960, and the rails were removed in 1961 (Turner 1965).

The Tonopah & Tidewater Railroad, constructed between 1905 and 1907, was a 170-mile rail line that ran from Ludlow, California, to Beatty, Nevada. The line went through Death Valley Junction, where borax from the borax mines in Death Valley was loaded onto railcars for shipment. Both cargo and passenger trains operated on the line. The Pacific Coast Borax Company began shutting down operations in Death Valley in 1928, dealing a substantial blow to the revenue of the railroad. The line continued to run reduced operations for several years afterward, but finally closed down in June 1940 (Jennings and Wyant 1976).

A trail likely ran through Owens Valley into Mono County to the north since prehistoric times, but in the Historic period it became commonly used by prospectors passing through the area to the California gold fields and Comstock Lode. This trail became a road by at least the 1860s when ranchers began driving cattle into the high Sierra Nevada to supply the mining boomtown of Aurora. This road, eventually called El Camino Sierra, ultimately ran from Los Angeles in the south to Lake Tahoe in the north. Initially used to move materials to and from mines and mining communities, by the early twentieth century, El Camino Sierra was marketed as a scenic route for people in the newly available automobile. By 1931, the paving of El Camino Sierra was complete. Today, much of this route in Inyo County is occupied by US-395 (Di Pol 2013).

Though mining was the major industry of the county, farming and ranching kept it stable. Those industries required water, and at the beginning of the twentieth century, the city of Los Angeles was experiencing a severe water shortage. William Mulholland, president of the Los Angeles Water Department, identified the Owens River as a source that could be tapped to supply the city with its much-needed water (Norwood et al. 1980). The diversion of water to Los Angeles did not immediately affect agriculture in the Owens Valley, though tensions were high between farmers and Los Angelenos. A drought in 1921–1922 signaled the end of farming in the area by the mid-1930s, though the L.A. Aqueduct was the true cause (Chalfant 1933; Norwood et al. 1980).

4.5.1.4.4.2 Bishop

Bishop is the only incorporated city in Inyo County with a land area of 1.75 square miles. Samuel Bishop came to the area on a cattle drive in 1861 and stayed to build two small cabins and start San Francis Ranch near the site of the present town. Ranching remained an important economic interest in the area for many years, providing beef to nearby mining towns (Bateman 1995). Adjacent to the city are several developed unincorporated areas. The Bishop Paiute Indian Reservation is 8.74 square miles in size and is 2.6 km (1.6 miles) west of the city of Bishop.

4.5.1.4.4.3 Los Angeles Aqueduct

The Los Angeles Aqueduct spans Inyo, Kern, and Los Angeles counties. Plans to bring water to Los Angeles from the Owens River began as early as 1890. Fred Eaton, the former mayor of Los Angeles and a prominent landowner in Owens Valley, recognized the potential of capturing the water supply of the eastern Sierra Nevada for the rapidly expanding metropolis of Los Angeles, which by the late nineteenth century had outgrown its primary water source, the Los Angeles River (Underwood 2000). This developed into a full-blown water crisis by 1904, allowing Eaton to convince William Mulholland, the chief engineer and superintendent of the Los Angeles City Water Company, that the Owens River was the best source for Los Angeles' future needs. As Eaton secured the necessary land and water rights, Mulholland examined the feasibility and costs of the project. With their results, the two were able to first win the support of the Board of Water Commissioners and then the Los Angeles voters, who on September 7, 1905, approved a $1,500,000 bond measure to fund the project (Department of Public Service of the City of Los Angeles 1916).

Construction began in 1907 and was divided into several divisions, with division headquarters in various locations along the route of the aqueduct. Each was under the direction of a division engineer and included attendant office staff, surveyors, machinists, medical personnel, and laborers. Mojave functioned as the construction headquarters for the project, with supplies, equipment, and thousands of workers funneled through the small community on their way from Los Angeles to the Owens Valley.

To construct the Los Angeles Aqueduct, numerous temporary camps were constructed along the proposed system; these consisted of mess halls, bunkhouses, barns, shops, and homes for workers and their families (Underwood 2000). Alabama Gates was the location of one such work camp occupied between April 1912 and February 1913 (Van Bueren 2002). At this site, aqueduct gates were constructed to control and divert water for the Los Angeles Aqueduct. It was also the site of a number of rebellious acts by Owens Valley citizens, including the bombing of the gate on May 21, 1924, releasing 100 million gallons into Owens Lake. Just a few months later, starting on November 16, more than 700 farmers occupied the gate and drained the entire flow of the aqueduct into Owens Lake for four straight days in one of greatest acts of non-violent civil disobedience in California history (Costello and Marvin 1992).

At the northern end of San Francisquito Canyon was Elizabeth Tunnel, the longest tunnel of the aqueduct system, an engineering feat measuring 26,870 feet long, 10 to 12 feet in diameter, with a capacity of 27,000,000 gallons an hour. Completed on February 28, 1911, it was the site of intense competition between the two crews excavating it, led by W. C. Aston at the south and John Gray at the north. During its construction the southern crew broke the record for longest hard rock tunnel distance a total of three times, with the last record 604 feet in a single month (Guinn 1915).

When it was completed in 1913, the aqueduct was the third largest engineering achievement of its time, exceeded only by New York City's water system and the Panama Canal (Underwood 2000). Its development resulted in new innovations such as huge steam and electric shovels, which were used to excavate ditches, tunnels, dams, and reservoirs. Construction also required massive quantities of local resources, including limestone and clay provided by a plant developed specifically for the project northwest of Mojave at Monolith.

The aqueduct system was expanded in the 1930s by tapping the waters of the Mono Basin. The original system continues to be used today, although portions of the original aqueduct were reinforced in 1960 (Underwood 2000). As Los Angeles continued to grow in the decades following World War II, the increasing demand for water resulted in the development for a second aqueduct. Constructed between 1967 and 1972, this second aqueduct obtained water from the Haiwee Reservoir in the Owens Valley.

4.5.1.4.4.4 Cartago

As farmers and miners redirected the tributaries feeding Owens Lake, the area began to be used for soda processing. Dikes are still present, encircling the historic soda evaporators. The Cottonwood Charcoal Kilns, built to make charcoal for the Cerro Gordo smelters, are remnants of the area's connection to mining. The historic town of Cartago, which gives the protected area its name, served as the shipping port for the Cerro Gordo Mines.

4.5.1.4.4.5 Fort Independence

Originally Camp Independence, Fort Independence was established in 1862 and served as a U.S. Army post until 1877, though it was briefly abandoned in 1864. It was an important site during the Owens Valley Indian War (1861–1865), which was the reason for its construction. It also served as a Civil War army post (Key 1979). The land was transferred to the Interior Department in 1884, where it was neglected for decades. It is now the Fort Independence Indian Reservation, which was created in 1915 and expanded in 1916 and 2000. It is the home of the Fort Independence Indian Community of Paiute Indians.

4.5.1.4.4.6 Manzanar

In February 1942, President Franklin D. Roosevelt signed Executive Order 9066, which authorized the Secretary of War to establish Military Areas and to remove from those areas anyone, particularly those of Japanese descent, who they determined to be a threat to the war effort. This gave the U.S. Army the authority to forcibly relocate between 110,000 and 120,000 Japanese Americans to 10 internment camps away from the Pacific Coast. 1942, the U.S. Army leased 6,200 acres at Manzanar from the City of Los Angeles to establish the first of such internment camps for the purpose of holding Japanese Americans during World War II. This included approximately two-thirds who were American citizens by birth; the rest had been living in the United States for decades but were denied citizenship by law. During its use, Manzanar held a total of 11,070 Japanese Americans, from a high of 10,046 in September 1942 (Thompson 1984). The prisoner population dwindled to 6,000 by 1944, with the last several hundred internees released in November 1945, three months after the war ended. For many of them, they spent three-and-a-half years imprisoned within the fences of Manzanar. The camp consisted of one-story barracks with common bathrooms, showers, laundries, and mess halls, and it is the best-preserved internment camp from the era (Thompson 1984). The Manzanar Relocation Center is listed on the National Register of Historic Places (NRHP) (no. 76000484) and is designated a National Historic Landmark (no. 850) and a National Historic Site (no. 432).

4.5.1.4.4.7 Kern County

John C. Frémont led an expedition into Kern County in 1843 and 1844 under the commission of the U.S. government to explore and map the western territories (Brewer 2001). He brought an artist named Edward Meyer Kern from Philadelphia to act as the topographer for the expedition. While crossing a river, Kern narrowly escaped drowning, and Frémont named the river after his colleague (Gudde 1998:192; Hoover et al. 2002:124). Frémont was responsible for naming several landmarks, as well as the county itself during this expedition. He returned again in 1845 and 1846, this time with a larger force including several famous frontiersmen such as Kit Carson and Joseph Walker, and eventually joined the American forces fighting in San Francisco and San Jose during the Mexican–American War.

The construction of the Southern Pacific Railway across Antelope Valley began in the mid-1800s and was completed in 1876. After 1875, the use of the railroad system and the closing of mines forced the main stage lines in Kern County to come to an end, although small lines continued to transport passengers up until 1912 (Burmeister 1977). This period was followed by an influx of people during the southern California land boom of the late 1880s when immigrants settled in the Antelope Valley and Mojave

Desert areas in search for more affordable land near water. Between the 1880s and 1920s, climatic conditions in the region varied dramatically between wet and dry years. Only settlements with enough water supplies for human consumption and irrigation survived; the others failed. However, by the 1930s, there were more than 80 towns in the Antelope Valley, most of them located along the railroads.

Gold was discovered on the upper Kern River in 1853, bringing miners and settlers to the area. The importance of gold mining operations ended around 1942 due to the War Production Board issuance of Limitation Order L-208, which classified gold mines nonessential for the World War II effort (Taşkıran et al. 1997).

Kern County was established in 1866 with portions of Los Angeles and Tulare counties set aside to form the new county. It is California's third largest county, and the county seat was established at Havilah in 1866. Asbury Harpending, who made a fortune in gold mining along the Kern River, built a toll road from Bakersfield to Havilah. The county seat was moved from Havilah to Bakersfield in 1874 (Gudde 1998:161; Hoover et al. 2002:132).

Agricultural production has also been and continues to be identified with Kern County. The county was the destination of many of the Dust Bowl refugees chronicled by John Steinbeck in his Pulitzer Prize–winning novel The Grapes of Wrath. His account chronicles the people from Oklahoma and Arkansas who were displaced by the severe dust storms of the 1930s and migrated to California for employment. These people came to be known as "Oakies" and "Arkies," the terms usually applied as a pejorative. Many of them settled in Kern County to work the agricultural fields in the southern Central Valley.

4.5.1.4.4.8 Indian Wells Valley

In the late 1870s, the silver mines at Cerro Gordo and Panamint City brought scores of miners to Indian Wells Valley and transport of ore and minerals from the Indian Wells Valley became problematic. R. C. Jacobs went to Los Angeles to convince the city to construct a road from the Bullion Trail in Indian Wells across the Argus and Slate ranges, and in 1874, Chinese laborers blasted a road bed on the Slate Range crossing to connect Indian Wells with Panamint City. China Lake, a dry lake bed in the area, was named due to the Chinese laborers who temporarily resided in the Indian Wells Valley. The Indian Wells Valley was given its name in 1920 by the U.S. Geographical Board, consolidating the areas of Salt Wells, Brown Valley, and Inyokern Valley.

4.5.1.4.4.9 San Bernardino County

San Bernardino County was organized from parts of Los Angeles and San Diego counties in April 1853, and the city of San Bernardino became the county seat in 1854. The Treaty of Guadalupe Hidalgo ushered San Bernardino County into its American period. Horticulture and livestock, based primarily on cattle as the currency and staple of the Mexican rancho system, continued to dominate the economy through the first decade of the Gold Rush, which began in 1848. Since World War II, several areas in the Mojave have experienced a boom in urban growth. Much of this expansion has centered on Barstow, Victorville, Hesperia, and Apple Valley in the west, and near Twentynine Palms and Yucca Valley further to the east. Along with an increased number of year-round occupants and weekend inhabitants, there is an ever-growing number of visitors to natural areas such as Joshua Tree National Park, which was established as a National Monument in 1936. Off-road vehicle users, rock hounds, and relic hunters have significantly stepped up their activities in the area. Accessibility to the region was made easier by the establishment of the interstate freeway system.

4.5.1.4.4.10 Barstow

The city of Barstow is in the Mojave Desert, equidistant from Los Angeles and Las Vegas. The discovery of silver, and later borax, within the Barstow area in the 1800s and the building of several rail lines prompted an influx of settlers to the region. Ore was easily transported from the mines to various mills using the considerable transportation options available in Barstow at the time (Robinson 1989). As mining operations waned in the early twentieth century, Barstow's role as a transportation hub took off. Additional rail lines were laid through the city, with Barstow serving as a transfer point for people traveling to and from the west coast. The construction of Routes 66 and 91 and later the interstate system, which all run through Barstow, ensured the city's growth and future existence (Walker 1986). The city saw rapid population growth from the 1950s through the 1970s (from 6,135 in 1950 to 17,442 in 1970); however, the population growth of Barstow slowed significantly, increasing by approximately 5,000 people over the next 40 years. Known historic-era properties within Barstow are Barstow High School, located at Country Road and 2nd and the NRHP-listed Casa del Desierto/Harvey House, located adjacent to the AT&SF railroad lines on the northern end of the city. Barstow officially annexed Nebo Center in 2001. At the time of the 2010 U.S. Census, Barstow's population was 22,639.

4.5.1.4.4.11 Daggett

Daggett is an unincorporated area of San Bernardino County, located 19.3 kilometers (12 miles) east of Barstow in the Mojave Desert. Settled in the 1860s as Calico Junction, in 1883 the town's name was changed to Daggett to avoid confusion with the town of Calico, located a few miles to the north (Garrett 1992). The new name bestowed on the town was in honor of John Daggett, then Lieutenant Governor of California. Mining has played an important role in Daggett's history since its founding. Silver, and to a lesser extent gold, was found in the desert area in the late 1800s. Rail lines were laid to help move ore from the mines to the mills and beyond. By the turn of the century, borax mining had become the most important industry in Daggett, employing more than 200 men and supporting the burgeoning town's three stores, three saloons, two restaurants, lumber yard, and hotel (Robinson 1989; Thompson and Thompson 1995). When mining operations declined early in the twentieth century, the population of Daggett plateaued. Daggett experienced a small renaissance in the 1980s and 1990s, supported by a new industry: solar and experimental energy sources. The first commercial solar power plants in the world, SEGS I and SEGS II, were built in Daggett in the 1980s. SEGS II was moved from Daggett in 2009. In 2011 the population of Daggett was recorded as approximately 1,200 residents.

4.5.1.4.4.12 Yermo

Yermo, California, is an unincorporated community located in the Mojave Desert in San Bernardino County, 21 kilometers (13 miles) northwest of Barstow. The gold and silver mining boom of the 1800s introduced settlers to the land. The silver mining operations, located several miles north of Yermo in the Calico Mountains, supported Yermo's economy until the mid-1890s, when silver lost its value and mining operations in the area ceased. The railroad industry had been steadily growing in the area since the 1880s, with new tracks being laid through Yermo at a rapid pace. Yermo eventually became a rail hub for the AT&SF Railway (later purchased by Union Pacific, which operates the Yermo Yard today). In the mid-twentieth century, Yermo experienced an economic renaissance: the establishment of the "Calico Ghost Towns" by businessman Walter Knott in 1952 brought tourism to Yermo. The town's chamber of commerce marketed Yermo as the "Gateway to the Calicos," serving as the main point of entry to the mountains, the historic ghost town of Calico, and to recreational activities in the Mojave Desert. Business sprang up all around Yermo and today military operations and tourism are Yermo's largest industries. The most recent U.S. Census Bureau data list the population of Yermo at 1,092.

4.5.1.4.5 Mojave National Preserve

Created by the Desert Protection Act in 1994, the Mojave National Preserve comprises 1,600,000 acres of land and is the third largest unit of the National Park System within the contiguous United States. Previously the East Mojave National Scenic Area, it now contains the Providence Mountains State Recreation Area and the Mitchell Caverns Natural Preserve. Before the creation of the Preserve, the area was subject to intensive mining and ranching. In the 1880s, ranchers moved to the area now encompassed by the Mojave National Preserve to raise cattle. Five men—George S. Briggs, T. L. Blackburn, Daniel Murphy, Frank Monaghan and George Nay—formed a partnership and in 1894 incorporated the Rock Springs Land & Cattle Company. The company, later also known as the "88" after its cattle brand, was sold in 1904 to Earle J. Greening and John Ewing Jenison, who continued to grow the enterprise. At its peak, the Rock Springs Land & Cattle Company was said to have encompassed 1 million acres. Between 1928 and 1931 the company was split to form three smaller ranches: the California portion of the ranch became the Kessler Springs Ranch of about 300,000 acres and the OX Ranch of about 400,000 acres; the Nevada portion became the Walking Box Ranch. The ranches changed hands several times throughout the twentieth century, and by 1986 the two California ranches were again owned by one family, the Oversons. The 1994 Desert Protection Act established the Mojave National Preserve and encouraged the cessation of ranching operations for environmental reasons. The Overson family and their livestock left the area in 2001 after private donors provided the funds to purchase their holdings and end the region's long history of cattle ranching (Livingston 2002).

4.5.1.4.6 Military Installations

Military bases were established in the California desert prior to U.S. entry into World War II, but the military took control of much of the California desert at the onset of the war. Whereas General Patton's Desert Training Program (see Bischoff 2000; Howard 1985) was concentrated in the eastern Mojave (south of the IC Project area), several military bases were established in the western Mojave that are in or near the IC Project area. What would become Edwards Air Force Base (EAFB) was originally established in the early 1930s as the Muroc Lake Bombing and Gunnery Range, located near the remote settlement of Muroc in rural Kern County. The IC Project area intersects a small portion of EAFB near Kramer Junction, in the northeastern corner of the base. In 1940, a large tract of land northeast of Barstow was set aside for Fort Irwin, outside but near the southern segment of the IC Project area. Near Twentynine Palms, a glider training base was set up in 1941. Both of these sites were also used as armored division training areas. Army air bases were created near Daggett and Victorville. The Marine Corps took over supply depots at Nebo and Yermo after World War II, which are now administered as the Marine Corps Logistics Base (MCLB) Barstow (Norris and Carrico 1978). The IC Project area bisects the portion of the MCLB referred to as the Rifle Range and is situated outside the western and southern boundaries of the Yermo Annex. The Naval Air Weapons Station (NAWS) China Lake was established as Naval Ordnance Test Station Inyokern in 1943 as a research, development, acquisition, testing, and evaluation (RDAT&E) facility, and intersects portions of Inyo, Kern, and San Bernardino counties. The IC Project area is along the southwestern NAWS China Lake boundary, north of the community of Inyokern. Brief histories of the three military installations directly intersected by the IC Project area are described below.

4.5.1.4.6.1 Naval Air Weapons Station China Lake

The history of the military presence at NAWS China Lake can be broken down into three periods: Old Military, World War II era, and Cold War era. The Old Military period relates to the initial Euro-American exploration of the West, generally in the 1840s and 1850s, before mining, freighting, and settlement. Early military explorations in the area included Frémont's third expedition in 1845 down Owens Valley and over Walker Pass, and Lt. Bendire's expedition in the 1850s. Expeditions such as these left few discernable archaeological sites in the area because their camps were used for a very short duration.

Aside from exploration, the history of the Old Military period is concerned with conflicts among settlers, miners, and American Indians. The period of Army–Native American conflict (known as the "Indian Wars") coincided generally with the Civil War, from 1862 to 1865. In 1866 The Mining and Scientific Press reported the town of Coso as abandoned because of conflicts with Native Americans. The conflict was reportedly settled when miners at Darwin agreed to provide local Native Americans with jobs at the smelter in return for use of the spring. The reoccupation of Coso by Mexican miners in 1868 indicates that the conflict was resolved by then. Up until 2007 it was believed that stone buildings located near Coso Village and by a spring were the remnants of a military fort associated with the events of this period. Enhanced recordation of this building and associated structures suggest that this building was used not as a fort, but as an early mill for the Coso Mining District (ASM 2008).

In response to American involvement in World War II, the California Institute of Technology (CalTech) in Pasadena assembled a group of scientists who had expertise in rocket development. Under the direction of Dr. Charles Lauritsen, this group had a particular expertise in propellants and fuses. In 1943, the Navy was given the priority of developing a usable aircraft-fired rocket. Before the end of the year, the Navy had committed substantial financial resources to CalTech to advance rocket research, development, testing, and evaluation. Pasadena was a poor location in which to undertake this work due to logistical, safety, and security concerns. In mid-1943, Dr. Lauritsen and Navy Commander Jack Renard recommended that a new test range for Navy rockets be sited at Inyokern. Captain Sherman E. Burroughs, tasked with expediting the rocket program, endorsed these recommendations. In November 1943, the Bureau of Ordnance authorized the permanent establishment of the Naval Ordnance Test Station (NOTS) at Inyokern. Shortly thereafter Burroughs served as the first commander of NOTS Inyokern (Christman 1971; Esser and Treviño 2014).

The original NOTS Inyokern was located in Inyokern, but was moved to China Lake after construction of Armitage Airfield. The previous NOTS Inyokern became what is today the Inyokern Airport. As the original military and civilian directors of NOTS Inyokern, Burroughs and Lauritsen guided installation design, construction, and operation. Four characteristics distinguish NOTS from other World War II installations: 1) it was designed as a permanent facility, 2) it employed a very high percentage of civilian employees, 3) its personnel were a mixture of highly educated civilians and military career men of some rank, and 4) it was consciously designed to foster close communication and cooperation between these two groups. NOTS Inyokern, as originally created, included much of the area referred to today as the North Range. With the need for increasing ranges and test areas for rockets, warheads, fuses, and facilities for pilot training, Mojave B Range (established as a Marine Corps aerial gunnery range in 1943) was added in 1947, and the Randsburg Wash Test Range was added in 1950.

The installation's postwar mission remained largely the same as it had been during the war: to provide RDAT&E leading to the development of improved aircraft rockets for use by U.S. Navy pilots. An abbreviated list of some weapons advanced at NOTS Inyokern attests to the important military role of this facility. During the final years of World War II, the much-touted Holy Moses (a 5-inch high-velocity aircraft rocket) and Tiny Tim (an 11.75-inch air-launched rocket) rocket systems were developed and perfected largely at NOTS Inyokern. After the war, NOTS was tasked with developing a small-caliber, folding-fin rocket for air-to-air use. This effort resulted in two products: Mighty Mouse (released to the Fleet [RTF] in 1952) and Zuni (RTF in 1960).

Equally significant is NAWS China Lake's role in testing and developing production methods for rocket propellants, specifically ballistite, the principal solid rocket propellant used in the 1940s and 1950s. This program took place at the China Lake Pilot Plant facility (now known as the China Lake Propulsion Laboratory). Atomic bomb–related activities also took place at NAWS China Lake, at the rapidly built Salt Wells Pilot Plant (now known as the SWPL). At this facility, development of an explosive lens and testing of the design for atomic bomb casing and fins occurred. The Salt Wells Project spanned from 1945 to 1954.

In the postwar years, China Lake developed a large number of new technologies. The B-4 High Speed Test Track, for example, was a crucial testing facility between 1944 and 1954 (largely for jet aircraft components and missile systems) and is considered an important historic structure at NAWS China Lake. This is also the case for the Supersonic Naval Ordnance Research Track (SNORT), which was developed in 1953 and is still in use today (Mikesell and Larson 1999b).

During this interval, China Lake also continued to excel in developing air-to-air guided missiles. It was here that the world's first infrared homing air-to-air guided missile, the Sidewinder, was devised (RTF 1956). Underwater weapons development also advanced at NOTS, in particular the Mk-32, an acoustic homing torpedo (RTF 1951), and Weapon A, a 13.75-inch antisubmarine rocket (RTF 1951). NAWS China Lake maintained an annex at San Clemente Island, off the southern California coast. This facility hosted the testing and development of the submarine-based ballistic missile program, Polaris, which was intended to counter the Soviet's nuclear arsenals and delivery system.

The Vietnam War renewed Navy interest in conventional weapons, and NAWS China Lake was at the forefront in developing new technologies and customizing hardware to solve urgent problems. A "weapon-a-week" atmosphere developed at China Lake, and the more notable achievements included improvements to the Sidewinder; production of new weapons such as Shrike, Walleye, and fuel-air explosives; the development of night attack and variable thrust technologies; and testing/development of laser and optical guidance systems. Advancements in free-fall bombs were also being made at NAWS China Lake, most notably the cluster bomb "eye" series. Computer-driven weapons systems became increasingly important beginning in the 1970s, and NAWS China Lake played an integral role in developing and testing weapons software for the Navy, Air Force, and Marine Corps.

Throughout the 1960s, NAWS China Lake advanced work on developing precision-guided munitions, which are weapons guided by pilots after they are dropped. The Walleye, a glide bomb with a stabilized TV camera on its nose, was developed almost entirely at NAWS China Lake (RTF 1967). This weapon revolutionized air warfare tactics, and the precision targeting capabilities of Walleye altered conventional military bombing strategies. The nation's first antiradar guided missile, the air-to-ground Shrike missile (RTF early 1960s), is another major NAWS China Lake accomplishment. RDT&E for thrust vector-control (TVC) technology also took place here, with application in the vertical-launch missile systems for Antisubmarine Rocket (ASROC), Harpoon, and Sparrow missiles. Building on Sidewinder technology, forward-looking infrared (FLIR) systems were also advanced at NAWS China Lake. The static monitor testing facility at Skytop was built for the Fleet Ballistic Missile (FBM) project and also recommended eligible for listing to the NRHP. These systems were used extensively during the Vietnam War, as they allow nighttime detection and identification of heat-emanating targets.

In 1967, NOTS Inyokern was renamed the Naval Weapons Center (NWC) China Lake. Through the 1970s and 1980s NWC China Lake continued its excellent work in the RDAT&E field, adding more successful weaponry to the Navy's arsenal and making improvements to previously developed weapons, such as Sidewinder. On January 22, 1992, NWC China Lake was officially placed as a tenant activity under the Naval Air Weapons Station (an operational division of the Naval Air Systems Command [NAVAIR] headquartered in Patuxent River, Maryland) and became the Naval Air Warfare Center

Weapons Division (NAWCWD). In 1993 the station assumed its current designation as the NAWS China Lake.

4.5.1.4.6.2 Edwards Air Force Base

For several reasons, the area around Muroc gained increasing attention during the 1920s. Its proximity to Los Angeles provided an ideal filming location for the blossoming movie industry, and the hard, flat surfaces of Rosamond and Rogers dry lakes quickly became a favorite of automobile racing enthusiasts (Earle et al. 1998:65–70). For the same reasons, civilian aircraft manufacturers such as Northrop and Lockheed also began using the area for flight tests by the end of the decade (Earle et al. 1998:72).

The Army Air Corps first expressed interest in the dry lakebeds in 1928 as it looked to establish two bombing and gunnery ranges on the west coast (Earle et al 1998:72). Progress stalled, however, until 1931, when Lieutenant Colonel Henry "Hap" Arnold was assigned to command March Field in Riverside, California. Arnold favored Rogers Dry Lake's proximity to March Airfield, its remoteness, and, above all, its hard, flat surface, which he believed to be the finest landing field conceivable (Komporlides et al. 1997:2–5). Following the approval of the Secretary of War, Arnold began development of the Muroc Lake Bombing and Gunnery Range in 1933. Alternately named Camp 1, it was located on the eastern side of Rogers Dry Lake and within two years, consisted of a cantonment that included a mess hall and barracks (Komporidles et al. 1997:2–7). The complexity and size of the range continued to grow and by the end of the decade, it encompassed an area of more than 150,000 acres (Earle et al. 1998:76)

The eastern side of the lake proved adequate for the first decade of operation, but in 1940 the Muroc Bombing and Gunnery Range was moved to the western side of Rogers Dry Lake. Military decision makers believed this location was advantageous for its proximity to the existing infrastructure at Muroc and also believed it was a better landing field because of the prevailing northwestern winds (Earle 1998:76). Construction continued at what is now known as South Base when the U.S. Army Corps of Engineers developed a water system, roads, runways, range targets, and ordnance buildings (Cotterman et al. 1997:2-10–2-11).

Japan's attack at Pearl Harbor on December 7, 1941, and the U.S. entrance into World War II profoundly affected the development of the Muroc installation. The facility became a major hub of reconnaissance and bomber groups following the arrival of the 6th Reconnaissance Squadron and the 41st and 30th Bombardment Groups, and by 1942, nearly 90 percent of all Pacific Coast patrols were flying out of the airfield (Cotterman et al. 1997:2-11). Eventually made independent of March Field in mid-1942, it was briefly renamed the Muroc Army Air Base (AAB) before being redesignated the Muroc Army Air Field (AAF) in late 1943.

As the United States became involved in World War II, the primary mission of Muroc AAF focused on flight crew training, particularly for B-17 and B-24 bombers and P-38 fighters. Between 1942 and 1945, several thousand pilots, bombardiers, and aerial gunners received training at Muroc, where they practiced strafing, identification, and skip bombing (Komporlides et al. 1997:2-12). The permanent population of the base grew exponentially during this period, from 150 enlisted men in mid-1941 to 6,300 by the end of 1942 (Earle et al. 1998:76).

To support both the mission and the growing population, construction activity accelerated greatly along the western side of Rogers Dry Lake (renamed in 1946). Technical facilities built at South Base included a year-round concrete runway, radio buildings, hangars and support buildings, and a large control tower that provided a commanding overview of the installation (Cotterman et al. 1997:2-11; Earle et al.

1998:76). Further development of the base also involved the construction of administrative buildings, barracks, officer's quarters, mess halls, and recreational facilities.

However, development in California's high desert carried with it a complex set of issues. To fill the base's urgent needs, buildings were rapidly constructed, often at the expense of quality. In accordance with other military buildings built during World War II, many were constructed of wood and tar paper using standardized architectural plans, whereas others were prefabricated structures that were simply installed where needed (Cotterman et al. 1997:2-14–2-15; JRP 2006:30). Limited building materials were another concern, leading base planners to experiment with various construction methods. Two examples included revetments for sheltering aircraft constructed of rammed earth and the construction of a new commander's residence using adobe bricks.

On the northern side of Rogers Dry Lake, the Army Air Forces Materiel Command at Wright Field in Dayton, Ohio, established an additional and distinct installation in mid-1942. Now known as North Base, the facility was named the Muroc Flight Test Base and was built to house and test Bell's XP-59A Airacomet, a secret jet airplane project believed to be vital to the war effort (Hudlow et al. 1995:22). Initial development of the new test installation was intended to be temporary, and limited facilities included a hangar (Building 4305) and barracks. The success of the XP-59A program brought additional test programs at the test installation and construction of a permanent runway, control tower (Building 4500), and additional hangars, and other support buildings and structures were soon built (Hudlow et al. 1995:22). Development of the base also included a heavily guarded security perimeter with barbed wire fences and guard shacks.

Just prior to the end of World War II, the base would become home to another testing facility. Scientists and engineers from the Guggenheim Aeronautical Laboratory/California Institute of Technology (GALCIT) in Pasadena began development of an installation to continue their work on jet-assisted takeoff (JATO), a solid- or liquid-propellant motor engine mounted on a plane to assist with takeoff (Hudlow 1995:13). The GALCIT group was drawn to Rogers Dry Lake like many others for its isolated location and began constructing its new facility 0.75 mile north of the Muroc Flight Test Base in April 1945. Later renamed the Jet Propulsion Laboratory (JPL), the group conducted JATO tests under a U.S. Navy contract, as well as research on missiles for the Army Air Forces; and although there was some interchange with the Muroc Flight Test Base, security restrictions and competition limited any extensive exchange of ideas with other facilities on the base (Komporlides et al. 1997:2-13).

The transfer of Edwards AFB from Air Material Command (AMC) to Air Research Development Command (ARDC) in 1951 emphasized the need to develop the Main Base. Development of the newly re-sited Main Base began immediately and centered on a 300-foot wide by 15,000-foot long, 500,000-pound concrete runway located just north of South Base, which would be the longest and strongest in the world when completed (Weitze 2003:81). By situating it in a southwest/northeast orientation, the new runway took advantage of its natural surroundings and provided unobstructed approaches for more than 30 miles in either direction (J. Gordon Turnbull, Inc. 1950:24–26). Moreover, this location required minimal grading and offered test pilots emergency landing areas on Rogers Dry Lake and Rosamond Dry Lake a short distance to the southwest. A secondary, parallel runway for proven aircraft was located immediately to the north, reducing taxiing distances and reserving the main runway for the testing of unproven aircraft (J. Gordon Turnbull, Inc. 1950:24–26).

The increased capabilities of Edwards AFB were reflected in the growing workload of the base, which had doubled since the implementation of the Master Plan (U.S. Air Force 1959:7). As a result of its expanding operations, the Air Force Flight Test Center's (AFFTC's) mission was redefined on May 4, 1955, "…to accomplish functional (as distinct from engineering) flight tests of complete, manned aircraft weapons systems, including components and allied equipment; to conduct engineering evaluation flight test of aircraft and power plants; to accomplish static firing tests of guided missile power plants; to accomplish research and development related to such tests; to plan for, control, and operate ERETS, the 6511th Test Group (Parachute) facilities, the USAF Experimental Flight Test Pilot School, Center Track Testing Facilities, and other special test activities; to provide facilities and special services for contractors and for other governmental agencies in support of the ARDC Mission" (U.S. Air Force [USAF] 1959:7–8). Tests of experimental and prototype aircraft during this period included the F-100 fighter series; the C-130, C-133, and C-140 transport aircraft; adaptations of the B-52 and RB (reconnaissance bomber-66); and the U-2 (Weitze 2003:87).

As Edwards AFB entered into the 1980s, flight testing had become an increasingly complex and costly process, which required facilities capable of collecting and processing data efficiently. In addition, the ever-increasing sophistication of new weapons systems meant that the AFFTC constantly needed to expand and enhance its technical facilities and equipment (USAF 1981:62). As a result, a number of improvement and modernization efforts were begun by the start of the decade to accommodate the next generation of aircraft. The Ridley Mission Control Complex opened on June 12, 1980, and provided the AFFTC with a modern facility that integrated the Center's mission control and range control functions (USAF 1981:63). Other facilities constructed during the 1980s included the Integration Facility for Avionic Systems Test, the Modeling and Simulation Facility, and the Benefield Anechoic Facility, which was the largest anechoic chamber in the world when constructed (USAF 1989:105). All part of the Avionics Test and Integration Complex, these facilities allowed the testing and integration of software-intensive systems on the ground before ever being taken to the air.

Flight testing and large rocket motor data gathering continued at Edwards AFB through the end of the Cold War in 1991. A large number of fighter, reconnaissance, support, and research aircraft continued to be tested at Edwards AFB, including the Grumman X-29, the AFTI/F-111, the F-15 STOL/MTD, the McDonnell Douglas C-17 Globemaster III, and the Northrop B-2 Spirit. In addition, a new weapons system developed in association with the B-2 was the Short-Range Attack Missile (SRAM), a nuclear cruise missile (Weitze 2003:94). Although flight and weapons RDT&E evolved significantly since the AFFTC's founding, the unique combination of natural, technical, and human resources at Edwards AFB would ensure the base's role as one of the world's preeminent testing installations.

4.5.1.4.6.3 Marine Corps Logistics Base (MCLB) Barstow

With the onset of World War II in 1939, the United States increased military funding and began to develop and expand new and existing facilities. To meet this demand, the Navy's Bureau of Yards and Docks developed a set of standardized plans that provided for the efficient construction of temporary facilities, bases, and buildings. This type of construction is commonly referred to as "World War II temporary" and was used because of wartime shortages of time, manpower, and materials.

As the military's personnel and facilities rapidly expanded, so did a demand for additional supplies and logistical support. In 1940, the Navy only had two continental naval supply depots and two small Marine Corps depots, which procured, stored, and delivered materials to individual installations. As a result, the Navy began a campaign to develop a number of new depots in remote inland locations with standardized plans and new palletizing and forklift storage systems.

Barstow was chosen as the site of a new depot because of its proximity to existing roads and highways, and a dry climate that allowed for outdoor storage. Congress authorized construction of the new depot on May 8, 1942, and contacted James T. Holmes and D. Lee Narver's Los Angeles engineering firm to design and construct the new supply depot. Prior to construction, naval engineers addressed concerns over flooding from the Mojave River by constructing a series of culverts. Other preliminary considerations included the development of wells and provision of electricity through lines run along highway and railroad rights-of-way.

Holmes and Narver began working on plans in June 1942, with construction beginning in September of the same year. In late 1942, the Navy made the decision to transfer the supply depot to the Marine Corps. The new supply depot was officially activated on January 4, 1943, and would continue to develop into the following months. Throughout the rest of World War II, MCLB Barstow supported the war effort by providing supply and warehouse functions.

After World War II, MCLB Barstow grew in size and expanded the scope of its operations. Equipment damaged during the war was repaired, and new equipment was added. In 1946, MCLB Barstow was re-designated as the Marine Corps Storage and Repair Depot (MCSRD) in response to the installation's new function. By April 1946, the Navy was looking to expand MCSRD by acquiring a nearby World War II Army post known as the U.S. Army Quartermaster Depot at Yermo. After successful negotiations in July 1946, the USMC officially moved into the Yermo facility.

During the early postwar period, new residential units and storage facilities were added to the base. A 1947 housing project constructed 100 family apartments for both civilian and military personnel, 44 apartments for officers and enlisted personnel, 20 dormitory units for women, and 30 dormitory units for men. As the population of installation personnel grew, the number of Morale, Welfare, and Recreation (MWR) facilities, medical facilities, and civilian-operated businesses increased. Along with this growth came the addition and upgrade of storage and repair facilities.

In March 1948, the installation's official designation was changed to Marine Corps Depot of Supplies, Barstow. The installation was now composed of two separate areas: the original location, known as the Nebo Area, and the newly acquired Yermo Annex. In response to a labor shortage on base, the USMC pushed for the recruitment of Navajo Indians to fill the labor gap. In March 1949, the installation was re-designated Barstow Annex, Marine Corps Depot of Supplies, San Francisco. By this time, the base had grown to accommodate more than 1,200 personnel. In response, Commanding Officer Colonel Chester R. Allen looked to the Wherry Housing program under Title VIII of the National Housing Act for a solution to the housing shortage.

Throughout the Korean Conflict (1950–1953), the installation performed the same supply function as it did during World War II, with the addition of the new Yermo repair facility. During the conflict, the installation was able to expand its capabilities, upgrading existing systems and adding new storage and housing projects. The base now served the USMC in the western United States and overseas forces, provided storage for the California National Guard 140th Heavy Tank Battalion, and conducted automotive maintenance for the Army at Camp Irwin.

In the mid-1950s, the San Francisco depot was phased out and its functions transferred to Barstow. From 1958 on, MCLB Barstow was responsible for all USMC logistics west of the Mississippi River, as well as the Pacific and Far East. These new responsibilities led to further expansion of the base with the acquisition of the Rifle Range along Highway 66. During this time, MCLB Barstow constructed a repair facility building at Yermo (Building 573), which became the largest single-story workspace ever constructed for the USMC, covering 10 acres and equipped with several cranes to repair and service equipment. This new repair facility elevated the installation's level of support during the Vietnam War, continuing to expand throughout the 1960s and 1970s.

In November 1978, the installation was given its current name, MCLB Barstow. MCLB Barstow would go on to have an active support role following Iraq's invasion of Kuwait in 1990, providing Marines stationed in Saudi Arabia with thousands of tons of supplies. Between 2004 and 2005, MCLB Barstow was faced with the possibility of a base closure or substantial reduction after Congress called for base closures across the United States. Despite this congressional action, MCLB Barstow managed to remain open and is currently one of the Barstow region's largest employers.

4.5.2 Research Design

The following research design is a high-level overview of expected resource types and research topics, identified through background research, which is intended to inform site recordation and NRHP and CRHR eligibility recommendations. As the project crosses several distinct geographies with variations in culture history, history of archaeological analysis, and present-day management approaches, this represents an attempt at synthesis that is aimed at maximum utility in site recordation and analysis. It is likely that resource types and topics will be encountered during the study that do not fit neatly into the categories below; these will be addressed during discovery and subsequent analysis.

4.5.2.1 Prehistoric Research Domains

4.5.2.1.1 Prehistoric Site Types

SCE's consultant SWCA will classify all resources into non-overlapping site categories, followed by an analysis of the characteristics that would contribute to NRHP or CRHR eligibility analysis. The prehistoric site types that are most likely to be identified during the current survey include: lithic scatter, ceramic scatter, artifact scatter, bedrock milling station, quarry, rock art, trail, rock feature, rock shelter, temporary camp, and habitation. Project work conducted within federally managed lands will defer to locally accepted resource definitions, including what constitutes a site, and specific site type definitions. For example, on BLM-managed lands, a site will be defined as 10 artifacts within a 10 × 10 m area bounded by a 30-m buffer of no artifacts. Our work conducted within the boundaries of NAWS China Lake will use the China Lake Integrated Cultural Resources Management Plan (ICRMP; SWCA 2011) as a guide for site and site type definition. For private lands, we will adopt the convention of the nearest federally managed land to ensure consistent data collection.

4.5.2.2 Prehistoric Research Topics

The review of previous research identifies a wide range of prehistoric research topics that pertain to the IC Project vicinity. These topics fall under four general domains: chronology, land use pattern change, trade and exchange patterns, and technology. The domains and corresponding topics discussed below do not represent the full range of research interests or opportunities for the resources within the IC Project APE/Api. Rather, the examples were chosen to demonstrate the nature and direction of current research and were focused on those having clear linkages to data available prior to the survey of the IC Project APE/API. Although not exhaustive, these topics serve as a starting point for making informed decisions regarding the NRHP and CRHR eligibility of sites within the IC Project APE/API.

4.5.2.2.1 Chronology

The establishment of accurate regional chronologies has long been a focus of archaeological research. Research in the Great Basin has established an accurate projectile point chronology from stratified contexts supported by radiocarbon dates (Thomas 1983), but there is currently a paucity of similar data from southern California in general and the Mojave Desert in particular (e.g., Sutton 1996; Sutton et al. 2007). Improving the accuracy of projectile point chronology is a dominant question in the research area.

Archaeological finds in the central and eastern Mojave Desert have been found along paleoshores of pluvial lakes and have been dated based on the association with lake highstands. However, Sutton (1996) notes that the assumption that the artifacts are in primary context at these shores is problematic. In addition, there have been multiple claims of pre-Clovis occupations of the Mojave Desert (Davis 1967, 1969, 1974, 1978; Leakey et al. 1968, 1970; Simpson 1958, 1960; Budinger 1992). With burgeoning evidence of pre-Clovis occupations of the New World (e.g., Dillehay and Collins 1988; Meltzer et al. 1997; Jenkins et al. 2012), these claims cannot be as easily dismissed as they once were and should be considered a viable research topic.

4.5.2.2.1.1 Projectile Point Chronology

Projectile points are often used to date archaeological sites. Projectile point forms are known to change over time and archaeologists have used radiocarbon dating of stratified deposits containing projectile points to create date ranges for specific projectile point types. However, many California desert sites do not have stratified deposits and have not been directly dated. The assumption that dates for projectile points are consistent over wide ranges of space also requires further examination. Few direct radiocarbon dates exist for projectile points in the regions surrounding the project (e.g., Altschul et al. 1989:20; Sutton 1996). Increasing the precision and accuracy of projectile point chronologies is an important research topic in the California deserts.

Gilreath and Hildebrandt's (1995, 1997) analyses of projectile point hydration data show that the traditional chronological projectile point sequence for the Great Basin is accurate back to approximately 3,500 years BP (see Bettinger and Taylor 1974). Using Basgall's (1991) Coso hydration rate, thin Elko points (less than 0.25-inch [6.5-mm] maximum thickness) correctly fall within the Newberry period (3,500–1,350 years BP); Rose Spring points occur within the Haiwee period (1,350–650 years BP), and Desert-series points date to the Marana period (after 650 years BP). Early Elko forms have been recognized at Airport Lake (within NAWS China Lake) by Hildebrandt and Jones (1997) and at the Stahl site (near Little Lake, also within NAWS China Lake) by Schroth (1994). Some gains in regional projectile point chronology have been made by Basgall et al. (1995), who defined the Fish Slough series, a separate type of notched dart point used in the Early Holocene; however, a great deal of work remains to be done. Because these points are often used for cross-dating purposes, changes to the traditional chronological sequence and the presence of early projectile point types at sites along the IC Project APE/API have serious implications for understanding the chronology of the wider region. Due to the local presence of multiple obsidian sources (e.g., Sugarloaf and Glass Mountain), most points found in the area are made from obsidian, a material conducive to hydration analysis. The use of newer hydration rate calculation approaches (e.g., Rogers and Stevenson 2017) is also likely to have an impact on this debate.

The refinement of projectile point chronologies is especially difficult in the Mojave Desert due to the absence of deep stratified deposits and co-occurrence of multiple time periods on deflated surfaces. For instance, despite being interpreted as distinct cultural complexes in the central Mojave Desert, the Lake Mohave Complex and the Pinto Complex appear to co-occur at many sites with overlapping radiometric and obsidian hydration dates (Sutton et al. 2007). As Altschul et al. (1989:20) note, "the character and dating of the transition from the Lake Mojave to the Pinto period is probably the most vexing chronological problem in the region."

4.5.2.2.2 Land Use Pattern Change

Several interesting topics fall under this broad domain, and they are best organized according to the following chronological parameters: Terminal Pleistocene–Early Holocene occupation of Great Basin and

Mojave Desert sites; Early and Middle Holocene adaptive change; and Late Holocene subsistence intensification.

4.5.2.2.2.1 Evidence for Terminal Pleistocene–Early Holocene Occupation

Investigations along the ancient shores of several Pleistocene-Holocene lakebeds along the IC Project alignment has revealed evidence for the Terminal Pleistocene–Early Holocene presence of humans. Although clear associations between extinct Pleistocene fauna and human-made stone tools have not been documented to everyone's satisfaction (see Basgall 2007a, 2007b), the potential for such an association still exists along ancient shorelines near or within the IC Project APE/API. Human tools and extinct Pleistocene fauna have been found together in the American Southwest and the Great Plains, but they have never been found in clear association in California or the Great Basin. While most scholars agree that "the only cultural complex dating the Pleistocene that has been confidently identified in the Mojave Desert is Clovis" (Sutton et al. 2007:233), the tantalizing prospect of identifying pre-Clovis deposits remains.

Two commonly discussed potential pre-Clovis sites in California are located near the project area: Calico Hills and Lake Manix. Pleistocene Lake Mohave, at the eastern end of the project area, also has been a locus of claims of Late Pleistocene artifacts (e.g., Davis 1967, 1969) but is less well-known.

The Calico Hills site is located approximately 2.5 miles north of the APE/API and is managed as an Area of Critical Environmental Concern (ACEC) by the BLM. The site is located on the remnants of an alluvial fan leading to Lake Manix (Moratto 1984:41). The site was excavated by Louis Leakey and Ruth Simpson in the 1960s; Leakey was an expert on pre-human hominin stone tools in Africa and was convinced that the lithic material at the Calico Hills site was of great antiquity, based on morphological similarities to what he had identified in Africa (Leakey et al. 1968, 1970, 1972). The veracity of the artifacts and dates were questioned by American archaeologists (e.g., Duvall and Venner 1979; Haynes 1969, 1973; Payen 1982). The early dates for the Calico Hills site proposed by Leakey and his collaborators are not accepted by most of the archaeological community, nor are his claims of an artifactual nature for much of the naturally occurring material (Moratto 1984: 41-48).

The project's APE/API runs through the ancient lakebeds of Pleistocene Lake Manix and Lake Mohave. Lake Manix was a large pluvial lake in the Mojave Desert and was at its greatest extent around 19,500 years ago (Moratto 1984:39). Lithic artifact scatters along the paleoshores of Lake Manix were identified in the mid-twentieth century and were interpreted to be 20,000 years old based on stylistic similarities to European Pleistocene-aged artifacts and relation to the paleoshores (Simpson 1958, 1960). These early dates have not been readily accepted by the archaeological community, but neither has the archaeological community wholly rejected the possibility of a Pleistocene occupation of the Mojave Desert (Moratto 1984:41). As Budinger notes, Pleistocene lakeshore and marsh depositional environments likely have the greatest potential to yield evidence of pre-Clovis occupation and related paleoenvironmental data (Budinger 1992:49). Lake Mohave has also yielded material dated to >11,500 years ago based on association with the paleoshore (Davis 1967). Potential exists for identifying lithic material along the paleoshores of these lakes which could help elucidate our understanding of the earliest occupation of the region.

4.5.2.2.2.2 Early and Middle Holocene Adaptive Change

A second issue falling under land use pattern change involves contrasting interpretations of Early and Middle Holocene adaptive change. Warren (1986) argues that people in the Mojave Desert in the Early Holocene (10,000–7,000 years BP) focused on large game and a rich assortment of lake and riparian resources. Lake Manix and Lake Mohave in the central Mojave Desert do provide evidence of occupation during this time period, even with the lack of earlier dates (Sutton et al. 2007). Between 8,000 and 7,000 years BP, lowland lakes and streams began to dry up, and large-game populations became limited to a few isolated locations. For example, Owens Lake's last sustained highstand at approximately 8,800 years BP, which was followed by what is known as the mid-Holocene Xerithermic period, characterized by nearly 5,000 years of drought (McGuire et al. 2015:26). In response to these changes, Warren asserts, settlements shifted to upland settings where ephemeral lakes and streams still existed, and drier lowlands were effectively abandoned. This land use change was also correlated with changes in assemblage content and diversity (defined as the Pinto Complex), including the increased use of milling equipment, which was thought to indicate a greater reliance on small-seed resources. Warren (1986) contends that by the height of the Middle Holocene climatic optimum (ca. 6,500–4,000 years BP), Pinto Complex sites decreased in frequency and were restricted to places where springs still flowed. There is currently debate whether the central and eastern Mojave Desert was abandoned between the period of the Lake Mojave Complex in the Early Holocene and the Middle Holocene Pinto Complex (Altschul et al 1989:21-22) and abandoned again between the Middle and Late Holocene (Sutton et al. 2007:404). An alternative perspective provided by Basgall and Hall (1995) suggests that Early Holocene environments were not characterized by perennial rivers and lakes, but by a variety of springs and the intermittent filling of playa lakes. They also argue that Lake Mojave sites were located in a wider range of habitats and produced tool and faunal assemblages indicative of a more generalized adaptation than proposed by Warren (1986).

During the Middle Holocene, a striking increase in the frequency of milling equipment is seen, signifying a greater focus on small-seed resources (Basgall and Hall 1995; Warren 1986). Site locations continue to cross-cut a wide range of habitats, but, in contrast to the ideas of Warren (1986), they are not necessarily located next to springs. Moreover, Basgall and Hall (1995) do not recognize a Middle Holocene depopulation of the desert. Much of the IC Project is within arid land where questions of Middle Holocene abandonment can be tested. It also has a significant amount of upland habitat containing productive springs that could be used to examine the Middle Holocene refugia hypothesis. Sites in this area that may yield reliable absolute dates could help elucidate land use and population patterns.

The Middle Holocene also saw the development of ritual behavior likely associated with the hunting of large game, specifically bighorn sheep. The Coso rock art is the most spectacular example of this ritual behavior, but split twig figurines found in Newberry Cave in the central Mojave Desert are also associated with bighorn sheep hunting ritual behavior (Hildebrandt and McGuire 2012; Sutton 1996:234). Hildebrandt and McGuire (2002) associate the big game hunting and ritual behavior with costly signaling theory. McGuire and Hildebrandt (2005:698) define costly signaling theory as follows:

> Costly signaling theory attempts to explain how seemingly inefficient (or costly) types of behavior can evolve through natural selection, as long as these behaviors communicate a series of underlying qualities that are of interest to observers. Signalers display (communicate) their intrinsic qualities, while the pay-off to the observer derives from the information inferred from the signal - he or she should be able to evaluate signaler qualities as a rival, mate, or ally by attending to the signal rather than by other more expensive means (e.g., direct competition, trial-and-error).... In this conception, meat can be a medium of communication through which the hunter transmits information to potential mates, allies, and competitors.

The concurrent rise of large game hunting and small seed processing in the Middle Holocene has led the human behavior ecologists in the Great Basin archaeological community to discuss the relative merits of the different provisioning activities within a discussion of sexual division of labor (e.g., Hildebrandt and McGuire 2003). It appears that the small seed and small game provisioning conducted primarily by women supported the riskier large game hunting by men (e.g., Zeanah 2004). Large game hunting by men resulted in increased social attention, improved access to alliance networks including in the obsidian trade, and increased mating opportunities for the successful hunter (McGuire and Hildebrandt 2005). Settlement hierarchies related to this sexual division of labor with large semi-sedentary base camps located near the predictable and stable resources exploited by the women and smaller, temporary logistical camps located near the less predictable resources exploited by men who wished to take advantage of the increased social attention earned by successful hunting. Rock art associated with the large game hunting appears in much of the Great Basin, the Sierra Nevada Mountains, and the Mojave Desert during the Middle Holocene (McGuire and Hildebrandt 2002). Petroglyphs and rock shelters have been recorded in the APE/API and within 0.5 mile (0.8 km) of the project area, suggesting that additional resources may be identified during survey that could add to our understanding of this behavior in the Mojave Desert and potentially clarify gender roles in relation to resource acquisition.

4.5.2.2.2.3 Late Holocene Economic Transformations

Various researchers have suggested that as population densities increased over time throughout the Great Basin, local prehistoric populations were required to increase subsistence production per unit of land. Bettinger and Baumhoff (1982) think this problem became acute at approximately 1,000 years BP, resulting in the more intensive and generalized use of habitat zones previously used for only specialized purposes. Bettinger (1991) and McGuire (1981) have argued that upland areas in the White Mountains, southern Sierra Nevada, and Mojave Desert were used essentially for specialized hunting or other specialized resource procurement until relatively late in time (ca. 1,000 years BP), when seasonal villages were established and entire families exploited a much wider range of resources (including pinyon). The IC Project APE/API is immediately adjacent to these areas.

Gilreath and Hildebrandt (1997) have found similar changes in land use within the Coso Volcanic Field. Prior to 1,000 years BP, use of the area was largely restricted to the acquisition of obsidian; after 1,000 years BP, subsistence production became the primary focus, particularly the exploitation of a variety of small-seed resources. Curiously, this intensification coincided with sharp declines in large-scale obsidian production and the discontinuance of the Coso rock art tradition, and a decline in the accumulation of substantial middens indicative of habitation sites in favor of more dispersed camps and processing stations (McGuire et al. 2015:38-39). If split twig figurines found at Newberry Cave in the central Mojave Desert are related to the same large game hunting ritual behavior seen in the Coso rock art as Hildebrandt and McGuire (2012) propose, a similar change in land use patterns may be reflected in the central Mojave.

Previous studies have identified increased use of marginal habitats late in time (see Bouey and Mikkelsen 1989; Gilreath and Hildebrandt 1997), and future studies should continue this line of research. Future investigations should also focus on the degree to which intensification led to increased predictability of settlement locations during the annual subsistence-settlement cycle, and whether this facilitated the development of regular exchange relationships. The frequency of Newberry period hydration readings increases at sites throughout the western Mojave (Allen 1986; Whitley et al. 1988; Yohe 1992), the Kern Plateau (Garfinkel et al. 1984; McGuire and Garfinkel 1980), the western slope of the southern Sierra (Dillon 1988; Gehr 1981, 1988), and various locations within Ventura and Los Angeles Counties. These trends suggest that most Late Newberry production surpluses were ultimately consumed by the relatively large population centers of coastal southern California. Whether these transformations were caused by climate change (the Medieval Climatic Anomaly), the introduction of bow-and-arrow technology, or other factors is currently an open question (McGuire et al. 2015:39-40). Large-scale surveys like the current project have the potential to contribute to our understanding of these changes by identifying temporally discrete sites in the centuries immediately before and after 1,000 years BP whose data sets include subsistence-related artifacts and floral and faunal remains. The location of the Mojave River near the project APE/API could provide resource-acquisition sites that could be useful in identifying these discrete sites.

4.5.2.2.3 Technology and Exchange

The Mojave Desert is an ideal laboratory for the study of technology and exchange due to its long occupation and ample supply of lithic and ceramic artifacts that are both chronologically sensitive and traceable to their points of origin. Changing patterns of resource use and technological advancements such as the adoption of the bow and arrow or pottery are evident in the region’s archaeological record, and the subject of longstanding problem-oriented research.

During the Late Holocene, the north-eastern portion of the Mojave Desert saw the establishment of Ancestral Puebloan (Anasazi) populations practicing agriculture and possessing ceramics along the Virgin and Muddy Rivers in Nevada (Sutton 1996:237). While this is well outside of the project area, the establishment of this population in the Mojave Desert increased trade relations between the Southwest and Pacific Coast and helped establish people living along the Mojave River as trade intermediaries (Rogers 1945:175). In addition, numerous prehistoric trails were identified by James (1987, 1996) in the Afton Canyon area, which is adjacent to the APE/API. Prehistoric sites in the APE/API have the potential to provide information about trade or migrations of populations from the east.

4.5.2.2.3.1 Obsidian Use and Exchange

The Coso volcanic fields are a large source of high-quality obsidian, and collectively represent a major source for obsidian artifacts for central and southern California through much of prehistory. For example, artifacts chemically traced to Coso were brought to the Channel Islands as early as 11,750 years BP and represent 93.7 percent of the obsidian found in island assemblages throughout prehistory (Gill et al. 2019:11-12). Coso obsidian was presumably exchanged for coastal items like marine shell beads and ornaments as a part of the Southern California Exchange Network, perhaps as well as other imported items that are found in the area such as non-local pottery, steatite beads, slate pendants, and, rarely, turquoise items (McGuire et al. 2015:45). Non-local obsidian becomes more common in the southern Owens Valley after 650 years BP, but also more heterogeneous, suggesting increasing household focus on internal subsistence and exchange pursuits, rather than village-scale trade (Eerkens and Spurling 2008). If clearly imported items are encountered during survey, placing them in time and considering them for future isotopic sourcing studies would benefit our understanding of patterns of regional exchange.

Research by Gilreath and Hildebrandt (1997) suggests that use and control of the Coso quarries changed over time, beginning with short-term use of lag deposits, shifting to intensive use of primary flows between 2,300 and 1,275 years BP, coming under strong local control between 1,275 and 800 years BP, and dropping off precipitously thereafter. A variety of reasons have been posited for this decline, including disruption of long-distance trade due to increased sedentism and territoriality, changes in demand for obsidian due to the introduction of the bow and arrow (i.e., less material was needed to make arrows as opposed to darts). It is further argued that older (often Newberry period) biface production sites could supply people in the Late period with most of the obsidian they needed, obviating the need to travel to a quarry for raw material, and perhaps minimizing the need to trade for tool stone. If scavenging commonly occurred, then it should be possible to observe multiple hydration rims on individual tools: one rim from the original surface and one from the tool’s more recent modification. This might best be tested on simple flake tools because large portions of the original flake blank often remain intact in these types of artifacts. Documenting this pattern will help improve methods for identifying Late period sites. The behavioral pattern itself is of interest, as it may help explain the decline in obsidian quarry production, a major shift in the regional archaeological record. A recent study in the Antelope Valley examined this question and found that the perceived pattern of declining obsidian use during the late Holocene was a product of sampling bias and faulty data organization, rather than a genuine cultural trend (Bark 2017). Examining whether that is the case in the desert areas east of the Antelope Valley would be a productive region of research.

4.5.2.2.3.2 The Diffusion of Pottery Innovation

Long thought to be largely exotic, ceramics are not uncommon finds in the Mojave Desert, and late twentieth century studies increasingly made a case for local manufacture based on chemical sourcing analysis, particularly in the northern Mojave (Arnold et al. 2004:46). According to recent research by Eerkens and Lipo (2014) using nearly 100 luminescence dates, western Mojave populations experimented with alternative pottery forms in the Late Holocene, making this an interesting case for studies of innovation and diffusion. Direct-rimmed ceramic pottery first appeared in the Southern Owens Valley around 950 years BP, while pottery forms using recurved rims appeared in the China Lake area to the east about 600 years BP. Direct-rimmed forms diffused to China Lake and Death Valley by 400 years BP, apparently resulting in the rapid abandonment of the recurved rim technology in favor of direct rims. Ceramics identified during the current survey, particularly rim sherds from well-dated sites, may be used to validate or refute the conclusions of the Eerkens and Lipo (2014) study over a broader geography.

There is potential for exotic material to be identified in the project area along the Mojave River. Sutton (1996:239) notes the presence of "apparent Anasazi materials" along the Mojave River in the Cronese Lakes area, which are adjacent to the APE/API

. There is debate over whether this material represents an "occupation" of the area by Anasazi or trade items. Additional finds could elucidate whether Anasazi populations were directly or indirectly influencing pottery production in the Mojave Desert.

4.5.2.3 Historic Research Domains

4.5.2.3.1 Historical Resource Types

Historical Resources are defined as any building, structure, object, site, or isolate at least 50 years of age, or less than 50 years old with exceptional significance, or having Native American religious significance. Certain resource types may be associated with specific ethnic groups within the historic-period (e.g. unpaved trails and Spanish or Mexican explorers, wagon roads and early American settlers, railroad lines and Chinese peoples). Historical Resource attributes may include, but are not limited to, the following:

- Buildings and structures of residential, commercial, industrial, and government use
- Unpaved and paved roads, including wagon trails, auto highways, any transportation or travel pathways, historic period trails, mining routes, or other
- Water and electrical power conveyance systems, including canals and transmission lines
- Native American sacred sites or other significant ethnic sites (of any age)
- Trash pits, privies, wells, and associated artifacts, surface dumps, and artifact scatters
- Isolated artifacts or isolated clusters of artifacts (metal cans, glass bottles, ceramic vessels, etc.)

4.5.3 Cultural Resources Methods

4.5.3.1 Archaeological Methods

4.5.3.1.1 Records Search Methods for Archaeological Sites

SCE consultant SWCA Environmental Consultants (SWCA) reviewed resource records and previous studies located within 0.8 kilometer (0.5 mile) of the IC Project Alignment. This information was obtained from multiple sources. SWCA conducted a records search within SCE's internal ArcGIS Online (AGOL) system, which contains results from the Southern San Joaquin Valley Information Center (SSJVIC) of the California Historical Resources Information System (CHRIS), located at California State University, Bakersfield, and the Eastern Information Center (EIC) of the CHRIS, located at the University of California Riverside. In June 2018, Material Culture Consulting, Inc. (MCC) conducted a records search at the SSJVIC and the EIC; records from San Bernardino County, which were not on file within the SCE AGOL system, were obtained from the South Central Coastal Information Center (SCCIC), located at California State University, Fullerton.

4.5.3.1.2 Native American Coordination

The Native American Heritage Commission (NAHC) maintains two databases to assist cultural resources specialists in identifying cultural resources of concern to California Native Americans. On December 7, 2018, SWCA contacted the NAHC to obtain information about known cultural and tribal cultural resources and request a list of Native American tribal representatives who may have a cultural affiliation with the IC Project area. The NAHC responded on December 28, 2018, stating that the Sacred Lands File (SLF) database includes previously identified sacred sites in the vicinity of the IC Project Alignment. In consideration of these culturally significant sacred sites, the NAHC suggested contacting two Native American tribes for more information. The NAHC also forwarded a list of 12 Native American groups or individuals that are culturally affiliated with the IC Project area. The results of the NAHC SLF search would be provided to the CPUC and BLM for use in their respective Native American consultation efforts.

4.5.3.1.3 Survey

An intensive pedestrian survey of the project APE/API for cultural resources would be conducted following the methodology described in the project Work Plan (Martinez and Wesson 2018), a draft of which was submitted to the Bureau of Land Management (BLM) for review in late November 2018. The direct APE for Section 106 and the API for CEQA for the IC Project is defined as construction areas for the IC Project. This is a 22.8-m (75-foot) buffer along the existing IC Project Alignment, which includes a total of a 45.7-m (150-foot)-wide swath for 576 km (358 miles). The direct APE/API further includes a 15.2-m (50-foot) buffer around ancillary areas needed during construction, for staging, equipment laydown, materials storage, vehicle parking, etc., as well as a 7.6-m (25-foot) buffer on all access roads needed for construction. The combined area of the direct APE/API is 8,309.8 acres, all of which would be subjected to intensive pedestrian survey for cultural resources.

SWCA would conduct a Class III pedestrian survey as defined by the California BLM Guidelines for a Cultural Resources Inventory (BLM 2009). The survey would be conducted using equally spaced parallel transects approximately 15 m in width, except when necessitated by hazardous topography, excessively dense vegetation, or other physical barriers. Transect spacing may be reduced to facilitate the recordation of features and boundaries within sites with dense vegetation (or other ground cover that limits visibility). A global positioning system (GPS) receiver with submeter accuracy and topographic maps would be used to locate previously recorded sites and APE/API boundaries, and to maintain transit accuracy. Field data would be recorded on a global positioning system (GPS) receiver with submeter accuracy and on digital forms using Samsung tablets with Android operating systems, with standard field forms available in case of equipment failure.

SWCA would collect all data necessary on new and previously recorded resources to complete the appropriate State of California Department of Parks and Recreation (DPR) Series 523 forms. Resources that were initially recorded or updated in the last 10 years that exhibit no discrepancy when compared with existing records would not be updated. SWCA would not survey areas of the APE/API where a previous survey was conducted in the last 10 years if the survey meets modern standards of adequacy.

4.5.3.1.4 National Register and California Register Evaluations

SWCA would make recommendations on NRHP/California Register of Historical Resources (CRHR) eligibility based on surface manifestations of features and visible artifact assemblages. Resources would be evaluated for their integrity and be recommended eligible or not eligible; alternatively, resources would remain unevaluated where eligibility recommendations cannot be made for sites with only survey-level data.

4.5.3.2 Built Environment Methods

For the purposes of differentiating the scope of Class III cultural resources work between the Class III Report and the Historic Built Environment Report (HBER), the historic-era built environment is defined to include any building, structure, built object, or property improvement; manmade road or circulation route; and manmade park, open space, or other scenic location which could be regarded as a designed cultural landscape. This definition includes but is not limited to single- and multifamily dwellings, commercial buildings, warehouses and other industrial and utilitarian structures, powerhouses and substations, electrical transmission lines, roads and highways, water conveyance channels and holding features, walls, railroad tracks/lines with associated infrastructure, onsite or offsite advertising signage, and agricultural or homestead properties with intact or remnant buildings, structures, and animal husbandry and containment structures.

4.5.3.2.1 Records Search Methods for the Built Environment

In July 2018 Urbana completed a desktop survey of the direct APE/API using Google Earth aerial views, historic aerial imagery, and other available data layers. A desktop survey database/spreadsheet was compiled listing all built environment improvements observed within the direct APE/API. These observed improvements were preliminarily researched to assign approximate year-built dates. Each built environment improvement was categorized as more than 45 years of age (historic-era) or less than 45 years of age (contemporary-period) to inform properties and would be photographed as part of field survey efforts. Sources used to obtain year-built dates include County Assessor data, GIS road ownership data, historic USGS topographic maps, and U.S. Department of Agriculture (USDA) aerial photography.

4.5.3.2.2 Survey

The historic built environment survey would divide the survey into two segments and photograph and observe each historic-era or potentially historic-era improvement to obtain representative views and to understand construction features and level of integrity. Urbana would document historic roads on the appropriate DPR Series 523 forms. Documentation for any archaeological resources associated with the roads would be provided by SWCA so that Urbana can augment their documentation for each road to include any associated archaeological resources. Associated archaeological resources would be considered features of a linear resource comprising both the road and associated features and reported in the HBER. Field survey photos would be processed for use in California DPR Series 523 forms and within the HBER. All newly recorded historic-era properties within the direct APE shall be documented, at a minimum, on DPR 523 A (Primary Record), B (Building, Structure, Object Record), L (Continuation Sheet, as needed), and J (Map Sheet) series forms.

4.5.3.2.3 National Register and California Register Evaluations

Each property shall be evaluated under the eligibility criteria of the NRHP, CRHR, and local registers. A CRHR status code shall be assigned to each property to indicate significance findings and eligibility conclusions. Contextual and property-specific research shall inform Urbana's eligibility findings, with the historical narrative and contexts included in the HBER. Improvements that were previously recorded prior to 2014 shall be updated or re-evaluated as needed on the appropriate DPR forms.

4.5.4 Cultural Resources Results

4.5.4.1 Records Search

SWCA reviewed the records search results from a 0.5-mile (0.8-km) buffer around the direct APE/API, which is congruent with the indirect APE/API. Tables that document these results are provided in The Work Plan Appendices E and F (Martinez and Wesson 2018). Results for those previously conducted studies and previously recorded resources that intersect the direct APE/API are presented first (Appendix E), with the remaining studies and resources within 0.5 mile (0.8 km) presented separately (Appendix F).

4.5.4.2 Previously Conducted Cultural Resource Studies within the Direct APE/API

Approximately 878 acres, or 10.6 percent of the APE/API, has been subject to survey in the past 10 years. A total of 63 intensive surveys totaling 441 acres, or 5.3 percent of the APE/API, have been conducted within the direct APE during the last 10 years. Non-intensive studies previously conducted within the direct APE include one reconnaissance survey of 116.47 acres, two monitoring projects totaling 2.31 acres, and two studies categorized as "unknown" totaling 0.34 acres. The data set includes 22 surveys with no value provided for survey type; together, these cover a total of 306.66 acres within the direct APE/API.

4.5.4.3 Previously Recorded Resources within the Direct APE/API

A total of 582 previously recorded cultural resources are present within or intersect the direct APE/API (Appendix E). Of the 582 previously recorded cultural resources present within the direct APE/API, 237 (40.7 percent) are historic, 186 (32.0 percent) are prehistoric, and 153 (26.3 percent) are multicomponent resources. The temporal affiliation of six cultural resources is unknown.

The majority (n=410, 70.4 percent) of the previously recorded cultural resources within the direct APE/API were recorded more than 10 years ago. More than one-fourth (n=156, 26.8 percent) of the cultural resources within the APE/API were recorded since 2008. Resource recording dates could not be identified for 16 resources.

4.5.4.4 Historic-Period Resources

A total of 237 cultural resources of historic age have previously been recorded in the direct APE/API. This total includes three districts, one element of a district, 130 historic archaeological sites, 42 historic structures, seven historic buildings, 53 isolates, and one historic cultural resource of unknown type.

Historic districts within the direct APE/API include the Rand Mining District, Stringer Mining District, and Crestview Subdivision. The Rand Mining District—where gold, silver, and tungsten were mined—

was part of the California Gold Rush in the late nineteenth century; the district is a California Historical Landmark (no. 938). The eligibility status of this district for listing in the NRHP is unknown. Elements of the Stringer Mining District, determined ineligible for listing in the NRHP, include a structure and debris associated with mining and habitation; its status for listing in the CRHR is unknown. Crestview Subdivision is a private, residential subdivision of Barstow with unknown status in terms of the NRHP and CRHR.

Several types of previously recorded historic structures are present within the direct APE/API. These include the AT&SF, BNSF, SPRR, San Pedro–Los Angeles and Salt Lake, and Union Pacific Railroads; Big Pine Canal and other unnamed water conveyance features; the SCE Coolwater Substation/Switchyard; several transmission lines; as well as a number of named roads and highways.

Types of historic buildings previously recorded within the direct APE include commercial, farm/ranch, and industrial buildings. Named resources include the BCHS, Cabin Bar Café and Ranch, Darr Motel, Kramer Services Corporation, and the Randsburg Substation/NOTS Railroad Spur.

Previously recorded historic archaeological sites within the direct APE/API are characterized by various feature types including privies, dumps, and trash scatters, building foundations, and linear resources. Notable historic sites in the direct APE include the Cartago Boat Landing and Soda Ash Plant; Kelly and Mohawk Mines; the Los Angeles Aqueduct; Manzanar Federal Airport, Sewer System, and War Relocation Camp; U.S. Route 66 (National Old Trails Road/Highway); the Mormon Trail; and two wagon trails, among other named sites.

4.5.4.5 Prehistoric Resources

A total of 186 previously recorded prehistoric cultural resources are located within the direct APE/API. This total includes one district, one element of this district, 109 archaeological sites, 69 isolates, and six prehistoric cultural resources of unknown type.

The Little Lake Prehistoric District that intersects with the APE/API has been recommended eligible for listing in the NRHP. Hundreds of petroglyphs and several pictographs are noted in the district as well as the presence of a small shelter with associated midden.

Previously recorded prehistoric archaeological sites within the direct APE/API several site types (Table 4.5-2). Notable prehistoric sites in the direct APE include the Coolwater Coal Site, Halloran Spring Camp Site, and Harvard Hill.

4.5.4.6 Multicomponent Resources

The direct APE/API encompasses a total of 153 previously recorded multicomponent cultural resources. This total includes one district, 139 archaeological sites, and 13 isolates that include both historic and prehistoric components. The multicomponent Last Chance Canyon Archaeological District is rich with archaeological sites such as gold mining campsites, aboriginal villages, house ring complexes, and petroglyphs. Evidence suggests an indigenous presence in the district from the Pleistocene through the historic era. This district is listed with the NRHP (no. 72000225).

Previously recorded multicomponent archaeological sites within the direct APE include various combinations of prehistoric and historic feature types and attributes. Notable multicomponent resources in the direct APE/API include the Old Mojave Road (Mojave Trail, Old Government Road), Pagunda Village Site, and Toomey Headless Horseman Site.

Table 4.5-2: Summary of Previously Recorded Prehistoric Resources within the Direct APE/API

Resource Attribute(s)	Quantity
Lithic Scatter	59
Lithic Scatter, Bedrock Milling Feature	6
Lithic Scatter, Ceramic Scatter	6
Cairns/Rock Features	4
Bedrock Milling Feature	3
Habitation Debris	3
Lithic Scatter, Hearths/Pits	3
Lithic Scatter, Quarry	3
Hearths/Pits	2
Lithic Scatter, Cairns/Rock Features	2
Lithic Scatter, Pictographs	2
Petroglyphs	2
Architectural Feature, Caches	1
Bedrock Milling Feature, Petroglyphs	1
Ceramic Scatter	1
Ceramic Scatter, Habitation Debris	1
Ceramic Scatter, Rock Shelter/Cave	1
Habitation Debris, Bedrock Milling Feature	1
Habitation Debris, Rock Shelter/Cave	1
Hearth/Pits	1
Hearths/Pits, Ceramic Scatter	1
Lithic Scatter, Cairns/Rock Features, Quarry	1
Lithic Scatter, Ceramic Scatter, Bedrock Milling Feature, Petroglyphs, Hearths/Pits	1
Lithic Scatter, Ceramic Scatter, Hearths/Pits	1
Lithic Scatter, Habitation Debris	1
Lithic Scatter, Other	1

4.5.4.7 NRHP/CRHR Eligibility Status

Within the direct APE, two cultural resources are listed on the NRHP: the Last Chance Canyon Archaeological District (NRHP no. 72000225) and the Manzanar War Relocation Center, National Historic Site (NRHP no. 76000484). The Manzanar War Relocation Center is a California State Historical Landmark (CRHR no. 850). Eligibility of resources within the direct APE for listing on the NRHP and CRHR are detailed below in Table 4.5-3, which provides counts of resources listed in each category.

Table 4.5-3: Eligibility Status of Resources within the Direct APE

Category	NRHP Status	CRHR Status
Listed	2	24
Eligible	25	2
Not Eligible	38	3
Not Evaluated	143	24
Unknown	374	529

Of the 25 previously recorded cultural resources within the direct APE/API that have been determined eligible or recommended eligible for listing in the NRHP, 12 (48 percent) are historic, seven (28 percent) are prehistoric, and six (24 percent) are multicomponent. Named resources eligible for listing in the NRHP include the AT&SF Railroad; BCHS and several individual elements of the system; BNSF Railroad; Boulder Dam–San Bernardino 115-kV Transmission Line/San Bernardino–Boulder Dam 132-kV Transmission Line; Daggett Ditch Lateral Canal; the Los Angeles Aqueduct; U.S. Route 66 (National Old Trails Road/Highway); the Pagunda Village Site; and the Tower Line segment of SCE's Kramer-Victor 115-kV Transmission Line.

Twenty-four previously recorded cultural resources within the direct APE/API are listed on the CRHR: 12 (50 percent) are historic, eight (33.3 percent) are prehistoric, and four (16.7 percent) are multicomponent. Named resources eligible for listing in the CRHR include the AT&SF Railroad; BCHS and several individual elements of the system; Boulder Dam–San Bernardino 115-kV Transmission Line/San Bernardino–Boulder Dam 132-kV Transmission Line; Coolwater Tiefort 115-kV Transmission Line; Daggett Ditch Lateral Canal; the Los Angeles Aqueduct; U.S. Route 66 (National Old Trails Road/Highway); the Pagunda Village Site; and the Tower Line segment of SCE's Kramer-Victor 115-kV Transmission Line. The two cultural resources recommended eligible for listing in the CRHR are both historic structures (BNSF Railroad and the Mormon Trail).

4.5.4.8 Previously Conducted Cultural Resource Studies within the Indirect APE/API

A total of 344 cultural resource studies have been previously conducted within the indirect APE, defined as a 0.5-mile (0.8-km) buffer around the direct APE (Appendix F). Most of these studies (n=245, 71.2 percent) were conducted more than 10 years ago. The remainder (n=65, 18.9 percent) was conducted from 2009 to the present. Dates of work conducted are unknown for 9.9 percent (n=34) of the studies.

4.5.4.9 Previously Recorded Resources within the Indirect APE/API

A total of 1,926 previously recorded cultural resources are present within 0.5 mile (0.8 km) of the direct APE (see Appendix F).

4.5.4.9.1 Time Periods

Of the 1,926 previously recorded cultural resources present within the indirect APE/API, 1,093 (56.7 percent) are prehistoric, 699 (36.3 percent) are historic, and 118 (6.1 percent) are considered multicomponent sites, as they include both historic and prehistoric components. The temporal affiliation for 16 resources was not identified.

The previously recorded resources within the indirect APE/API include six districts, 11 elements of a district, 54 historic buildings, 50 historic structures, one historic object, 1,142 archaeological sites, 658 isolates, and five resources for which no information was available. The districts include Fossil Falls (P-14-006028; NRHP no. 80004492 and CRHR no. N888) and Atlatl Cliffs (P-14-000389) in Kern County, and the townsites of Daggett/Calico (P-36-0265310) and Yermo (P-36-029386), as well as the Grandview Subdivision (P-36-026529) and the Crestview Subdivision (P-36-026530) in San Bernardino County.

4.5.4.9.2 NRHP/CRHR Eligibility Status

Within the indirect APE/API, 45 resources were identified as either listed on the NRHP (n = 12) or otherwise described as eligible for listing (n = 33). CRHR eligibility was cited for only four resources, which were already identified as listed on the NRHP. The remaining resources are listed as not eligible (n = 148) or unevaluated (n = 1733). Table 4.5-4 below summarizes the NRHP/CRHR-listed resources identified within the indirect APE.

Table 4.5-4: NRHP-Listed Resources Identified within the Indirect APE/API

Category	**NRHP Status**	**CRHR Status**
Primary No.	Resource Name	Description
14-001482	N/A	Lithic Scatter
14-001634	Rock Ring Village	Habitation Debris, Bedrock Milling Feature
14-001635	Fossil Falls Shelter	Rock Shelter/Cave, Lithic Scatter
14-001650	Parking Lot Rock Shelter	Petroglyphs, Rock Shelter/Cave
14-001651	Orange Paint Shelter	Rock Shelter/Cave, Bedrock Milling Feature
14-001669	Chipping Circle Site	Habitation Debris
14-001671	N/A	Bedrock Slick, Lithic Scatter
14-006028	Fossil Falls Archaeological District	
14-001648	N/A	Bedrock Milling Feature, Lithic Scatter
14-005254	Manzanar War Relocation Camp	Roads/Trails/Railroad Grades, Other
14-005255	Manzanar War Relocation Camp	Lithic Scatter, Other
14-005257	Manzanar War Relocation Camp	Foundations/Structure Pads, Privies/Dumps/Trash Scatters
14-000043	N/A	Lithic Scatter, Bedrock Milling Feature, Other
14-000124	N/A	Privies/Dumps/Trash Scatters, Hearths/Pits
14-000215	N/A	Lithic Scatter
14-000384	N/A	Lithic Scatter
14-001428	N/A	Habitation Debris
14-002243	N/A	Foundations/Structure Pads, Privies/Dumps/Trash Scatters
14-002323	N/A	Unknown
14-002325	N/A	Rock Shelter/Cave, Other
14-002329	N/A	Lithic Scatter, Walls/Fences
14-003645	N/A	Bedrock Milling Feature, Lithic Scatter
14-003769	N/A	Habitation Debris, Hearths/Pits
14-004550	N/A	Unknown
14-004554	N/A	Lithic Scatter
14-005194	Carson & Colorado Railroad	Roads/Trails/Railroad Grades
14-005260	Manzanar War Relocation Camp	Lithic Scatter, Ceramic Scatter
14-005739	N/A	Unknown
14-005745	N/A	Unknown
14-007009	Whos Stuck	Lithic Scatter
36-004212	N/A	Unknown
36-006017	N/A	Lithic Scatter, Hearths/Pits
36-006018	N/A	Privies/Dumps/Trash Scatters, Lithic Scatter

4.5.4.10 Native American Consultation

California Public Resources Code (PRC) Section 5097.91 established the Native American Heritage Commission (NAHC), the duties of which include taking inventory of places of religious or social significance to Native Americans and identifying known graves and cemeteries of Native Americans on private lands. PRC Section 5097.98 specifies a protocol to follow when the NAHC is notified of a discovery of Native American human remains from a county coroner.

SWCA contacted the NAHC on December 7, 2018, with a request for a search of its Sacred Lands File (SLF) within the IC Project area. A search of the SLF was completed for the project with positive results. Initial tribal outreach letters were sent by the CPUC to 39 tribal contacts on December 14, 2018, with a fact sheet summarizing the IC Project. Follow-up email messages were sent on December 16 and 24, 2018.

See Section 4.18, Tribal Cultural Resources, for a discussion on cultural resources of potential importance to California Native American tribes.

4.5.4.11 Survey

Information regarding the intensive pedestrian survey of the project APE/API and the findings of the survey would be made available following completion of the survey and agency approval of the associated technical report.

4.5.5 Cultural Resources Regulatory Setting

Federal, state, and local regulations were reviewed for applicability to the IC Project.

4.5.5.1 Federal

A federal undertaking is a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license, or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency (36 Code of Federal Regulations [CFR] 800.16[y]). Actions and undertakings may take place either on or off federally controlled property and include new and continuing projects, activities, or programs and any of their elements not previously considered under the National Environmental Policy Act (NEPA) and Section 106 of the NHPA. If the project requires federal water permitting or is located on federal lands, it is subject to compliance with NEPA and Section 106 of the NHPA. In addition to the federal regulations described in the following subsections, federal authorizations would also be required because portions of the IC Project area are under the jurisdiction of the Department of the Interior's BLM, the Department of Defense (DoD), or the National Park Service.

4.5.5.1.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires the federal government to carry out its plans and programs in such a way as to "preserve important historic, cultural, and natural aspects of our national heritage" (42 United States Code [USC] Section 4331[b][4]). The intent of the statute is to require that agencies obtain sufficient information regarding historic and cultural properties (including consulting, for example, appropriate members of the public; local, state and other federal government agencies; and Native American tribes, organizations, and individuals) to make a determination of the historical and cultural significance of affected historic or cultural properties and to take into account whether irreversible adverse impacts to such resources can or should be avoided, minimized, or mitigated.

4.5.5.1.2 National Historic Preservation Act

Enacted in 1966 and amended most recently in 2014, the National Historic Preservation Act (NHPA; 54 USC 300101 et seq.) instituted a multifaceted program, administered by the Secretary of the Interior, to encourage sound preservation policies of the nation's cultural resources at the federal, state, and local levels. The NHPA authorized the expansion and maintenance of the NRHP, established the position of State Historic Preservation Officer (SHPO), and provided for the designation of State Review Boards. The NHPA also set up a mechanism to certify local governments to carry out the goals of the NHPA, assisted Native American tribes in preserving their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

4.5.5.1.2.1 Section 106

Section 106 of the NHPA requires federal agencies to consult with the ACHP to take into account the effects of their undertakings on historic properties. The Section 106 process involves identification of significant historic resources within an "area of potential effects [APE]; determination if the undertaking will cause an adverse effect on historic resources; and resolution of those adverse effects through execution of a Memorandum of Agreement." Title 36 of the Code of Federal Regulations (CFR) part 800 defines how federal agencies meet these responsibilities. 36 CFR 800.5(a) describes the process for evaluating a project's adverse effects on cultural resources. An adverse effect is found when a federal undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Examples of adverse effects are provided in 36 CFR 800(a)(2) and include, but are not limited to:

- Physical destruction of or damage to all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

4.5.5.1.3 National Register of Historic Places

The National Register of Historic Places (NRHP) was established by the NHPA of 1966 as "an authoritative guide to be used by federal, state, and local governments, private groups and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (36 CFR part 60.2). The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, and association.

A property is eligible for the NRHP if it is significant under one or more of the following criteria:

- Criterion A: It is associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: It is associated with the lives of persons who are significant in our past.
- Criterion C: It embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: It has yielded, or may be likely to yield, information important in prehistory or history. Ordinarily cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their

original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions. In general, a resource must be 50 years of age to be considered for the NRHP unless it satisfies a standard of exceptional importance.

In addition to meeting the significance criteria, a property must retain historic integrity, which is defined in the National Register Bulletin 15 as the "ability of a property to convey its significance" (National Park Service 1990). To assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity. To retain integrity, a property must possess several, if not all, of these seven qualities, which are defined in the following manner in National Register Bulletin 15:

- Location: the place where the historic property was constructed or the place where the historic event occurred
- Design: the combination of elements that create the form, plan, space, structure, and style of a property
- Setting: the physical environment of a historic property
- Materials: the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property
- Workmanship: the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory
- Feeling: a property's expression of the aesthetic or historic sense of a particular period of time; and/or
- Association: The direct link between an important historic event or person and a historic property

A cultural resource that meets the definition provided, meets at least one of the criteria listed above, and meets at least several qualities of historic integrity is considered eligible for listing in the NRHP and is referred to as a "historic property."

4.5.5.1.4 Archaeological Resources Protection Act

The Archaeological Resources Protection Act (ARPA) of 1979 provides for the protection of archaeological resources more than 100 years old and that occur on federally owned or controlled lands. The statute makes it unlawful to excavate and remove items of archaeological interest from federal lands without a permit, and it defines the process for obtaining such a permit from the responsible federal agency. This process includes a 30-day notification to interested persons, including Native American tribes, by the agency to receive comments regarding the intended issuing of a permit. The law establishes a process for prosecuting persons who illegally remove archaeological materials from lands subject to ARPA. The law also provides for curation of archaeological artifacts, ecofacts, notes, records, photographs, and other items associated with collections made on federal lands. Standards for curation are provided for in regulations at 36 CFR 79.

4.5.5.1.5 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) provides a process for museums and federal agencies to return certain Native American "cultural items" (i.e., human remains, funerary objects, sacred objects, and objects of cultural patrimony) to lineal descendants, culturally affiliated Native American tribes (i.e., tribes recognized by the Secretary of the Interior), and Native Hawaiian organizations, if the legitimate cultural affiliation of the cultural items can be determined according to the law. Museums, as defined under the statute, are required to inventory cultural items in their possession and determine which items can be repatriated to the appropriate party. Cultural items intentionally or unintentionally excavated and removed from federal lands may be subject to NAGPRA.

Under the NAGPRA regulations (43 CFR 10.3 and 10.5), a federal agency must prepare, approve, and sign a Plan of Action (POA) if the agency intends to excavate or remove, or leave in place NAGPRA cultural items when these cultural items are exposed or are found already exposed, and does not wish for activity in the area of the exposed cultural items to halt.

4.5.5.2 State

4.5.5.2.1 California Public Utilities Commission (CPUC) General Order 131-D

Pursuant to CPUC General Order (GO) 131-D, the California Public Utilities Commission (CPUC) has sole and exclusive jurisdiction over the siting and design of electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities in the state of California. Under CEQA, the CPUC is the lead agency for such IC Project elements within the state of California. SCE is required to comply with GO 131-D and is seeking a Permit to Construct (PTC) from the CPUC for the IC Project; therefore, compliance with CEQA and other state environmental statutes involving cultural resources is required. The CPUC is tasked with compliance of all provisions in CEQA and the CEQA Guidelines that concern cultural resources as explained below.

4.5.5.2.2 California Environmental Quality Act

The California Environmental Quality Act (CEQA) Statute and Guidelines direct lead agencies to determine whether cultural resources are "historically significant" resources. CEQA requires that potential project impacts to cultural resources be assessed, and requires mitigation if significant (or "unique") cultural resources would be affected (Section 21083.2 [a-1] and CEQA Guidelines Appendix G). Generally, a cultural resource is considered "historically significant" if the resource is 45 years old or older; possesses integrity of location, design, setting, materials, workmanship, feeling, and association; and meets the requirements for listing on the CRHR under any one of the following criteria:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or,
4) Has yielded, or may be likely to yield, information important in prehistory or history (Title 14 California Code of Regulations [CCR] Section 15064.5).

The statutes and guidelines specify how cultural resources are to be managed in the context of projects, such as the IC Project. Briefly, archival and field surveys must be conducted, and identified cultural resources must be inventoried and evaluated in prescribed ways. Prehistoric and historical archaeological resources as well as historic built environment resources deemed "historically significant" must be considered in project planning and development. Resources eligible for listing on the CRHR are referred to as "historical resources."

If a Lead Agency determines that an archaeological site is a historical resource, the provisions of PRC Section 21084.1 and CEQA Guidelines Section 15064.5 would apply. If an archaeological site does not meet the CEQA Guidelines criteria for a historical resource, the site is to be treated in accordance with the provisions of PRC Section 21083 regarding unique archaeological resources. The CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of a project on that resource shall not be considered a significant effect on the environment (CEQA Guidelines Section 15064[c][4]).

CEQA Guidelines Section 15064.5(e), Assembly Bill 2641, Public Resources Code Sections 15064.5(e) and 15064.5(d), and Health and Safety Code Section 7050.5

If human remains of any kind are found during construction activities on non-federal or reservation land, these codes require that ground-disturbing project activities be stopped in the immediate vicinity of the discovery and that the county coroner be called in to assess the remains. The coroner will examine the remains and determine the next appropriate action based on his or her findings. If the county coroner determines that the remains to be of Native American origin, the coroner must contact the NAHC within 24 hours. The NAHC will then identify a most likely descendant (MLD) to be consulted regarding treatment and/or reburial of the remains.

4.5.5.2.2.1 Area of Potential Impact

Under CEQA, the impact area is defined as the geographic area or area within which a project may directly or indirectly cause alterations in the character or use of significant historical or archaeological resources. In the current document, area of potential impact (API) is used for this term.

4.5.5.2.3 California State Assembly Bill 52

California State Assembly Bill 52 (AB 52) of 2014 amended PRC Section 5097.94 and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3.

AB 52 formalizes the lead agency/tribal consultation process, requiring the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with the project, including tribes that may not be federally recognized. Lead agencies are required to begin consultation prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report.

Section 4 of AB 52 adds Sections 21074(a) and 21074(b) to the PRC, which address tribal cultural resources and cultural landscapes. Section 21074(a) defines tribal cultural resources as one of the following:

1. Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
   a. Included or determined to be eligible for inclusion in the CRHR
   b. Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

Section 1 (a)(9) of AB 52 establishes that "a substantial adverse change to a tribal cultural resource has a significant effect on the environment." Effects on tribal cultural resources should be considered under CEQA. Section 6 of AB 52 adds Section 21080.3.2 to the PRC, which states that parties may propose mitigation measures "capable of avoiding or substantially lessening potential significant impacts to a tribal cultural resource or alternatives that would avoid significant impacts to a tribal cultural resource." Further, if a California Native American tribe requests consultation regarding project alternatives, mitigation measures, or significant effects to tribal cultural resources, the consultation shall include those topics (PRC Section 21080.3.2[a]). The environmental document and the mitigation monitoring and reporting program (where applicable) shall include any mitigation measures that are adopted (PRC Section 21082.3[a]).

4.5.5.2.4 California Register of Historical Resources

Created in 1992 and implemented in 1998, the California Register of Historical Resources (CRHR) is "an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Sections 21083.2 and 21084.1). Certain properties, including those listed in or formally determined eligible for listing in the NRHP and California Historical Landmarks numbered 770 and higher, are automatically included in the CRHR. Other properties recognized under the California Points of Historical Interest program, identified as significant in historical resources surveys, or designated by local landmarks programs, may be nominated for inclusion in the CRHR. According to PRC Section 5024.1(c), a resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission determines that it meets one or more of the following criteria, which are modeled on NRHP criteria:

- Criterion 1: It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
- Criterion 2: It is associated with the lives of persons important in our past.
- Criterion 3: It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- Criterion 4: It has yielded, or may be likely to yield, information important in history or prehistory.

Resources nominated to the CRHR must retain enough of their historic character or appearance to convey the reasons for their significance. Resources whose historic integrity does not meet NRHP criteria may still be eligible for listing in the CRHR.

4.5.5.2.5 Treatment of Human Remains

The disposition of burials falls first under the general prohibition on disturbing or removing human remains under California Health and Safety Code (CHSC) Section 7050.5. More specifically, remains suspected to be Native American are treated under CEQA at CCR Section 15064.5; PRC Section 5097.98 illustrates the process to be followed in the event that remains are discovered. If human remains are discovered during construction, no further disturbance to the site shall occur, and the County Coroner must be notified (CCR 15064.5 and PRC 5097.98).

All work reported here was conducted in conformance with the stipulations of SWCA's U.S. DOI BLM Cultural Resources Use Permit (CRUP) Authorization CA-17-23. All work was also conducted in conformance with SCE's Environmental, Health and Safety Handbook for Contractors (2016).

4.5.5.3 Local

The California Public Utilities Commission (CPUC) has sole and exclusive state jurisdiction over the siting and design of the IC Project. Pursuant to CPUC General Order 131-D (GO 131-D), Section XIV.B, "Local jurisdictions acting pursuant to local authority are preempted from regulating electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities subject to the CPUC's jurisdiction. However, in locating such projects, the public utilities shall consult with local agencies regarding land use matters." Consequently, public utilities are directed to consider local regulations and consult with local agencies, but the counties' and cities' regulations are not applicable as the counties and cities do not have jurisdiction over the IC Project. Accordingly, the following discussion of local land use regulations is provided for informational purposes only.

General plans and municipal codes were reviewed for relevant local policies pertaining to cultural resources in the vicinity of the IC Project. General plans reviewed included preservation programs for Inyo, Kern, and San Bernardino counties; the Daggett Community Plan; and the City of Barstow Historic Preservation Program. Relevant goals, policies, and objectives are discussed in the following subsections.

4.5.5.3.1 Inyo County Historic Preservation Program

There are several preservation ordinances that apply under the Inyo County Code (ICC). Pursuant to Section 9.52.030, no publicly or privately sponsored project or action shall be expressly permitted by the county planning commission, hereinafter, the County Commission, or any other county agency where the County Commission finds that any archaeological, paleontological, and historical features, or Native California Indian burial sites may be disturbed in any way by the project or action. Further, there is a stipulation that no plan shall be sufficient, and no plan shall be approved by the County Commission unless the plan, in addition to proposed preservation, protection, or relocation measures, shall propose reasonable alternatives to the proposed project or action that do not require significant disturbance of the features or sites.

Chapter 9.52 of the ICC covers the disturbance of archaeological, paleontological, and historical features. Pursuant to ICC Chapter 9.52, the excavation or exploration for archaeological, educational, or artifact collection purposes of any Native California Indian burial site is prohibited. In addition, when archaeological or historical evidence indicates that a site was set aside for a Native California Indian burial site, all plans for a project that may cause disturbance must be submitted to the Big Pine Paiute Tribe of the Owens Valley, the Bishop Paiute, the Death Valley Timbisha Shoshone Tribe, the Fort Independence Indian Community of Paiute Indians, the Lone Pine Paiute–Shoshone Tribe, the Owens Valley-Paiute-Shoshone Band, or other representatives for review and comment.

The ICC covers Native California Indian burial sites. If one such site is discovered in the course of a project development, the person responsible for the project must notify the County Commission and interested California Native Indians in the county. The County Commission will weigh the archaeological, paleontological, or historical value of the burial site against the economic detriment to the project; based on the outcome, either the project or the burial site may be relocated.

4.5.5.3.2 Kern County Historic Preservation Program

Policies and implementation measures for cultural resources are contained within the Land Use Element of the Kern County General Plan, within Section 1.10.3 “Archaeological, Paleontological, Cultural, and Historical Preservation.”

Kern County Policy: The County will promote the preservation of cultural and historic resources that provide ties with the past and constitute a heritage value to residents and visitors.

4.5.5.3.3 San Bernardino County Historic Preservation Program

The County of San Bernardino regulates the identification, protection, and appropriate treatment of historical resources and historic properties through the General Plan Cultural Resources Element, Cultural Resources Preservation Overlay, and San Bernardino County Development Code.

Goals and policies for cultural resources, including historic buildings and properties, are included within the Conservation Element of the San Bernardino County General Plan.

Established under Development Code Section 82.01.020 and Section 82.01.030, the Cultural Resources Preservation Overlay (CRPO) provides for the identification and preservation of important archaeological and historical resources as many are regarded as unique and non-renewable, and their preservation provides a greater knowledge of County history and identity for the benefit of future generations. The

CRPO may be applied to areas where archaeological and historic sites that warrant preservation are known to be present, or are likely, to be present.

Currently, the CRPO map only covers the Oak Hills, Phelan, and Pinon Hills area of San Bernardino County. An overlay does not exist for the proposed IC Project area.

4.5.5.3.4 Daggett Community Plan

The Daggett Community Plan (DCP) is a specific plan intended to guide the future character and independent identity of the unincorporated community of Daggett. Emphasizing the importance on local history, the values statement of the DCP cites its first value as “Community Pride and History. The community takes pride in its people and its heritage. Daggett values its heritage and works to remember, preserve and document its historical roots as it looks to the future.”

4.5.5.3.5 City of Barstow Historic Preservation Program

The City of Barstow maintains goals, policies, and implementation strategies relating to the protection and enhancement of historical and cultural resources within the Resources Conservation and Open Space Element of the General Plan, and also outlines procedures for the review of discretionary and non-discretionary projects within the Resources Conservation and Open Space Element of the General Plan. The City also provides a cultural resources sensitivity map to inform project applicants of the potential for the occurrence of historical and cultural resources within the City’s jurisdiction. The sensitivity map defines areas that have been the subject of cultural evaluations, as well as areas requiring additional study should they be significantly impacted by future development.

4.5.6 Cultural Resources Significance Criteria

CEQA, its Guidelines, and other provisions of the PRC call for the protection and preservation of significant cultural resources (i.e., “historical resources” and “unique archaeological resources”). The CEQA Guidelines provide three ways in which a resource can be a “historical resource,” and thus a cultural resource meriting analysis:

1. The resource is listed on the CRHR;
2. The resource is included in a local register of historical resources (pursuant to PRC Section 5020.1[k]), or identified as significant in an historical resources survey (meeting the criteria in PR Section 5024.1[g]); or
3. The lead agency determines the resource is “historically significant” by assessing CRHR listing guidelines that parallel the federal criteria (CEQA Guidelines Section 15064.5[a][1]–[3] [as amended]).

To qualify as a historical resource under 1) or 3), the resource must also retain the integrity of its physical identity that existed during its period of significance. Integrity is evaluated with regard to retention of location, design, setting, materials, workmanship, feeling, and association (14 CCR 4852[c]).

Finally, under both federal and California state law, Native American human remains and associated grave goods are granted special consideration. Direct and indirect impacts only to historic properties (NRHP) and historical resources (CRHR) are considered in the assessment. Management of cultural resources not eligible for listing in the NRHP or CRHR is not required (36 CFR 800 and Section 15064.5[c][4] of the CEQA Guidelines [as amended]).

The significance criteria for assessing the impacts to cultural resources come from the CEQA Environmental Checklist and states that a project causes a potentially significant impact if it would:

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5;
- Cause a substantial adverse change in the significance of an archeological resource pursuant to Section 15064.5; and/or
- Disturb any human remains, including those interred outside of formal cemeteries.

4.5.7 Cultural Resources Impact Analysis

CEQA guidelines specify that a "substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines Section 15064.5). Material impairment occurs when a project alters in an adverse manner or demolishes "those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion" or eligibility for inclusion in the NRHP, CRHR, or local register. In addition, pursuant to CEQA Guidelines section 15126.2, the "direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

The following guides and requirements are of particular relevance to this study's analysis of indirect impacts to historic resources. Pursuant to CEQA Guidelines (Section 15378), study of a project under CEQA requires consideration of "the whole of an action, which has the potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." CEQA Guidelines (section 15064[d]) further defines direct and indirect impacts as follows:

1. A direct physical change in the environment is a physical change in the environment which is caused by and immediately related to the project.
2. An indirect physical change in the environment is a physical change in the environment which is not immediately related to the project, but which is caused indirectly by the project. If a direct physical change in the environment in turn causes another change in the environment, then the other change is an indirect physical change in the environment.
3. An indirect physical change is to be considered only if that change is a reasonably foreseeable impact which may be caused by the project.

In terms of archaeological resources, PRC Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

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

If it can be demonstrated that a proposed project would cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (PRC Sections 21083.2[a], [b], and [c]). CEQA notes that if an archaeological resource is neither a unique archaeological resource nor a historical resource, the effects of the project on those resources shall not be considered to be a significant effect on the environment (CEQA Guidelines section 15064.5[c][4]).

4.5.7.1 Would the project cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

4.5.7.1.1 Construction

This analysis would be provided under separate cover following completion of pedestrian surveys and approval of technical report(s) by the responsible agency(ies).

4.5.7.1.2 Operation

Less than Significant Impact. Normal operation and maintenance (O&M) of subtransmission lines would be controlled remotely through SCE control systems, and manually in the field as required. Maintenance would occur as needed and could include activities such as repairing conductors, washing or replacing insulators, repairing or replacing other hardware components, replacing poles, tree trimming, brush and weed control, and access road maintenance. Most regular O&M activities of overhead facilities are performed from existing access roads with no surface disturbance. Repairs to facilities, such as repairing or replacing poles and structures, could occur in undisturbed but previously surveyed areas. Therefore, operation impacts to historical resources as defined in Section 15064.5 would be less than significant.

4.5.7.2 Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

4.5.7.2.1 Construction

This analysis would be provided under separate cover following completion of pedestrian surveys and approval of technical report(s) by the responsible agency(ies). This analysis will include a buried sensitivity analysis, where appropriate and needed.

4.5.7.2.2 Operation

Less than Significant Impact. Normal operation of substation, transmission, subtransmission, distribution, and telecommunications lines would be controlled remotely through SCE control systems, and manually in the field as required. Maintenance would occur as needed and could include activities such as repairing conductors, washing or replacing insulators, repairing or replacing other hardware components, replacing poles, tree trimming, brush and weed control, and access road maintenance. Most regular O&M activities of overhead facilities are performed from existing access roads with no surface disturbance. Repairs to facilities, such as repairing or replacing poles and structures, could occur in undisturbed, but previously surveyed areas. Therefore, operation impacts to archaeological resources as defined in Section 15064.5 would be less than significant.

4.5.7.3 Would the project disturb any human remains, including those interred outside of dedicated cemeteries?

4.5.7.3.1 Construction

Less than Significant Impact with Mitigation. The cultural resources inventory identified human remains and the potential for human remains in select areas of the IC Project area. Through mitigation, all known burial features and potential locations of human remains would be avoided during ground-disturbing construction activities. Mitigation will include changing the construction location, construction methods, and other impacts to avoid known or potential human remains. The presence of both archaeological and Native American monitors may also be warranted.

Additionally, it is possible that human remains (beyond those identified and those potentially identified during survey), could be uncovered. It is not always possible to predict where Native American human remains might occur outside of formal cemeteries. Ground-disturbing activities could disturb human remains, including those interred outside of formal cemeteries. However, implementation of a Workers Environmental Awareness Program (WEAP) would help workers identify potential human remains and establish procedures for stopping work and notifying SCE's cultural resource staff and construction supervisors in the event that human remains are detected.

If human remains are inadvertently discovered during construction activities, all work in the vicinity of the find would cease within a 100-foot (30.5-m) radius of the remains, and the area would be secured and protected to ensure that no additional disturbance occurs. The county coroner would then be contacted in accordance with CEQA Guidelines Section 15064.5(e), AB 2641, PRC Sections 15064.5(e) and 15064.5(d), and California Health and Safety Code (HSC) Section 7050.5. The coroner would have two working days to examine the remains after being notified. If the coroner determines that the remains are Native American (i.e., not subject to the coroner's authority) and located on private or state land, the coroner has 24 hours to notify the NAHC of the determination. The NAHC is required under PRC Section 5097.98 to identify an MLD, notify that person, and request that they inspect the remains and make recommendations for treatment and/or disposition. The MLD would have 48 hours to inspect the find and make recommendations for treatment of the human remains. Work would be suspended in the area of the find until the MLD and landowner confer on the mitigation and treatment of the human remains. However, the human remains and associated burial items would be reburied, with appropriate dignity, on the property in a location not subject to further subsurface disturbance if one of the following occurs:

- The NAHC is unable to identify an MLD.
- The MLD identified fails to make a recommendation.
- The recommendation of the MLD is rejected and the mediation provided in PRC Section 5097.94(k) fails to provide measures acceptable to the landowner.

This procedure would ensure that the remains are treated in accordance with Section 15064.5(d) and (e) of the CEQA Guidelines, California HSC Section 7050.5, and PRC Sections 5097.98 and 5097.99.

As described in Section 4.5.4, Cultural Resources Regulatory Setting, cultural resources intentionally or unintentionally excavated and removed from federal lands may be subject to NAGPRA if the resources are confirmed to be of Native American origin. In the event that Native American items are inadvertently discovered on federal lands, NAGPRA requires that the responsible federal agency must be immediately notified by telephone and in writing. Following the receipt of the written notification, the federal agency must certify the receipt of it within three days. The activity that resulted in the discovery must be stopped immediately after discovery and may not resume until 30 days after the applicable federal agency certifies the receipt of the notification. The federal agency would also be responsible for taking immediate steps, if necessary, to further secure and protect the remains and/or items that were discovered. During this process, the federal agency would notify any MLDs or applicable Native American tribes of the discovery, obtain written confirmation of the notification, and initiate consultation, if necessary. Following consultation, the federal agency would prepare, approve, and sign a written NAGPRA POA (43 CFR 10.3 and 10.5), which would specify the treatment, care, and handling of the discovered remains and cultural resources.

SCE would comply with the applicable regulations to ensure the protection of human remains and burial sites during construction. Based on implementation of APM WEAP and APMs CUL-1, CUL-2, CUL-3, CUL-4, and CUL-5, and the consideration of sites that may contain human remains during the final design of the IC Project, impacts to human remains during construction would be reduced to less-than-significant levels.

4.5.7.3.2 Operations

Less than Significant Impact. O&M activities for subtransmission lines would include repairing conductors, washing or replacing insulators, repairing or replacing other hardware components, replacing poles and towers, tree trimming, brush and weed control, and access road maintenance. O&M activities would also include routine inspections and emergency repair, which would require the use of vehicles and equipment, and are typically short term in nature. Ground disturbance during O&M activities could occur in previously disturbed or potentially undisturbed but previously surveyed areas. However, O&M activities would have a low potential to encounter human remains, if any are present. If human remains are discovered during O&M activities of the IC Project, work would stop, best management practices similar to those previously outlined would be implemented, and the remains would be treated in accordance with applicable laws. Therefore, any potential impacts would be less than significant.

4.5.8 Paleontological Resources Environmental Setting

The IC Project Alignment is within California's Basin and Range and Mojave Desert geomorphic provinces. Within California, the Basin and Range Geomorphic Province is bordered on the west by the Sierra Nevada, on the southeast by the Mojave Desert, and on the northeast by the Nevada border (Harden 2004). The Mojave Desert Geomorphic Province is bound on the southwest by the San Andreas Fault Zone and the Transverse Ranges; on the north and northeast by the Garlock Fault, the Tehachapi Mountains, and the Basin and Range; and on the south by the Colorado Desert (Harden 2004; Norris and Webb 1990).

Both geomorphic provinces share a similar and related geologic history until the Neogene (approximately 23.5 million years ago), when younger structural deformation from faulting and volcanic activity changed the two related provinces. Within both geomorphic provinces, the oldest rocks consist of a complex of early to middle Proterozoic schists and gneisses of sedimentary origin with associated granitic rocks, some of which date to 2.5 to 1.7 billion years ago (Hall 2007; Norris and Webb 1990). The overlying younger Proterozoic rocks consist of regularly bedded conglomerates, sandstones, siltstones, shales, limestones, and dolomites deposited as nearshore marine sediments near the continental shelf edge as subsidence and supercontinental divergence occurred at this time (Hall 2007; Norris and Webb 1990).

The Basin and Range contains thick sections of marine siliciclastic and carbonaceous sedimentary rocks of latest Proterozoic to Paleozoic age, particularly in the Death Valley and Inyo mountains, the latter of which contains the thickest Paleozoic section in California's Basin and Range, with an aggregate thickness of approximately 7,010 meters (23,000 feet), nearly half of which is of Cambrian age (Norris and Webb 1990). Deposition of thick strata representative of most Paleozoic periods implies relatively continuous sedimentary deposition in a tectonically stable setting, with the deposition of limestone and dolomite implying shallow, warm paleoenvironments throughout the Paleozoic (Hall 2007; Harden 2004; Norris and Webb 1990). Unlike within the Basin and Range, the Mojave Desert province yields only partial Paleozoic sections, which are mainly present within its eastern ranges and are relatively thinner than those exposed in the Basin and Range province and divided by unconformities. For example, the lower Paleozoic of the Mojave Desert is represented by less than 1,524 meters (5,000 feet) thick of cumulative rock, with no continuous sections greater than 762 to 914 meters (2,500 to 3,000 feet) thick throughout most of the province; however, the thickest marine Paleozoic section within the Mojave Desert is exposed in the Providence Mountains, totaling approximately 3,050 meters (10,000 feet) thick, and Upper Paleozoic strata are recognized in the Ord Mountains and near Victorville (Hall 2007). Thick Paleozoic rock sections, specifically those of Cambrian age in the Basin and Range province, have been important for understanding the adaptation and evolution of shelled forms and the rapid evolution and diversification of marine life during the "Cambrian Radiation" and metazoan evolution during the early to middle Paleozoic.

Throughout the Paleozoic and into the early Mesozoic, shallow seas and low lands persisted in the area, with the rifting away of the Mojave region west of Barstow, giving rise to the recognizable north-south coastline of California (Hall 2007). Shallow seas transgressed and regressed repeatedly over mudflat low lands throughout the Triassic. By the late Triassic and early Jurassic, the seas had regressed to the northwest during orogenic and volcanic activities associated with the Sierra Nevada, Owens Valley, and Inyo Mountains in the Basin and Range province (Norris and Webb 1990), and arid conditions became widespread within the Mojave Desert province, depositing nonmarine deposits such as eolian red sands (Hall 2007). Throughout the middle of the Mesozoic era, erosion and nondeposition persisted until the middle to late Cretaceous when granitic intrusions developed due to tectonic subduction and subsequently caused contact metamorphism of the rocks surrounding the intrusions (Hall 2007; Norris and Webb 1990). Within the Mojave Desert, continued orogenic activity associated with the neighboring ranges thrust older rocks eastward on top of younger strata during the Cretaceous, but by the end of the Mesozoic, Nevadan orogenic activities and erosion reduced the Mojave and the Sierra Nevada to relatively lower topographic relief (Hall 2007; Harden 2004; Norris and Webb 1990; Prothero 2017).

Widespread erosion and/or nondeposition persisted from the late Cretaceous to the Oligocene in both provinces, representing a significant unconformity (Hall 2007; Norris and Webb 1990). However, by the Oligocene, sediment deposition resumed in both the Basin and Range and Mojave Desert geomorphic provinces, with nonmarine sediments deposited in the savanna-type environment with moderately moist climates, water-retaining vegetation, and numerous vertebrate fossils (Norris and Webb 1990). From the Oligocene to the Miocene, both provinces became increasingly more arid, and nonmarine basinal deposition became widespread. In addition, both provinces became increasingly more tectonically active, with structural extension and faulting increasing throughout the Miocene. Structural extension caused the creation of basins and ranges, as well as volcanoes in the southern Nevada (Hall 2007). Within the Basin and Range province, crustal extension occurred simultaneously with the transition from oblique subduction near the continental margin to transform faulting along the San Andreas fault system (Hall 2007; Norris and Webb 1990). Due to increased tectonics, the Mojave Desert block was uplifted by 3,050 to 4,572 meters (10,000 to 15,000 feet) by the late Miocene, with some basins accruing at least 10,000 feet of nonmarine sedimentary deposits overlying pre-Cretaceous basement rocks (Hall 2007). Tectonic extension in both provinces during the Miocene resulted in the formation of detachment faults, more noticeably in the eastern Mojave Desert, with numerous faults occurring throughout this time in the western Mojave Desert that parallel the San Andreas and are truncated by the Garlock Fault (Hall 2007; Harden 2004; Norris and Webb 1990). Tectonic extension and periods of subduction at the continental margin increased volcanic activity from the Miocene and into the Plio-Pleistocene, with basins filled with tuff, ash, andesites, rhyolites, volcanic flows, and flow breccias often interbedded with lacustrine, playa, and evaporite deposits (Norris and Webb 1990). Within the Basin and Range province, erosion had reduced the ancestral Sierra Nevada to a range of low hills, allowing grasslands to be more widespread in the area (Norris and Webb 1990). During the late Pliocene and Holocene, volcanic activity was abundant in both the Basin and Range and Mojave Desert provinces, with several cinder cones and flow deposits present today at the surface (Hall 2007; Norris and Webb 1990). Throughout the Pleistocene and into the

Holocene, lakes, playas, dune fields, and lava flows continued to fill basins, with lacustrine environments occurring during cooler periods with less evaporation (Harden 2004; Norris and Webb 1990). During the Pleistocene, snowmelt from the Sierra Nevada drained to the Owens Valley, Mono Lake, and Owens Lake areas within the Basin and Range before draining to the lower Lake Manly along the floor of Death Valley, and within the Mojave Desert, snowmelt from the San Gabriel and San Bernardino mountains drained into Lake Manix, located northwest of Barstow, before also draining to Lake Manly (Norris and Webb 1990; Prothero 2017). However, by the late Pleistocene and Holocene, the entire region became hotter and drier, resulting in more noticeable climate gradients between mountainous ranges and intermontaine basins and the reduction of lakes in the region (Norris and Webb 1990).

The regional geology of the Basin and Range and Mojave Desert geomorphic provinces is characteristic of crustal extension, giving the characteristic north-south–trending peaks, valleys, and detachment faults; volcanic eruptions from crustal extension; and filling of dropped basins with alluvial and colluvial sediments eroded and transported downslope from ranges of higher relief (Harden 2004). The Basin and Range Geomorphic Province has much more prominent north-south–trending ranges, basins, and faults from consistent east-west crustal extension over the past 16 million years to the present (Harden 2004; Norris and Webb 1990). Conversely, the Mojave Desert province has a much more subdued landscape, with broader basins and less continuous ranges due to relatively less crustal extension within the province since the Miocene and the recent right-lateral faulting due to transform faulting near the San Andreas and Garlock faults (Harden 2004; Prothero 2017).

Geologic mapping indicates that the IC Project Alignment is underlain by Precambrian igneous and metamorphic rocks; Precambrian (Neoproterozoic) Noonday Dolomite; Cambrian to Devonian Goodsprings Dolomite; Devonian Sultan Limestone; Carboniferous Monte Cristo Limestone; Paleozoic and Mesozoic igneous and metamorphic rocks; Cenozoic (Quaternary and Tertiary) igneous rocks; Tertiary sedimentary rocks; Paleocene to Eocene Goler Formation; Miocene Ricardo Group; Miocene to Pliocene Tropico Group; Miocene to Pliocene Coso Formation; Pliocene Bedrock Spring Formation; Pliocene volcanic sediments; Pleistocene Manix Lake Beds; older Quaternary (Pleistocene) alluvial deposits; and younger Quaternary (Holocene) deposits (Bateman 1964a, 1964b; Dibblee 2008a, 2008b, 2008c, 2008d, 2008e, 2008f, 2008g, 2008h, 2008i; du Bray and Moore 1985; Hewett 1956; Jennings et al. 1962; Nelson 1966; Ross 1965; Stinson 1977a, 1977b; Stone et al. 2000). Paleontological potential rankings for each geologic unit were assigned using the federal Potential Fossil Yield Classification (PFYC) system (BLM 2016) based on the results of a literature search and two institutional record searches completed during preparation of the IC Project's paleontological resources survey work plan (Aron et al. 2018).

A summary of the paleontological resources and paleontological potential of the geologic units within the IC Project Alignment is provided in Table 4.5-5. Full discussions of the geologic units and associated paleontological resources are provided in the paleontological resources survey work plan (Aron et al. 2018).

Table 4.5-5: Paleontological Potential by Geologic Unit

Geologic Unit	Age	Common Fossil Types	Paleontological Potential	General Location
Unnamed Igneous and Metamorphic Rocks (includes metamorphic rocks in the Soda Mountains area, and gneiss and granite)	Precambrian	None	Very Low (PFYC 1)	Eastern portion of the IC Project Alignment near I-15 from Baker to northeast of Mountain Pass, CA (San Bernardino County)
Rand Schist	Precambrian	None	Very Low (PFYC 1)	Central portion of the IC Project Alignment near Randsburg, CA (Kern County)
Noonday Dolomite	Precambrian	Trace fossils	Low (PFYC 2)	Eastern portion of the IC Project Alignment near I-15 between Halloran Springs and Mountain Pass, CA (San Bernardino County)
Waterman Gneiss	Precambrian or Paleozoic	None	Very Low (PFYC 1)	Southern portion of the IC Project Alignment in the vicinity of Hinkley and Barstow, CA
Garlock Series Meta-Sediments and Meta-Volcanics	Paleozoic	None	Very Low (PFYC 1)	Central portion of the IC Project Alignment to the south of Inyokern and north of Randsburg, CA (Kern County)
Goodsprings Dolomite	Late Cambrian to Devonian (?)	Scarce Invertebrate fossils: brachiopod, gastropod, sponge, coral, cephalopod	Low (PFYC 2)	Eastern portion of the IC Project Alignment near I-15 between Halloran Springs and Mountain Pass, CA (San Bernardino County)
Sultan Limestone	Middle to Late Devonian	Invertebrate fossils: sponge, coral, brachiopod	Moderate (PFYC 3)	Eastern portion of the IC Project Alignment north of I-15 near Mountain Pass, CA (San Bernardino County)
Monte Cristo Group	Early Mississippian	Invertebrate fossils: coral, brachiopod, bryozoan, crinoid, bivalve, gastropod, cephalopod, trilobite, ostracod	Moderate (PFYC 3)	Eastern portion of the IC Project Alignment north of I-15 near Mountain Pass, CA (San Bernardino County)
Unnamed Igneous and Metamorphic Rocks (includes pelitic hornfels, quartzite, and schist; marble; granitic rocks; felsite dikes; hornfels; quartz latite dikes; metavolcanics rocks; granodiorite; quartz diorite; granite to quartz monzonite; quartz monzonite porphyry; plutonic diorite; syenite; aplite dikes; and leucogranite)	Paleozoic to Mesozoic	None	Very Low (PFYC 1)	Sporadically throughout the extent of the IC Project Alignment (Inyo, Kern, and San Bernardino counties)
Tungsten Hill Granite	Late Triassic	None	Very Low (PFYC 1)	Northern portion of the IC Project Alignment along Highway 395 north of Big Pine, CA (Inyo County)
Volcanic Complex of the Alabama Hills	Middle Jurassic	None	Very Low (PFYC 1)	Northern portion of the IC Project Alignment along Highway 395 near Lone Pine, CA (Inyo County)
Tinemaha Granodiorite	Jurassic or Cretaceous	None	Very Low (PFYC 1)	Northern portion of the IC Project Alignment along Highway 395 near Tinemaha Reservoir (Inyo County)

Table 4.5-5: Paleontological Potential by Geologic Unit

Geologic Unit	Age	Common Fossil Types	Paleontological Potential	General Location
Cathedral Peak Granite	Cretaceous	None	Very Low (PFYC 1)	Northern portion of the IC Project Alignment along Highway 395 near Big Pine, CA (Inyo County)
Teutonia Quartz Monzonite	late Cretaceous or lower Tertiary	None	Very Low (PFYC 1)	Eastern portion of the IC Project Alignment along I-15 near Halloran Springs, CA (San Bernardino County)
Igneous Rocks (includes felsite, andesite and/or dacite, diabase, tuff breccia, silicious veins in volcanic rocks, felsitic rhyolite or quartz latite, and rhyolitic breccia, includes younger basalt and cinders, basalt, andesite, basalt dikes, intrusive basalt)	Cenozoic (Quaternary and Tertiary)	Scarce to None Fossils can rarely be preserved in tuffs and breccias. No fossils will be preserved in the remainder of the igneous rocks.	Very Low (PFYC 1) with the exception of tuff breccia and rhyolitic breccia, which have Unknown Potential (PFYC U)	Sporadically throughout the extent of the IC Project Alignment
Red Buttes Quartz Basalt	Tertiary (Pliocene, or possibly Miocene)	None	Very Low (PFYC 1)	Southern portion of the IC Project Alignment in the vicinity of Kramer Junction, CA (San Bernardino County)
Unnamed Sedimentary Rocks (includes limestone, shale, undifferentiated nonmarine sedimentary rocks, fanglomerates, conglomerate, and sandstone)	Tertiary	Undetermined: There are no recorded fossils from the unnamed rocks, however, fossils are known from named formations of similar age and lithology, including horse, rhinoceros, peccary, camel, antelope, elephant, dog, cat, and microvertebrates. If these unnamed sediments are determined to be equivalent, then similar types of fossils may be present.	Unknown (PFYC U)	Southern and eastern portions of the IC Project Alignment, sporadically between the Barstow area and Halloran Springs
Goler Formation	Paleocene to Early Eocene	Invertebrate fossils: foraminifera, mollusk Vertebrate fossils: turtle, ray, lizard, crocodile, shark, marsupial, primate Plant fossils: wood	Very High (PFYC 5)	Central portion of the IC Project Alignment to the south of Inyokern and north of Randsburg, CA (Kern County)
Ricardo Group (includes the Ricardo and Dove Springs formations)	Miocene	Vertebrate fossils: fish, amphibians, reptiles, birds, rodent, rabbit, perissodactyl, artiodactyl, elephant Plant fossils: wood, grass, pollen	High (PFYC 4)	Central portion of the IC Project Alignment to the south of Inyokern and north of Randsburg, CA (Kern County)
Tropico Group	Miocene and Pliocene	Vertebrate fossils: camel, oreodont, rodents, extinct deer-like animal, artiodactyl, snake	High to Very High (PFYC 4-5)	Southern portion of the IC Project Alignment in the vicinity of Kramer Junction, CA (San Bernardino County)

Table 4.5-5: Paleontological Potential by Geologic Unit

Geologic Unit	Age	Common Fossil Types	Paleontological Potential	General Location
Coso Formation (includes both sedimentary and pyroclastic units)	Miocene and Pliocene	Sedimentary Units– Vertebrate fossils: mastodon, hyena-like canid, peccary, camel, bear, hare Pyroclastic Units– Scarce fossils: Fossils can rarely be preserved in pyroclastic sediments	High (PFYC 4) in sedimentary units Low (PFYC 2) in pyroclastic units	Central portion of the IC Project Alignment near the Haiwee Reservoir (Inyo County)
Volcanic Sediments (diatomite interbedded with lacustrine silt and sand and pebble conglomerate)	Pliocene	Undetermined: No recorded fossils, but fossils have been preserved in similar types of Pliocene-aged sediments.	Unknown (PFYC U)	Northern portion of the IC Project Alignment along Highway 395 near Tinemaha Reservoir (Inyo County) and in the southern portion along I-15 near Manix, Midway, and Dunn, CA (San Bernardino County)
Bedrock Spring Formation	Middle Pliocene	Vertebrate fossils: ungulate, camel, horse, pronghorn, elephant, saber-toothed cat	Moderate (PFYC 3)	Central portion of the IC Project Alignment along Highway 395 near Red Mountain, CA (westernmost San Bernardino County)
Manix Lake Beds	Pleistocene	Vertebrate fossils: mammoth, dire wolves, pronghorn, sheep, sloth, camel, saber-toothed cat, bear, rabbit, rodents, turtle, birds, fish Invertebrate fossils	Very High (PFYC 5)	Southern portion of the IC Project Alignment along I-15 near Manix, Midway, and Dunn, CA (San Bernardino County)
Unnamed Older Quaternary Deposits (includes older alluvium, older alluvium and fanglomerate, fanglomerate of andesitic detritus, fanglomerate of metasediment and basalt detritus, older fanglomerate and gravel, older alluvial gravel, older debris flow gravels, younger debris flow gravels, lacustrine deposits, older lake deposits, older alluvial fan and lakebed deposits, and clay and marl)	Pleistocene	Vertebrate fossils: mastodon, mammoth, horse, bison, antelope, cougar, sloth, bighorn sheep, camel, llamas, coyote, dog, fox, wolf, saber-toothed cat, mole, rabbit, rodent, bat, snake, frog, lizard, turtle, bird Plant fossils Insect fossils	Unknown and Moderate (PFYC U and 3) – Potential is dependent on lithology	Throughout the extent of the IC Project Alignment in lower lying areas and potentially underlying younger Quaternary deposits at shallow depths (Inyo, Kern, and San Bernardino counties)
Unnamed Younger Quaternary Deposits (includes alluvium, alluvial fan deposits, inactive alluvium, colluvium, river terrace gravel, Mojave River channel sand, dune/eolian sand, lake deposits, Owens Lake deposits, Waucobi Lake deposits, talus, valley fill, and clay)	Holocene	Scarce reworked fossils and subfossils: typically too young to contain in situ fossils, but may overlie higher paleontological potential units	Low (PFYC 2)	Throughout the extent of the IC Project Alignment in lower lying areas (Inyo, Kern, and San Bernardino counties)

Source: Aron et al. 2018

4.5.9 Paleontological Resources Survey Results

4.5.9.1 Paleontological Resources Locality Searches

Paleontological records searches were requested from the Natural History Museum of Los Angeles County (LACM) and the University of California Museum of Paleontology (UCMP) to identify if there are any known fossils along the IC Project Alignment. LACM responded on August 18, 2017, and July 27, 2018, that they do not have any vertebrate localities within the IC Project Alignment, but do have localities nearby from sedimentary deposits similar to those within the IC Project Alignment, including fossils from Owens Lake and Manix Lake sediments, which are crossed by the IC Project Alignment (McLeod 2017, 2018; see Confidential Appendix A in Aron et al. 2018). Exact fossil locations were not provided by the museum, but general locations with regard to the IC Project area are provided in the discussion below where available. UCMP responded on March 7, 2017, that they have no record of vertebrate localities within the project area (Finger 2017; see Confidential Appendix A in Aron et al. 2018).

Numerous vertebrate localities were reported from the Coso Formation, including LACM (CIT) 131, 284–285, LACM 1106, 1182, 3515, 4102, and 4591–4600, which are all approximately 5 miles east to east-northeast of Dirty Socks hot spring on the northern flank of the Coso Mountains and southeast of Highway 190. These localities have produced fossil chub, eagle, loon, pelican, cormorant, and large and small mammals including camel, peccary, dog, horse, mammoth, mastodon, rabbit, and rodents. The most notable are the holotypes of the mastodon *Pliomastodon cosoensis*, field mouse *Cosomys primus* [now *Mimomys primus*], and bone-crushing dog *Hyaenognathus solus* [now *Borophagus diversidens*] (McLeod 2017).

Manix Lake Beds along the Manix Wash and Mojave River have produced an extensive fossil fauna, consisting primarily of birds, from localities LACM (CIT) 540–542, LACM 1093, 3496, 4032–4039, 4054–4061, and 5746–5756. The exact locations of the Manix Lake Bed localities were not provided by LACM, however, the project crosses Manix Lake Beds and the Manix Wash approximately one mile east of Manix, CA. In this area, the IC Project Alignment is situated between I-15 to the north and the Mojave River to the south. A single fossil is also recorded from these sediments near Dunn (locality LACM [CIT] 582), approximately 1.5 miles south of the IC Project Alignment. The composite fossil fauna consists of minnows, carp, pond turtles, eagles, hawks, geese, ducks, gulls, extinct gull relatives, terns, sandpipers, avocets, storks, cranes, coots, pelicans, cormorants, grebes, cattle, sheep, goats, camels, cats, bears, rabbits, horses, mammoths, and ground sloths (McLeod 2018).

Localities in and around Owens Lake and China Lake have produced diverse fossil assemblages. Recovered fossils include bony fish, suckers, chub, turtle, legless lizard, frog, golden eagle, bald eagle, ducks, swan, goose, gulls, California quail, loon, coot, rail, grebes, crane, cormorant, mammoth, elephantoid, horse, camels, deer, sheep, bison, dire wolf, wolf, saber-toothed cat, puma, bobcat, jackrabbit, cottontail, vole, meadow mouse, deer mouse, pocket gopher, pocket mouse, house mouse, squirrel, and pronghorn antelope (McLeod 2017). Localities LACM 4691, 7716–7719, 7992–7998, and 8027–8029 were reported from older Quaternary lacustrine deposits in and around Owens Lake. The exact locations of the Owens Lake localities were not provided by LACM, however, the project area crosses Owens Lake sediments as it traverses along Highway 395 from north of Bartlett to Cartago, and the current lake is located immediately east of the IC Project Alignment in this area. Localities LACM (CIT) 226, LACM 1543, 3659, 5151–5157, 7013, and 7262 are located near the current dry China Lake approximately 7 miles east of the IC Project Alignment as it crosses through Inyokern (McLeod 2017).

Locality LACM 4538 from older Quaternary alluvium near the current dam for the North Haiwee Reservoir less than a half-mile east of the IC Project Alignment produced a specimen of Columbian mammoth (McLeod 2017). Older Quaternary alluvium to the west of the IC Project Alignment on the southern flank of the El Paso Mountains as the line transverses form Inyokern to Randsburg has produced Ice Age fossils. Localities near Goler Gulch (approximately 2 miles west of the project), Mesquite Canyon (approximately 2.5 miles west of the project), and Garlock (approximately 6 miles west of the project) have produced fossil horse, antelope, camel, and rabbit from localities LACM 3721, 5853–5854, and 6263–6267. Fossil horse and camel were reported from older alluvial deposits to the west of the Mesquite Hills (locality LACM 1208), approximately 8 miles south of the IC Project Alignment as it traverses northeast towards Beacon Station along I-15.

In Nevada, more than 10 miles northeast of the IC Project Alignment, older Quaternary sediments in the beds of the dry Mesquite Lake produced fossils of dog and camel from localities LACM 8000 and 8001, respectively. South of the Las Vegas Mountain Range, fossil specimens of undermined carnivore, mammoth, horse, camel, and bison were recovered from locality LACM 7797 (McLeod 2018).

4.5.9.2 Paleontological Sensitivity Analysis

Based on the abundance and significance of the fossils identified during the literature review and record searches (summarized in Table 4.5-6 and Section 4.5.7.1 and described in detail in Aron et al., 2018), the Paleocene to Eocene Goler Formation and Pleistocene Manix Lake Beds are assigned a very high paleontological potential (PFYC 5). Sediments of the Tropico Group have a high to very high paleontological potential (PFYC 4-5). The Miocene Ricardo Group and sedimentary units of the Miocene to Pliocene Coso Formation are assigned a high paleontological potential (PFYC 4). The Devonian Sultan Limestone, Carboniferous Monte Cristo Group, and Pliocene Bedrock Spring Formation are all considered to have a moderate paleontological potential (PFYC 3). Older Quaternary (Pleistocene) alluvial deposits have undetermined and moderate potential (PFYC U and 3) depending on the lithology. The Precambrian (Neoproterozoic) Noonday Dolomite, Cambrian to Devonian Goodsprings Dolomite, and younger Quaternary (Holocene) deposits all have low paleontological potential (PFYC 2); however, the younger Quaternary deposits may be underlain by higher sensitivity geologic units at unknown depth. Precambrian igneous and metamorphic rocks, Paleozoic and Mesozoic igneous and metamorphic rocks, and Cenozoic (Quaternary and Tertiary) igneous rocks (with the exception of breccia units) have very low paleontological potential (PFYC 1). Breccia units of the Cenozoic igneous rocks, pyroclastic units of the Miocene to Pliocene Coso Formation, Tertiary sedimentary rocks, and Pliocene volcanic sediments are all considered have an unknown paleontological potential (PFYC U).

Table 4.5-6: Potential Fossil Yield Classification (BLM 2016)

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources. Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units. Units are Precambrian in age. Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low Potential	Geologic units are not likely to contain paleontological resources. Field surveys have verified that significant paleontological resources are not present or are very rare. Units are generally younger than 10,000 years before present. Recent eolian deposits. Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely. Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Marine in origin with sporadic known occurrences of paleontological resources. Paleontological resources may occur intermittently, but these occurrences are widely scattered. The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate. Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may 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.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources. Significant paleontological resources have been documented but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources. Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present. Illegal collecting activities may impact some areas. Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources. Significant paleontological resources have been documented and occur consistently. Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities. Unit is frequently the focus of illegal collecting activities. Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
U = Unknown Potential	Geologic units that cannot receive an informed PFYC assignment. Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is unknown. Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail. Scientific literature does not exist or does not reveal the nature of paleontological resources. Reports of paleontological resources are anecdotal or have not been verified. Area or geologic unit is poorly or under-studied. BLM staff has not yet been able to assess the nature of the geologic unit. Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

4.5.9.3 Field Survey

Information regarding the survey of the IC Project Alignment and the findings of the survey would be made available following completion of the survey and agency approval of the associated technical report.

4.5.10 Paleontological Resources Regulatory Setting

Federal, state, and local regulations were reviewed for applicability to the IC Project.

4.5.10.1 Federal

A federal undertaking is a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency (36 CFR 800.16[y]). Actions and undertakings may take place either on or off federally controlled property and include new and continuing projects, activities, or programs and any of their elements not previously considered under NEPA, the Federal Land Policy and Management Act (FLPMA), and CFR 43, among others. In addition to the federal regulations described in the following subsections, federal authorizations would also be required because portions of the IC Project area is under the jurisdiction of the BLM Bishop, Ridgecrest, Barstow, and Needles Field Offices; and Department of Defense (DoD) Naval Air Weapons Station China Lake, Edwards Air Force Base, and Marine Corps Logistics Base Barstow.

4.5.10.1.1 National Environmental Policy Act

The National Environmental Protection Act (NEPA) requires the federal government to carry out its plans and programs in such a way as to "preserve important historic, cultural, and natural aspects of our national heritage" (42 USC Section 4331[b][4]). The intent of the statute is to require that agencies obtain sufficient information regarding historic and cultural properties (including consulting, for example, appropriate members of the public; local, state, and other federal government agencies; and Native American tribes, organizations, and individuals) to make a determination of the historical and cultural significance of affected historic or cultural properties (including paleontological resources) and to take into account whether irreversible adverse impacts to such resources can or should be avoided, minimized, or mitigated.

4.5.10.1.2 Federal Land Policy and Management Act (FLPMA)

This law (Public Law [PL] 94-579; 90 Statute 2743, USC 1701–1782) requires that public lands be managed in a manner that will protect the quality of their scientific values. Specifically, FLPMA was established as a public land policy to "provide for the management, protection, development, and enhancement of the public lands." FLPMA requires federal agencies to manage public lands so that environmental, historic, archeological, and scientific resources are preserved and protected, where appropriate. Though FLPMA does not refer specifically to fossils, the law does protect scientific resources such as significant fossils, including vertebrate remains. FLPMA regulates the "use and development of public lands and resources through easements, licenses, and permits." The law requires the public lands to be inventoried so that the data can be used to make informed land-use decisions, and requires permits for the use, occupancy and development of the certain public lands, including the collection of significant fossils for scientific purposes (43 USC 1701 Section 102, 302 [U.S. Department of the Interior et al. 2001]).

4.5.10.1.3 Code of Federal Regulations, Title 43

Under Title 43, CFR Section 8365.1–5, the collection of scientific and paleontological resources, including vertebrate fossils, on federal land is prohibited. The collection of a "reasonable amount" of common invertebrate or plant fossils for noncommercial purposes is permissible (43 CFR 8365.1–5 [U.S. Government Printing Office 2014]).

4.5.10.1.4 Omnibus Public Lands Act

The Omnibus Public Lands Act (OPLA) directs the Secretaries of Interior and Agriculture to manage and protect paleontological resources on federal land using “scientific principles and expertise.” OPLA incorporates most of the recommendations of the report of the Secretary of the Interior titled “Assessment of Fossil Management on Federal and Indian Lands” (2000) to formulate a consistent paleontological resources management framework. In passing the OPLA, Congress officially recognized the scientific importance of paleontological resources on some federal lands by declaring that fossils from these lands are federal property that must be preserved and protected. Title VI, Subtitle D on Paleontological Resources Preservation (OPLA-PRP) codifies existing policies of federal agencies and provides the following:

- Uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from federal lands;
- Uniform minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants);
- Uniform definitions for “paleontological resources” and “casual collecting”; and
- Uniform requirements for curation of federal fossils in approved repositories.

Federal legislative protections for scientifically significant fossils applies to projects that take place on federal lands (with certain exceptions such as the Department of Defense), involve federal funding, require a federal permit, or involve crossing state lines. Since a portion of the IC Project area occurs on federal agency-managed lands, federal protections for paleontological resources for those areas apply under NEPA, FLPMA, and OPLA-PRP. All paleontological work on federal agency lands must be approved and coordinated by the federal agency. All fossils collected from federal agency lands must be housed in a federally approved paleontological repository. The paleontological repository would be determined following lead agency coordination and the issuance of applicable permits for the IC Project.

4.5.10.1.5 BLM Procedures and Policies for Managing Paleontological Resources

The PFYC system was developed by the BLM (2016) and provides an estimate of the potential that significant paleontological resources will be discovered within a particular mapped geological unit. The system is used to determine potential impacts to paleontological resources for federal actions involving surface disturbance, land use planning, or land tenure adjustment. Implementation of the PFYC system does not require changes to existing land use plans, project plans, or other completed efforts. However, integration into plans presently being developed is recommended. The IM 2016-124 revision is an update to the guidance that was introduced in IM 2008-009 (2007). The BLM Manual and Handbook H-8270-1 (1998) provides policies and direction for the BLM’s Paleontological Resource Management Program as well as detailed procedures and standards for implementing policies. According to Section 6 of the BLM Manual and Handbook H-8270-1 (1998), it shall be BLM’s policy to:

1. Actively work with other federal, state, and Local Government Agencies, professional organizations, private land owners, educational institutions, and other interested parties to enhance and further the BLM’s and the public’s needs and objectives for paleontological resources.
2. Consider paleontological resource management a distinct BLM program, to be given full and equal consideration in all its land use planning and decision making actions.

3. Maintain a staff of professional paleontologists to provide BLM decision makers with the most current and scientifically sound paleontological resource data and advice.
4. Mitigate adverse impacts to paleontological resources as necessary.
5. Facilitate appropriate public and scientific use of and interest in paleontological resources.
6. Utilize the additional skills and resources of the Bureau's recreation and minerals programs to develop and implement interpretation strategies and products to enhance public understanding, appreciation, and enjoyment of paleontological resources.
7. Vigorously pursue the protection of paleontological resources from theft, destruction, and other illegal or unauthorized uses.
8. Authorize land tenure adjustments, when appropriate, as means to protect paleontological localities.

4.5.10.2 State

4.5.10.2.1 California Public Utilities Commission General Order 131-D

Pursuant to CPUC GO 131-D, the CPUC has sole and exclusive jurisdiction over the siting and design of electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities in the State of California. Under CEQA, the CPUC is the lead agency with respect to such IC Project elements within the State of California. SCE is required to comply with GO 131-D and is seeking a PTC from the CPUC for the IC Project and therefore compliance with CEQA and other state environmental statutes involving cultural (including paleontological) resources. The CPUC is tasked with compliance of all provisions in CEQA and the CEQA Guidelines that concern cultural (including paleontological) resources as explained below.

4.5.10.2.2 California Environmental Quality Act

This law encourages the protection of all aspects of the environment by requiring state and local agencies to prepare multidisciplinary analyses of the environmental impacts of a proposed project, and to make decisions based on the findings of those analyses. CEQA also takes into account the laws and procedures of local California jurisdictions. CEQA includes in its definition of historical resources, "any object [or] site…that has yielded or may be likely to yield information important in prehistory" (14 CCR 15064.5[3]), which is typically interpreted as including fossil materials and other paleontological resources. More specifically, destruction of a "unique paleontological resource or site or unique geologic feature constitutes a significant impact under CEQA" (State CEQA Guidelines Appendix G). CEQA does not provide an explicit definition of a "unique paleontological resource," but a definition is implied by comparable language within the act relating to archaeological resources: "The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in: Guidelines for the Implementation of CEQA, as amended March 29, 1999" (Title 14, Chapter 3, CCR 15000 et seq.; Association of Environmental Professionals 2012). Treatment of paleontological resources under CEQA is generally similar to treatment of cultural resources, requiring evaluation of resources in the project; assessment of potential impacts on significant or unique resources; and development of mitigation measures for potentially significant impacts, which may include avoidance, monitoring, or data recovery excavation.

4.5.10.2.3 Public Resources Code Section 5097.5

This law affirms that no person shall willingly or knowingly excavate, remove, or otherwise destroy a vertebrate paleontological site or paleontological feature without the express permission of the overseeing public land agency. It further states under PRC 30244 that any development that would adversely affect paleontological resources shall require reasonable mitigation. These regulations apply to projects located on land owned by or under the jurisdiction of the state or any city, county, district, or other public agency (PRC Section 5097.5; California OHP 2005).

4.5.10.3 Local

The California Public Utilities Commission (CPUC) has sole and exclusive state jurisdiction over the siting and design of the IC Project. Pursuant to CPUC General Order 131-D (GO 131-D), Section XIV.B, "Local jurisdictions acting pursuant to local authority are preempted from regulating electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities subject to the CPUC's jurisdiction. However, in locating such projects, the public utilities shall consult with local agencies regarding land use matters." Consequently, public utilities are directed to consider local regulations and consult with local agencies, but the counties' and cities' regulations are not applicable as the counties and cities do not have jurisdiction over the IC Project. Accordingly, the following discussion of local land use regulations is provided for informational purposes only.

General plans and municipal codes were reviewed for relevant local policies pertaining to paleontological resources in the vicinity of the IC Project. General plans reviewed included the County of Inyo, County of Kern, and County of San Bernardino General Plans. Relevant goals, policies, and objectives are discussed in the following subsections.

4.5.10.3.1 Inyo County

Inyo County's General Plan (2001) has no mention of paleontological resources.

4.5.10.3.2 Kern County

Paleontological resources are briefly mentioned in the Land Use, Open Space and Conservation element of the Kern County General Plan (Kern County 2009) in Section 1.10.3, "Archaeological, Paleontological, Cultural, and Historical Preservation." Policy 25 states that the County will promote the preservation of cultural and historic resources that provide ties with the past and constitute a heritage value to residents and visitors. Implementation Measure M is the only measure that directly or indirectly addresses paleontological resources, and it states that in areas of known paleontological resources, the County should address the preservation of these resources where feasible.

4.5.10.3.3 San Bernardino County

The Conservation Element of the San Bernardino County General Plan (2007) contains one goal (CO 3) and one map (Paleontologic Resources Overlay Map, noted in the General Plan as "not available yet"), as well as three programs regarding paleontological resources within the County. Goal CO 3 requires that the County will preserve and promote its historic and prehistoric cultural heritage. Three programs within the General Plan delineate the required County actions regarding paleontological resources. In areas of potential but unknown sensitivity, field surveys prior to grading will be required to establish the need for paleontologic monitoring. Projects requiring grading plans that are located in areas of known fossil occurrences, or demonstrated in a field survey to have fossils present, will have all rough grading (cuts greater than 3 feet) monitored by trained paleontologic crews working under the direction of a qualified professional, so that fossils exposed during grading can be recovered and preserved. Fossils include large and small vertebrate fossils, the latter recovered by screen washing of bulk samples. Finally, a report of findings with an itemized accession inventory will be prepared as evidence that monitoring has been successfully completed. A preliminary report will be submitted and approved prior to granting of building permits, and a final report will be submitted and approved prior to granting of occupancy permits. The adequacy of paleontologic reports will be determined in consultation with the Curator of Earth Science, San Bernardino County Museum.

4.5.11 Paleontological Resources Significance Criteria

Appendix G (part V) of the CEQA Guidelines provides guidance relative to significant impacts on paleontological resources, which states, "a project will normally result in a significant impact on the environment if it will…disrupt or adversely affect a paleontological resource or site or unique geologic feature, except as part of a scientific study." The significance criteria for assessing the impacts to paleontological resources come from the CEQA Environmental Checklist, and state that a project causes a potentially significant impact if it would directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

4.5.12 Paleontological Resources Impact Analysis

4.5.12.1 Would the project directly or indirectly destroy a unique paleontological resource or site or unique geological feature?

4.5.12.1.1 Construction

Less than Significant Impact with Mitigation. No previously recorded fossil localities occur within the IC Project footprint. However, scientifically significant fossils have been found in the vicinity and elsewhere in Kern and San Bernardino counties from several of the same formations and from sediments of similar age, lithology, and depositional environment. Similar fossils may be encountered during excavation into geologic units with very high, high, moderate, or unknown paleontological potential (PFYC 5, 4, 3, or U; see Table 4.5-3). Excavation into these geologic units may well result in a significant adverse direct impact on paleontological resources. Excavations entirely within low-potential (PFYC 2) geologic units are unlikely to uncover significant fossil vertebrate remains. However, the unnamed low-potential younger Quaternary deposits may shallowly overlie older, more sensitive sedimentary deposits that could be encountered during project excavation. Excavation in areas of very-low-potential (PFYC 1) geologic units (i.e., igneous and metamorphic rocks) would not result in impacts to paleontological resources. Direct adverse impacts on paleontological resources resulting from construction of the project would be less than significant with implementation of APMs PAL-1, PAL-2, PAL-3, and PAL-4. These measures include preparation of a Paleontological Resources Monitoring and Mitigation Plan (PRMMP), construction monitoring, and procedures to implement if paleontological resources are encountered during construction. The IC Project would not result in indirect impacts on paleontological resources during construction since it would not increase public access.

4.5.12.1.2 Operations

Less than Significant Impact. Normal operation of substation, transmission, subtransmission, distribution, and telecommunications lines would be controlled remotely through SCE control systems, and manually in the field as required. Maintenance would occur as needed and could include activities such as repairing conductors, washing or replacing insulators, repairing or replacing other hardware components, replacing poles, tree trimming, brush and weed control, and access road maintenance. Most regular O&M activities of overhead facilities are performed from existing access roads with no surface disturbance. Repairs to facilities, such as repairing or replacing poles and structures, could occur in undisturbed, but previously surveyed areas. Therefore, operation impacts to unique paleontological resources would be less than significant.

4.5.13 Applicant Proposed Measures

SCE would implement the following APMs, as appropriate, to reduce impacts on cultural and paleontological resources to less-than-significant:

- CUL-1: Develop Cultural Resource Management Plan
- CUL-2: Avoid Environmentally Sensitive Areas (ESAs)
- CUL-3: Conduct Construction Monitoring
- CUL-4: Property Treat Human Remains
- CUL-5: Train Construction Personnel
- PAL-1: Develop Paleontological Resource Mitigation and Monitoring Plan
- PAL-2: Monitor Construction for Paleontological Resources
- PAL-3: Final Reporting and Curation
- PAL-4: Train Construction Personnel

The full text of each APM is presented in Section 5.1.

4.5.14 Alternatives

Alternatives to the IC Project are addressed in Section 5.2, Description of Project Alternatives and Impact Analysis.

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