Appendix I

Cultural Resources Overview

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I.1 Introduction

The plan area for the Lower San Joaquin River (LSJR) alternatives, as described in Chapter 1, *Introduction*, includes the northern San Joaquin Valley and the adjacent Sierra Nevada foothills. This appendix provides an overview of the prehistoric and historic cultural setting, as well as the paleontological setting, for this region for reference.

I.2 Prehistoric and Historic Cultural Setting

I.2.1 Prehistoric Overview

The San Joaquin Valley and western Sierra Nevada foothills were occupied by different prehistoric cultures dating to as early as 12,000 years ago. Evidence for the presence of humans prior to about 8,000 years ago is relatively sparse and scattered throughout the state. In the alternatives region, fluted Clovis-like projectile points associated with the Paleo-Indian Period some 12,000 years ago have been found in the foothills near Copperopolis and in the San Joaquin Valley at Tracy Lake and near the confluence of the Merced River and the San Joaquin River (SJR) (Rondeau et al. 2007:65; Rosenthal et al. 2007:151). Few archaeological sites that predate 6,000 years ago have been discovered in the region. In the Central Valley, Paleo-Indian and subsequent Lower Archaic Period sites were buried by periodic episodes of landscape evolution and deposition (Rosenthal et al. 2007:151). Above the valley floor, the Skyrocket site excavated in the foothills of Calaveras County is one of the few Lower Archaic archaeological sites recorded in the region (Rosenthal et al. 2007:152).

Between 8,000 and 3,000 years ago during the Middle Archaic Period, regional subsistence strategies shifted to an increased emphasis on plant resources as a result of climatic changes and the drying of pluvial lakes (Rosenthal et al. 2007:152-155). The abundance of milling implements in archaeological sites dating to this period attests to the addition of hard seeds, acorns, and pine nuts to a wide range of natural resources (game animals, wild plants, waterfowl, and fish) procured as part of a seasonal foraging pattern. Although sites dating to the Middle Archaic are scarce on the valley floor and more common in the foothills, the archaeological assemblages indicate that as groups became better adapted to their regional or local environments, the subsistence and settlement patterns varied somewhat among the foothills and valley floor.

After approximately 3,000 years ago during the Upper Archaic and Late Prehistoric periods, the complexity of the prehistoric archaeological record within the valley and foothills reflects increases in specialized adaptations to locally available resources such as acorns and salmon, in permanently occupied settlements, and in the expansion of regional populations and trade networks (Rosenthal et al. 2007:155-159). Large shell midden/mounds at coastal and inland sites in the Sacramento Valley and northern San Joaquin Valley attest to the regular reuse of these locales over hundreds of years or more from the Upper Archaic into the Late Prehistoric period. During the Upper Archaic, marine shell beads and obsidian continue to be the hallmark of long-distance trade and exchange networks developed during the preceding period (Hughes and Milliken 2007:259-270).

Changes in the technology used to pursue and process resources are some of the hallmarks of the Late Prehistoric period. These include an increase in the prevalence of mortars and pestles, a diversification in types of watercraft and fishhooks, and the use of the bow and arrow (Jones and Klar 2007:305-307). The period also witnessed the beginning of ceramic manufacture in parts of the Central Valley, as well as in California's southeast desert region and southwest basin ranges.

The increase in sedentism and exchange networks during the Late Prehistoric period was accompanied by the development of social stratification and craft specialization, as indicated by the variety of artifacts, including bone tools, basketry, marine shell beads, obsidian tools, and brownware ceramics, the use of clamshell disk beads as a form of currency, architectural features such as house floors and rock-lined ovens in large mounded villages, and variation in burial types and associated grave goods (Rosenthal et al. 2007:157-159). Many of the numerous large and small villages arrayed along the major rivers and tributaries in the valley and foothills have been attributed to known ethnographic settlements.

I.2.2 Ethnographic Overview

At the time of European contact, the Northern Valley Yokuts occupied the northern San Joaquin Valley while the Central and Southern Sierra Miwok (also Me-wuk or Miwuk) inhabited the Sierra Nevada foothills in the vicinity of today's three large reservoirs on the Stanislaus, Tuolumne, and Merced Rivers (Kroeber 1925:474-491; Levy 1978:398-413; Wallace 1978:462-470).

The Northern Valley Yokuts generally established villages on low, natural rises along major watercourses. The eastern side of the SJR, with its permanent waterways flowing from the Sierra Nevada, was more heavily populated than the land to the west of the river, where semi-permanent watercourses predominate. In the foothills, the semi-permanent settlements or winter villages of the seasonally mobile Sierra Miwok were clustered along the river drainages: Central Sierra Miwok along the Stanislaus and Tuolumne drainages, and Southern Sierra Miwok along the Merced and Fresno drainages. Archaeological sites and prehistoric burials have been identified along the various river banks, many at the locations of ethnographic Miwok or Yokuts villages.

The abundant natural resources hunted, gathered, and fished by the Yokuts and Sierra Miwok varied seasonally (Levy 1978:402-406; Wallace 1978:464-465). As resources became available, the Sierra Miwok groups dispersed to higher or lower elevations. Acorns from valley, foothills, and mountain oaks were of particular importance to the diet of the three groups. A variety of tools, implements, and enclosures, including tule canoes, were employed by each group to gather plant foods, fish, hunt land mammals, and capture waterfowl and other birds. The Yokuts and Sierra Miwok also participated in an extensive east-west trade network connected by trails between the coast and the Great Basin with salt and obsidian moving westward, marine shell and steatite moving eastward, and basketry traded in both directions (Levy 1978:411–412; Wallace 1978:465).

The influence of the northern California coastal missions established by the Spanish and the Franciscan Order between 1770 and 1797 soon reached into the interior San Joaquin Valley. By 1805, Northern Valley Yokuts were being transported to the San José, Santa Clara, Soledad, San Juan Bautista, and San Antonio missions (Wallace 1978:468-469). During the following period of Mexican colonization on large land grants in the interior, disease and military raids claimed many lives in the valley and foothills. The discovery in 1848 of gold in the Sierra foothills and the ensuing Gold Rush resulted in drastic changes in population, resource access, and native lifeways for the Yokuts and Miwok as thousands of prospectors traveled through the northern San Joaquin Valley and into the foothills, and hundreds more settled in the valley and began farming (Levy 1978:401; Wallace 1978:469).

Today, there are three federally recognized Miwok tribes who live on reservation lands in Calaveras and Tuolumne Counties. The Tuolumne Rancheria in Central Sierra Miwok territory in Tuolumne County was established in 1910. Near New Melones Lake in Tuolumne County, the Chicken Ranch Rancheria of Me-wuk Indians are also descendants of Central Sierra Miwok. Members of the California Valley Miwok Tribe reside on a rancheria in Calaveras County. The Southern Sierra Miwuk Nation has petitioned for federal recognition status, but no reservations have been established in Southern Sierra Miwok territory. Additionally, there are no Miwok or Yokuts reservations in Merced, Mariposa, San Joaquin, or Stanislaus Counties.

I.2.3 Historic Overview

The earliest significant European exploration and settlement of California began during the Spanish period with the establishment in 1769 of the first of a series of 21 missions on the coast between San Diego and Sonoma. Under Spanish law, large tracts of land, including cattle ranches and farms, fell under the jurisdiction of the missions. Native Americans were removed from their traditional lands, converted to Christianity, concentrated at the missions, and used as labor on the mission farms and ranches (Castillo 1978:100-102). Since the mission friars had civil as well as religious authority over their converts, they held title to lands in trust for indigenous groups. The lands were to be repatriated once the native peoples learned Spanish laws and culture.

Following independence from Spain in 1822, Mexico opened California to exploration by American fur trappers and mountain men. In 1826, Jedediah Smith was the first American trapper to enter California; his party explored along the Sierra Nevada and entered the Sacramento Valley (Gunsky 1989:9-11). The following year he journeyed eastward across the Sierra, possibly along the Stanislaus River. The Mexican economy depended on an extensive rancho system, which was carved from the former Franciscan missions and hundreds of land grants awarded in the state's interior to Mexican citizens (Beck and Haase 1974:24; Castillo 1978:104-105; Staniford 1975:98-100). Although secularization schemes had called for redistribution of lands to Native American neophytes who enabled construction of the mission empire, the distribution was a practical failure. Most Native American converts returned to traditional lands that had not yet been colonized or found work with the large cattle ranchos being generated from the mission lands.

The rancho landowners mainly focused on the cattle industry and devoted large tracts to grazing and dry farming of wheat (Staniford 1975:100-101, 103). Rancheria del Río Estanislao included 48,887 acres in Stanislaus and Calaveras Counties near New Melones Lake (Beck and Haase 1974:28, 32). On its western boundary, 35,533-acre Thompson's Ranch extended into eastern San Joaquin County. Three large grants were awarded along the SJR in southern San Joaquin County, through Stanislaus County, and into northern Merced County (El Pescador 34,446 acres; Rancho del Puerto 13,340 acres; Rancho de Orestimba 26,666 acres). To the east in Mariposa County, the 44,387 acres comprising the Las Mariposas grant extended west along the Merced River to Lake McClure.

In 1848, shortly after California became a territory of the United States with the signing of the Treaty of Guadalupe Hidalgo ending Mexican rule, gold was discovered on the American River at Sutter's Mill in Coloma. The resulting Gold Rush era influenced the history of the state and the nation. Thousands of people flocked to the gold fields in the Mother Lode region that stretches along the western Sierra foothills and includes the drainages around New Don Pedro Lake, Lake McClure, and New Melones Lake. The continual discoveries of placer gold deposits in the first few years of the Gold Rush led to the establishment of hundreds of foothills mining camps and towns. The locations of several mining communities are now covered by the reservoir waters, including Jacksonville beneath Don Pedro Lake, Robinson's Ferry (later renamed Melones) beneath New Melones Lake, and Benton Mills (later renamed Bagby), Camp Horseshoe Bend, and Exchequer Camp beneath Lake McClure (Hoover et al. 2002:45; Merced Irrigation District [Merced ID] 2008:7.12/12; Turlock Irrigation District [TID] and Modesto Irrigation District [MID] 2011a:5.252).

California became the 31st state in 1850, largely as a result of the Gold Rush. Outside the city ports of Sacramento, Stockton, and San Francisco, the increasing demand of miners for commodities and foodstuffs was met by enterprising individuals and businesses (Staniford 1975:176-177). The demand boosted the expansion and success of the agriculture industry, as well as an increase in ranching and raising beef and dairy cattle, pigs, sheep, turkeys, and chickens to feed the thousands of miners. The manufacture of all types of goods and clothing, the ore processing industry, lumber production, and the beginning of a fishing industry were also prompted during this period in California's history.

The availability of a reliable supply of water was a critical component of successful farm and ranch homesteading and the related growth of riverside towns (California Department of Transportation [Caltrans] 2006:16-17, 34-35; Caltrans 2007:31-35; Hoover et al. 2002:212-213, 378, 517-521). Farms and ranches in the San Joaquin Valley were thus initially established along the rivers and large perennial streams as a source of water for stock or crop irrigation and for transport to consumer markets. Overflow lands in the valley, such as historically found along the LSJR and the Stanislaus, Tuolumne, and Merced Rivers, were particularly suitable for cultivating feed or row crops, and also used for grazing livestock. Settlements and towns that served the needs of the farming and ranching homesteads were typically established at river crossing points by trails or roadways, and many became important commercial centers for trade and transport. Examples of riverside towns established in this region during the Gold Rush era include Knight's Ferry and Murphy's Ferry (now Ripon) on the Stanislaus River; French Bar (later La Grange and now listed on the National Register of Historic Places) and Tuolumne City on the Tuolumne River; Merced Falls, Hopeton, and Snelling on the Merced River; and Grayson and San Joaquin City on the LSJR. With the construction of the railroads through the valley in the early 1870s and the availability of rail transport for agricultural products, some of the farming communities, such as Hill's Ferry on the SJR and Burneyville on the Stanislaus River, were displaced by railside towns (replaced by Newman and Oakdale, respectively).

By 1853, the population of the state exceeded 300,000 and in 1854, Sacramento became the state capital. With the completion of the transcontinental railroad in 1869, settlers and immigrants continued to arrive. Thousands of miles of railway lines were constructed throughout the state in the 1870s—along the coast, southern California, and the Central Valley (Beck and Haase 1974:68; Caltrans 2007:98). Southward expansion of the Central Pacific Railroad on the east side of the San Joaquin Valley reached Merced County in 1871. A year later the Southern Pacific Railroad completed its line through the west side of the valley. Settlement of the American West was also encouraged by the passage of the Swampland Acts of the mid-1800s to early 1900s and the Homestead Act of 1862.

Mining shifted toward more industrialized methods of extraction as the placer gold disappeared along the rivers and channels (Caltrans 2008:50-59). Developed in the mid-1850s and outlawed in 1884, hydraulic mining used water directed from low pressure nozzles or high pressure "monitors" that destroyed the contours of the land. The development of dredge mining in 1898 renewed gold mining as a major industry in the state. Dredgers were massive machines capable of processing tons of riverbed gravels that left behind tailing piles still visible today along many of the rivers in the

Central Valley, including segments of the Tuolumne and Merced Rivers between the Don Pedro and Exchequer Dams, respectively, and the LSJR (Merced ID 2010:2.5-2.6; TID and MID 2011:5.8).

The growth and variety of techniques employed for gold mining was accompanied by the development of water conveyance systems (JRP and Caltrans 2000:33-39). In the early 1850s, ditches were dug to get water to the “dry diggings” and companies were soon organized and building ditches, canals, and flumes to supply water to miners using sluices to extract gold from the river gravels. With the advent of hydraulic mining, the demand for water increased and its supply by ditch companies became even more lucrative. Soon, ditch and canal networks radiated across the Mother Lode. Major companies also dug tunnels and dammed streams or lakes to create storage reservoirs. By 1865, over 5,300 miles of mining ditches and canals had been officially recorded in the Mother Lode region. Of these, many are still used for agricultural irrigation, municipal water services, and hydroelectric power systems, and remain an important feature of the state’s cultural landscape (JRP and Caltrans 2000:53).

In 1878, the Miller and Lux Company, a cattle company with vast land holdings in the West, including 1 million acres in California, mostly in Merced and Madera Counties, completed the first extensive agricultural irrigation canal in the state, the 67-mile San Joaquin and Kings River Canal in the San Joaquin Valley (Beck and Haase 1974:69; Clough and Secrest 1984:187). The company was a pioneer of larger-scale irrigation projects, and also organized mutual canal companies to control water in drier regions. This prompted the formation of irrigation districts and the passage of the Wright Act in 1887. Established in June 1887, TID was the first such district formed under the Wright Act; MID was established shortly thereafter in July 1887 (TID and MID 2011:3.14).

To provide year-round crop irrigation needed by the local farmers along the Tuolumne River, TID and MID constructed LaGrange Dam in 1893, followed by MID’s Modesto Reservoir on the Tuolumne River in 1911 and TID’s Davis Reservoir in 1914 (TID and MID 2011:3.15). In 1917, Davis Reservoir was renamed Owen Reservoir and then renamed Turlock Lake when it was leased by TID to the state in 1950 (Paterson 2004:202, 333). The two districts constructed the original Don Pedro Dam in 1923, and completed construction of the New Don Pedro Dam and Powerhouse in 1971 (TID and MID 2011a:3.3).

The Oakdale Irrigation District (OID) was established in 1909, and joined with the South San Joaquin Irrigation District (SSJID) to complete the Goodwin Dam in 1912. In 1921, the SSJID, which was also established in 1909 (SSJID 2012), agreed with OID to build the original Melones dam and powerplant. The project was completed in December 1926 (OID 2002). The two districts also constructed Tulloch Dam and enlarged Goodwin Dam on the Lower Stanislaus River in the 1950s.

Established in 1919, the Merced ID selected the Exchequer Mining Company on the Merced River as the ideal location to construct the district’s first dam (Merced ID 2008:7.12/10-11). Planning for the dam began in 1921 and it was operational 5 years later. With an ever increasing demand for water, Merced ID was granted a license from the Federal Power Commission in 1964 to expand the facilities. By 1967, the district had completed construction of the New Exchequer Dam, as well as a second dam 6 miles downstream. The downstream McSwain Dam serves as a regulating reservoir.

The formation of irrigation districts and related canal development, coupled with the extensive levee systems constructed after passage of the Swampland Act of 1850 to prevent flooding of prime agricultural lands and settlements in the greater Sacramento–San Joaquin Delta region, foreshadowed the extensive, twentieth century federally funded water projects, like the Central Valley Project (CVP) that delivers Sacramento River water to the arid San Joaquin Valley (JRP and

Caltrans 2000:73-74). Irrigation and related flood control management had become an integral component of the history of the productive agricultural and livestock economy of the state.

The Flood Control Act of 1944 authorized improvement of the lower reaches of the SJR and its tributaries. The LSJR and Tributaries Project, completed in 1972, provided for improvement of the existing channel and levee system on the LSJR from the Delta upstream to the mouth of the Merced River and on the lower reaches of the Stanislaus and Tuolumne Rivers. Improvements included raising and strengthening existing levees, constructing new levees, constructing revetments on riverbanks where required, and removing accumulated snags in the main river channel (Central Valley Flood Management Planning Program 2010:2.52-2.53).

The Flood Control Act of 1944 also authorized construction of the New Melones Dam to replace the original Melones Dam. The project was reauthorized by the Flood Control Act of 1962, begun by the United States Army Corps of Engineers in 1966, and completed in 1979. Management of the project was transferred to the U.S. Bureau of Reclamation (USBR) in 1979, and the reservoir is now part of the CVP (USBR 2010:1.3, 1.12, 1.14).

I.3 Paleontological Resources Setting

The San Joaquin Valley and the Sacramento Valley form the Central Valley (or the Great Valley), an elongated depression that lies between the Coast Ranges and the Sierra Nevada. Geologically, the Central Valley is a large sediment-filled basin, where interbedded mud, silt, sand, and gravel thousands of feet deep overlie Sierran basement rocks that extend downward at an angle from the western slope of the Sierra Nevada. Most of the surface of the Central Valley is covered with alluvial deposits dating to less than 11,700 years ago during the Holocene and between 2.6 million and 11,700 years ago during the Pleistocene (Table I-1). The alluvium deposited on the valley floor is composed of sediments transported by water from the Coast Ranges to the west and the Sierra Nevada to the east. Generally, the maximum thickness of Holocene sediments in the Central Valley is estimated at 150 feet toward its center and in the Bay/Delta regions, pinching out to near zero along the valley margins (Page 1986:19). The thickness of Holocene sediments is important because in almost all areas of the Central Valley, such sediments are underlain by Pleistocene or older sedimentary rocks with a high paleontological potential.

Table I-1. Divisions of Geologic Time

Era	Period	Time in Millions of Years Ago	Epoch
Cenozoic	Quaternary	<0.01	Holocene
		2.60	Pleistocene
	Tertiary	5.30	Pliocene
		23.00	Miocene
		33.90	Oligocene
		55.80	Eocene
		65.50	Paleocene
Mesozoic	Cretaceous	145.50	
	Jurassic	199.60	
	Triassic	251.00	
Paleozoic	Permian	299.00	
	Carboniferous	359.20	
	Devonian	416.00	
	Silurian	443.70	
	Ordovician	488.30	
	Cambrian	542.00	
Precambrian		2500.00	

Source: U.S. Geological Survey Geologic Names Committee 2010.

Note: Approved change from 1.6 to 2.6 million years ago for the base of the Pleistocene boundary at the start of the Quaternary, and age of the Pleistocene/Holocene boundary at 11,700 years ago.

Paleontological potential refers to the likelihood that a rock unit will yield a unique or significant paleontological resource. All sedimentary rocks, some volcanic rocks, and some low-grade metamorphic rocks have potential to yield significant paleontological resources. Depending on location, the paleontological potential of subsurface materials generally increases with depth beneath the surface, as well as with proximity to known fossiliferous deposits.

Criteria for screening the paleontological potential of rock units has been established and recently updated by the Society of Vertebrate Paleontology (SVP 2010). Table I-2 lists the criteria for high-potential, undetermined, low-potential, and no-potential rock units.

Table I-2. Paleontological Potential Criteria

Paleontological Potential	Description
High	Geologic units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered. Also rock units that contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units that may contain new vertebrate deposits, traces, or trackways.
Undetermined	Geologic units for which little to no information are available.
Low	Geologic units that are not known to have produced a substantial body of significant paleontological material.
None	Geologic units with no potential for containing significant paleontological resources.

Source: SVP 2010.

Pleistocene or older (older than 11,000 years) continental sedimentary deposits are considered as having a high paleontological potential because they have a history of yielding numerous vertebrate fossils of extinct mammals or other fauna. Pleistocene or older sedimentary rock units mapped at the surface along the edges of the northern San Joaquin Valley and in many foothill areas, as well as underneath Holocene-age deposits closer to the valley's center, include the Laguna, Mehrten, Modesto, Moreno, Riverbank, and Turlock Lake Formations (Page 1986: Plate 2). These formations have all yielded numerous vertebrate fossils (University of California Museum of Paleontology [UCMP] 2012).

Holocene-age deposits (less than 10,000 years old) are considered to have a low paleontological potential because they are geologically immature and are unlikely to have fossilized the remains of organisms (fossilization processes take place over millions of years). The thickness of Holocene sediments is important because in almost all areas of the Central Valley such sediments are underlain by Pleistocene or older sedimentary rocks with a high paleontological potential. Holocene-age deposits blanket the majority of the Central Valley floor and primarily consist of the following (Page 1986:18-19, 22).

- Flood-basin deposits of mud, muck, loam, and sand, which occur during the flood-stages of major streams. These deposits are found along the LSJR and are extensive along the long-axis of the Central Valley.
- River deposits of gravel, sand, and silt along channels, floodplains, and natural levees of major streams. Typically, the widths of river floodplains are proportional to the size of their contributing watershed. Thus, these deposits range in width from about 1 mile in the foothills to several miles along the LSJR.
- Younger (Holocene-age) alluvial fan deposits of gravel, sand, and silt, typically located along the edges of the Central Valley, where streams exit the Sierra Nevada or Coast Range mountains. Alluvial fans form large lobes centered on a stream's outlet from the mountain, and develop due to the rapid deposition of their sediment load (triggered by the distinct break in stream gradient), and due to the lateral migration of steam channels over the land surface.

Metamorphic and igneous rock units have a low paleontological potential, either because they formed beneath the surface of the earth (such as granite), or because they have been altered under high heat and pressures, chaotically mixed or severely fractured. Generally, the processes that form igneous and metamorphic rocks are too destructive to preserve identifiable fossil remains. The bulk of the Sierra Nevada range is formed by granitic intrusions and metamorphic rock complexes.

Areas of the region with disturbed soils, reworked sediment, or artificial fills from agricultural, mining, settlement, or other development, are considered to have a low paleontological potential. In agricultural areas, native soils have been greatly reworked due to historic plowing and crop-ripping, as well as irrigation practices. Native soils in mining areas have been extensively reworked by a variety of mineral extraction or processing techniques, including dredging, use of hydraulics, tunneling, and construction of ditches, canals, and earthen dams, to name a few. Such disturbed or destroyed soils do not represent in-situ geologic deposits and it is highly unlikely that paleontological resources would be present near the surface.

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