# DOCKETED

| | |
|---|---|
| **Docket Number:** | 13-AFC-01 |
| **Project Title:** | Alamitos Energy Center |
| **TN #:** | 201620-13 |
| **Document Title:** | AEC AFC 5.3 Cultural Resources |
| **Description:** | Previously TN# 201495-12 |
| **Filer:** | Tiffani Winter |
| **Organization:** | CH2M Hill |
| **Submitter Role:** | Applicant Consultant |
| **Submission Date:** | 2/3/2014 12:47:11 PM |
| **Docketed Date:** | 2/3/2014 |

# 5.3 Cultural Resources

This section discusses the potential effects of the Alamitos Energy Center (AEC) on cultural resources. Section 5.3.1 describes the project setting and Section 5.3.2 describes the cultural resources environment that might be affected by the AEC. Section 5.3.3 provides a discussion of the research design of the cultural resources inventory, and Section 5.3.4 summarizes the inventory results. Section 5.3.5 presents an environmental analysis of project construction, demolition, and operation. Section 5.3.6 discusses cumulative effects, and Section 5.3.7 presents mitigation measures that will be implemented to avoid project-related impacts. The AEC is not anticipated to require mitigation measures for cultural resources once it is operational. Section 5.3.8 discusses the laws, ordinances, regulations, and standards (LORS) applicable to the protection of cultural resources. Section 5.3.9 lists the agencies involved and agency contacts, and Section 5.3.10 discusses permits. Section 5.3.11 lists reference materials used in preparing this section.

This section is consistent with state regulatory requirements for cultural resources pursuant to the California Environmental Quality Act (CEQA). Cultural resources include prehistoric and historic archaeological sites;[1] districts and objects; standing historic structures, buildings, districts, and objects; locations of important historic events; and sites of traditional/cultural importance to various groups.[2] The study scope was developed according to the California Energy Commission's (CEC) cultural resources guidelines and complies with *Instructions to the California Energy Commission Staff for the Review of and Information Requirements for an Application for Certification* (CEC, 1992) and *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 2007). This study was conducted by Gloriella Cardenas, M.A., RPA; Natalie Lawson, M.A., RPA; and Clint Helton, M.A., RPA, Cultural Resource Specialists (CRS) who meet the qualifications for Principal Investigator stated in the Secretary of the Interior's standards and guidelines for archaeology and historic preservation (National Park Service [NPS], 1995). Lori Durio-Price, M.A., Architectural Historian qualified by the Secretary of Interior, conducted all research related to historic architecture.

Per CEC Data Adequacy requirements, Appendix 5.3A provides copies of agency consultation letters. Appendix 5.3B provides the Cultural Resources Inventory Report, including California Department of Parks and Recreation (DPR) 523 forms for newly recorded resources. Appendix 5.3C provides archival research material, including copies of historic maps and aerial photographs of the project and a complete copy of the California Historical Resources Information System (CHRIS) literature search results, which include copies of previous technical reports occurring within 0.25 mile of the project and DPR 523 forms for previously recorded resources occurring within 1 mile of the project. As required by applicable law, Appendix 5.3B and Appendix 5.3C will be submitted separately to the CEC under a request for confidentiality. Appendix 5.3D

[1] Site is defined as "The location of a significant event, a prehistoric or historic occupation or activity, or a building or structure…where the location itself possesses historic, cultural, or archeological value." (NPS, 1995).

[2] The federal definitions of cultural resource, historic property or historic resource, traditional use area, and sacred resources are reviewed below and are typically applied to non-federal projects.

A cultural resource may be defined as a phenomenon associated with prehistory, historical events, or individuals or extant cultural systems. These include archaeological sites, districts, and objects; standing historic structures, districts, and objects; locations of important historic events; and places, objects, and living or non-living things that are important to the practice and continuity of traditional cultures. Cultural resources may involve historic properties, traditional use areas, and sacred resource areas.

Historic property or historic resource means any prehistoric district, site building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). The definition also includes artifacts, records, and remains that are related to such a district, site, building, structure, or object.

Traditional use area refers to an area or physical landscape identified by a cultural group to be necessary for the perpetuation of the traditional culture. The concept can include areas for the collection of food and non-food resources, occupation sites, and ceremonial and/or sacred areas.

Sacred resources applies to traditional sites, places, or objects that Native American tribes or groups, or their members, perceive as having religious significance.

provides names and qualifications of personnel who contributed to this study. Appendix 5.3E contains a map of all resources recorded during the cultural resources assessment.

The AEC study area referred to in this section includes the survey areas for both archaeological and architectural resources (see Figure 5.3-1). The archaeological survey area includes the proposed AEC site, which is approximately 63 acres including 8 acres of onsite construction laydown and parking, and 10 acres for offsite laydown, a 200-foot buffer comprising approximately 58 acres, and the sewer line corridor, which is approximately 12 acres. Approximately 1 acre of overlap occurs between the AEC and the sewer line corridor, and thus the total acreage in the survey area is 142 acres. Generally, project improvements will be built at or near existing site grades. Trench excavations for pipelines and utilities are expected to reach depths of approximately 10 feet below the surface. Excavations for the sewer line upgrades would be an average of 10 feet deep and are expected to reach maximum depths of approximately 15 feet below the surface.

The architectural survey area includes the existing Alamitos Generating Station, as well as a buffer around the plant site consisting of at least one additional parcel deep on all sides, as per CEC requirements for a project in an urban setting. Offsite, the AEC will include a new 1,000-foot-long process/sanitary wastewater pipeline to the first point of interconnection with the existing Long Beach Water Department (LBWD) sewer system. Because the project may also require upgrading approximately 4,000 feet of the existing offsite LBWD sewer line downstream of the first point of interconnection, this possible offsite improvement to the LBWD system is also analyzed in this Application for Certification (AFC). The total length of the new pipeline (1,000 feet) and the upgraded pipeline (4,000 feet) is approximately 5,000 feet. This offsite area was also included in the architectural survey area.

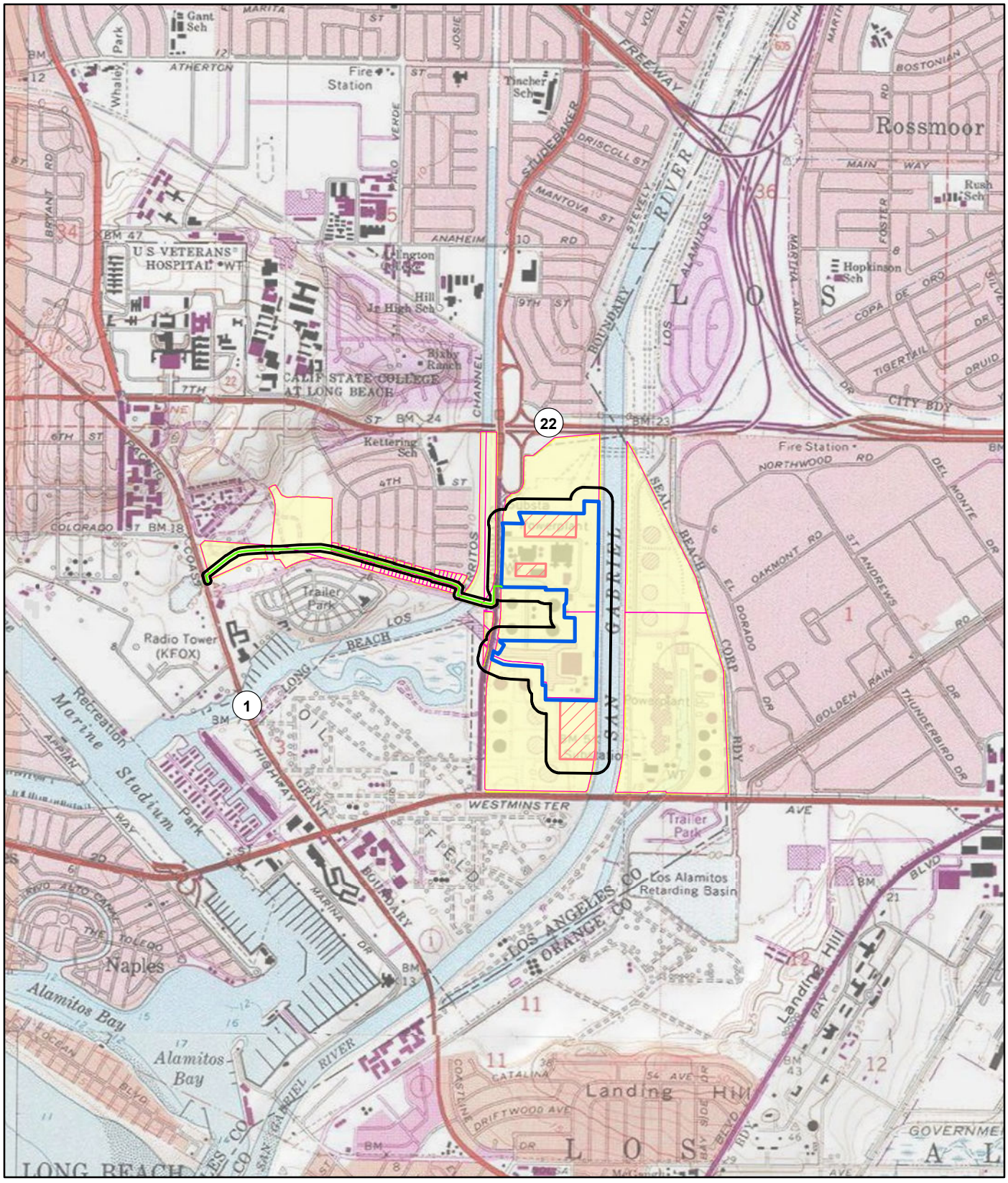
## 5.3.1 Setting

AES Southland Development, LLC (AES-SLD) proposes to construct, own, and operate the AEC—a natural-gas-fired, air-cooled, combined-cycle, electrical generating facility in Long Beach, Los Angeles County, California. The proposed AEC will have a net generating capacity of 1,936 megawatts (MW) and gross generating capacity of 1,995 MW.[3] The AEC will replace and be constructed on the site of the existing Alamitos Generating Station.

The AEC will consist of four 3-on-1 combined-cycle gas turbine power blocks with twelve natural-gas-fired combustion turbine generators, twelve heat recovery steam generators, four steam turbine generators, four air-cooled condensers, and related ancillary equipment. The AEC will use air-cooled condensers for cooling, completely eliminating the existing ocean water once-through-cooling system. The AEC will use potable water provided by the LBWD for construction, operational process, and sanitary uses but at substantially lower volumes than the existing Alamitos Generating Station has historically used. This water will be supplied through existing onsite potable water lines.

The AEC will interconnect to the existing Southern California Edison (SCE) 230-kilovolt (kV) switchyard adjacent to the north side of the property. Natural gas will be supplied to the AEC via the existing offsite 30-inch-diameter pipeline owned and operated by Southern California Gas Company (SoCalGas) that currently serves the Alamitos Generating Station. Existing water treatment facilities, emergency services, and administration and maintenance buildings will be reused for the AEC. The AEC will require relocation of the natural gas metering facilities and construction of a new natural gas compressor building within the existing Alamitos Generating Station site footprint. Stormwater will be discharged to two retention basins and then ultimately to the San Gabriel River via existing stormwater outfalls.

[3] Referenced to site ambient average temperature conditions of 65.3 degrees Fahrenheit (°F) dry bulb and 62.7°F wet bulb temperature without evaporative cooler operation.




**Legend**

- Project Boundary
- Parking/Laydown Construction Area
- Process/Sanitary Wastewater Pipeline
- Archaeological Survey Area
- Architectural Survey Area
- Parcel Boundary

0 1,000 2,000 Feet

N

**FIGURE 5.3-1**
**Archaeological and Historic Architectural Survey Area**
Alamitos Energy Center
*Long Beach, California*

\\ZION\SACGIS\PROJ\ALAMITOS\MAPFILES\CULTURAL\5_3-1_AEC_CULTURAL_SURVEYAREA_TOPO.MXD KMINO 12/13/2013 8:53:29 AM

CH2MHILL

The AEC will include a new 1,000-foot process/sanitary wastewater pipeline to the first point of interconnection with the existing LBWD sewer system and will eliminate the current practice of treatment and discharge of process/sanitary wastewater to the San Gabriel River. The project may also require upgrading approximately 4,000 feet of the existing offsite LBWD sewer line downstream of the first point of interconnection, therefore, this possible offsite improvement to the LBWD system is also analyzed in this AFC. The total length of the new pipeline (1,000 feet) and the upgraded pipeline (4,000 feet) is approximately 5,000 feet.

To provide fast-starting and stopping, flexible generating resources, the AEC will be configured and deployed as a multi-stage generating (MSG) facility. The MSG configuration will allow the AEC to generate power across a wide and flexible operating range. The AEC can serve both peak and intermediate loads with the added capabilities of rapid startup, significant turndown capability (ability to turn down to a low load), and fast ramp rates (30 percent per minute when operating above minimum gas turbine turndown capacity). As California's intermittent renewable energy portfolio continues to grow, operating in either load following or partial shutdown mode will become necessary to maintain electrical grid reliability, thus placing an increased importance upon the rapid startup, high turndown, steep ramp rate, and superior heat rate of the MSG configuration employed at the AEC.

By using proven combined-cycle technology, the AEC can also run as a baseload facility, if needed, providing greater reliability to meet resource adequacy needs for the southern California electrical system. As an in-basin generating asset, the AEC will provide local generating capacity, voltage support, and reactive power that are essential for transmission system reliability. The AEC will be able to provide system stability by providing reactive power, voltage support, frequency stability, and rotating mass in the heart of the critical Western Los Angeles local reliability area. By being in the load center, the AEC also helps to avoid potential transmission line overloads and can provide reliable local energy supplies when electricity from more distant generating resources is unavailable.

The AEC's combustion turbines and associated equipment will include the use of best available control technology to limit emissions of criteria pollutants and hazardous air pollutants. By being able to deliver flexible operating characteristics across a wide range of generating capacity, at a relatively consistent and superior heat rate, the AEC will help lower the overall greenhouse gas emissions resulting from electrical generation in southern California and allow for smoother integration of intermittent renewable resources.

Existing Alamitos Generating Station Units 1–6 are currently in operation. All six operating units and retired Unit 7 will be demolished as part of the proposed project. Construction and demolition activities at the project site are anticipated to last 139 months, from first quarter 2016 until third quarter 2027. The project will commence with the demolition of retired Unit 7 and other ancillary structures to make room for the construction of AEC Blocks 1 and 2. The demolition of Unit 7 will commence in the first quarter of 2016. The construction of Block 1 is scheduled to commence in the third quarter of 2016 and construction of Block 2 is scheduled to commence in the fourth quarter of 2016. The demolition of existing Units 5 and 6 will make space for the construction of AEC Block 3. AEC Block 3 construction is scheduled to commence in the first quarter of 2020 and will be completed in the second quarter of 2022. The demolition of existing Units 3 and 4 will make space for the construction of AEC Block 4. AEC Block 4 construction is scheduled to commence in the second quarter of 2023 and will be completed in the fourth quarter of 2025. The demolition of remaining existing units is scheduled to commence in the third quarter of 2025.

Construction of the AEC will require the use of onsite laydown areas (approximately 8 acres dispersed throughout the existing site) and an approximately 10-acre laydown area located adjacent to the existing site. The adjacent 10-acre laydown area will be shared with another project being developed by the Applicant (Huntington Beach Energy Project [HBEP] 12-AFC-02). Due to the timing for commencement of construction for these two projects, the adjacent laydown area will already be in use for equipment storage before AEC construction begins.

## 5.3.2 Affected Environment

The climate in the project area is defined by warm, dry summers with average highs of 75°F and mild winters with average temperatures of 55°F. Rainfall averages 13 inches annually (U.S. Climate Data, 2013). Precipitation usually occurs in the form of winter rain.

Long Beach is situated on a coastal floodplain in southwestern Los Angeles County. The sediments are primarily from San Gabriel River Quaternary deposits from the Holocene period. The San Gabriel River has been channelized, as has been the previously natural inlet to the Alamitos Bay, the Los Cerritos Channel. The AEC area is located in a reclaimed salt marsh environment, an area that previously contained a marshland ecological community, called the Alamitos Saltwater Marsh. Historically, the groundwater at the AEC has been quite shallow at 10 feet below ground surface (bgs) or higher (Ninyo & Moore, 2011). Land development in the early 1900s allowed for agriculture in the area, despite the marshland environment and high groundwater.

Historical aerial photographs from 1952 indicate that prior to the construction of the site, the area, particularly in the northern portion of the Alamitos Generating Station, was largely used for agriculture (Ninyo & Moore, 2011). Primary disturbances to the area are the construction of the existing six operating generating units (Units 1–6), retired Unit 7, administration, maintenance and certain warehouse buildings, two existing SoCalGas natural gas pipeline, LBWD potable water connections, and the existing SCE switchyard, and the Los Cerritos Channel. Other disturbances and facilities in the AEC study area include various pipelines, transmission lines, residential housing, and roads.

A subsurface geotechnical survey, conducted by Ninyo & Moore in 2011, reports that the Alamitos Generating Station was constructed on artificial fill. Ninyo & Moore indicates that the AEC study area is underlain by artificial fill, younger dune sand deposits, marsh deposits, and older dune sand deposits. Artificial fill was encountered at depths ranging from approximately 6 to 9 feet bgs. Alluvial sediment deposits primarily consisting of interbedded layers of silty to clayey sand were encountered below the fill. These deposits were observed up to 63 feet bgs (Ninyo & Moore, 2011).

### 5.3.2.1 Local Paleoenvironment

At the start of the Holocene and during the earliest known occupations of the southern California coast, the coastline looked very different than it does today. Seas were lower, and the coastline extended out a few miles farther than now. The off-coast islands were larger, and a few more spits of land were extant. Many of the embayments found along the coast today did not exist at the start of the Holocene. Many of the bays that dot the California coastline in the present did not exist either. San Pedro Bay, for example, the closest natural bay to the AEC, did not exist near the start of the Holocene. Land extended to within 15 miles of Santa Catalina Island, rather than the 26 to 32 miles of today (Porcasi et al., 1999). At the start of the Holocene, the project site would have been much farther from the sea, both to the east and the south.

California's seasonal wet and dry periods (winters having the most annual rainfall, followed by dry, hot, mostly rainless summers) appear to have been a pattern that occurred throughout the Holocene (West et al., 2007). However, the overall climate of the southern California coastline has changed throughout the Holocene, exhibiting periods with radical differences in temperature and precipitation. Evidence indicates that some of these swings were not only quick, but also involved more dramatic drought or flood events than those recorded in the modern era (Boxt et al., 1999). Pollen analysis from sites along the San Diego coastline, approximately 100 miles south of the AEC, indicate that the early Holocene exhibited frequent and heavy coastal fog, the middle Holocene was characterized by a stable and mild climate, and the late Holocene climate varied widely. Yearly El Niño conditions with heavy winter rains and warmer temperatures traded with years of drought in this later period (West et al., 2007). Pollen analysis of samples taken from the San Joaquin Marsh near Newport Bay, Orange County, approximately 20 miles south of the AEC site, exhibit indications of extreme drought identified inland between 900 and 1300 AD. Although located well outside of the project site, these findings have implications for the entire coastline. The

drought, which lasted centuries, is associated with, and is likely a driver for, changes in settlement patterns, subsistence strategies, trade networks, and other cultural behaviors throughout California. The pollen analyses conducted at San Joaquin Marsh also revealed a period of increased freshwater runoff around 1600 AD, at the start of the Little Ice Age. This period of increased precipitation influenced yet another round of cultural changes and adaptations (Boxt et al., 1999). These changes between drought and increased precipitation would have affected deposition at the project site. Periods of high runoff would result in more rapid deposition of sediment, particularly in areas near where streams or rivers emptied into the ocean, whereas periods of drought would result in more stable and less frequent depositional activities.

In addition to the climate changes, surface sea temperatures also appeared to have fluctuated on a millennial period, from cold to warm waters. Surface temperatures in the Early and Middle Holocene were more stable than those from the Late Holocene (West et al., 2007). Changes in the surface temperatures of the sea would have affected local sea life and the different resources available to human settlements near the ocean.

Specific written records and accounts of climate change for southern California are not readily available before the mid to late 1800s. During the latter half of the nineteenth century, southern California was rapidly settled, and by the start of the twentieth century, it looked very different than it had in its more natural state in the early 1800s. Differences in pre-settled coastal California weather indicated that winter winds were stronger and storm waves were larger and more ferocious than at present. Erosion from these large waves along the shore was more extreme than now. Southeasters, storms likened by nineteenth century sailors to hurricanes, decreased in frequency as the nineteenth century came to a close and the Little Ice Age ended (Engstrom, 2006).

At the start of the Holocene, the familiar plant communities of southern California—chaparral, oak woodland, and coastal sage scrub—rapidly increased throughout the region (West et al., 2007). These communities grew and replaced the pines, which the pollen record show inhabited the now pine-less areas of southern California at the Pleistocene-Holocene transition. The pollen record at Daisy Cave on San Miguel Island shows the presence of pine trees on the island at the start of the Holocene. There are no pine trees on San Miguel Island now (West et al., 2007). Many of the observed landforms along the shoreline in southern California in the nineteenth century consisted of low hillock dunes, generally less than 5 feet in height, which ran along the beaches. Vegetation generally consisted of red sand verbena and occasional salt bush and silver beach weed. Generally, written historical accounts agree that shellfish was very abundant, more so than at present, along the shore at this time. Estuaries were common on the land side of the small barrier spits along the coasts. Salt marshes and grass covered areas surrounded these estuaries (Engstrom, 2006).

As late as the mid-1800s, estuaries along the coast connected to the ocean via inlets. These inlets could be seasonal; in winter, they would be open and useable, frequently due to rain, while in summer, heavy waves would create dams, which blocked ocean access. Heavy deposition of sediment during winter could also block inlet access. Once access was blocked, the evaporation of the water would result in alkali flats and high salinity in the water (Engstrom, 2006).

#### 5.3.2.2 Regional Setting

The project is located within the existing Alamitos Generating Station site in a developed area of Long Beach comprising residential, industrial, and commercial developments. The Alamitos Generating Station is a natural gas-fired steam electric generating facility located in the city of Long Beach, Los Angeles County. The facility occupies approximately 120 acres of a 230-acre industrial site along the west bank of the San Gabriel River, 2 miles northeast of the entrance to Alamitos Bay and the Long Beach Marina.

The project site lies within a region characterized by flat floodplains and terraces and very gently sloped alluvial fans with small areas of marine terraces (Ninyo & Moore, 2011). Historically, the predominant natural plant community of the area was salt marsh, the Alamitos Saltwater Marsh. Before the modern era,

the area would have offered habitat for the various land animals and plants associated with the southern coastal salt marsh environment.

Southern coastal salt marsh occurs in areas subject to regular tidal flooding by salt water, such as sheltered inland bays, estuaries, and lagoons. The distribution of plant species within the salt marsh is often in distinct zones based on the frequency and duration of tidal flooding. Vegetation in these areas is characterized by pickleweed along with other salt-tolerant species such as saltgrass (*Distichlis spicata*), alkali heath (*Frankenia salina*), alkali weed (*Cressa truxilensis*), California seablite (*Suaeda californica*), marsh jaumea (*Jaumea carinosa*), and saltwort (*Batis maritima*). Open unvegetated salt pannes and tidal channels are present in some areas. Several avian species use salt marsh, including the Belding's savanna sparrows, western snowy plover, the California least tern (*Sternula antillarum browni*), the California brown pelican, and other various water fowl. Harvest mice and shrews are also found in coastal salt marsh environments.

The development of a regional chronology marking the major stages of cultural evolution in the southern California area has been an important topic of archaeological research. In general, cultural developments in southern California have occurred gradually and have shown long-term stability; consequently, developing chronologies and applying them to specific locales has often been problematic. The following chronology is based on Byrd and Raab's (2007) updated synthesis of the southern bight cultures, an area that encompasses the California coast from Point Conception in the north to the Mexican border in the south.

Abundant evidence exists that humans were present in North America for at least the past 11,500 years. Fragmentary, but growing, evidence also shows that humans were present long before that date. Linguistic and genetic studies suggest that human colonization of North America may have occurred 20,000 to 40,000 years ago. Evidence of this earlier occupation is not yet conclusive but is beginning to be accepted by archaeologists. For example, the Meadowcroft Rockshelter in Pennsylvania, Saltville and Cactus Hill in Virginia, and the Topper site in South Carolina are sites that have produced apparently reliable dates as early as 12,500 years before present (Goodyear, 2005).

Ancient sites are known in southern California. In January 1936, Work Progress Administration (WPA) workers digging a storm drain along the Los Angeles River (north of Baldwin Hills) recovered human bones from an ancient streambed (Moratto, 1984). In March 1936, imperial mammoth teeth were exposed at the same depth as the human remains (Moratto, 1984). The next oldest site in southern California where both human skeletal remains and artifacts occur is the La Brea Tar Pits (CA-LAN-159). The Arlington Spring site on Santa Rosa Island has provided occupation dates as early as 13,000 years old; the discovery of Arlington Spring Man is the second find in North America that has dated to this period (Johnson, 2008). Evidence for Paleo-Indian occupation in California exists, particularly along the coast of southern California, but remains scant (Byrd and Raab, 2007).

#### 5.3.2.2.1 Early Holocene (9600 cal B.C. to 5600 cal B.C.)

The first groups to inhabit California (for which there is significant evidence) are described as hunters and gatherers who used specialized bifacial projectile points, well-made scrapers, knives, and many other tools designed for subsistence related tasks (food processing). They adapted to a number of environments and developed a variety of secondary subsistence strategies that enabled them to live in a changing environment (Pleistocene to Holocene). As the (Wisconsin) Ice Age ended, previously stable water sources began to dry up in inland California, prompting migrations to the coast. California's islands were occupied as early as 9600 to 9000 cal B.C., as indicated by the oldest levels at Daisy Cave on San Miguel Island. Southern California dwellers exploited a wider range of plants and animals, and the archaeological record shows that a greater emphasis was placed on gathering wild grasses and seeds, rather than on hunting large mammals. Coastal groups, including those living on the islands off of California's coast, utilized marine resources such as shellfish, fish, sea lions, and dolphins. Shell midden sites of the early Holocene are characterized by cobble tools, basin metates, manos, discoids, and flexed burials (Byrd and Raab, 2007).

#### 5.3.2.2.2 Middle Holocene (6000 cal B.C. to cal A.D. 500)

At the start of the Middle Holocene, millingstone cultures appeared throughout central and southern California. The Millingstone Horizon represents an adaptive subsistence shift indicated by the first occurrence of millingstones (mano and metate), which were used to process hard seeds like *Salvia* sp. (sages) and *Eriogonum fasciculatum*. Sites from this period are characterized by the majority of artifacts being manos and metates suggesting the importance of vegetal resources. Most of these sites are located in grassland and sagebrush communities where these hard seeds could support small populations on a yearly basis. Late fall and winter were difficult seasons when vegetal foods were scarce and their diet had to be supplemented with deer and small mammal hunting and shellfish collecting (Byrd and Raab, 2007).

Middle Holocene cultures are quite diverse. Large middle Holocene sites have been well documented along the coast as well as inland. Archaeological evidence of extensive trade networks between southern California and the Southwest has been found. Rare artifact types, including the marine purple olive shell, indicate trade networks that extend from Catalina Island through the Mojave Desert and into Oregon extant in the Middle Holocene (Byrd and Raab, 2007).

Temporary settlements for a few nuclear families (10 to 25 individuals) have been recorded. These sites were seasonal campsites for exploiting yucca and acorns from April through September. The seasonal pattern has been documented as regional variations in the Millingstone Horizon sites in southern California (King, 1971). These sites are characterized by plant processing tools (scraper planes, an absence of hunting implements, millingstones, and earth ovens—necessary to prepare yucca). Peoples intensively exploited their environment with reliance on no particular food resource. Characteristic features of this period include crude chopping tools, large projectile points, manos and metates, *Olivella* shell beads, quartz crystals and cog stones, few ornaments, earth roasting pits, extended posture burials, reburials (secondary interment), and rock cairns (Wallace, 1955:). The first evidence of cemeteries are recorded during this period, and the relative absence of non-utilitarian artifacts indicates that an egalitarian social system was likely in place. Recent evidence indicates that the first permanent villages may have been erected during the Middle Holocene on San Clemente Island (Byrd and Raab, 2007). The presence of daub, the archaeological remains of a wattle-and-daub dwelling, at Middle Holocene coastal sites indicates that at least some of the villages along the coast may have had permanent structures. Wattle-and-daub structures were constructed of bundles of woven sticks or reeds, called wattle, that were placed on a circular, domed-shaped frame, and packed with clay or mud, called daub. When these structures burned, the clay was fired, much like pottery, and can be identified in the archaeological record (Strudwick, 2005).

#### 5.3.2.2.3 Late Holocene (cal A.D. 500 to Historic Contact)

The Late Holocene is characterized by a larger number of more specialized and diversified sites. Population increased substantially and is reflected in a greater number of sites recorded during this time period. This period is characterized by large village sites, tightly flexed burials, bow and arrow, arrowshaft straighteners, *ollas* (jars) and *comals* (cooking flats), personal ornaments, pottery vessels, circular shell fishhooks, an extensive trade network, a wide variety of ritual objects, and large stone bowls (Wallace, 1955:). Elaborate mortuary artifacts are recovered from sites of this period.

Villages occurred in the same general locations as they did in earlier time periods, but they increased in size and decreased in their frequency; base camps were often associated with villages. There was also an increase in the number of specialized and/or diversified sites. Trade was extensive during this period, and long distances are reflected in artifacts recovered from the American Southwest (pottery) in California sites, while steatite objects and Pacific Coast seashells occur in American Southwest sites. During the Late Period, many more classes of artifacts are found in the archaeological record, and they reveal a higher order of workmanship. Larger and more extensive settlement systems are evident, likely a byproduct of a more intensive subsistence base exploiting all of the available food resources. The bow and arrow was introduced, and other aspects of culture expanded (population growth, and more complex social system and trade network).

New studies indicate that culture change in southern California may have been rapid rather than gradual. Overexploitation of resources may have caused shifts to new resources that occurred in greater amounts (Byrd and Raab, 2007). On the coast, intensified fishing and small sea mammal hunting replaced hunting of large sea mammals and shellfish collection. Fish resources were concentrated on smaller near-shore species rather than on deep sea resources. Vegetal resources focused on grasses rather than acorns, and direct evidence of acorn use is minimal at Late Holocene sites. Changes in subsistence strategies in prehistoric California appear to be related to overexploitation of preferred resources, leading to a shortage of the desired resource, followed by shifts to more costly resources (Byrd and Raab, 2007).

Coastal village sites that have yielded important information about this period are the village sites recorded at Goleta Slough located near Santa Barbara, California: Helo, Saxpilil, Geliec, and Alcas. In southern California and within a 5-mile radius of the AEC site, important coastal village sites include the Palmer-Redondo site (CA-LAN-127) and the Old Salt Lake village site, also known as Engva.

### 5.3.2.3 Ethnohistory

The Native Americans living in what is now Long Beach, and specifically within the AEC study area, were the Gabrieleño, or Tongva. The AEC study area is located near the prehistoric location of the Gabrieleño village, *Povuu'nga,* which was situated less than 1 mile northwest within present day California State University, Long Beach.

#### 5.3.2.3.1 Gabrieleño

The Gabrieleño's language belongs to the Takic sub-family of the Uto-Aztecan language stock. The territory of the Gabrieleño comprised inland valleys and coastal plains, and spanned from Topanga Canyon (Los Angeles County) in the north to El Toro (Orange County) in the south, and included Catalina, San Clemente, and San Nicolas Islands in the Channel Islands, and the San Gabriel and San Bernardino inland valleys in the east (McCawley, 1996).

Pre-European contact population numbers are difficult to assess because of discrepancies in the record; in 1852, Scottish-born Los Angeles resident Hugo Reid published letters about the Gabrieleño life and he believed there were some 68 villages, 28 of which he identified in Los Angeles County (McCawley, 1996). Each village was reported to have contained an average of 100 people, and McCawley (1996) estimates more than 5,000 Gabrieleños at the time of contact.

The pre-contact Gabrieleño practiced a patrilineal system. Members of the lineage were given access to diverse resources held by the families within their lineage, allowing the Gabrieleño to exploit multiple ecologies. The heavily hierarchical Gabrieleño social system comprised elites, commoners, middle-class, poor, and slaves. The elites were the only ones to possess access to religious items, and the middle-class supported the elites.

Distribution of settlements did not follow a consistent pattern throughout the Gabrieleño territory largely because of the diverse ecological zones within Gabrieleño territory, which comprised the coast, islands, valleys, and foothills. Their settlement pattern appears to be centered upon a central village, with satellite villages used for resource acquisition. They built large, circular houses with thatched, domed roofs that were large enough to house several families. Ceremonial buildings were often found scattered throughout the village, each with specialized uses, such as sweatlodges, menstrual huts, or meeting rooms. The level of use of these satellite campsites was in direct response to population and village size as well as distance from the main village to the campsite (Earle and O'Neal, 1994).

The Gabrieleño's subsistence strategies incorporated seasonal procurement of resources, both terrestrial and marine. Throughout the year, individual Gabrieleño families would move to temporary encampments for hunting, harvesting, and collecting; depending on the season and resources that could be harvested, travel would occur through various ecological zones. In the interior, where primary habitation was thought to take place in the summers, hunting of deer and rabbit was a significant resource for the Gabrieleño, who

were expert hunters (McCawley, 1996). In spring and summer, temporary camps would be established in order to gather roots, seeds, and bulbs; in the fall, acorns and other wild seeds were gathered as staples in their diet. In coastal areas that were less exposed, such as in the AEC area, wintertime villages were occupied; satellite or temporary campsites would be erected near the shore to collect shellfish and other marine resources. In addition to being expert terrestrial hunters, the Gabrieleño were adept at maritime subsistence and procurement, building planked canoes that were sealed with pine pitch or asphalt, and hunting sea otters and other marine mammals with harpoons, as evidenced in the archaeological record from sites such as CA-LAN-2616 (Langenwalter et al., 2001).

Ethnographies have not consistently documented the indigenous groups of southern California. Various tribes, such as the Chumash, Gabrieleño, Juaneño, and Luiseño, often have been intertwined so that it becomes difficult for the researcher to distinguish one from the other in the written record. Due to this discrepancy, architecture for the southern groups and the documentation of the use of space is virtually unknown (Ciolek-Torrelo, 1998). What is known is that domestic structures for southern California groups were constructed of reeds, grass, and tule. The Gabrieleño houses were semi-subterranean structures built by erecting a pole at the center of an approximately 2.5-foot-deep circular pit; postholes would have been dug around its circumference where willow reeds would be placed and leaned toward the center and secured, then covered in tule and grasses. Although neighboring groups covered their houses in daub, it is reported that the Gabrieleño did not; however, their sweatlodges were covered in daub after construction (Bean, 1974; Ciolek-Torrelo, 1998; McCawley, 1996).

Bean (1974) writes of the Gabrieleño as “The most powerful of the Shoshonean groups and were probably very influential in the diffusion of ideas to inland peoples. The powerful military competency of the Gabrieleño undoubtedly limited territorial expansion of the Cahuilla.”

Neighbors of the Gabrieleño were the Chumash to the north, the Serrano to the east, the Cahuilla to the southeast, and the Luiseño and Juaneño to the south.

Approximately 1 mile northwest of the AEC is the location of the prehistoric Gabrieleño village *Povuu’nga*, also spelled *Pubug-na, Puvunga*, and *Punvungna*. The land on which the village stood was considered sacred land, an important center of power for the Gabrieleño. The village was a large habitation area with associated cemeteries, ceremonial sites, and sister campsites (Boxt and Raab, 2000). *Povuu’nga* has also been identified as the place of origin of *Chingishnish,* also spelled *Chengiichngech* or *Chinigchinich*, an important creation deity for the Gabrieleño (Boscana, 1814; Boxt and Raab, 2000; McCawley, 1996; Strudwick et al., 1996).

According to the ethnographic account of Father Boscana (1814), a Franciscan priest from Mission San Juan Capistrano, the name *Chingishnish* translates to “all powerful” or “all mighty.” Boscana writes “And this was the God Chinigchinich, so feared, venerated, and respected by the Indians, who taught first in the town of Pubuna, and afterwards in all the neighboring parts, explaining the laws, and establishing the rites and ceremonies necessary to the preservation of life” (Boscana, 1814).

Boscana documented oral accounts about the cosmology and traditions of the indigenous and titled the historical account *Chinigchinich*. Boscana’s informants were the neophytes at San Juan Capistrano, which included Serrano, Luiseño, Juaneño, and Gabrieleño Indians. In his account, Boscana documents several great chiefs, good and bad, associations with *Povuu’nga* (alternately spelled *Pubuna* in the account); “out of the confines of a Rancheria, called *Pubuna*, distant from St. Juan Capistrano north east about eight leagues, came the monster *Ouiot*, and the Indians, at the present time, preserve the account in their annals” (Boscana, 1814).

Mission San Gabriel contains baptismal records dating between 1785 and 1805 for 35 individuals from the Puvunga Rancheria (Heizer, 1968). In 1790, *Povuu’nga* was part of a large land grant, the Rancho Los Alamitos, which was given to Spanish soldier Manuel Perez Nieto. After his death in 1804, the Los Nietos property was portioned off into smaller ranchos by his heirs. The following year, the last baptisms for any

*Povuu'nga* Gabrieleño occurred at both the Mission San Juan Capistrano and the Mission San Gabriel (Boxt and Raab, 2000; Heizer, 1968; Strudwick et al., 1996). In 1852, local rancher Hugo Reid identified the village site of *Pubug-na* within the Rancho Los Alamitos. At this time, the property belonged to Abel Stearns (Boxt and Raab, 2000; Heizer, 1968).

The village of *Povuu'nga* has been archaeologically recorded to some extent, although it is impossible to accurately understand its pre-contact size due to the destruction of much of its landscape. The village now comprises sites CA-LAN-234/235 and CA-LAN-306. *Povuu'nga* was listed on the National Register of Historic Places (NRHP) in 1974 with a recorded period of significance in the Late Holocene. The site is described on the NRHP listings as a complex Gabrieleño site that functioned as a ceremonial site, a burial site, and habitation site dating from the Prehistoric era into the Historic Period (NRHP, 2012).

#### 5.3.2.4 Historic Setting

Generally, a historic period begins with the first documented entrance by a European into a specific region; however, due to known contact in other parts of California by Russians, Chinese, Spanish, and Portuguese, some chronologies terminate the late prehistoric for all California in 1542, when the first documented European entered the territory now known as California. This period is termed the Protohistoric Period. In 1542, Juan Rodriguez Cabrillo explored the California coast by ship, entering San Diego Bay and claiming Alta California for Spain. Cabrillo landed near Point Mugu in the same year. Sixty years later, Sebastian Vizcaino sailed into San Diego Bay. Exploration of the land was slower to come. Don Gaspar de Portola searched Alta California for suitable mission sites in 1769.

In California, the historic era is generally divided into three periods: the Spanish or Mission Period (1769 to 1834), the Mexican or Rancho Period (1821 to 1848), and the American Period (1848 to present).

##### 5.3.2.4.1 Spanish/Mission Period (1769 to 1834)

Gaspar de Portola was appointed as the first governor of California in 1767, and the first command given to him by the Viceroy of Mexico was to expel the Jesuits from Baja California. This prompted the launch of military and Franciscan expeditions from Baja California into the region, and with it, the official start of the historic period in California. Following the expulsion of the Jesuits from Baja California, Spanish Colonial military outposts were established in Alta California, the first of which was El Presidio Real de San Diego in 1769, with Pedro Fages as its commander. Military outposts continued to be built as expeditions travelled north. The Portola expedition of 1769 reached Orange County on July 22, was in the San Gabriel Valley by August 2, and was passing through what would become Ventura County by the end of that month (Beebe and Senkewicz, 2001).

The following is a summary of local missions from the California Missions Resource Center (2011) and the California Missions Foundation (2008). During this period, 21 missions would be built in California, lined up from south to north along the El Camino Real, the first of which was San Diego de Alcala, founded by Father Junipero Serra. Of the 21 missions, three are located in Orange and Los Angeles counties. Mission San Gabriel Arcángel, established by Father Pedro Cambon and Father Angel Somera in the San Gabriel Valley on September 8, 1771, was the fourth mission founded in southern California and the first mission constructed in present-day Los Angeles and Orange counties. In 1776, Santa Ana River floods destroyed much of the mission, and it was relocated from Montebello, California, to what is now the city of San Gabriel, California. When the mission was rebuilt, 27 outlying *estancias* (ranchos) were established to supply this mission with meat, hay, grain, vegetables, and fruits. Mission San Juan Capistrano, in present-day Orange County, was founded on November 1, 1776, by Father Junipero Serra. Mission San Fernando Rey de España, the third of the region's missions, was constructed in Los Angeles County in 1797.The construction of the first mission in what is now the Los Angeles–Orange County region introduced the era of Missionization: a period of forced conversion of the Native Americans who occupied the region. Captured and removed from their villages, the indigenous peoples were brought to these missions and into servitude. Many perished due to ill treatment,

and more from the introduction of European diseases, ultimately decimating the Native American populations.

The Spanish government was awarding *ranchos* (land grants) to soldiers and other Spanish Californios by the 1790s; vast tracts of land were used for livestock and farming. In 1784, Governor Pedro Fages awarded one of his soldiers, Jose Manuel Nieto, a 300,000-acre land grant that spanned from what is today known as Long Beach in the north, south into Huntington Beach, and east into San Bernardino County. A short time later, the land grant was retracted and regranted, resulting in a reduction of Nieto's acreage by roughly half (Rancho Los Alamitos, 2012). At the time of Nieto's death in 1804, the Los Coyotes grant, as the land was named, included 167,000 acres within the modern cities of Long Beach, Huntington Beach, and Los Alamitos, among others.

The last mission to be founded was San Francisco Solano in 1823. Further attempts to construct additional missions were thwarted by Spain itself due to the costly endeavor each new mission posed. Later, as Spain lost its rule over New Spain and secularization was sought by the new government, the mission system was disbanded in 1834 (Weber, 2006).

#### 5.3.2.4.2 Mexican/Rancho Period (1821 to 1848)

Mexico became independent of Spain in 1821, and the Decree of Secularization, passed in 1834, effectively ended the Mission Period in California. The following years were marked by the proliferation of cattle ranching throughout the region as the Mexican governor, Pio Pico, granted vast tracts of land to Mexican (and some American) settlers. The former mission lands were then opened for grants by the Mexican government to citizens who would colonize the area and develop the land, generally for grazing cattle and sheep (Lech, 2004).

The newly appointed Mexican government demanded that all who had received land grants from Spain show proof of land ownership. The AEC is located within the original 1790 grant of the Rancho Los Alamitos given to Spanish soldier Manuel Perez Nieto. By 1833, however, land disputes had greatly reduced the holdings of Nieto's original 1790 land grant. A total of 21 square miles of an area called Rancho Las Bolsas were deeded to Catarina Ruiz, which in turn later became known as Huntington Beach, Garden Grove, Westminster, and Fountain Valley (City of Huntington Beach, 1996).

Nieto's heirs further subdivided the remaining land into smaller ranches. In the Long Beach area, the Nieto land was divided into Rancho Los Alamitos and Rancho Los Cerritos. The latter ranch was inherited by Nieto's daughter Manuela Cota (Rancho Los Cerritos, 2003). In 1843 it was acquired by John Temple (Rancho Los Cerritos, 2003). Rancho Los Alamitos, which means "Ranch of the Little Cottonwoods," was sold to Governor Figueroa in 1834. Following his death in 1835, it was inherited by his brother Francisco. In 1842 Don Abel Stearns bought the Alamitos Ranch (Rancho Los Alamitos, 2012).

In 1846, in response to the Mexican-American War, the United States Navy posted a naval base in what is today San Pedro; the base was abandoned after the war (California State Military Museum, 2012).

#### 5.3.2.4.3 American Period (1848 to Present)

Gold was discovered in California in 1848, and by 1849 the Gold Rush brought many speculators from the eastern United States and European countries flocking to California to make their fortune. The rapid growth of the region was substantial, and it is estimated that as many as 300,000 people arrived in the region during this period, heralding the start of industry, transportation, and changes in legislature.

Following the signing of the Treaty of Guadalupe Hidalgo in 1848, the United States took possession of California. The treaty bound the United States to honor the legitimate land claims of Mexican citizens residing in captured territories. On September 9, 1850, California became the thirty-first state in the Union. The Land Act of 1851 established a board of Land Commissioners to review and adjudicate land claims, and charged the Surveyor General with surveying confirmed land grants. In order to investigate and confirm titles of California, American officials acquired the provincial records of the Spanish and Mexican

governments that were located in Monterey. Those records, most of which were transferred to the U.S. Surveyor General's Office in San Francisco, included land deeds and sketch maps (Gutierrez and Orsi, 1998).

From 1852 to 1856, a board of Land Commissioners determined the validity of grant claims. In 1858, Manuel Dominguez received a land patent, securing the ownership of the Rancho Dominguez and becoming the first land patent to be granted in California by the U.S. government (Dominguez Rancho Adobe Museum, 2012).

At the start of this period, ranching was a lucrative enterprise and interest in this industry brought many from other parts of the county to stake a claim in the cattle boom. Near the project area, agricultural crops of barley, potatoes, and corn were grown (Strudwick et al., 1996). The drought of the early 1860s and the subsequent loss of cattle caused Abel Stearns to lose the Alamitos Ranch, which later was acquired through lease by John Bixby in 1878. Through a partnership with Jotham Bixby and Isaias W. Hellman, John Bixby purchased the property in 1881 (Rancho Los Alamitos, 2012). Jotham Bixby, meanwhile, acquired the neighboring Rancho Los Cerritos. John Bixby and his partners, under the Alamitos Land Company, had interests in city development and creating oceanfront property; consequently, the Alamitos Land Company began designing and engineering city infrastructure such as streets, parks, and living communities. These communities would include the areas of Belmont Heights, Belmont Shore, and Naples.

In 1887, John Bixby died and Rancho Los Alamitos was subdivided and distributed amongst Bixby's partners and family. John Bixby's family retained the land that included the AEC study area and occupied it until 1961 (Rancho Los Alamitos, 2012). The Bixby heirs deeded a 7.5-acre area that contained the ranch house and associated facilities to the City of Long Beach in 1968. The ranch is listed on the NRHP and currently operates as a historical site, significant for both its prehistoric importance as a sacred village site of the Gabrieleño and for its continuous historic landscape (Rancho Los Alamitos, 2012).

Upon Jotham Bixby's death in 1916, his ranch was parceled into the communities of Bixby Knolls, California Heights, North Long Beach, and portions of Signal Hill (Rancho Los Alamitos, 2012).

***Long Beach***

The area now known as Long Beach was originally planned as Willmore City in a commercial venture by William Willmore in 1882, but because of financial difficulties, Willmore was not able to promote the area and built only 12 houses. The Long Beach Land and Water Company acquired the land from Willmore in 1884 and renamed the town Long Beach (Rancho Los Cerritos, 2003). Long Beach was incorporated in 1887. In 1888, there was one school and fewer than 50 residences covering less than 3 square miles (Long Beach Planning, 2013).

In the early 1900s, Long Beach became one of the premier resort beach towns and boasted many attractions such as the Pike, an amusement park located at the end of the red car electric line along the coast. The Pike contained games; rides such as the Cyclone Racer, a wooden two-track rollercoaster, the Plunge, originally a bathhouse, and an original Looff's Carousel; eight movie theatres; and ballrooms. The Pike opened in 1902 and operated under various names until 1979.

Charles H. Windham, the mayor of Long Beach, established the Los Angeles Dock and Terminal Company and purchased an area of mudflats with the intent of developing a commercial harbor. On June 24, 1911, the Port of Long Beach officially opened and shortly thereafter, steamships, such as the North Pacific Steamship Company, scheduled regular routes between Long Beach and San Francisco. In 1916, the Los Angeles Dock and Terminal Company went bankrupt, and the City of Long Beach was forced to take over the construction of the additional harbor developments (Port of Long Beach, 2011). The City established the Harbor Commission as the governing body for the port (Port of Long Beach, n.d.).

The Navy came to Long Beach in 1917 to establish a training facility for submarines, and this evolved into a Navy auxiliary servicing station for its ships (California State Military Museum, n.d.). A long period of naval base construction began in 1939, initiated by the onset of World War II.

Oil was produced in Los Angeles County for minimal commercial use since about the late 1850s; however the industry did not become fully developed until the introduction of the railway system in the late 1800s. With the ease of transportation and access, oil quickly began to replace other types of fuel in the form of kerosene and other refined oils, prompting an oil boom. Oil was discovered in Long Beach in 1921, and this set off a population boom that resulted in millions of dollars in development (Long Beach Planning, 2013). In 1936, there was a second major discovery of oil in Long Beach (California Department of Conservation, 2005). During this time, Long Beach was the fastest-growing city in the nation, spurred by the oil boom, the growing port, and tourism (Downtown Long Beach, 2012). From the first major discovery in the late 1800s through the next hundred years, oil was Los Angeles County's main export (Paleontological Research Institution, 2012).

A magnitude 6.4 earthquake struck Long Beach in 1933, causing the death of 120 residents and over $50 million in damage (Long Beach Planning, 2013). The city rebuilt, embracing the Art Deco style for many of its new downtown buildings. The earthquake served as an impetus to pass the Field Act of 1933, which required earthquake-resistant design and construction for all public schools (Long Beach Planning, 2013).

Before World War II, Japanese-Americans had a significant presence in the area, specifically on Terminal Island in east San Pedro, but this changed as a result of the war (NPS, 2004). Terminal Island was viewed as a Japanese fishing village with a population of 3,000 residents who worked primarily as fishermen for the canneries. In 1942, Japanese-Americans were removed from Long Beach and transferred to inland internment camps under the orders of Lieutenant General John De Witt of the Army's Western Defense Command (NPS, 2004). By the end of the war, there would be over 120,000 Japanese-Americans in internment camps. Even after their release from the camps, none of the families returned to Terminal Island, and to date, Japanese-Americans do not have a large presence in the Long Beach area (NPS, 2004).

In the 1950s, Long Beach experienced a population boom of ex-servicemen and their families, which altered the landscape from resort town to suburb. In additional, there was a high presence of military servicemen from the nearby naval base, and adult entertainment services began to proliferate downtown to serve them. Like many urban centers in the 1960s, downtown Long Beach experienced a decline as the federal Eisenhower Interstate System and malls drew away the major retailers and their patrons.

In 1967, the Long Beach City Council purchased the decommissioned ship *Queen Mary* and brought her to Long Beach to serve as a luxury hotel complete with restaurants and shops. The city began to plan for the revitalization of downtown, drafting a Downtown Plan and beginning construction on the Long Beach Plaza Mall, the Promenade, and the Long Beach Convention and Entertainment Center (Downtown Long Beach, 2012).

Since the 1970s, downtown Long Beach has prospered and the city of Long Beach has continued to grow. It has many industries including electronics manufacturing, aerospace, energy, and oil. Long Beach continues to be an important port city and is the second busiest shipping port in the United States.

#### 5.3.2.4.4 Steam Generation Plants in California

The first commercial electrical central generating stations were the Pearl Street Station in New York and the Holborn Viaduct power station in London, both of which opened in 1882 (Parsons, 1940). Both of these stations used reciprocating steam engines, but the development of the steam turbine allowed larger and more efficient central generating stations to be built. Turbines offered higher speeds, more compact machinery, and stable speed regulation. British designer Sir Charles Parsons built the first multi-stage reaction steam turbine in 1884 and patented it in 1885 (Cambridge, 2000). Almost immediately he and others began making improvements upon his original concept. By 1893 Parsons had a 300-kW turbine generator (Skrabec, 2007). George Westinghouse, Jr., bought the U.S. rights to the Parsons turbine in 1896 and improved the Parsons technology and increased its scale (Skrabec, 2007). In 1903, Aegidius Elling of Norway built the first successful experimental gas turbine that was able to produce more power than needed to run its own components. It used both rotary compressors and turbines, and is recognized as the

first applied method of injecting steam into the combustion chambers of a gas turbine engine (Encyclopedia Britannica, 1995). By the beginning of the twentieth century, power plants with steam turbines began to replace the original steam engine power plants, and turbines entirely replaced reciprocating engines in large central stations after about 1905 (Parsons, 1940). In less than 30 years, the technology of engines capable of supplying power and electricity had improved greatly.

In the early stages of steam turbine power plant development, the materials needed to withstand the high temperatures of modern turbines were not yet available. Technology and improvements for steam turbine engines continued to advance throughout the 1920s and 1930s, leading to a generation of more efficient turbine power plants in the 1950s.

In 1920, hydroelectric power accounted for 69 percent of all electrical power generated in California. By 1930, that figure had risen to 76 percent; by 1940 it was up to 89 percent (Williams 1997; Herbert and Brookshear, 2006). But after 1941, new thermal or steam-electric generating units accounted for most of the new power capacity in the state. By 1950, hydroelectricity accounted for only 59 percent of the total, falling to 27 percent in 1960 (Williams, 1997; Herbert and Brookshear, 2006).

Pacific Gas and Electric Company (PG&E) and SCE, California's largest electrical utility providers, made efforts to build large-scale steam generation plants as early as the 1920s. James Williams, a historian of energy policies and practices in California, noted that the decision by PG&E and SCE to build steam plants in the 1920s may be attributed to three things. First, a persistent drought in California from 1924 through the mid-1930s caused the major utilities to question the viability of systems that relied heavily on hydroelectricity. Second, new steam generation power plants on the East Coast were achieving far greater efficiencies than had previously been possible. Between 1900 and 1930, for example, the fuel efficiency of steam plants, measured in kilowatts per barrel of oil, increased more than nine-fold. Third, new natural gas lines were completed in the late 1920s that could bring new gas supplies to both northern and southern California from the San Joaquin Valley (Williams, 1997).

SCE began constructing its steam generation plant at Long Beach on Terminal Island in 1911. The Los Angeles Department of Water and Power (LADWP) constructed a steam station at Seal Beach consisting of two units installed in 1925 and 1928. PG&E built a steam plant in Oakland in 1928. In 1929, the Great Western Power Company (which was absorbed by PG&E in 1930) built a large steam plant on San Francisco Bay, near the Hunters Point shipyard (Herbert and Brookshear, 2006).

The years following World War II were a time of expansive growth in southern California. The population swelled in response to business and industrial development. Housing expanded into formerly agricultural areas, creating suburbs around Los Angeles and San Diego. The increased population and industry made greater power generation crucial, and California's utility providers expanded their capacity to meet the demand. At this point, most of the more favorable hydroelectric sites in California had already been developed, and as previously noted, the viability of hydroelectricity had been called into question during the drought of the 1920s and 1930s. The technology of steam generation had progressed, and abundant natural gas resources to help run them were now available. "Steam turbine power plants were cheaper and quicker to build than hydroelectric plants, so utilities companies moved away from hydroelectricity, establishing steam turbine power as the generator of choice" (Herbert and Brookshear, 2006). The "momentum for steam had been established by war, by drought, and by a positive history of increased thermal power plant development" (Williams, 1997).

Starting in the 1950s, dozens of new steam generation plants were built throughout California. In a detailed article in 1950 in C*ivil Engineering*, I. C. Steele, chief engineer for PG&E, summarized the design criteria of four major steam plants the company had under construction at that time: Moss Landing, Contra Costa, Kern, and Hunters Point in San Francisco. The criteria were the same in all cases: build the facility close to load centers to reduce transmission costs, close to fuel supplies, near a water supply, and on a site where land was inexpensive and could support a good foundation (Steele, 1950; Herbert and Brookshear, 2006).

Between 1950 and 1970, steam generating capacity in California saw its greatest expansion. During this period, SCE built a series of similar steam plants in the Los Angeles basin and in San Bernardino County. In 1952, the company began work on Redondo No. 2, which was adjacent to an earlier plant at Redondo Beach. In 1953, the Etiwanda plant went online, followed in 1955 by El Segundo, Alamitos in 1956, and Huntington Beach and Mandalay in 1958. By 1960, all SCE plants had either multiple units or additional units in the planning stages. In 1950, PG&E operated 15 steam electric plants in California. Between 1950 and 1960, they added several new plants and expanded older ones. Chief among these were Contra Costa (1951–53), Moss Landing (1950–52), Morro Bay (1955), Hunters Point (addition 1958), Humboldt Bay (1956–58), and Pittsburg (1959–60) (Herbert and Brookshear, 2006).

Although SCE and PG&E were the major players, smaller utility companies also expanded their facilities. The LADWP system consisted of five steam electric power plants by 1962: Seal Beach Plant (1925–28), Harbor Plant on Los Angeles Harbor (1943), Valley Plant in the San Fernando Valley (1954), Scattergood (1958), and Haynes (1961). San Diego Gas & Electric Company had three steam electric power plants by 1960: Silver Gate (1943), Encina (1954), and South Bay (1960). By the late 1970s, there were more than 20 fossil fuel thermal plants in California, clustered around San Francisco Bay, Santa Monica Bay, and in San Diego County, along with a few interior plants in San Bernardino, Riverside, and Imperial counties, as well as a few plants on the Central Coast (Herbert and Brookshear, 2006).

#### 5.3.2.4.5 Southern California Edison Company

The history of SCE dates to 1886, when a company called Holt and Knupps illuminated Visalia, California, with street lights. They became known as Visalia Electric Light & Gas Company, the earliest of several companies that became SCE (Edison International, 2012). In 1896 a group of investors, including Elmer Peck and George Baker, established the West Side Lighting Company to provide electricity to Los Angeles and bought the franchise to operate the city's power system (Edison International, 2012; Myers, 1983). But that same year the city passed an ordinance prohibiting most overhead line construction because the city streets had become a maze of overhead lines (Lundsten and Flick, 2012). The ordinance established the "conduit district" in which new wiring had to be laid underground (Myers, 1983). West Side Lighting decided that the best technology available was the Edison three-wire conduit technology, and that they needed this technology to continue to grow their business. But Los Angeles Edison Electric, formed in 1894, owned the rights to the Edison name and patents (Lundsten and Flick, 2012). The two companies came together and formed Edison Electric Company of Los Angeles in 1897 (Slade et al., 2012). Edison Electric then purchased several smaller utility companies, including Visalia Electric Light & Gas Company, San Bernardino Electric Company, Santa Barbara Electric Light Company, and Ventura Land & Power. They also began to build new plants and transmission lines, and became the first company to install Edison-type DC-power underground conduits in the Southwest. The Los Angeles No. 2 substation opened in 1898, distributing power throughout the City of Los Angeles via the new conduit system (Myers, 1983). Continuing to expand, they purchased the Southern California Power Company that same year (Myers, 1983).

In 1899 their Santa Ana River No. 1 hydroelectric plant began operation, transmitting power to Los Angeles over the Santa Ana River Line, at the time the world's longest power line at 83 miles long (Edison International, 2012). The power line was the first to use "transposition" technology which has been used ever since for long-distance transmission lines (Myers, 1983). In 1907 the company surpassed this achievement when their Kern River–Los Angeles Transmission Line began operation. At 118 miles and 75 kV, it was the world's longest, and highest voltage, power line and the first transmission line in the nation to be supported entirely by steel towers (Edison International, 2012). The company continued to expand and on July 6, 1909, changed its name from Edison Electric Company of Los Angeles to Southern California Edison to reflect its expanded service area (Edison International, 2012).

In 1917, SCE purchased the Pacific Light & Power Corporation, the Ventura County Power Company, and the Mount Whitney Power & Electric Company, making it the fifth-largest central-station power company in the United States (Slade et al., 2012). The acquisition of Pacific Light & Power gave SCE the Big Creek Project, at

the time the world's largest hydroelectric plant, energized in 1913 (Edison International, 2012). By 1929 the eight powerhouses at Big Creek generated a total of 360,000 kilowatts, half of SCE's total power capacity (Slade et al., 2012).

In 1912 the City of Los Angeles decided to develop its own power distribution system, known as the Los Angeles Department of Water and Power (LADWP). It was enshrined in the Charter of the City of Los Angeles in 1925, and by 1939 had become the sole general distributor of electric energy in Los Angeles (Lundsten and Flick, 2012). SCE had to sell its Los Angeles distribution system to the Los Angeles City Council in 1922 (Slade et al., 2012). But it continued to grow outside of the city limits, expanding its steam plants in Long Beach during the 1930s to include eleven new generators (Slade et al., 2012).

After World War II, SCE grew substantially and installed its one millionth meter in 1951 (Slade et al., 2012). By the early 1950s Edison was the fifth-largest investor-owned power company in the United States. Its service area covered 18,500 square miles and contained about 225 communities with a combined population of almost three million. SCE built 11 fossil-fuel powered stations between 1948 and 1973. They also expanded into nuclear power. In July 1957, at the Santa Susana Experimental Station, SCE became the first investor-owned utility to generate non-military nuclear power (Slade et al., 2012). They broke ground on the San Onofre Nuclear Generating Station in 1963, and it began operation in 1968 (Edison International, 2012). In January 1964 the California Electric Power Company, which served 450,000 people, merged with SCE (Slade et al., 2012).

In 1988 SCE formed a parent holding company, which became known as Edison International in 1996. SCE sold Alamitos Generating Station to the AES Corporation in 1998.

Founded in 1981, the AES Corporation built its first power plant in 1985 in Texas. The AES Corporation now operates on five continents and in 27 countries. They engage in power generation and distribution, and also operate utility companies. AES-SLD owns and operates three generating stations: AES Huntington Beach, AES Redondo Beach, and AES Alamitos. AES-SLD is an independent power generator and sells all of its power for distribution in California.

***Alamitos Generating Station***

SCE built the Alamitos Generating Station between 1955 and 1969. The first unit began commercial operation in September 1956; Unit 2 in February 1957; Unit 3 in December 1961; Unit 4 in June 1962; Unit 5 in March 1966; Unit 6 in September 1966; and Unit 7 in July 1969 (AES, 2010). Unit 7 was decommissioned in 2003. The facility was designed to be dual-source powered by either oil or natural gas, and had four large fuel tanks to hold oil. In the 1970s all dual-source fueled plants were required to convert to natural gas only. By the 1980s, the Alamitos Generating Station was converted from oil use to natural gas, and the fuel oil tanks were removed in 2010.

AES-SLD acquired the Alamitos Generating Station plant from SCE on May 18, 1998. SCE owns the electrical transmission lines and a portion of the switchyard facilities.

## 5.3.3 Research Design for the Cultural Resources Inventory

### 5.3.3.1 Research Objective

This section provides the research design used by CH2M HILL to guide the records and archival search and subsequent fieldwork phase of the cultural resource inventory for the AEC. Given the themes identified in the Region Setting, Section 5.3.2.2, above, property types and survey expectations for this project were defined. The methods used both during the records and archival search and the fieldwork phase were planned to meet or exceed the CEC requirements according to the *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 2007), as well as California Archaeological Resource Management reporting and CEQA requirements for analyzing potential impacts to historical resources.

The initial goal was to identify any cultural resources located onsite and within the project area so that potential effects of the project could be assessed. To accomplish this goal, background information was examined and assessed, the study area was defined, and a field survey was conducted to identify cultural remains. Reviews of the records search results, previous work in the project area and vicinity, and a historical map check indicated that cultural resources within the study area were likely to be mostly prehistoric or historic remains related to salt collection and refinement, and historic structures related to the 1950s-era Alamitos Generating Station.

The fundamental goals of an intensive pedestrian survey are to identify and document previously unrecorded cultural resources and analyze cultural materials, not only to better characterize potential project effects, but also to attempt to confirm or elaborate on our current understanding of the prehistory and history of the region. From a management perspective, the ability of specific resources to address research questions provides a basis to evaluate California Register of Historic Resources (CRHR) and NRHP eligibility. Methods for conducting the field survey and inventory are described below.

### 5.3.3.2 Research Questions

The literature review and search results suggest that the project area has a low archaeological sensitivity. Although there are known prehistoric sites near the project, none is located within the study area. In addition, although historic period sites tend to be associated with historic linear features such as roads, railroads, transmission lines, all of which are or have been in the area, the area is built.

Pertinent research questions that are applicable to the project site are discussed below:

1. Historically, the AEC is located adjacent or near to various water resources, including the San Gabriel River and the Pacific Ocean, and is situated in close proximity to a complex Gabrieleño village site (1 mile northwest of the AEC). With access to various resources and the presence of a large occupation site within 1 mile, it would indicate that the general area was a locale for prehistoric resource procurement and satellite campsites.

***Research Question:*** Are there any remaining areas around the plant site or within the 200 foot buffer that remain intact enough to contain archaeological remains? Is there evidence of prehistoric resource procurement, processing or habitation?

2. The AEC study area is located within the historic Rancho Los Alamitos. If any remains are identified in the study area, they would most likely be historic trash dumps or scatters related to ranching or agricultural activities.

***Research Question:*** Is there any evidence of these historic activities in the study area? If so, do any of these remains offer evidence of any different ethnic groups who may have been involved in the ranching or agricultural activities?

3. Starting in the 1950s, dozens of new steam generation plants were built throughout California. The Alamitos Generating Station is one among several of these plants constructed in the greater Los Angeles area during the years following World War II and the subsequent expansive growth in southern California.

***Research Question:*** Does the plant have any unique features or employ any different technologies that other steam generation plants lack which were constructed at the same time in the greater Los Angeles area?

4. After World War II, the population in southern California swelled in response to both business and industrial development. Housing expanded into formerly agricultural areas, creating suburbs around Los Angeles and San Diego. The increased population and industry made greater power generation crucial and California's utility providers expanded their capacity to meet the demand.

***Research Question:*** Are there any extant buildings directly adjacent to the study area that appear to be directly related to the construction of the plant? If so, are these buildings commercial or residential? Do the commercial buildings directly relate to the Alamitos Generating Station?

#### 5.3.3.3 Survey Expectations

Based on the high degree of surface disturbance at the Alamitos Generating Station, the potential presence of archaeological resources within the study area was considered low. Although unlikely, prehistoric archaeological sites that could theoretically be found in undisturbed or open areas of the project vicinity, including the 200-foot buffer, include shell middens, lithic scatters, or habitation sites. Historic period sites could include trash dumps.

The Alamitos Generating Station was constructed in the 1950s and it was expected that at least some of the buildings on the site would date to the 1950s.

The archaeological sensitivity of the project study area was expected to be low; however, the likelihood of identifying historic buildings within the study area is expected to be high.

Many of the archaeological sites previously documented in the vicinity of the AEC are no longer extant. Although specific site dimensions are not known, general site descriptions are included in several reports reviewed during the literature search. These site descriptions were reviewed to determine potential site types in the AEC study area. This review found descriptions for both small and large prehistoric sites in the study area.

Because at least some of the site descriptions found in various reports described smaller sites, transect spacing and observation strategies allowed for the detection of small sites (fewer than five artifacts or features). The survey methodology for prehistoric and historic archaeological resources was performed using pedestrian transects spaced at 10- to 15-meter intervals throughout the entire surveyed area. Additionally, other surveys in the area also utilized a 10-meter interval methodology; therefore, a 10- to 15-meter interval was determined sufficient for the AEC archaeological survey.

### 5.3.4 Resources Inventory

A cultural resources inventory, which included archival research, architectural reconnaissance, and a surface pedestrian survey, was conducted for the AEC. The AEC study area was determined in accordance with the latest CEC *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 2007) for assessing potential impacts on archaeological and architectural resources. The results of the resource inventory are presented in the following sections. Figure 5.3-1 shows the AEC site and the archaeological and the architectural survey areas. The archaeological survey area includes the existing Alamitos Generating Station site and the 200-foot buffer around the site. The architectural survey area includes the existing Alamitos Generating Station site and a buffer of at least one additional parcel deep on all sides of the site as well as the offsite linear alignment of the process/sanitary wastewater pipeline.

#### 5.3.4.1 Archival Research

CH2M HILL requested a literature search from CHRIS staff, South Central Coastal Information Center (SCCIC), searching within a 1-mile buffer zone around the AEC project site and laydown areas on August 30, 2011. This search radius encompasses the entire research area required by the CEC for archaeological and architectural resources. An additional literature search for the process/sanitary wastewater pipeline corridor was completed by CH2M HILL at the SCCIC on July 2, 2013.

The CHRIS literature and records review included a review of all recorded archaeological sites and all known cultural resource survey and excavation reports. Other sources examined included the NHRP, the CRHR, California Historical Landmarks, and California Points of Historical Interest. Historical maps consulted included 1896 Los Alamitos, California, and the 1942 and 1943 Downey, California, 15-minute U.S. Geological Survey (USGS) topographic quadrangle map. State and local listings were consulted for the

presence of historic buildings, structures, landmarks, points of historical interest, and other cultural resources via the California State Parks Office of Historic Preservation (OHP) website.

The Department of Regional Planning and the City of Long Beach Development Services was contacted by telephone on August 29, 2011, as was the City of Long Beach Department of Regional Planning on August 30, 2011.

The property owner was contacted and provided specific information on the history, design, and construction of the Alamitos Generating Station facilities. Historical photographs of the site before, during, and after construction were obtained from the Huntington Digital Library.

According to information available in the CHRIS files, two previous cultural resource studies, primarily cultural resource survey reports, have been prepared within the AEC area; one survey report includes the process/sanitary wastewater pipeline corridor, and an additional 71 studies have been prepared within 1 mile of the AEC site, laydown area, and offsite linear (Table 5.3-1). Approximately 10 percent of the study area has been previously subject to cultural resources studies. A complete copy of the CHRIS records search is provided as Appendix 5.3C, which has been provided under a request for confidentiality.

TABLE 5.3-1
Cultural Resources Studies Conducted in the Study Area

| Report Authors and Date | CHRIS Catalogue NADB Numbers |
|---|---|
| **Studies within a 1-Mile Radius** | |
| Nelson, 1974 | LA-57 |
| Dixon, 1977 | LA-491 |
| Dixon, 1974 | LA-503 |
| Allen, 1980 | LA-939 |
| Van Horn and Brock, 1981 | LA-987 |
| McKenna, 1990 | LA-2114 |
| Winman and Stickel, 1978 | LA-2399 |
| Dixon and Rosenthal, 1981 | LA-2792 |
| Dixon, 1972 | LA-2794 |
| Desautels, Dixon, and Rosen, 1979 | LA-2795 |
| Dixon, 1993 | LA-2864 |
| Bonner, 1994 | LA-3114 |
| Bucknam, 1974 | LA-3583 |
| Milliken and Hildebrandt, 1998 | LA-4091 |
| McLean, Strudwick, and McCawley, 1997 | LA-4157 |
| Brooks, 1960 | LA-4266 |
| Zahnister, 1974 | LA-4269 |
| Underwood, 1993 | LA-4270 |
| Underwood, 1993 | LA-4274 |
| Underwood, 1993 | LA-4275 |
| Underwood, 1993 | LA-4276 |
| Underwood, 1993 | LA-4277 |
| Widell, 1994 | LA-4355 |
| Zahnister, 1974 | LA-5315 |
| Cottrell, 1974 | LA-5727 |

TABLE 5.3-1
Cultural Resources Studies Conducted in the Study Area

| Report Authors and Date | CHRIS Catalogue NADB Numbers |
|---|---|
| Strudwick et al., 1996 | LA-5890 |
| McCormick and Ferraro, 2002 | LA-6089 |
| Shepard, 2003 | LA-6107 |
| Baksh et al., 1994 | LA-6160 |
| Cottrell, 1975 | LA-6163 |
| Billat, 2003 | LA-6909 |
| Shepard, 2004 | LA-8494 |
| URS Corporation, 2003 | LA-8495 |
| Raab and Boxt, 1993 | LA-8497 |
| Raab and Boxt, 1994 | LA-8498 |
| Taniguchi, 2006 | LA-9839 |
| Will, 2006 | LA-9840 |
| Fulton, 2009 | LA-10483 |
| Archaeological Associates, Ltd., 1980 | OR-493 |
| Scientific Resource Surveys, Inc., 1981 | OR-639 |
| Redwine, 1958 | OR-1049 |
| Stickel, 1991 | OR-1272 |
| Whitney-Desautels, 1997 | OR-1581 |
| Clevenger, Crawford, and Pigniolo, 1993 | OR-1599 |
| Stickel, 1996 | OR-1608 |
| York, Cleland, and Baksh, 1997 | OR-1609 |
| Stickel, 1996 | OR-1610 |
| York, Cleland, and Baksh, 1997 | OR-1643 |
| York, Cleland, and Baksh, 1997 | OR-1644 |
| Stickel, 1996 | OR-1816 |
| York and Cleland, 1997 | OR-1858 |
| Ogden Environmental and Energy Services, 1997 | OR-1897 |
| Davy, 1997 | OR-1931 |
| Clevenger and Crawford, 1995 | OR-1958 |
| Mason and Cerreto, 1995 | OR-1960 |
| Clevenger and Crawford, 1997 | OR-1969 |
| Berryman and Pettus, 1995 | OR-1989 |
| Mason, 1987 | OR-2033 |
| Romani, 1981 | OR-2161 |
| Duke, 2000 | OR-2164 |
| Shepard, 2003 | OR-2774 |
| Ogden Environmental and Energy Services, 1995 | OR-3174 |
| JRP Historical Consulting Services, 1999 | OR-3175 |
| Ritchie, 2000 | OR-3371 |
| York et al., 2003 | OR-3391 |

TABLE 5.3-1
Cultural Resources Studies Conducted in the Study Area

| Report Authors and Date | CHRIS Catalogue NADB Numbers |
|---|---|
| Wlodarski, 2006 | OR-3402 |
| Ehringer, 2009 | OR-3762 |
| Cleland, York, and Willey, 2007 | OR-3828 |
| Mason, 2009 | OR-3870 |
| Slauson, 2000 | OR-3890 |
| Bucknam, 1974 | OR-4034 |
| **Studies within the Study Area** | |
| Cooley, 1979 | LA-522 |
| McKenna, 2001 | LA-5215 |
| Strudwick, 2004 | LA-8487 |

Source: CHRIS South Central Coastal Information Center

CHRIS= California Historical Resources Information System
NADB= National Archaeological Database

A total of 56 sites are located within the literature search area. Of these resources, only one is located within the AEC, site number P-19-186880, which is the Alamitos Generating Station Fuel Oil Tank Farm. This resource was previously recommended as not eligible for the NRHP or CRHR by other consultants (Strudwick, 2004). Additional information about this resource is provided in Table 5.3-2. A total of 52 prehistoric and historic sites are located outside of the study area but within the 1-mile radius. These resources are also shown on Table 5.3-2.

Two of the sites within the 1-mile radius are listed on both the CRHR and the NRHP. These two sites are the Puvunga Indian Village, site number P-19-000306, and the Rancho Los Alamitos, also known as the Bixby House, site number P-178684. Both listed properties are outside of the study area. One additional resource is listed on the CRHR. This resource, the Long Beach Marine Stadium, site number P-19-186115, is outside of the study area, but located within the 1-mile literature search radius. Additional information about these three resources is provided below.

A review of historic maps (1896 Los Alamitos, California, and the 1942 and 1943 Downey, California, 15-minute USGS topographic quadrangle map) did not identify any additional resources or historic features. Review of the historic 1896 map did show, however, unnamed roads and bridges that crossed the San Gabriel River north of the AEC. Review of the historical 1942 and 1943 maps identifies the channeled and concreted San Gabriel River and the Los Cerritos Channel. Within the AEC, an unnamed fuel tank farm and associated facilities are depicted. Several roads in a grid pattern were also noted. The Alamitos Bay is shown as fully developed and the marshland having been filled.

TABLE 5.3-2
Cultural Sites within the AEC Literature Search Area

| Site Number | Site Type | Site Description | Evaluation - Year |
|---|---|---|---|
| **Sites within 1-mile Radius** | | | |
| P-19-000102 | Prehistoric | Shell midden | Not evaluated |
| P-19-000232 | Prehistoric | Shell midden | Not evaluated |
| P-19-000233 | Prehistoric | Shell midden | Not evaluated |
| P-19-000271 | Prehistoric | Shell midden | Not evaluated |
| P-19-000273 | Prehistoric | Midden | Not evaluated |
| P-19-000274 | Prehistoric | Shell fragments | Not evaluated |
| P-19-000275 | Prehistoric | Shell fragments | Not evaluated |
| P-19-000278 | Prehistoric | Campsite | Not evaluated |
| P-19-000306 | Prehistoric | Puvunga Indian Village | NRHP Listed - 1974 |
| P-19-000702 | Prehistoric | Midden | Not evaluated |
| P-19-001006 | Prehistoric | Midden | Not evaluated |
| P-19-001007 | Prehistoric | Midden | Not evaluated |
| P-19-001821 | Prehistoric | Shell midden | Not evaluated |
| P-19-002616 | Prehistoric | Campsite | Not evaluated |
| P-19-003040 | Historic | Oil tank farm | Not evaluated |
| P-19-120038 | Prehistoric | Midden | Not evaluated |
| P-19-120039 | Prehistoric | Midden | Not evaluated |
| P-19-120040 | Prehistoric | Midden | Not evaluated |
| P-19-120045 | Prehistoric | Midden | Not evaluated |
| P-19-120046 | Prehistoric | Midden | Not evaluated |
| P-19-120047 | Prehistoric | Midden | Not evaluated |
| P-19-120048 | Prehistoric | Midden | Not evaluated |
| P-19-120049 | Prehistoric | Midden | Not evaluated |
| P-19-120050 | Prehistoric | Midden | Not evaluated |
| P-19-120038 | Prehistoric | Midden | Not evaluated |
| P-19-120053 | Prehistoric | Midden | Not evaluated |
| P-19-178684 | Historic | Rancho Los Alamitos | NRHP/CRHR Listed 1981 |
| P-19-186115 | Historic | Long Beach Marine Stadium | CRHR Listed 1995<br>NRHP Not Eligible 1990 |
| P-19-186926 | Historic | Los Alamitos Retarding Basin- Pump Station | Not evaluated |
| P-19-187656 | Historic | Long Beach Veterans Medical Center | NHRP Not eligible 2003 |
| P-19-187657 | Historic | Bixby Ranch Field Office | Not evaluated |
| P-30-000143 | Prehistoric | Midden/possible burials | Not evaluated |
| P-30-000256 | Prehistoric | Midden | Not evaluated |
| P-30-000257 | Prehistoric | Site | Not evaluated |
| P-30-000258 | Prehistoric | Campsite | Not evaluated |
| P-30-000259 | Prehistoric | Campsite | Not evaluated |
| P-30-000260 | Prehistoric | Campsite | Not evaluated |
| P-30-000262 | Prehistoric | Campsite | Not evaluated |

TABLE 5.3-2
Cultural Sites within the AEC Literature Search Area

| Site Number | Site Type | Site Description | Evaluation - Year |
|---|---|---|---|
| P-30-000263 | Prehistoric | Midden | Not evaluated |
| P-30-000264 | Prehistoric | Occupation site with human remains | Not evaluated |
| P-30-000265 | Prehistoric | Campsite | Not evaluated |
| P-30-000850 | Prehistoric | Shell scatter | Not evaluated |
| P-30-000851 | Prehistoric | Shell scatter | Not evaluated |
| P-30-000852 | Prehistoric | Shell scatter | Not evaluated |
| P-30-001473 | Prehistoric | Shell midden | Eligible/1996 |
| P-30-001539 | Prehistoric | Shell scatter | Not evaluated |
| P-30-001540 | Prehistoric | Shell scatter | Not evaluated |
| P-30-001541 | Prehistoric | Shell scatter | Not evaluated |
| P-30-001542 | Multicomponent | Shell midden, glass shards | Not evaluated |
| P-30-001543 | Historic | Refuse deposit | Not evaluated |
| P-30-001544 | Prehistoric | Midden | Not evaluated |
| P-30-001545 | Prehistoric | Shell scatter | Not evaluated |
| P-30-001546 | Prehistoric | Lithic scatter | Not evaluated |
| P-30-001644 | Prehistoric | Shell midden | Not evaluated |
| P-30-176840 | Historic | Naval Weapons Station | NRHP Not eligible 1998 |
| **Sites within the Study Area** | | | |
| P-19-186880 | Historic | Fuel tank farm | NRHP/CRHR Not eligible 2004 |

Source: CHRIS South Central Coastal Information Center

#### 5.3.4.1.1 Sites within the AEC Study Area

Site forms and specific locational information for the resource discussed below can be found in confidential Appendix 5.3C.

***Site P-19-186880, Alamitos Generating Station Fuel Oil Tank Farm***

The Alamitos Generating Station Fuel Oil Tank Farm is an historic period built resource. The tank farm is a large-capacity petroleum storage tank farm, first recorded by Ivan Strudwick in 2004. The tank farm was part of the original SCE Alamitos Generating Station built in 1955 and consisted of four large-capacity petroleum fuel storage tanks, each measuring 40 feet high and 60 feet in diameter (Strudwick, 2004). This site was evaluated as not eligible for the NRHP or CRHR, and the fuel tanks were removed in 2010 (Gazette Newspapers, 2010).

#### 5.3.4.1.2 Sites within the 1-Mile Buffer

Site forms and specific locational information for all of the resources discussed below can be found in confidential Appendix 5.3C.

***Site P-19-000306 (includes P-19-000234 and P-19-000235), Puvunga Indian Village***

This previously recorded resource is the location of the prehistoric and historic period Gabrieleño village site of *Povuu'nga*. Part of the site was likely destroyed by construction of buildings at California State University, Long Beach (CSULB). The site boundary includes the southern portion of CSULB and a portion of the Rancho Los Alamitos property, which operates as a historic site that is open to the public. During the Spanish period, the village, termed a *Rancheria* in mission records, was part of the Nieto land grant. The village occupants

had been removed from the village to the missions by c. 1790. More specific boundaries of the village and its land use elements have not been determined due to disturbances from historic era ranching and farming and the urbanization and industrialization of the area, beginning after World War II. Previous work at the site includes a surface collection by William Lockett of the Historical Society of Long Beach between 1963 and 1965 and an excavation by Robert Pence and Gerald Williams, students at CSULB, in 1964. In 1974, Keith Dixon provided a detailed analysis of the village site (Dixon, 1972).

This site is a complex habitation that includes middens and artifacts, including manos, metates, mortars, pestles, stone bowls, bifaces, asphaltum, projectile points, scrapers, Tizon Brown Wear ceramics, and faunal material. Several ethnohistoric accounts of this village exist, and several of its residents can be traced through mission records (Boscano, 1814; Dixon, 1972; Milliken, 1997). Section 2.4.2 contains a detailed description of the village, *Povuu'nga*. This site, which is located outside of the study area, was listed on the NRHP and the CRHP in 1974.

***Site P-19-178684, Rancho Los Alamitos, Also Known as the Bixby House***

This site is the location of a part of the Rancho Los Alamitos. Rancho Los Alamitos was first recorded as a cultural resource in 1981, when it was nominated for listing in the NRHP by Nancy J. Sanquist on behalf of the Bixby Ranch Company. The property was once a part of the original 300,000-acre Spanish land grant bequeathed to Jose Manuel Nieto in 1790. Over the years, the property decreased to approximately 27,000 acres until it was purchased by Bixby in 1881. The Bixbys were one of the largest cattle ranching families in California at that time, and with their partnership in the Alamitos Land Company, the family became one of the founders of the City of Long Beach. The Bixbys occupied the property until the death of Fred Bixby. In 1968 the Bixby heirs deeded Rancho Los Alamitos to the City of Long Beach. Today, the property consists of 7.5-acres and contains a "U" shaped ranch house which sits atop the original eighteenth-century adobe structure. Other features of the site include gardens, a tennis court, a Spanish fountain, seven outbuildings associated with the Bixby Ranch and its operations, the foreman's house, other utilitarian structures, and a kitchen midden (Sanquist, 1981). The property was listed in the NRHP in 1981 and is therefore also listed in the CRHR. The site is outside of the AEC study area.

***Site P-19-186115, Long Beach Marine Stadium***

This site is a historic period site, the Long Beach Marine Stadium. This site was first recorded in 1992 by Laurence Goodhue as part of the application for a California Point of Historical Interest. The Long Beach Marine Stadium was designed and built in 1930 as the rowing venue for the 1932 Olympics. This was the first manmade rowing course in the United States. The stadium was selected six times as the official U.S. Olympic rowing training center and hosted the 1968 Olympic trials (Goodhue, 1992). Marine Stadium is one of only two remaining facilities built and used in the 1932 Olympics. The Los Angeles Coliseum is the other facility. The stadium was listed as a California Historic Landmark in 1995 and is also listed in the CRHR. The integrity of the site has been compromised and it has been recommended not eligible for listing in the NRHP by other consultants (Fulton and McLean, 2009). This resource is located outside of the study area.

### 5.3.4.2 Archaeological Field Survey

A cultural resources survey of the AEC study area was conducted on September 28, 2011, and September 29, 2011, by Gloriella Cardenas, M.A., RPA, a CRS who meets the qualifications for Principal Investigator stated in the Secretary of the Interior's standards and guidelines for archaeology and historic preservation (NPS, 1995). This field survey included the AEC site and laydown areas. An additional survey was completed on July 2, 2012, by Natalie Lawson, M.A., RPA, for the offsite process/sanitary wastewater pipeline. Ms. Lawson also meets the qualifications for Principal Investigator.

As per the latest CEC *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 2007), in addition to the AEC site and the construction laydown and/or parking area, a 200-foot minimum buffer was surveyed for cultural resources around this facility. A 50-foot buffer on either side of

the offsite linear corridor was surveyed for cultural resources, as well. A total of 125 acres surveyed for the archaeological survey.

The AEC site is located within the Alamitos Generating Station boundaries, and is composed of facilities, structures, roads, and paved areas. Ground visibility throughout the plant boundaries was generally zero, except where eroded asphalt or ungravelled patches had exposed soils and fuel tanks were removed. Within the 200 feet buffer, the survey area included streets, sidewalks, a concrete lined canal, and a small open area in the southeastern corner, another in the northwest, and exposed soils where fuel tanks were removed. These open areas were completely surveyed in 10 meter transects. The few open areas were opportunistically assessed and it was observed that open spaces were either landscaped with grass and other vegetation or were entirely in fill. The offsite linear corridor is primarily located within a residential neighborhood, entirely outside the Alamitos Generating Station boundary. The corridor crosses a canal, a golf course, a parking lot, and two streets. The majority of the linear route is paved; however, upgrades that maybe required for the existing LBWD sanitary line occur within areas heavily disturbed by the installation of the existing line. Disturbances to the survey area have affected 100 percent of the horizontal and an unknown percentage of the vertical. The 10 acre offsite laydown area is located within Plains All American Tank Farm site and is immediately adjacent to the AEC project boundary. The unpaved area appears to have been recently graded and is devoid of any vegetation. The entire area is completely disturbed by this grading and no native soils are visible on the surface.

No archaeological resources were observed during the investigation. No areas within the study area were left undisturbed by the construction of the Alamitos Generating Station or other modern construction. Current AES-SLD staff indicated that the present Alamitos Generating Station was constructed on fill. This is supported by the findings of a subsurface geotechnical survey that was completed by Ninyo & Moore in 2011. Ninyo & Moore (2011) encountered artificial fill at depths ranging from approximately 6 to 9 feet below ground surface (bgs) throughout the plant site. Excavations, which are proposed up to 10 feet bgs, will exceed this fill by 1 to 4 feet, and therefore, it is possible that excavations could extend beyond the fill into potentially undisturbed deposits below the fill. The study area was originally located in a tidal flats environment, the Alamitos Saltwater Marsh, before extensive land development in the area during the early 1900s. Prior to the construction of the AEC, the land was used for agriculture (Ninyo & Moore, 2011). According to Ninyo & Moore (2011), historically, groundwater levels have been very high in this area at approximately 10 feet bgs or less. Since historically, the groundwater is quite shallow in the area, the likelihood of intact archaeological deposits below the artificial fill is considered unlikely. Project-related pile driving could reach approximately 50 feet below the surface. The process/sanitary wastewater pipeline would involve excavations within an existing sanitary line corridor, within soils previously disturbed by the installation of the original sanitary line. Given the scope of previous ground disturbance in the area, the depth of the artificial fill at the site, historically high groundwater levels, and the proposed depths of the excavations for the AEC, archaeological sensitivity of the surface soils of the AEC study area is considered low.

#### 5.3.4.3 Architectural Survey

The historic architecture survey of the AEC was conducted on September 28, 2011, by Lori Price, who meets the Secretary of the Interior's Professional Standards for architectural history. The survey was inclusive of the project site and adjacent parcels, extending no less than one parcel from the Alamitos Generating Station, as per the CEC *Rules of Practice and Procedure & Power Plant Site Certification Regulations* (CEC, 2007). All parcels adjacent to the Alamitos Generating Station were reviewed for structures older than 45 years of age or structures that were considered exceptionally significant. Construction dates were obtained from the Los Angeles County Assessor's Office. Based on the assessor's information, review of historical aerial photographs, and the field survey, only the Alamitos Generating Station plant site contained properties that met those criteria. As per CEC requirements, the built environment bordering the alignment of the process/sanitary wastewater pipeline was subject to architecture field reconnaissance on July 2, 2013. Photographs are included in Attachment B in Appendix 5.3B.

Following the guidance provided in the OHP's *Instructions for Recording Historical Resources* (1995), the Alamitos Generating Station, as a large and complex landscape, was recorded as a district due to its concentration of buildings and structures united historically and functionally by plan and physical development. California DPR forms, including a Primary Record, Location Map, and District Record, were prepared to document the district as a whole. Each component of the district was documented separately on a Primary Record. All DPR forms prepared are included in Attachment A in Appendix 5.3B.

The present built environment is primarily a mix of industrial, commercial, and residential. The Alamitos Generating Station is flanked by the San Gabriel River to the east and Los Cerritos Channel to the west. A large tank farm is to the south, and the SCE electrical switchyard is to the north. The Los Angeles Department of Water and Power's Haynes Generating Station is located directly opposite the facility on the east bank of the San Gabriel River. West of Los Cerritos Channel is a residential subdivision, University Park Estates, dating from 1960. This neighborhood is characterized by one-story, single family, ranch-style houses on typical suburban lots. One street in this neighborhood is proposed for the wastewater pipeline.

#### 5.3.4.3.1 Within AEC Study Area

***Alamitos Generating Station***

The Alamitos Generating Station, which began operating in 1955, was evaluated as a district. Other individual components were evaluated to determine if they could be individually eligible. The district is irregularly shaped and encompasses the Alamitos Generating Station property, approximately 120 acres. The district boundaries are the parcel boundaries of the two contiguous parcels that make up the Alamitos Generating Station property (parcel numbers 7237018808 and 7237019808). It is roughly bounded by the San Gabriel River on the east, Los Cerritos Channel and North Studebaker Road on the west, East 7th Street on the north, and Westminster Boulevard on the south. The boundaries include all of the relevant features of the Alamitos Generating Station. Parcel 7237019005, which originally contained the four fuel oil tanks for the facility, is no longer a part of the Alamitos Generating Station, is not owned by the AES-SLD, and no longer contains the fuel tanks, so it is not included in the district boundaries.

Alamitos Generating Station is composed of three pairs of power generating units, the original administration building now used as a school, a group of newer administration buildings, a separate Unit 5/6 administration building, various warehouses and maintenance facilities, a bag house, transformers, and numerous support facilities such as a circulating water system, retention basins, a compressor house, and storage tanks.

Alamitos Generating Station is not recommended as a historic resource for the purposes of CEQA. Based on available research, the generating station is not significant in the context of the history of SCE, the history of steam generation of electricity, or the history of post-World War II steam generation plants (Criterion A and 1).

As discussed above, Alamitos Generating Station was one of several steam generating plants built by SCE in the mid-twentieth century. It was part of a trend for all electric companies in California to build steam generation plants to keep up with growing demand from new development and higher customer usage. The short timeframe for construction of these plants, and their similar technologies and designs, suggests that they were all being planned and designed at about the same time. These plants and their steam generation technology were the result of the exhaustion of available hydroelectric sites coinciding with a growing need for electricity. Together, the plants impacted the nature of power generation in southern California, overshadowing the importance of any single plant. As of 2008, 21 once-through cooling steam generation units remained in southern California, including Alamitos Generating Station, all dating from the same general time period, with an average age of 40 years. More than 1,200 steam generating units use this cooling method in the United States (Tetra Tech, 2008). Placed in the context of the time and of other power plants, Alamitos Generating Station is not unique. Available research does not provide any evidence of Alamitos Generating Station being associated with the life of a historically significant person (Criterion B and

2), and it is not significant under Criterion D and 4 as a potential source of data on human history. This property is well-documented through company records and construction documents and is not a principal source of important information. The plant has had minor alterations, yet as a whole it retains integrity of location, design, setting, materials, workmanship, feeling, and association.

This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code, and is not recommended as a historical resource for the purposes of CEQA.

***University Park Estates Neighborhood***

University Park Estates was developed in 1960 by S&S Construction and was originally known as College Park Estates for its proximity to Long Beach State College (now California State University at Long Beach) (Neighborhood Link, 2013). The great majority of the houses along East Vista Street, where the offsite process/wastewater pipeline is proposed, were built in 1960. Forty-one houses along the alignment are 45 years or older, all dating from 1960 to 1962.

This area of the neighborhood was composed primarily of one-story, single-family houses on typical suburban lots. Many have mature landscaping. They typically have hipped roofs and stucco siding with stone veneer accents. A slightly smaller number have gable roofs and vertical wood siding. Many of the buildings have been modified through the construction of additions and the installation of modern windows and doors, new roofing, and other modifications. A number have had large-scale renovations, including second stories, which have removed or covered any trace of the original building.

The process/sanitary wastewater pipeline alignment is mostly paved with concrete or highly disturbed. The pipeline would be buried within existing disturbed rights-of-way and then re-covered consistent with existing cover material as applicable. Buildings are outside the area of direct impact and will not be impacted by installation of the pipeline.

### 5.3.4.4 Discussion of Survey Expectations and Research Questions

The purpose of this section is to relate the findings of the investigation to the research questions posed above. No areas within the study area were left undisturbed by the construction of the Alamitos Generating Station or other modern construction. No archaeological sites of any type were found. Because excavations will overwhelmingly occur within previously disturbed fill, the potential to affect buried intact archaeological resources is very low. Therefore, the research questions pertaining to built environment, questions 3 and 4, are discussed below.

***Research Question 3.*** The Alamitos Generating Station is one among several of these plants constructed in the greater Los Angeles area during the years following World War II and the subsequent expansive growth in southern California. Alamitos Generating Station was one of many plants that constituted a trend for all electric companies in California to construct steam generation plants to provide power for the rapid post World War II development in the state. These facilities were constructed at approximately the same time and were likely developed and designed at about the same time. Alamitos Generating Station was one of more than 1,000 similar power plants built in the United States, one of 1,200 plants using once-through cooling, and does not have any unique features or employ any unique technologies that were not used at any of these numerous other plants.

***Research Question 4.*** No extant buildings related to the construction of the Alamitos Generating Station were found, and the four fuel tanks adjacent to the site that originally contained fuel for the plant have been removed.

### 5.3.4.5 Native American Consultation

The Native American Heritage Commission (NAHC) was contacted by CH2M HILL on August 26, 2011, to request a Sacred Lands File Search that includes information about traditional cultural properties such as cemeteries and sacred places in the project area. The NAHC responded on August 31, 2011, with a list of Native Americans interested in consulting on development projects. Each of these individuals/groups was contacted by letter on September 2, 2011, and follow-up telephone calls were made on March 16, 2012. Also, a detailed summary table of the results of consultations with the individual Native American organizations on the NAHC contact list is included in Appendix 5.3 A.

Anthony Morales, Chairman for the Gabrieleño Band of Mission Indians, telephoned on September 21, 2011, to request additional information about the project's proposed actions. A return phone call was made on September 23, 2011 to Mr. Morales, but he was occupied and did not have time to go over his data needs. It was suggested that Mr. Morales email his requests at his earliest convenience; no further responses have been received to date.

Individuals or groups that had not responded were called on March 16, 2012, as a follow up. Mr. Sam Dunlap, Chairperson of the Gabrieliño Tongva Nation, requested that the letter be re-sent to his email address; this was done on the same date. Mr. Andrew Salas, Chairperson for the Gabrieliño Band of Mission Indians, requested for the letter to be re-sent to his email address; this was done on the same date. For all other contacts, in addition to the letter correspondence, voicemail messages were left because there was no answer. No other responses have been received as of the date of this report. Copies of the letters are provided in Appendix 5.3 A.

The NAHC record search of the Sacred Lands file did not indicate the presence of Native American cultural resources in the project survey area. The record search conducted at the South Coastal Information Center of the California Historical Resources Information System also did not indicate the presence of Native American traditional cultural properties.

### 5.3.4.6 Local Historical Societies

CH2M HILL contacted the Los Alamitos Museum Association, Historical Society of Long Beach, Long Beach Heritage Coalition, and the Historical Society of Southern California, on August 25, 2011, and August 26, 2011. The Department of Regional Planning and the City of Long Beach Development Services were contacted by telephone on August 29, 2011, as was the City of Long Beach Department of Regional Planning on August 30, 2011.

The Historical Society of Long Beach website, accessed on August 30, 2011, contains several historical documents, including maps, newspapers, photos, and biographies, but does not contain a listing of historic properties.

The Long Beach Development Services maintains an online list of Historic Landmarks and Districts for the City of Long Beach and the Historic Preservation Element of the General Plan. One historic property was located within the AEC study area. This property is the Rancho Los Alamitos, which is also recorded with the SCCIC and is located outside of the study area. The City of Long Beach Department of Regional Planning does not maintain a Historic Properties or resources listing.

No other responses have been received as of the date of this report. A summary of these contacts is provided in Appendix 5.3A.

## 5.3.5 Environmental Analysis

This section describes the environmental impacts of project construction, demolition, and operation. CH2M HILL conducted a complete cultural survey of the AEC study area.

### 5.3.5.1 Significance Criteria

Appendix G of the California Environmental Quality Act is a screening tool, not a method for setting thresholds of significance. Appendix G is typically used during the Initial Study phase of the CEQA process, asking a series of questions. The purpose of these questions is to make a determination as to whether a project requires an EIR, a Mitigated Negative Declaration, or a Negative Declaration. As the Governor's Office of Planning and Research stated, "Appendix G of the Guidelines lists a variety of potentially significant effects, but does not provide a means of judging whether they are indeed significant in a given set of circumstances." The answers to the Appendix G questions are not determinative of whether an impact is significant or less than significant. Nevertheless, the questions presented in CEQA Appendix G are instructive.

In terms of Cultural Resources, Appendix G, Section V asks whether the project would:

- Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5? (Appendix G, V.(a).)
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 5064.5? (Appendix G, V.(b).)
- Disturb any human remains, including those interred outside of formal cemeteries? (Appendix G, V.(d).)

Project investigations included archival research; review of all cultural resource investigation reports within the AEC study area; contacts with all other interested agencies, Native American groups, and historic societies; and a complete field survey. These studies indicated no significant prehistoric or historic archaeological remains, or traditional cultural properties in the AEC study area. Therefore, no impacts on cultural resources are expected.

### 5.3.5.2 Construction and Demolition Impacts

The literature search and pedestrian inventories did not locate any significant prehistoric or historic sites within the existing Alamitos Generating Station site.

The literature search and pedestrian inventory have shown no significant prehistoric or historic sites located within the AEC study area. One resource was recorded during the survey of the built environment, the Alamitos Generating Station Historic District, which is located within the AEC study area. This district, however, is not considered eligible for the CRHR and is not a historical resource.

No areas within the study area were left undisturbed by the construction of the Alamitos Generating Station or other modern construction. The results of a geotechnical survey indicate the present Alamitos Generating Station is constructed on fill (Ninyo & Moore, 2011), and historically, groundwater in the area is at shallow depths (Ninyo & Moore, 2011). Although it is possible that excavations could extend beyond the fill into potentially undisturbed deposits below the fill, these areas were at or below groundwater, and intact archaeological deposits are unlikely. Given the extensive disturbance to the study area from decades of commercial development, the previously documented depth of the artificial fill at the site, and the proposed relative depths of the excavations for the AEC, it is anticipated that AEC construction impacts have a low to moderate potential to impact buried cultural resources that have not previously been disturbed or destroyed.

Proposed construction of the process/sanitary wastewater pipeline would involve excavations within the existing linear corridor and within soils previously disturbed by the installation of the original sanitary pipeline. With the incorporation of mitigation described in Section 5.3.7, construction and demolition impacts on cultural resources will be less than significant.

#### 5.3.5.3 Operation Impacts

No ground-disturbing activities are anticipated during AEC operations or maintenance activities; therefore, impacts to cultural resources are not expected during AEC operations or maintenance activities. Maintenance of AEC facilities will not cause any effects outside the initial construction area of impact. No significant impacts on cultural resources will result from operations or maintenance.

### 5.3.6 Cumulative Effects

Section 15355 of the CEQA Guidelines defines "cumulative impacts" as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." Subsection b of Section 15355 states, in part, that "The cumulative impact *from several projects* is the change in the environment which results from *the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects*." (Emphasis added.) Thus, cumulative impacts under CEQA involve the potential interrelationships of two or more projects, not the impacts from a single project. Specifically, under Section 15130 of the CEQA Guidelines, an EIR is required to discuss cumulative impacts when the project's incremental effect is "cumulatively considerable." Section 15065(a)(3) then defines "cumulatively considerable" as meaning "that the incremental effects of an individual project are significant when viewed in connection with the effects of *other* closely related past projects, the effects of *other* current projects and the effects of probable *future* projects." (Emphasis added.)

Potential cumulative impacts to cultural resources from construction and/or operation of the proposed project are not expected. The project will have a less than significant effect on cultural resources in the immediate vicinity of the project site. Projects that could result in a cumulative impact would also be required to comply with applicable federal, state, and local LORS. The proposed project is unlikely, therefore, to result in cumulative impacts to geologic hazards and resources in combination with other closely related past, present, and reasonably foreseeable future projects.

### 5.3.7 Mitigation Measures

No significant archaeological and historical sites were found during the survey of the AEC site, offsite linear, or laydown areas. The potential for subsurface construction activities to encounter buried archaeological remains is low. The AEC will include measures to mitigate any potential adverse impacts that could occur if there were an inadvertent discovery of buried cultural resources. This section describes nine mitigation measures proposed by the Project Owner. The primary measures discussed below include, but are not limited to: (1) designation of a CRS to investigate any cultural resource finds made during construction, (2) implementation of a construction worker training program, (3) procedures for halting construction in the event that there is an inadvertent discovery of archaeological deposits or human remains, (4) procedures for evaluating an inadvertent archaeological discovery, and (5) procedures to mitigate adverse impacts on any inadvertent archaeological discovery determined significant.

Once the AEC is operational, it is anticipated that no additional ground disturbance will occur at the AEC site because no additional excavations are anticipated once construction/demolition activities are concluded; therefore, no mitigation measures are required for AEC operations or maintenance.

#### 5.3.7.1 Designated Cultural Resources Specialist

The Project Owner will retain a designated CRS who will be available during the earth-disturbing portion of the AEC construction/demolition periods to inspect and evaluate any finds of buried archaeological resources that might occur during the construction phase. If archaeological remains are discovered during construction, the CRS, in conjunction with the construction superintendent and environmental compliance manager, will make certain that construction activity stops in the immediate vicinity of the find until the find can be evaluated. The CRS will inspect the find and evaluate its potential significance in consultation with CEC staff and the CEC compliance project manager (CPM). The CRS will make a recommendation as to the

significance of the find and any measures that would mitigate adverse impacts of construction on a significant find.

The CRS will meet the minimum qualifications for Principal Investigator on federal projects under the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. The CRS will be qualified, in addition to site detection, to evaluate the significance of the deposits, consult with regulatory agencies, and plan site evaluation and mitigation activities.

#### 5.3.7.2 Construction Worker Training

The Project Owner will prepare a construction worker sensitivity training program to ensure implementation of procedures to be followed if cultural resources are discovered during construction. This training will be provided to each construction worker as part of their environmental, health, and safety training. The training will include photographs of various types of historic and prehistoric artifacts and will describe the specific steps to be taken in the event of an unanticipated discovery of cultural material, including human remains. The live training and the videotaped training will both explain the importance of, and legal basis for, the protection of significant archaeological resources. The training also will be presented in the form of a written brochure.

#### 5.3.7.3 Monitoring

Excavations at the AEC site are expected to reach depths of up to 10 feet for building foundations. Major structures would require piles, and pile driving is expected to reach depths of up to 50 feet.

No areas within the study area were left undisturbed by the construction of the Alamitos Generating Station or other modern construction. The present Alamitos Generating Station was constructed on fill. This is supported by the findings of a subsurface geotechnical survey that was completed by Ninyo & Moore in 2011. Ninyo & Moore (2011) encountered artificial fill at depths ranging from approximately 6 to 9 feet below ground surface (bgs) throughout the plant site. Excavations, which are proposed up to 10 feet bgs, will exceed this fill by 1 to 4 feet, and therefore it is possible that excavations could extend beyond the fill into potentially undisturbed deposits below the fill. The study area was originally located in a tidal flats environment, the Alamitos Saltwater Marsh, before extensive land development in the area during the early 1900s. Prior to the construction of the AEC, the land was used for agriculture (Ninyo & Moore, 2011). According to Ninyo & Moore (2011), historically, groundwater levels have been very high in this area at approximately 10 feet bgs or less. Because the groundwater is historically quite shallow in the area, the likelihood of intact archaeological deposits below the artificial fill is considered unlikely. Project-related pile driving could reach approximately 50 feet below the surface. The proposed process/sanitary wastewater pipeline would involve excavations within the existing sanitary pipeline corridor and within soils previously disturbed by the installation of the original pipeline. Given the scope of previous ground disturbance in the area, the depth of the artificial fill at the site, historically high groundwater levels, and the proposed depths of the excavations for the AEC, archaeological sensitivity of the surface soils of the AEC study area is considered low, and monitoring of the excavations at the AEC is not recommended.

Pile driving is expected to reach below the fill and into native soil; however, pile driving would not require monitoring, even though it could reach into native soil as the nature of pile driving does not allow for the observation of the soils.

#### 5.3.7.4 Emergency Discovery

If the archaeological monitor, construction staff, or others identify archaeological resources during construction, they will immediately notify the CRS and the site superintendent, who will halt construction in the immediate vicinity of the find, if necessary. The archaeological monitor or CRS will use flagging tape, rope, or other means as necessary to delineate the area of the find within which construction will halt. This area will include the excavation trench from which the archaeological finds came and any piles of dirt or

rock spoil from that area. Construction will not occur within the delineated find area until the CRS, in consultation with the CEC staff and CEC CPM, can inspect and evaluate the find.

#### 5.3.7.5 Site Recording and Evaluation

The CRS will follow accepted professional standards in recording any find and will submit the standard Form DPR 523 and location information to the CHRIS SCCIC.

If the CRS determines that the find is not significant and the CEC CPM concurs, construction will proceed without further delay. If the CRS determines that further information is needed to determine whether the find is significant, construction will halt in the immediate vicinity of the find, and the designated CRS will, in consultation with the CEC, prepare a plan and a timetable for evaluating the find.

#### 5.3.7.6 Mitigation Planning

If the CRS and CPM determine that the find is significant, the CRS will prepare and conduct a mitigation plan in accordance with state guidelines. This plan will emphasize the avoidance, if possible, of significant archaeological resources. If avoidance is not possible, recovery of a sample of the deposit from which archaeologists can define scientific data to address archaeological research questions will be considered an effective mitigation measure for damage to or destruction of the deposit.

The mitigation program, if necessary, will be carried out as soon as possible to avoid construction delays. Construction will resume at the site as soon as the field data collection phase of any data recovery efforts is completed. The CRS will verify the completion of field data collection by letter to the project owner and the CPM so that they can authorize construction to resume.

#### 5.3.7.7 Curation

The CRS will arrange for curation of archaeological materials collected during an archaeological data recovery mitigation program. Curation will be performed at a qualified curation facility meeting the standards of the California OHP. The CRS will submit field notes, stratigraphic drawings, and other materials developed as part of the data recovery/mitigation program to the curation facility along with the archaeological collection, in accordance with the mitigation plan.

#### 5.3.7.8 Report of Findings

If a data recovery program is planned and implemented during construction as a mitigation measure, the CRS will prepare a detailed scientific report summarizing results of the excavations to recover data from an archaeological site. This report will describe the site soils and stratigraphy, describe and analyze artifacts and other materials recovered, and draw scientific conclusions regarding the results of the excavations. This report will be submitted to the curation facility with the collection.

#### 5.3.7.9 Inadvertent Discovery of Human Burials

If human remains are found during construction, project officials are required by the California Health and Safety Code (Section 7050.5) to contact the Los Angeles County Coroner. If the coroner determines that the find is Native American, he or she must contact the NAHC. The NAHC, as required by the Public Resources Code (Section 5097.98), determines and notifies the Most Likely Descendant with a request to inspect the burial and make recommendations for treatment or disposal.

### 5.3.8 Laws, Ordinances, Regulations, and Standards

Among the local LORS discussed in this section are certain ordinances, plans, or policies of the City of Long Beach and the State of California. Federal LORS are also discussed below. A summary of applicable LORS is provided in Table 5.3-3.

### 5.3.8.1 Federal LORS

The National Historic Preservation Act (NHPA) requires federal agencies or their delegates to consider the effects of their undertakings on historic properties, defined as properties (buildings, districts, sites, structures, objects) that meet the criteria for listing in the NRHP (36 CFR Part 60). The agencies' responsibilities under the NHPA are described in Section 106 of the Act and in federal regulations at 36 CFR Part 800. Federal agencies are enjoined to (1) determine an undertaking's study area on historic properties, (2) inventory potential historic properties within the study area, (3) evaluate properties identified to determine their eligibility for listing in the NRHP, (4) assess the potential effects of the undertaking on properties determined to meet NRHP criteria, and (5) if the effects would be adverse, avoid or mitigate those effects.

TABLE 5.3-3
**Laws, Ordinances, Regulations, and Standards for Cultural Resources**

| LORS | Requirements/Applicability | Administering Agency | AFC Section Explaining Conformance |
|---|---|---|---|
| **Federal** | | | |
| Section 106, National Historic Preservation Act | Federal agencies or state delegates issuing federal permits will determine applicability and compliance. | California Office of Historic Preservation/ Environmental Protection Agency | Section 5.3.8.1 |
| **State** | | | |
| CEQA Guidelines | Project construction may encounter archaeological and/or historical resources | CEC | Section 5.3.8.2 |
| Health and Safety Code Section 7050.5 | Construction may encounter Native American graves; coroner calls the NAHC | State of California | Section 5.3.8.2 |
| Public Resources Code Section 5097.98 | Construction may encounter Native American graves; NAHC assigns Most Likely Descendant | State of California | Section 5.3.8.2 |
| Public Resources Code Section 5097.5/5097.9 | Would apply only if some project land were acquired by the state (currently no state land) | State of California | Section 5.3.8.2 |
| **Local** | | | |
| Long Beach General Plan | Contains a Historic Preservation Element, specifically designed to address the management of cultural resources. Delineates the city's goal to "better integrate historic preservation into City procedures and interdepartmental decisions." Outlines the program's vision, goals, policies and implementation measures for upholding historic preservation plans. Outlines the city's policies/actions regarding cultural resources and procedures. Requirements are usually effected by placing conditions on a project during the environmental review process. | City of Long Beach | Section 5.3.8.3 |

### 5.3.8.2 State LORS

CEQA requires review to determine whether a project will have a significant effect on archaeological sites or a property of historic or cultural significance to a community or ethnic group eligible for inclusion in the CRHR (CEQA Guidelines). CEQA equates a substantial adverse change in the significance of a historical resource with a significant effect on the environment (Section 21084.1 of the Public Resources Code) and

defines substantial adverse change as demolition, destruction, relocation, or alteration that would impair historical significance (Section 5020.1). Section 21084.1 states that any resource listed in, or eligible for listing in, the CRHR[4] is presumed to be historically or culturally significant.[5]

Resources listed in a local historic register or deemed significant in a historical resource survey (as provided under Section 5024.1g) are presumed historically or culturally significant unless the preponderance of evidence demonstrates they are not.

A resource that is not listed in or determined to be eligible for listing in the CRHR, is not included in a local register of historic resources, or is not deemed significant in a historical resource survey may nonetheless be historically significant (Section 21084.1; see Section 21098.1).

CEQA requires a lead agency to identify and examine environmental effects that may result in significant adverse effects. Where a project may adversely affect a unique archaeological resource,[6] Section 21083.2 requires the lead agency to treat that effect as a significant environmental effect and prepare an environmental impact report. The CEC's certified regulatory program satisfies this requirement. When an archaeological resource is listed in or is eligible to be listed in the CRHR, Section 21084.1 requires that any substantial adverse effect to that resource be considered a significant environmental effect. Sections 21083.2 and 21084.1 operate independently to ensure that potential effects on archaeological resources are considered as part of a project's environmental analysis. Either of these benchmarks may indicate that a project may have a potential adverse effect on archaeological resources.

Other state-level requirements for cultural resources management appear in the California Public Resources Code Chapter 1.7, Section 5097.5 (Archaeological, Paleontological, and Historical Sites), and Chapter 1.75, beginning at Section 5097.9 (Native American Historical, Cultural, and Sacred Sites) for lands owned by the state or a state agency.

The disposition of Native American burials is governed by Section 7050.5 of the California Health and Safety Code and Sections 5097.94 and 5097.98 of the Public Resources Code, and falls within the jurisdiction of the NAHC.

If human remains are discovered, the county coroner must be notified within 48 hours, and there should be no further disturbance to the site where the remains were found. If the coroner determines the remains to be Native American, the coroner is responsible for contacting the NAHC within 24 hours. The NAHC, pursuant to Section 5097.98, will immediately notify those persons it believes to be most likely descended from the deceased Native American so they can inspect the burial site and make recommendations for treatment or disposal. The project will comply with these requirements related to cultural resources through the implementation of the mitigation measures described in Section 5.3.7.

---

[4] The CRHR is a listing of "…those properties which are to be protected from substantial adverse change." Any resource eligible for listing in the CRHR is also to be considered under CEQA.

[5] A historical resource may be listed in the CRHR if it meets one or more of the following criteria: "(1) is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; (2) is associated with the lives of persons important to local, California, or national history; (3) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; or (4) has yielded or has the potential to yield information important in prehistory or history (…of the local area, California, or the nation)" (Public Resources Code §5024.1, Title 14 CCR, Section 4852). Automatic CRHR listings include NRHP-listed and determined eligible historic properties (either by the Keeper of the NRHP or through a consensus determination on a project review), State Historical Landmarks from number 770 onward, and Points of Historical Interest nominated from January 1998 onward. Landmarks prior to 770 and Points of Historical Interest may be listed through an action of the State Historical Resources Commission.

[6] Public Resources Code 21083.2 (g) defines a unique archaeological resource to be: 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 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; or (3) is directly associated with a scientifically recognized important prehistoric or historic event or person.

### 5.3.8.3 Local LORS

#### 5.3.8.3.1 Long Beach General Plan

The City of Long Beach's General Plan contains a Historic Preservation Element specifically designed to address the management of cultural resources. The Historic Preservation Element delineates the city's goal to "better integrate historic preservation into City procedures and interdepartmental decisions." Part Two of the Element outlines the program's vision, goals, policies and implementation measures for upholding historic preservation plans. The element outlines the city's policies/actions regarding cultural resources and procedures to be followed to implement the county's goals.

## 5.3.9 Agencies and Agency Contacts

Table 5.3-4 lists the state agencies involved in cultural resources management for the project and a contact person at each agency. These agencies include the NAHC and, for federal undertakings, the California OHP.

TABLE 5.3-4
Agency Contacts for Cultural Resources

| Issue | Agency | Persons Contacted |
|---|---|---|
| Native American traditional cultural properties | Native American Heritage Commission | Dave Singleton<br>Associate Governmental Program Analyst<br>Native American Heritage Commission<br>915 Capitol Mall, Room 364<br>Sacramento, CA 95814<br>(916) 653-4082 |
| NHPA Section 106 compliance | California Department of Parks and Recreation Office of Historic Preservation | Milford Wayne Donaldson<br>State Historic Preservation Officer<br>1416 9th Street, Room 1442<br>Sacramento, CA 95814<br>(916) 653-6624 |
| Archival Research, Local Register Listings for Historical Resources | Long Beach Development Services | Mark Hungerford<br>333 W. Ocean Blvd., 4th Floor<br>Long Beach, CA 90802<br>Phone: (562) 570-5237 |
| Archival Research, Local Register Listings for Historical Resources | Department of Regional Planning, County of Los Angeles | Connie Chung<br>320 W. Temple Street<br>Los Angeles, CA 90012<br>Phone: (213) 974-6411 |

## 5.3.10 Permits and Permit Schedule

Other than certification by the CEC, no state, federal, or local permits are required by the project for the management of cultural resources. Consultation with the State Historic Preservation Officer would be required under Section 106 of the NHPA.

## 5.3.11 References Cited or Consulted

AES. 2010. Alamitos Generating Station Tour Information.

AES. 2012. "About Us – History." Available online at: http://www.aes.com/aes/index?page=history. Accessed February 1, 2012.

Bean, Lowell John. 1974. *Mukat's People: The Cahuilla Indians of Southern California.* Berkeley: University of California Press.

Beebe, Rose Marie, and Robert M. Senkewicz. 2001. Lands of Promise and Despair: Chronicles of Early California, 1535-1846. Berkeley: Heyday.

Boscana, Geronimo. 1814. *Chinigchinich: A Historical Account of the Origin, Customs, and Traditions of the Indians at the Missionary Establishment of St. Juan Capistrano, Alta-California*. Translated into English by Alfred Robinson 1846. New York: Wiley and Putnam.

Boxt, Matthew A., L. Mark Raab, Owen K. Davis, and Kevin O. Pope. 1999. Extreme Late Holocene Climate Change in Coastal Southern California. Pacific Coast Archaeological Society Quarterly, Volume 35, Numbers 2&3, pp 25-37

Boxt, Matthew A., and L. Mark Raab. 2000. Puvunga and Point Conception: A Comparative Study of Southern California Indian Traditionalism. *Journal of California and Great Basin Anthropology.* Volume 22, Number 1.

Byrd, Brian F., and L. Mark Raab. 2007. Prehistory of the Southern Bight: Models for a New Millennium. In *California Prehistory, Colonization, Culture, and Complexity,* edited by Terry L. Jones and Kathryn A. Klar, pp. 215–227. Lanham, MD: AltaMira Press.

California Department of Conservation. 2005. Division of Oil, Gas, and Geothermal Resources. "Oil and Gas Production History in California." June 30, 2005.

California Energy Commission (CEC). 1992. *Instructions to the California Energy Commission Staff for the Review of and Information Requirements for an Application for Certification*.

California Energy Commission (CEC). 2007. *Rules of Practice and Procedure & Power Plant Site Certification Regulations.* Available online at: http://www.energy.ca.gov/2007publications/CEC-140-2007-003/CEC-140-2007-003.PDF. Accessed November 8, 2011.

California Environmental Quality Act (CEQA). 2002. Statues and Guidelines. Available online at: http://www.ceres.ca.gov/ceqa/. Accessed April 22, 2011.

California Missions Foundation. 2008. California Missions. Available online at: http://www.californiamissionsfoundation.org/home.html. Accessed August 2, 2011.

California Missions Resources Center. 2011. Key Facts by Mission. http://www.missionscalifornia.com Accessed November 8.

California State Military Museum. 2012. Historic California Posts, Naval Station, Long Beach. Available online at: http://www.militarymuseum.org/NOBLongBeach.html. Accessed January 12, 2012.

Cambridge University Engineering Department. 2000. *125 Years of Engineering Excellence*. www-g.eng.cam.ac.uk/125/noflash/1875-1900/parsons.html. Accessed January 30, 2012.

Ciolek-Torrelo, Richard. 1998. Chapter 12: Architecture and Site Structure. In *House Pits and Middens: A Methodological Study of Site Structure and Formation Processes at CA-ORA-116, Newport Bay, Orange County, California*. Donn R. Grenda, Christopher J. Doolittle, and Jeffrey H. Altschul, eds. Technical Series 69. Statistical Research, Inc., Tocson, Arizona and Redlands, California.

Dixon, Keith. 1972. Reviving Puvunga: An Archaeological Project at Rancho Los Alamitos. In *The Masterkey,* Vol. 46, No. 3, July–September. Highland Park, CA: The Southwest Museum.

Dominguez Rancho Adobe Museum, Dominguez Rancho Adobe Museum. 2012. History. Electronic document. Available online at: http://dominguezrancho.org/history/. Accessed June 1, 2012.

Downtown Long Beach. 2012. History. http://downtownlongbeach.org/history. Accessed July 18, 2013.

Earle, David D., and Stephen O'Neal. 1994. Newport Coast Archaeological Project: An Ethnohistoric Analysis of Population, Settlement, and Social Organization in Coastal Orange County at the End of the Late Prehistoric Period. Prepared by The Keith Companies, Irvine, California. Manuscript on file at the South Central Coastal Information Center, California State University Fullerton, California.

Edison International. 2012. History. Available online at: http://www.edison.com/ourcompany/history.asp. Accessed January 31, 2012.

Encyclopaedia Britannica. 1995. Energy Conversion. Available online at: http://www.uv.es/EBRIT/macro/macro_5002_13_113.html. Accessed January 30, 2012.

Engstrom, Wayne N. 2006. Nineteenth Century Coastal Geomorphology of Southern California. *Journal of Coastal Research* 22(4): 847–861.

Fulton, Terri, and Deborah McLean. 2009. P-19-186115 Site Record Update: Building, Structure, and Object Record. Ms on file at the South Central Coastal Information Center, California State University Fullerton, California.

Gazette Newspapers. 2010. "Tank Farm Asbestos Removal, Demolition Started." September 8, 2010. Available online at: http://www.gazettes.com/tank-farm-asbestos-removal-demolition-started/article_7a5acf54-bb83-11df-81d8-001cc4c03286.html. Accessed July 29, 2013.

Goodhue, Laurence B. 1992. Site P-19-186115 Application for California Point of Historical Interest. Ms on file at the South Central Coastal Information Center, California State University Fullerton, California.

Goodyear, Albert C. 2005. Evidence for Pre-Clovis Sites in the Eastern United States. In *Paleoamerican Origins: Beyond Clovis*, ed. R. Bonnischen et al., pp. 103-112. College Station: Texas A&M University.

Gutierrez, R. A., and R. J. Orsi. 1998. *Contested Eden: California before the Gold Rush*. Berkley, California: University of California Press.

Heizer, Robert F. 1968. The Indians of Los Angeles County: Hugo Reid's Letters of 1852. Southwest Museum. Highland Park, California.

Herbert, Rand, and Cheryl Brookshear. 2006. State of California Building, Structure, and Object Record for Highgrove Generating Station. November 2006.

Johnson, John R. 2008. *Arlington Man*. National Park Service, electronic manuscript. Available online at: http://www.nps.gov/chis/historyculture/arlington.htm. Accessed June 1, 2012.

King, Chester. 1971. Chumash Inter-Village Economic Exchange. *In* The Indian Historian Vol. 4, No. 1. San Francisco: American Indian Historical Society: 31-34.

Langenwalter, Paul E., Matthew A. Boxt, Lawrence M. Boxt, and Theodore T. Miller. 2001. A Sea Otter (*Enhydra lutris)* Femur with Embedded Projectile Point Fragment from a Late Prehistoric Camp Site in Long Beach, California. In *Pacific Coast Archaeological Society Quarterly*, Volume 37, No. 1, Winter 2001.

Lech, Steve. 2004. *Along the Old Roads, A History of the Portion of Southern California that Became Riverside County 1772-1893*. Riverside, CA: Self-published.

Long Beach Planning. 2013. Long Beach History. Available online at: http://www.lbds.info/planning/historic_preservation/lb_history.asp. Accessed July 17, 2013.

Lundsten, Apryl, and Eileen Flick. 2012. *Plugged In: The History of Power in Los Angeles*. Available online at: http://www.usc.edu/libraries/archives/la/historic/power/. Accessed February 1, 2012.

McCawley, William. 1996. *The First Angelinos: The Gabrieleño Indians of Los Angeles*. Banning, CA: Malki Museum Press/Ballena Press, Morongo Indian Reservation.

Milliken, Randy. 1997. Site P-19-00306 Supplemental Archaeological Record Form. Ms on file at the South Central Coastal Information Center, California State University Fullerton, Fullerton, California.

Moratto, Michael. 1984. California Archaeology. Revised 2004. Salinas, California: Coyote Press.

Myers, William A. 1983. *Iron Men and Copper Wires: A Centennial History of the Southern California Edison Company*. Glendale, California: Trans-Anglo Books.

National Park Service (NPS). n.d. Arlington Man. Internet website accessed on April 26, 2012 at: http://www.nps.gov/chis/historyculture/arlington.htm

National Park Service (NPS). 1990 (revised 2002). How to Apply the National Register Criteria for Evaluation Bulletin 15. Electronic document. Available online at: http://www.nps.gov/nr/publications/bulletins/nrb16a/nrb16a_appendix_IV.htm. Accessed on November 9, 2011.

National Park Service (NPS). 1995. Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.

National Park Service (NPS). 2004. *A History of Japanese Americans in California: Historic Sites*. Electronic document. Available online at: http://www.nps.gov/history/history/online_books/5views/5views4h87.htm. Accessed May 31, 2012.

National Register Bulletin. 1997. How to Complete the National Register Registration Form. Available online at: http://www.nps.gov/nr/publications/bulletins/nrb16a/. Accessed April 22, 2011.

National Register of Historic Places. 2012 State Listings: California- Los Angeles County. Available online at: http://www.nationalregisterofhistoricplaces.com/ca/los+angeles/state8.html. Accessed May 30, 2012.

Neighborhood Link. 2013. University Park Estates Neighborhood Association. Available online at: http://www.neighborhoodlink.com/University_Park_Estates/info Accessed July 19, 2013.

Ninyo & Moore. 2011. *Preliminary Geotechnical Evaluation, Alamitos Generating Station 690 Studebaker Road, Long Beach, California*. October.

Office of Historic Preservation. 1995. Instructions for Recording Historical Resources. Sacramento, California.

Parsons, R.H. 1940. *The Early Days of the Power Station Industry*. Cambridge (Eng.): University Press. New York: The Macmillan Company.

Paleontological Research Institution. 2012. Petroleum Education: History of Oil, The Story of Oil in California. Available online at: http://www.priweb.org/ed/pgws/history/signal_hill/signal_hill.html. Accessed January 12, 2012.

Porcasi, Paul, Judith F. Porcasi, and Collin O'Neill. 1999. Early Holocene Coastlines of the California Bight: The Channel Islands as First Visited by Humans. *PCAS Quarterly* 35 (2&3) pp. 1-24.

Port of Long Beach. No date. Harbor Commission History. Electronic document. Available online at: http://www.polb.com/commission/commissionhistory.asp. Accessed June 1, 2012.

Port of Long Beach. 2012. 100 Years of History. Available online at: http://polb100.com/history/. Accessed January 12.

Rancho Los Alamitos. 2012. Historic Ranch and Gardens. Available online at: http://www.rancholosalamitos.com/history.html. Accessed January 9.

Rancho Los Cerritos. 2003. The Roots of Long Beach. Available online at: http://www.rancholoscerritos.org/history.html. Accessed January 11, 2012.

Sanquist, Nancy, J. 1981. Site P-19-178684 Rancho Los Alamitos, National Register of Historic Places Inventory- Nomination Form. Ms on file at the South Central Coastal Information Center, California State University Fullerton, California.

Skrabec, Quentin R., Jr. 2007. *George Westinghouse: Gentle Genius*. New York: Algora Publishing.

Slade, Liz, Jennifer Moore, Nora Brennan Morrison, and Jeff Cronin, Lehman Brothers Collection project staff. 2012. "Southern California Edison Company," Harvard Business School, Baker Library, Historical Collections. Lehman Brothers Collection – Contemporary Business Archives. Available online at: http://www.library.hbs.edu/hc/lehman/chrono.html?company=southern_california_edison_company. Accessed January 31, 2012.

Steele, I. C. 1950. "Steam Power Gains on Hydro in California." *Civil Engineering* (January 1950): 17-21.

Strudwick, Ivan. H., William McCawley, Deborah K. B. McLean, and Bradley L. Sturm. 1996. *Cultural Resource Survey of the Bixby Ranch Parcel Near Alamitos Bay, Los Angeles, County, California*. Prepared by LSA Associates, Inc. for the Bixby Ranch Company. Manuscript on file at the South Central Coastal Information Center, California State University Fullerton, California.

Strudwick, Ivan H. 2004. *Cultural Resource Survey of the Alamitos Electrical Generating Station Fuel Oil Tank Farm, City of Long Beach, Los Angeles County, California*. Prepared by LSA Associates, Inc. Manuscript on file at the South Central Coastal Information Center, California State University Fullerton, California.

Strudwick, Ivan. 2005. The Use of Fired Clay Daub from CA-ORA-269 in the Identification of Prehistoric Dwelling Construction Methods, San Joaquin Hills, Orange County, California. *Proceedings of the Society for California Archaeology* Volume 18, pp. 219-237.

Tetra Tech, Inc. 2008. *California's Coastal Power Plants: Alternative Cooling System Analysis.* Prepared for California Ocean Protection Council, Oakland, CA. February 2008.

U.S. Climate Data. 2013. Climate Long Beach, California. Available online at: http://www.usclimatedata.com/climate.php?location=USCA0632. Accessed November 2013.

U.S. Geological Survey (USGS). 2003. Geologic Map of the Long Beach 30' X 60' Quadrangle, California. Version 1.0. Available online at: ftp://ftp.consrv.ca.gov/pub/dmg/rgmp/Prelim_geo_pdf/lb_geol-dem.pdf. Accessed January 11, 2012.

Wallace, William. 1955. A Suggested Chronology for Southern California Coastal Archaeology. *Southwestern Journal of Anthropology* 11 (3): 214-230.

Weber, Tricia. 2006. Mission Santa Barbara. Available online at: http://californias-missions.org/individual/mission_santa_barbara.htm. Accessed August 2, 2011.

West, G. James, Wallace Woolfenden, James A. Wanket, and R. Scott Anderson. 2007 Late Pleistocene and Holocene Environments. In *California Prehistory, Colonization, Culture, and Complexity*. Edited by Terry L. Jones and Kathryn A. Klar. Altamira Press, UK.

Williams, James C. 1997. *Energy and the Making of Modern California.* Akron, Ohio: University of Akron Press