

Upper San Joaquin River Basin Storage Investigation



Mill Creek Reservoir

Surface Storage Option Technical Appendix to the Phase 1 Investigation Report

A Joint Study by:



**Bureau of Reclamation
Mid-Pacific Region**



**California Department
of Water Resources**

In Coordination with:



The California Bay-Delta Authority

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MWH

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SURFACE WATER STORAGE OPTION

TECHNICAL MEMORANDUM

MILL CREEK RESERVOIR

UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION

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ACRONYMS AND ABBREVIATIONS

CEQA	California Environmental Quality Act
cfs	cubic feet per second
CNDDDB	California Natural Diversity Database
Corps	United States Army Corps of Engineers
elevation	number of feet above mean sea level
HEP	Habitat Evaluation Procedure
IECO	International Engineering Company, Inc.
Investigation	Upper San Joaquin River Basin Storage Investigation
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
NEPA	National Environmental Policy Act
PCB	polychlorinated biphenyl
Reclamation	Bureau of Reclamation
ROD	Record of Decision
SAW	sycamore alluvial woodland
TAF	thousand acre-feet
TM	Technical Memorandum
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The Upper San Joaquin River Basin Storage Investigation (Investigation) considered several potential storage options in the eastern San Joaquin Valley. This Technical Memorandum (TM) describes a potential dam and reservoir on Mill Creek, which flows into the Kings River approximately 1.7 miles downstream of Pine Flat Dam. A dam could be constructed on Mill Creek approximately 1.3 miles upstream of the confluence and would impound a reservoir with a storage capacity of up to 200 thousand acre-feet (TAF).

As previously considered by the Kings River Conservation District, the dam would be a zoned embankment structure up to 250 feet in height with a crest length of 3,700 feet at an elevation of 830 feet above mean sea level (elevation 830). Gross pool would be at elevation 800. Flood flows in the Kings River would be diverted by gravity into Mill Creek Reservoir by means of an unlined conveyance tunnel 5,000 feet long and 10 feet in diameter. Stored water would be used to offset releases from Millerton Lake.

The initial engineering review described in this TM found no problematic issues that would inhibit physically constructing the potential facilities. Foundation conditions include competent bedrock; sufficient quantities of raw materials are nearby; the electrical grid is close; an existing road leads directly to the construction site; a landing strip is within 2 miles of the site; and staging areas are more than adequate.

Significant environmental concerns, however, would affect implementation of this option. At maximum pool, the reservoir would inundate about 4.5 miles of Mill Creek. Mill Creek, a broad alluvial plain with a braided streambed, sustains a sycamore alluvial woodland (SAW), a sensitive habitat type that hosts a diverse assemblage of wildlife, particularly birds. An extensive SAW is located in the lower reaches of Mill Creek near its confluence with the Kings River. Although sycamore trees are common, SAW has been described as a “very rare and essentially irreplaceable habitat type.” There are fewer than six viable occurrences and/or less than 2,000 acres of SAW in California and worldwide. Reservoir construction and water diversion are considered threats to SAW habitat, as sycamores have little tolerance to artificially manipulated water levels. Regeneration of SAW depends on substantial scour caused by flood events. Replacement of SAW is unlikely to be successful and its destruction is therefore unmitigable.

Fish species adapted to stream environments would also be negatively impacted, but fish suited to lake environments could benefit. The reservoir would provide excellent conditions for both cold-water and warm-water fisheries because its deep waters would likely stratify during the summer. The reservoir would inundate Wonder Valley Ranch, a 75-acre resort, conference center, and summer camp that provides a wide variety of recreational facilities. In addition to the ranch, several houses and ranchettes would be inundated.

In sum, although site characteristics appear well suited to construction, environmental impacts due to a loss of SAW are considered unmitigable by resource agencies. Therefore, this option was dropped from further consideration in the Investigation

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CHAPTER 1. INTRODUCTION

The Bureau of Reclamation, in cooperation with the California Department of Water Resources, is completing the Upper San Joaquin River Basin Storage Investigation (Investigation) consistent with the CALFED Bay-Delta Program Record of Decision (ROD), August 2000. The Investigation will consider opportunities to develop water supplies to contribute to water quality improvements in and restoration of the San Joaquin River, and to enhance conjunctive management and exchanges to provide high-quality water to urban areas. The ROD indicated that the Investigation should consider enlarging Friant Dam or developing an equivalent storage program to meet Investigation objectives.

The Investigation identified several potential surface storage sites to be initially considered through prefeasibility-level studies of engineering and environmental issues. This Technical Memorandum (TM), prepared as an appendix to the Phase 1 Investigation Report, presents findings from a prefeasibility-level review of the potential Mill Creek Dam and Reservoir.

OPTION SUMMARY

The potential Mill Creek Dam and Reservoir would be located in Fresno County, 26 miles east of the city of Fresno. The dam site is located on Mill Creek, roughly 1 mile upstream of its confluence with the Kings River. Figure 1-1 shows the general site location and Figure 1-2 shows Mill Creek and vicinity.

Mill Creek Reservoir would have a storage capacity of up to 200 TAF at a gross pool elevation of 800 feet above mean sea level (elevation 800). The dam would impound Mill Creek flows and water diverted from Pine Flat Reservoir through a long, unlined tunnel.

Water stored in Mill Creek Reservoir would be released to the Kings River and diverted to the Friant-Kern Canal or left instream. These flows would be exchanged for water delivered from Millerton Lake via canal or released from Millerton to the San Joaquin River.

EXISTING FACILITIES

No water storage facility presently exists at the Mill Creek site.

Pine Flat Dam and Reservoir are located on the Kings River about 1.7 miles upstream of its confluence with Mill Creek. Pine Flat Dam was constructed in 1954 by the United States Army Corps of Engineers (Corps) to provide flood protection to downstream properties. The dam is owned and operated by the Corps and has a storage capacity of 1,000 TAF. In 1984, Kings River Conservation District (KRCD) constructed Pine Flat Power Plant at the downstream toe of the dam on the right abutment. Pine Flat Power Plant is owned and operated by KRCD.

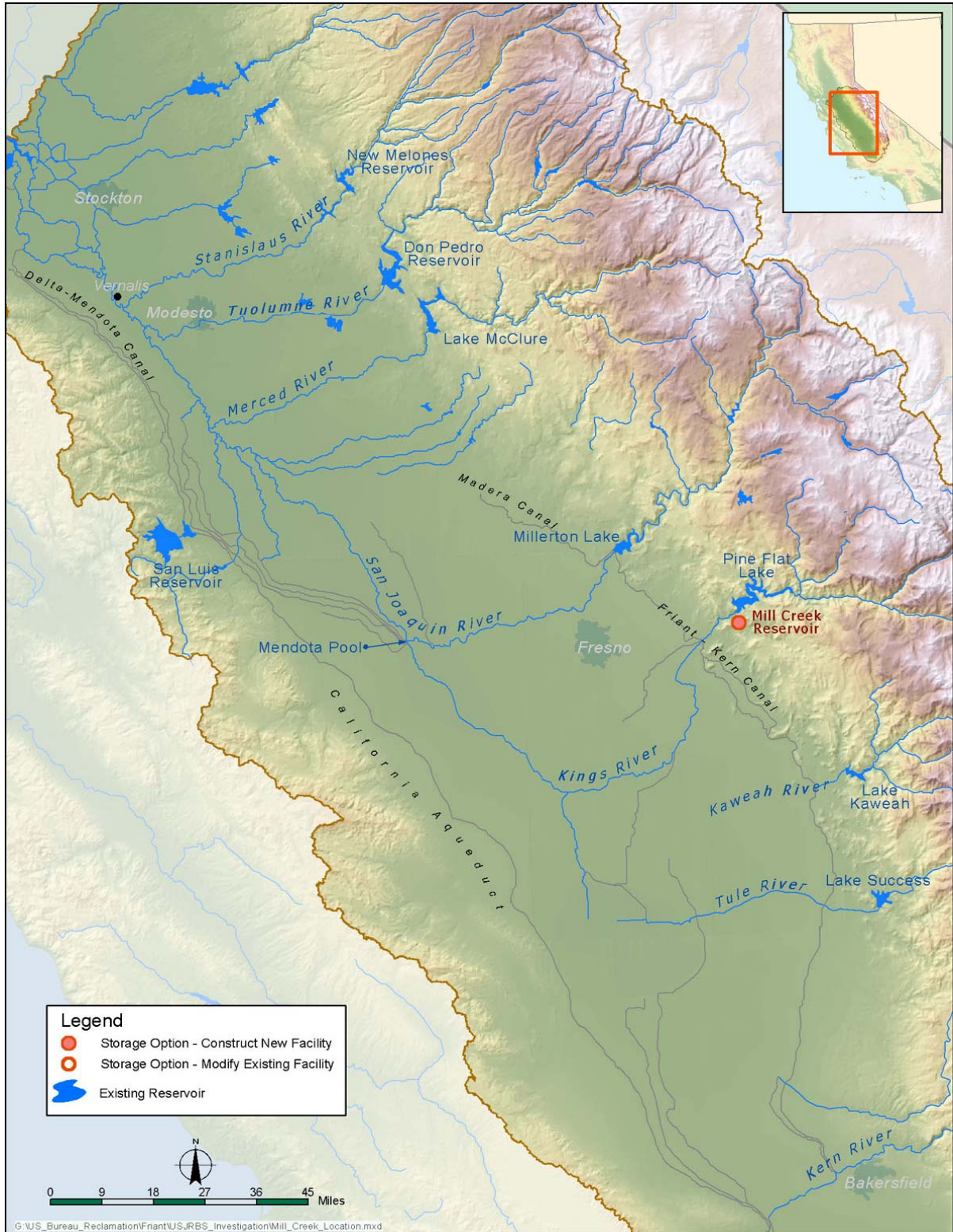


FIGURE 1-1. MILL CREEK SITE LOCATION MAP

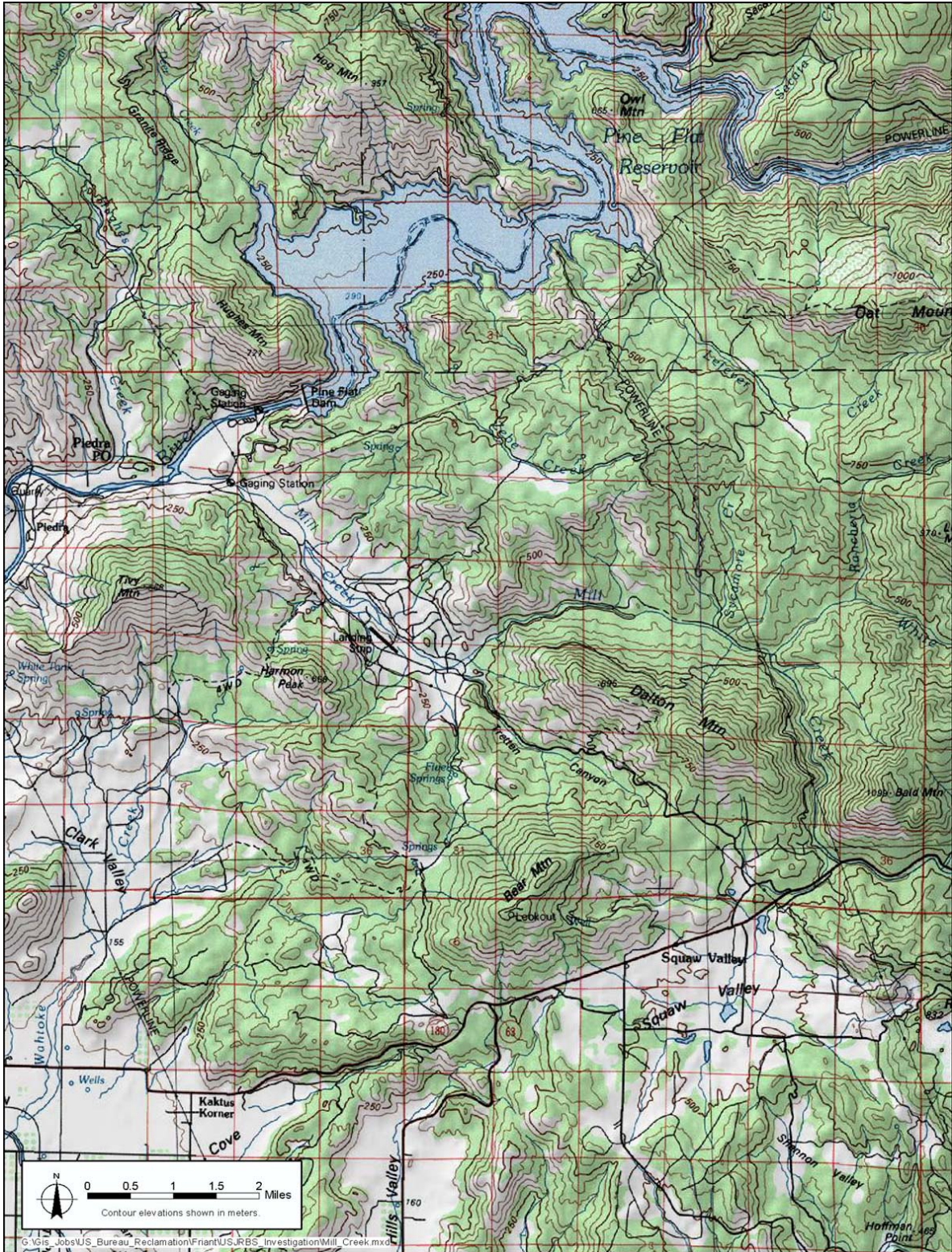


FIGURE 1-2. MILL CREEK AND VICINITY

The Friant-Kern Canal, part of the Federal Central Valley Project, crosses the Kings River about 8 miles downstream of Pine Flat Dam. There are also numerous flood control levees and irrigation distribution systems downstream of Pine Flat Dam.

SUMMARY OF PREVIOUS INVESTIGATIONS

In 1965, a Committee of Engineers issued a Progress Report on the Kings River Water Utilization Projects Upstream from Pine Flat Reservoir for the Kings River Water Association (KRWA). The report evaluated three alternative storage sites, which included Junction Dam (on the main stem of the Kings River just downstream of its confluence with the North Fork); Rodgers Crossing Dam (on the main stem just upstream of the North Fork confluence); and Mill Creek Dam (on Mill Creek, which joins the Kings River from the south, just downstream of Pine Flat Dam).

Mill Creek Dam was not considered economically feasible at the time of the KRWA investigation. The committee also concluded that the project would not become feasible in the future. It was recommended that Mill Creek Dam and Reservoir be eliminated from further consideration.

In 1974, a Master Plan of the Kings River Service Area was carried out on behalf of KRCD by International Engineering Company, Inc. (IECO, 1974). The purpose of the Master Plan was to recommend a course of action that would accomplish the following: 1) provide a balanced water supply; 2) minimize flood damage; and 3) conserve and develop water and power resources. One of the alternatives evaluated consisted of the potential 250-foot-high, zoned rockfill dam at Mill Creek. The report concluded that the service area was deficient in water, and that unless additional water supplies were obtained, groundwater would be overdrafted to the point where a large segment of the agricultural service area would ultimately have to revert to dry farming.

To address the issue, IECO concluded that a staged development of the recommended alternatives be pursued. The Mill Creek Dam alternative was not considered economically feasible at the time of the investigation, but was retained as an alternative because future economic conditions might render it feasible.

POTENTIAL IMPROVEMENTS CONSIDERED

As proposed in the KRCD Master Plan, Mill Creek Dam would be a 250-foot-high, zoned rockfill structure with a crest 3,700 feet long and width of 30 feet at elevation 830. The dam would create Mill Creek Reservoir with a storage capacity of about 200 TAF with a gross pool at elevation 800 (Figure 1-3). The dam would impound Mill Creek flows and water diverted by gravity from Pine Flat Reservoir through a long, unlined tunnel that is 10 feet in diameter and 5,000 feet long. The tunnel would be sized for a maximum discharge of 2,500 cubic feet per second (cfs).

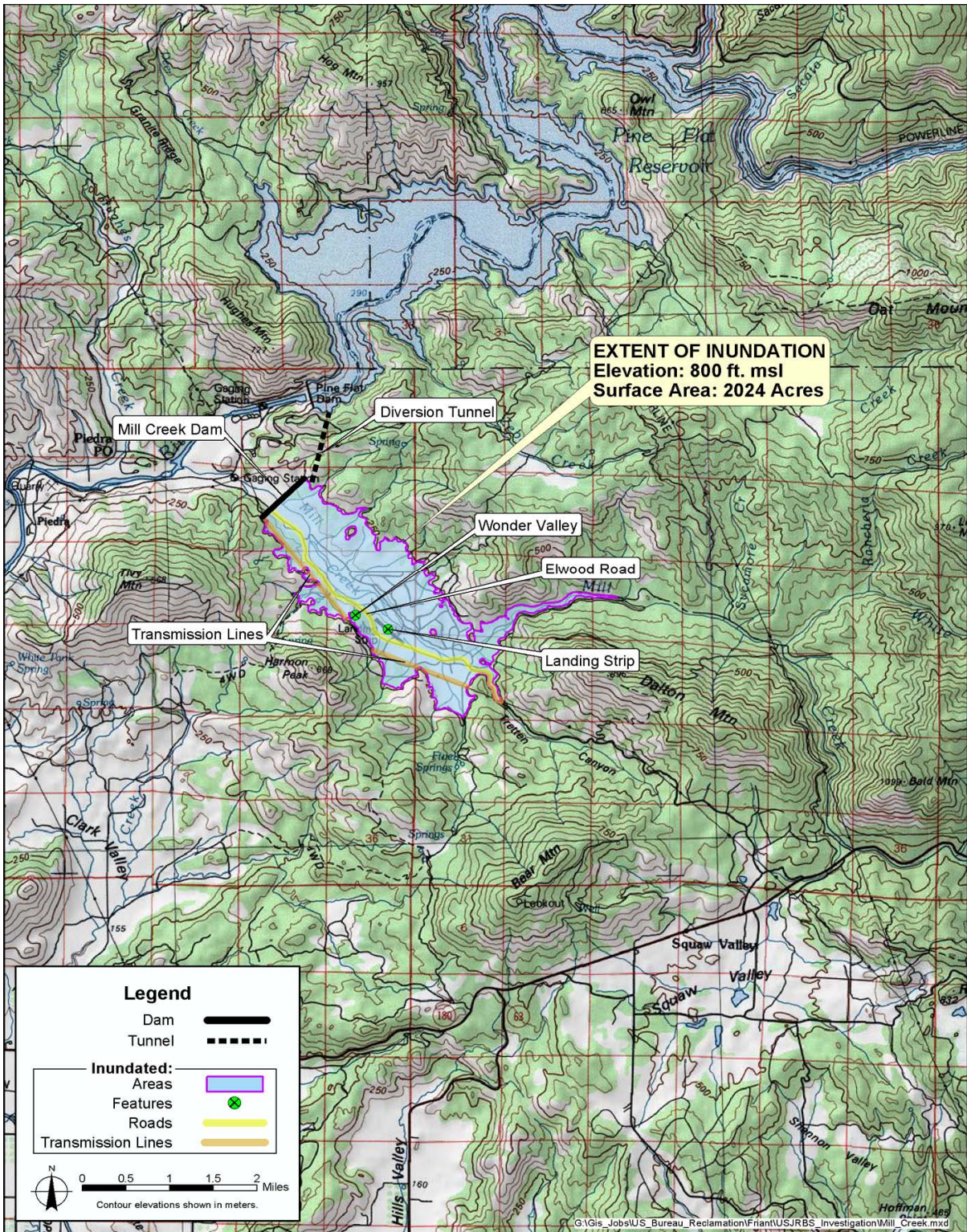


FIGURE 1-3. POTENTIAL MILL CREEK RESERVOIR INUNDATION AREA

An ungated, 150-foot wide spillway would be on the left abutment. The spillway would consist of an excavated approach channel, a 1,900-foot-long, 150-foot-wide concrete-lined chute, a 130-foot-long hydraulic-jump stilling basin, and an exit channel to Mill Creek. The spillway crest would be at elevation 800. Discharge at water surface elevation 810 would be 11,600 cfs; at elevation 820, discharge would be 35,000 cfs.

The intake and portal structure would be located in the left abutment and would include trash racks and slots for a bulkhead or stoplogs. The 2,000-foot-long outlet tunnel would have upstream and downstream diameters of 10 and 14 feet, respectively. An emergency valve chamber would be provided in the tunnel and a 1,100-foot-long, 4-foot-diameter steel conduit would carry irrigation flows from the emergency valve chamber to the outlet structure.

APPROACH AND METHODOLOGY

This TM was prepared from a brief review of the prior studies listed above, an engineering field reconnaissance on 13 June 2002 (Appendix A), and an environmental field reconnaissance of the dam and reservoir on 29 May 2002 (Appendix B).

During the June 2002 field trip, engineers and geologists examined the site under consideration. Locations of existing and potential structures were visually assessed. Topography, geology, geotechnical conditions, and utilities were noted. Access routes and possible borrow, staging, and lay-down areas were considered.

During the environmental field review, specialists in botany, wildlife, aquatic biology, recreational resources, and cultural resources visually assessed existing environmental resources. Additional research was conducted, making use of prior studies and available literature, the California Natural Diversity Database (CNDDDB), topographic maps, and aerial photographs. This information was used to preliminarily identify the extent to which potential environmental impacts might constrain storage options under consideration. Where evident, opportunities for improving environmental resources or mitigating adverse effects were also noted. Surveys and consultations with external resource management or environmental agencies were not conducted.

The seismotectonic evaluation conducted by Reclamation for this study was based on readily available information and is considered appropriate for prefeasibility-level designs only. Detailed, site-specific seismotectonic investigations have not been conducted and remotely sensed imagery was not evaluated. More detailed, site-specific studies would be required for higher-level designs.

For prefeasibility-level studies, designs and analyses are typically quite general. Extensive efforts to optimize the design have not been done, and only limited value engineering techniques have been applied.

CHAPTER 2. TOPOGRAPHIC SETTING

Regional topography is that of the nearly level floor of the San Joaquin Valley rising abruptly to moderately steep, northwest-trending foothills with rounded canyons. Elevations in the immediate area range from about elevation 600 to nearly elevation 2,400.

Farther east, the terrain steepens and the canyons become more incised. The canyons have been cut by southwest- to west-flowing rivers and associated large tributaries. The Kings River is the main river in the area. The topography of the Kings River basin is the most rugged in the entire Sierra Nevada, rising to over elevation 14,000 in the upper watershed.

The Wonder Valley area consists of a northwest-trending, relatively broad (1 mile), short (3 miles), flat-bottomed valley rimmed by moderately steep to steep slopes. Somewhat sharper ridges and mountains surround most of the downstream portion of the valley and rise to over elevation 2,800. The more round-topped Dalton Mountain (elevation 3,500) dominates the head of the main valley. The right dam abutment rises at a slope inclination of about 3.5:1 (horizontal to vertical), while the left abutment rises at about 2.5:1.

AVAILABLE TOPOGRAPHIC MAPPING

Topographic maps of the area are publicly available from the United States Geological Survey (USGS). It is likely that topographic maps of the reservoir and dam site are held by the Corps at an unknown scale and contour interval.

AVAILABLE AERIAL PHOTOGRAPHY

Aerial photography of various scales and imagery is available from the archive files of the USGS. Additional aerial imagery may also be available from the United States Department of Agriculture, Reclamation, and the Corps. A specific search of the available photography was not conducted for this TM nor were any existing aerial photographs reviewed.

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CHAPTER 3. GEOLOGIC AND SEISMIC SETTING

The Mill Creek area is located near the boundary of the Sierra Nevada Geomorphic Province and the San Joaquin Valley portion of the Great Valley Geomorphic Province. The Great Valley basin is filled with thick accumulations of marine (at depth) and non-marine sediments shed largely from the Sierra Nevada mountain range. Recent alluvium of lake and river origin blankets most of the present-day surface, while dissected remnants of Pleistocene alluvial fans rim the valley margin.

The Kings River basin is within a complex geologic area containing pre-Cretaceous meta-sedimentary and meta-volcanic rocks that have been folded, faulted, and intruded by granitic rocks of three different ages. Volcanism, followed by glaciation and recent stream down-cutting, has modified the topography to essentially the present day landscape. Major geologic structures trend to the northwest. Bedding and foliation of the rock units typically strike northerly and dip steeply west. The degree of weathering and jointing is variable, depending on rock type.

Overall, seismic hazard potential at the site is low. A preliminary earthquake loading analysis for this prefeasibility-level evaluation considered two types of potential earthquake sources: fault sources and areal/background sources (Reclamation, 2002).

Twenty-two potential fault sources for the site were identified, including those associated with the San Andreas fault, seven western Great Valley faults, seven eastern Sierra Nevada faults, the White Wolf fault of the southern San Joaquin Valley, and six faults of the Sierra Nevada Foothills system. No major through-going or shear zones have been identified in this area of the Sierra Nevada and historic seismicity rates are low.

The areal/background seismic source considered was the South Sierran Source Block, the region surrounding the potential dam and reservoir site. This region possesses relatively uniform seismotectonic characteristics.

Probabilistic seismic hazard analysis shows that peak horizontal accelerations to be expected at the site are 0.13g with a 2,500-year return period, 0.17g with a 5,000-year return period, and 0.23g with a 10,000-year return period.

SITE GEOLOGY

The potential Mill Creek Dam and Reservoir are located near the boundary of the Sierra Nevada foothills and the Great Valley. The state geologic map shows that the area to the north of the lower part of the reservoir is a complex of geologic units comprising pre-Cenozoic granitics and Mesozoic granitics (CDMG, 1966). Pre-Cretaceous basic intrusive rocks and Mesozoic granitics are shown south of the potential reservoir. Dalton Mountain, in the upper reaches of the reservoir area, is composed of pre-Cretaceous meta-volcanic rock. Recent alluvium fills the valley bottom.

IECO (1974) describes the rock in the right abutment as consisting of metamorphics with scattered aplite dikes and quartz seams. The left abutment is described as being composed of granitic and basic intrusive rocks.

SITE GEOTECHNICAL CONDITIONS

As described by IECO in 1974, the potential right abutment is underlain by hard, slightly weathered metamorphic rock, which outcrops high on the abutment. Here, the rock is fractured and contains scattered aplite dikes and quartz seams ranging from 1 to 6 inches thick. Near the base of the abutment, a few large boulders of metamorphic rock are surrounded by slope wash.

Both granitic and basic intrusive rocks crop out on the left abutment. Geologic contacts are covered by slope wash. The rocks here are presumably fractured and weathered. The gray basic intrusive rock is hard, fractured, and slightly weathered. Highly weathered and decomposed granitic rock is exposed in the shallow cuts of the power line access road (elevation 800), both downstream and higher on the abutment. This weathering may penetrate to a considerable depth. Consequently, hard and soft zones would be expected during excavation. Typically, the slope wash is shallow, increasing in thickness near the valley floor. Downstream of the potential dam site is an alluvial fan deposit.

The potential spillway location, high on the left abutment, is underlain by intrusive rocks. The near-surface materials are characterized by decomposed granite containing scattered, hard, angular fragments. The overlying slope wash is shallow.

Based on previous subsurface exploration by Reclamation, it appears that the depth of the overlying alluvial material is variable, but in general is more than 15 feet below ground surface. The alluvium is composed of stratified river-deposited sand and gravel that locally contains lenses of well-graded material. Only a small percentage of silt-size material is present, although some silty sand layers were noted near the ground surface. The gravels are predominately less than 6 inches in diameter, but a few boulders up to 2 feet in diameter were observed.

Significant landslides were not observed. However, slumps and minor slides could occur on filling the reservoir. Seepage is not expected to be a problem, even though the underlying bedrock is fractured.

CHAPTER 4. HYDROLOGIC SETTING

The potential Mill Creek dam site is approximately 3,500 feet upstream from Gaging Station No. 2217 and 1.3 miles upstream from the confluence of Mill Creek and the Kings River. The drainage area at the gage is 127 square miles; mean annual discharge is 32.240 TAF.

RAINFALL

Rainfall in this Mediterranean climate region varies from about 8 or 9 inches per year in the valley to about 60 inches per year in the Sierra Nevada. About 90 percent of runoff-producing precipitation occurs from November through April.

Precipitation usually occurs as rain below elevation 4,000 and as snow at higher elevations. However, snow has occurred in the San Joaquin Valley and rain sometimes occurs above elevation 10,000. The snow pack accumulates during the winter and early spring and generally starts melting in April. At the Piedra stream gaging station, just downstream of Pine Flat Dam, April to July runoff accounts for an average of about 75 percent of total annual runoff.

EROSION, RUNOFF, AND RECHARGE

No specific information on soils/erosion potential for the site was identified. It is expected that the soils in the Kings River basin could be broadly classified into two types. One soil type is shallow, well-drained, slightly acidic, rocky, medium-textured, and underlain by slates, schists, volcanic debris, and serpentine bedrock. Soils of this type are reasonably stable with adequate vegetation.

The other soil type is moderately deep, moderately coarse-textured, well-drained, slightly acidic, and granitic. Soils of this type are subject to severe erosion.

Farther southwest along the Kings River, the flood plain area consists of moderately deep, nearly level to gently rolling, well-drained loams underlain with hardpan.

Stream flow data has been collected at gaging stations in the Kings River basin by the USGS, Corps, and local agencies for a varying number of years. The gage at Piedra has been in operation since 1895 and provides the longest continuous set of flow data available.

Discharge records for Mill Creek are available from 1938 to the present. These data were extended back to water-year 1922-23 by a flow frequency study (annual basis) using Kings River flows at Piedra to estimate the distribution of monthly flows. According to the 1974 IECO report, average annual flow at Mill Creek is 36 cfs with a maximum average flow of 213 cfs and a minimum annual average of 2 cfs.

AVAILABLE FLOOD DATA

Detailed flood data were not identified in the documents reviewed. Two types of flood flows occur on the Kings River: winter rain floods and spring snowmelt floods. The winter rain floods, which occur from November through March, are caused by heavy rains and are characterized by sharp, high peaks of short duration and comparatively small volumes. Snowmelt floods occur from March through June. While not producing the high peak flows of winter-type floods, snowmelt floods have a much larger runoff volume.

The recorded history of flooding in the Kings River basin extends back to 1895. Major flood years were 1966, 1969, and 1978. Snowmelt in 1966 was 290 percent of normal. In 1969, snowmelt was even greater, exceeding all previous recorded years. In that year, flood control releases to the San Joaquin River from Pine Flat Dam totaled 1,017 TAF. For reference, Pine Flat Dam was designed to control outflow to a maximum of 17,100 cfs (Corps, 1989b).

CHAPTER 5. STORAGE STRUCTURES AND APPURTENANT FEATURES

This chapter describes the recommended storage structure and appurtenant features for the Mill Creek site, and the constructibility, cost, and systems operations for this option.

STORAGE STRUCTURE

A zoned rockfill type dam was considered by IECO in its 1974 study to be the most suitable type for the Mill Creek site. The embankment would consist of an impervious core with outer zones of pervious material. Fine and coarse filters would be located between the impervious core and the downstream rockfill. A filter blanket would be provided downstream of the impervious core.

IECO recommended that the dam crest be at elevation 830. The embankment would be approximately 250 feet high, with a crest length of about 3,700 feet. The dam crest would be 30 feet above the spillway crest and normal full reservoir level of elevation 800, and 10 feet above the surcharge reservoir level of elevation 820. The dam crest width would be 30 feet to accommodate a roadway for upstream access. The overall upstream slope of the embankment would be 1.85:1, and the downstream slope 1.75:1. Approximately 10 million cubic yards of embankment materials would be required.

A core trench, excavated 5 feet into sound rock beneath the impervious core of the embankment, would facilitate cutoff grouting and sealing of the foundation. The average depth of foundation stripping was assumed to be 10 feet. The grout curtain would extend into each abutment. Figure 5-1 is a cross section of the potential dam from the 1974 IECO study.

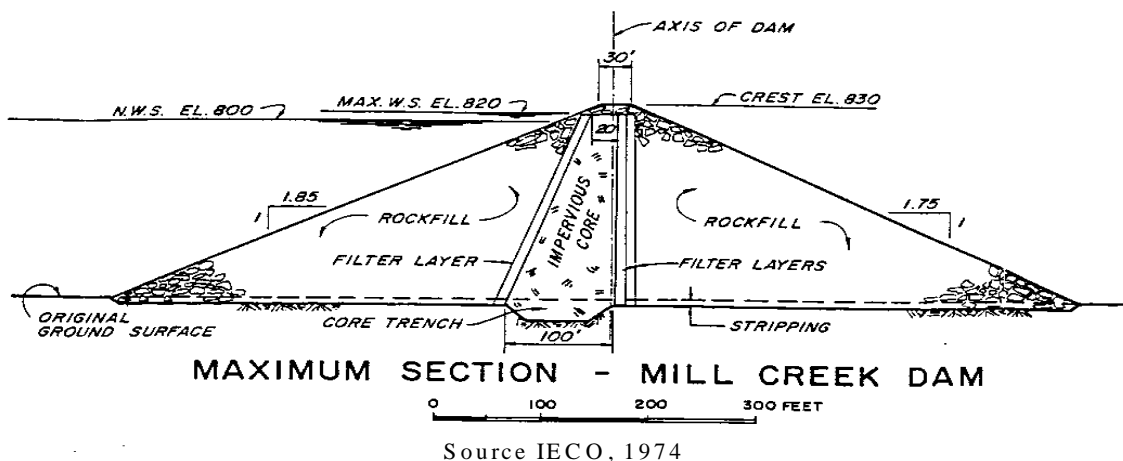


FIGURE 5-1. CROSS SECTION OF THE POTENTIAL DAM

RESERVOIR ELEVATION/CAPACITY CURVE

The reservoir elevation versus storage volume curve (adapted from IECO, 1974) is shown in Figure 5-2.

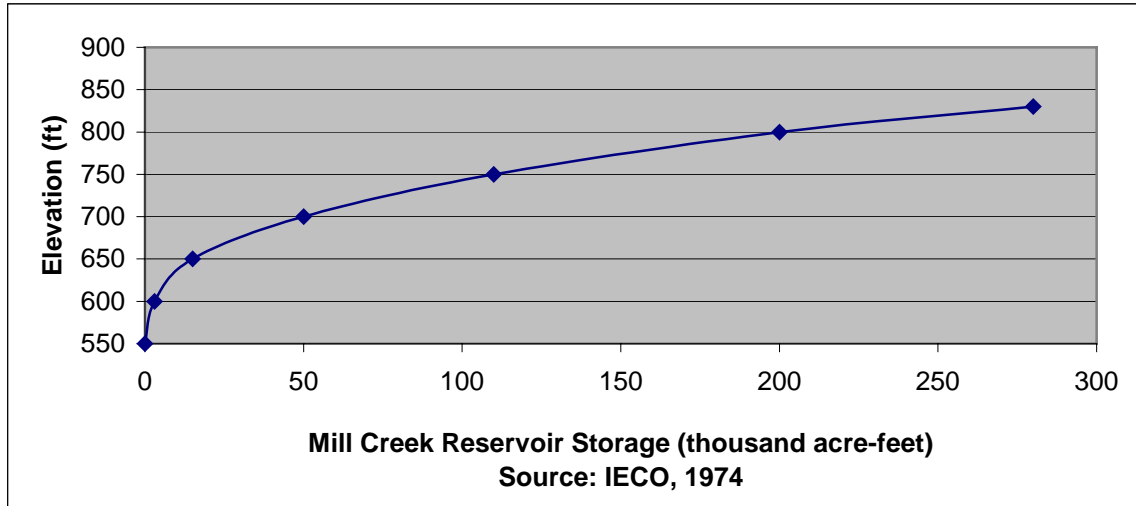


FIGURE 5-2. RESERVOIR ELEVATIONS VS. CAPACITY CURVE

APPURTENANT FEATURES

This section describes major appurtenant features that would be associated with the dam. Features described include conveyance facilities, a spillway, and reservoir outlet works.

Conveyance

To divert excess flood discharges that would ordinarily be released from Pine Flat Reservoir, an approximately 5,000-foot-long, 10-foot-diameter, unlined tunnel would be constructed between the two reservoirs. The inlet invert at Pine Flat Reservoir would be at about elevation 885, and the outlet invert at Mill Creek at about gross pool elevation 800. The tunnel would have a maximum discharge of about 2,500 cfs.

The intake and portal structure would be located on the south bank of Pine Flat Reservoir. It would include trash racks, gates, and slots for a bulkhead or stoplogs. A concrete chute would be provided at the downstream end of the tunnel to discharge flow into Mill Creek Reservoir.

Spillway

An ungated spillway would be located on the left abutment ridge. It would consist of an approach channel excavated in rock, a concrete ogee structure, concrete-lined chute, a hydraulic jump stilling basin, and an exit channel that would discharge into Mill Creek.

The spillway crest would be at elevation 800 and have a total effective width of about 150 feet. Discharge at water surface elevation 810 would be 11,600 cfs. Peak discharge would be about 35,000 cfs at a reservoir level of elevation 820.

Outlet Works

The intake for the outlet works would be a reinforced concrete structure on the left abutment that would house trash racks and slots for stoplogs. The outlet tunnel through the left abutment would be about 2,000 feet long. An emergency valve chamber would be provided in the tunnel, along with an 1,100-foot-long, 48-inch-diameter steel conduit for releasing irrigation flows from an emergency valve chamber to the outlet structure.

The outlet works would include a 48-inch control butterfly valve and fixed-cone dispersion valve that would discharge into a steel-lined energy dissipation structure. A concrete-lined stilling basin would lead to a riprap-lined exit channel downstream.

CONSTRUCTIBILITY

This section discusses issues of concern related to constructing the dam, reservoir, and appurtenant facilities.

Land, Rights-of-Way, Access, and Easements

Public roads lead to the Mill Creek Dam and Reservoir area. Elwood Road would be realigned to traverse the crest of Mill Creek Dam in a northeasterly direction and to continue southeasterly above maximum reservoir level during surcharge (elevation 820) to rejoin the existing road at the extreme southeast limit of the reservoir in Tretten Canyon. The total length of road to be relocated would be about 8.0 miles.

Overhead and underground utilities lead to the dam site and service area below the dam. A high-voltage transmission line traverses the area at the potential top of the left abutment.

Borrow Sources/Materials

A brief reconnaissance of the general vicinity of the Mill Creek dam site indicates the probable existence of borrow deposits of material of sufficient quality and quantity that when processed, would provide the construction materials necessary for the this option. Construction materials investigations were carried out previously by Reclamation and the Corps.

The closest known source of impervious materials is located about 2 miles upstream of the potential dam site, along Mill Creek and its tributaries. Another potential source is the relatively flat flood plain adjacent to the Kings River downstream of the dam site. Portions of this area are presently covered with orange groves.

Alluvial deposits containing material suitable for concrete aggregate exist along the Kings River and the lower Mill Creek valley. Rock suitable for riprap was not specifically investigated; however, it is believed that a quarry could be developed locally. There are hard metamorphic and granitic rock outcrops at several places within 10 miles of the potential dam site.

Excavation required for the spillway would generate soil and rock that could be used in the dam embankment. Exploration and testing would have to be conducted to assess the suitability of the spillway excavation materials for use in the various impervious, pervious, rockfill, and riprap zones of the dam.

Foundations

The dam would be founded on massive, igneous, and metamorphic bedrock.

Power Sources

Nearby electrical power is available from the local distribution grid.

Staging and Lay-Down Area

Staging/lay-down areas of more than adequate size are available both upstream and downstream of the potential dam axis.

Contractor Availability and Resources

There are several regional general contractors capable of performing the work necessary to construct the dam.

Construction Schedule and Seasonal Constraints

Construction of the dam would take at least 2 years and span at least 2 winters. No seasonal constraints are anticipated other than care and handling of Mill Creek flood flows during the rainy season.

Flood Routing During Construction

The river would be diverted during construction in stages. Initially, the river would be left to flow in its current bed until a concrete diversion gallery could be constructed. The river would then be diverted into the gallery by means of earth embankment cofferdams both upstream and downstream of the dam axis. Once construction of the dam was adequately advanced, the gate(s) controlling flow through the diversion gallery would be closed and the reservoir filled.

Environmental Impacts During Construction

Environmental impacts during construction could be mitigated with proper planning and implementation of best management practices. Noise and visual impacts would affect inhabitants of Wonder Valley. Air quality issues could be mitigated by dust control measures for quarrying, material processing, and construction of the dam. Quarries and blasting for abutment excavation would require both noise monitoring and vibration monitoring on the dam. A cultural survey would have to be conducted to identify any ancestral American Indian or historic artifacts, and construction activities would be restricted in those areas. Importing cement and concrete aggregate from distant sources could cause traffic impacts but with proper planning and coordination with Caltrans, major impacts could be mitigated. All construction equipment should have spark arresters and fire control equipment should be kept readily accessible during construction. Construction water would have to be controlled and provisions made for runoff and erosion control. A spill control plan would be needed to control any construction-related fuels, lubricants, and other materials.

Permits

Both Federal and non-Federal entities would sponsor construction of the dam. This joint sponsorship could complicate the permitting process as Federal projects are not subjected to the same level of permitting required for non-Federal projects.

Given the probable duality of sponsorship, and potential environmental and cultural impacts identified, at a minimum, certain permits could be required from the permitting agencies listed in Table 5-1.

TABLE 5-1. POSSIBLE PERMITS REQUIRED

Permit	Permitting Agency
Permit to Construct	DSOD, Fresno County
Encroachment	Caltrans, Fresno County
Air Quality	CARB, Fresno County
Low/No Threat NPDES	RWQCB
Waste Discharge	RWQCB
401 Certification	SWRCB
Blasting	Fresno County
Stream Bed Alteration	CDFG
Fire/Burn	CDF, Fresno County
Key:	
CARB	California Air Resources Board
CDF	California Department of Forestry
CDFG	California Department of Fish and Game
DSOD	Department of Safety of Dams
NPDES	National Pollutant Discharge Elimination System
RWQCB	Regional Water Quality Control Board
SWRCB	State Water Resources Control Board

In addition, the following agencies could be involved in reviewing permit conditions:

- Bureau of Indian Affairs
- Bureau of Land Management
- State Historic Preservation Office
- Advisory Council on Historic Preservation
- United States Fish and Wildlife Service (USFWS)

In obtaining these various permits, several plans would have to be prepared and submitted to the responsible agencies for review and approval:

- Construction Plan and Summary Documents
- Quality Control Inspection Plan
- Highway Notification Plan
- Blasting Plan
- Noise Monitoring Plan
- Water Quality Monitoring Plan
- Noxious Weed Control Plan
- Bat Protection Plan
- Management Plan for Avoidance and Protection of Historic and Cultural Properties
- Storm Water Pollution Prevention Plan
- Spill Prevention/Containment Plan
- Visual Quality Control Plan
- Dust Control and Air Quality Plan

Another important regulatory requirement involves compensation/mitigation for habitat loss. In October 1998, USFWS issued its draft Coordination Act Report and Habitat Evaluation Procedure (HEP Analysis). The HEP Analysis delineates how compensation for adversely affected baseline habitat and wildlife conditions is to be determined.

In addition, if power generation is included in a project or is modified for an existing project, the Federal Energy Regulatory Commission may become involved in the permitting process.

COSTS

The cost estimate for the potential Mill Creek Dam and Reservoir was based on the 1974 IEEO study and updated to April 2002 unit costs using Reclamation Construction Cost Trends. Costs were also evaluated by MWH dam cost estimators and costs were modified to reflect current material costs and standards of practice, especially with respect to seismic requirements. Summaries of the estimated costs are presented in Table 5-2 and Appendix C.

TABLE 5-2. SUMMARY OF FIRST COSTS

Component	2002 Cost (\$Millions)
Main Dam	132
Spillway	8
Outlet Works	7
Tunnel	15
Unlisted Items	24
Contingency	46
Mitigation	12
Total Field Cost	243
Invest/Design/CM	36
Land	17
Total First Cost	296

Initial Construction Costs

The estimated total first cost for the potential Mill Creek Dam and Reservoir option is \$296 million. Field costs represent the estimated cost to construct identified features, plus provisions for unlisted items (15 percent), contingencies (25 percent), and mitigation (5 percent). Total costs include field costs plus estimated costs for future analyses and planning documentation, development of designs, and construction management (15 percent).

Operations and Maintenance Costs

Operations and maintenance costs were not evaluated in any previous studies of the potential Mill Creek option and have not been estimated for this prefeasibility-level report.

SYSTEMS OPERATIONS

The following summarizes results of the IECO reservoir operation study and other studies on which it was based:

Normal full reservoir capacity	200 TAF
Full reservoir elevation	800 feet
Minimum reservoir capacity	2
Minimum reservoir elevation	610 feet
Average annual flows (natural and diverted)	50.50 TAF/year
Average annual increase in water yield	22 TAF/year

CHAPTER 6. HYDROELECTRIC POWER OPTIONS

Various hydroelectric power options were considered for each surface storage site, including Mill Creek.

PUMPED STORAGE

This storage site option does not include any power facilities.

ADDED HYDROELECTRIC POWER TO EXISTING STRUCTURES

There are no existing facilities.

NEW HYDROELECTRIC POWER

No new hydroelectric power is anticipated.

TRANSMISSION AND DISTRIBUTION

Existing transmission and distribution facilities are located nearby.

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CHAPTER 7. ENVIRONMENTAL CONSIDERATIONS

This chapter describes existing environmental resources at the site and qualitatively describes potential effects of reservoir development. The discussion in this chapter is intended to indicate the extent to which expected or potential environmental effects might pose a constraint to reservoir development. Where evident, opportunities for improving environmental resources or mitigating adverse effects have been noted. Analysis focused on botany, terrestrial wildlife, aquatic biology, water quality, recreational resources, cultural resources, and existing land uses. Mining and other known past activities that might affect site conditions are also briefly discussed, along with the potential presence of hazardous or toxic materials. Temporary construction-related disruptions and impacts are discussed in Chapter 5.

Identification of constraints was conducted at a preliminary, prefeasibility-level of planning, consistent with the current phase of the Investigation. Criteria considered were based, in part, on criteria commonly used to evaluate environmental impacts of projects under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The application of criteria that may be used for NEPA or CEQA evaluation does not imply that the analysis is at a level necessary to support an Environmental Impact Statement or Environmental Impact Report. Considerations included presence of special status species (e.g., species listed as endangered or threatened), species of concern, or sensitive habitats; relative amounts of affected riparian or wetland habitat; effects on native or game fish; conflict with established recreational uses or land uses; presence of nationally registered historic places, sacred Native American sites, or Traditional Cultural Properties; permanent disruption or division of established communities; and loss of energy production facilities.

BOTANY

Annual grassland, oak woodland, and riparian habitats are found in the area. The possibility of wetlands being present is high. Many of the tributaries are likely to have narrow riparian corridors and may have seeps and springs.

Mill Creek, a broad alluvial plain with a braided streambed, sustains a sycamore alluvial woodland (SAW), a sensitive habitat type that hosts a diverse assemblage of wildlife, particularly birds. An extensive SAW has been noted in the lower reaches of Mill Creek near its confluence with the Kings River (Corps, 1994). Although sycamore trees are common, SAW has been described as a “very rare and essentially irreplaceable habitat type.” (Carson, 1989) There are fewer than six viable occurrences and/or less than 2,000 acres of SAW in California and worldwide (Prose, 2002).

Of five special-status species in the area, only one (the tree anemone) is listed. Suitable habitat for this species is very likely in some tributaries to Mill Creek.

Constraints

With the exception of the tree anemone, special status plant species are not likely to be a serious constraint. However, loss of vegetation, particularly riparian habitat, is likely to be substantial. In addition, seeps, springs, and other wetland habitats may be present along many Mill Creek tributaries, and field surveys would be needed to identify these habitats.

Reservoir construction and water diversion are considered threats to SAW, as sycamores have little tolerance to artificially manipulated water levels (Prose, 2002). Sexual regeneration of SAW depends on substantial scour caused by flood events (Enstrom, 2002). Constructing Mill Creek Reservoir would thus be likely to adversely affect this resource. Replacement of SAW is considered unlikely to be successful and its destruction, therefore, is considered unmitigable (Enstrom, 2002).

Opportunities

Mitigation for impacts to wetlands and riparian habitat would probably have to be conducted off site because of the magnitude of the potential habitat loss.

WILDLIFE

Mill Creek flows through a broad, alluvium-filled valley. As noted above, an extensive SAW is found near the confluence of Mill Creek with the Kings River. This sensitive habitat hosts a diverse assemblage of wildlife, particularly birds. Beyond the SAW, the only sensitive species in the area noted in the CNDDDB is the valley elderberry longhorn beetle, Federally listed as threatened. Because the host plant for the beetle can be grown in a number of settings to offset losses by projects, its mitigation is relatively easily implemented.

Constraints

Mitigation for the valley elderberry longhorn beetle should be feasible. However, loss of normal runoff flows from Mill Creek could be a significant issue if loss of runoff were to affect the river and habitats below the potential dam. In particular, as discussed above, the loss of a SAW would be a significant adverse impact. Its replacement is considered unlikely to be successful and its destruction therefore unmitigable (Enstrom, 2002).

AQUATIC BIOLOGY/WATER QUALITY

Mill Creek is a tributary to the Kings River, located just downstream of Pine Flat Reservoir. The stream had little flow at the time of the field visit in May 2002. Flow may cease entirely by late summer, with pool habitat persisting through the dry season. The stream has a braided channel with well-developed riparian vegetation. The stream contained numerous small fish, bullfrog tadpoles, and snails. The most likely native fish species to occur in this stream is the California roach. Its presence should be investigated if creation of Mill Creek Reservoir is pursued. The San Joaquin form of the California roach has been designated a State Species of Special Concern.

The habitat in Mill Creek is probably also suitable for the exotic species mosquito fish and green sunfish. Rainbow and brown trout reside in Kings River just downstream of the potential Mill Creek dam site, but these are sustained by cold-water releases from Pine Flat Reservoir. Water temperatures in Mill Creek are almost certainly too warm for trout.

Constraints

This option would entail creation of a reservoir with a maximum pool at elevation 800. At maximum pool, the reservoir would inundate about 4½ miles of Mill Creek.

The principal effects of this option on aquatic biological resources result from replacing stream habitat with lacustrine habitat. Populations of fish and other organisms adapted to a stream environment would be reduced or eliminated from inundated areas, while those of species adapted to lacustrine conditions would be enhanced. The most likely native fish species to be affected would be the California roach, which is generally not found in lakes.

Opportunities

The principal opportunity afforded by this measure is creation of substantial new fish habitat by the reservoir. Because of its depth, Mill Creek Reservoir would likely stratify each summer. Therefore, the reservoir would provide excellent conditions for both cold-water and warm-water fisheries. Most fisheries would probably be successfully self-sustaining, but regular stocking could increase production.

The potential Mill Creek Reservoir would likely affect habitat and water quality in the lower Kings River. Assuming water stored in the reservoir would be released from the reservoir bottom, releases would probably maintain lower water temperatures in the Kings River. This reduction in water temperatures would benefit the trout fishery that currently exists in the lower Kings River.

If existing vegetation in the new reservoir inundation area were not removed prior to filling, it would be inundated, providing a short-term increase in nutrient levels in the reservoir and enhancing habitat structure. Both effects would likely benefit fish production.

Fish habitat in the new reservoir could be greatly improved if the dam were operated to minimize water level fluctuations, at least during times of year important for fish spawning and rearing.

RECREATION

Recreation facilities are present in Mill Creek at Wonder Valley, a private ranch resort and conference center. Wonder Valley is reported to be the oldest “dude ranch” in California. It encompasses 75 acres and includes a dining hall, cocktail lounge, two conference rooms, two swimming pools, a gift shop, tennis courts, whirlpool spa, horseshoe area, walking trails, horseback riding stables, a private lake for boating and fishing, basketball courts, athletic fields, a barnyard petting farm, and overnight lodging facilities.

During the summer months, Wonder Valley hosts children's and family summer camps. The facilities are also available to groups from September through June (Wonder Valley, 2002).

Four developed recreation facilities are located near the confluence of Mill Creek and the Kings River, just downstream of Pine Flat Reservoir. These facilities include the Pine Flat Recreation Area, Choinumni Park, Winton Park, and Avocado Lake Park.

Constraints

Constructing Mill Creek Dam and Reservoir would inundate Wonder Valley Resort, thereby eliminating the recreation opportunities associated with this facility. Some of these lost opportunities could be replaced by constructing new facilities. However, the atmosphere associated with the historic ranch setting would be lost.

A new reservoir on Mill Creek could also increase use at other nearby recreation areas located on the Kings River downstream of Pine Flat Reservoir, depending on the type and capacity of facilities provided at the new reservoir. Accordingly, it may be necessary to improve the existing facilities at these sites to accommodate increased use.

Opportunities

The potential Mill Creek Reservoir would be filled with natural flows from Mill Creek and by diverting water from Pine Flat Reservoir. If diversions from Pine Flat Reservoir were limited to excess flood flows that would otherwise be released, then creation of Mill Creek Reservoir would not affect water levels at Pine Flat Reservoir. As such, recreation activities and opportunities at Pine Flat Reservoir would be unaffected.

The new reservoir would create new water-oriented recreation opportunities. A variety of developed day and overnight facilities could be provided at various locations around the lake. Consideration should be given to developing the following:

- Parking areas
- Flush toilets
- Picnic sites with tables, grills, potable water, and shade canopies
- Overnight camp sites with picnic tables, grills, fire rings, and potable water
- RV facilities, including a dump station
- Boat launching facilities
- Trails
- Information kiosk

All developed recreation sites should be accessible by paved or graded dirt roads. In addition, all improvements should be designed and constructed to meet Americans with Disabilities Act standards.

CULTURAL RESOURCES

The Mill Creek drainage is the traditional home of the Entimbich, a Numic-speaking group closely related to the Wobonuch and Northfork Mono people (Spier, 1978). Entimbich people now live in Dunlap, a community on the upper end of the Mill Creek drainage, along with Wobonuch people who were displaced from their former homes along the upper Kings River (White, 1996).

Specific information is presently unavailable regarding the archaeology of the Mill Creek drainage. Riparian woodland and adjacent blue oak woodland suggest a high probability of archaeological sites being present, including habitation sites, bedrock milling stations, and hunting and fishing camps.

Specific information also is not readily available regarding the history of the Mill Creek area. However, a variety of sites could be present associated with mining, logging, residential development, and other activities.

Constraints

Numerous cultural resources are known to be present, and there may be additional resources not yet recorded. Inundation of archaeological sites (prehistoric or historic) can result in loss of important scientific data. An unknown number of archaeological sites would be adversely affected by construction of the Mill Creek Dam. No properties eligible for the National Register of Historic Places are known to be present, but future study is likely to identify such properties. No Native American sacred sites or Traditional Cultural Places are known to occur, but Entimbich Mono concerns would be expected.

Opportunities

Inundation damage to archaeological sites can be mitigated with scientific data recovery programs. Reservoir projects also provide an opportunity for public interpretation of the past. For ancillary facilities, such as roads, power lines, or other structures, impact to archaeological sites might be avoided through design or facility placement.

LAND USE

Many residences and ranches occur along Elmwood Road, including a dude ranch called Wonder Valley that has been in existence for many years and is known locally as an informal community “landmark” (not historically designated). The road, all structures along the road, and the transmission line along the road would be removed if Mill Creek Dam and Reservoir were constructed.

Constraints

Removal of Wonder Valley would be a constraint because of its community value. Additional research would be needed to determine to what extent removing Wonder Valley, Elmwood Road, and the houses on Elmwood Road would represent a significant land use constraint. This issue would be clarified on completing the review of the Fresno County General Plan and Zoning Ordinance.

MINING AND OTHER PAST ACTIVITIES

There is no evidence of mining or other past activities in the area that could affect the site.

Constraints

No constraints have been identified.

HAZARDOUS AND TOXIC MATERIALS

Rural residential homes usually have septic systems. The community of Mill Valley and agricultural properties in the area may possess, or may have once possessed, underground or aboveground storage tanks for petroleum hydrocarbons, fertilizers, pesticides, or herbicides. Depending on the type of operation, electrical transformers containing polychlorinated biphenyls (PCBs) may also be or have been in the area.

Constraints

Potential residuals from septic systems, fuel and lubricant hydrocarbons, fertilizers, pesticides, herbicides, and/or from electrical transformers might exist on the site and would require remediation.

CHAPTER 8. FINDINGS AND CONCLUSIONS

This TM describes a potential dam and reservoir on Mill Creek, which flows into the Kings River approximately 1.7 miles downstream of Pine Flat Dam. A dam could be constructed on Mill Creek approximately 1.3 miles upstream of the confluence that would impound a reservoir with a storage capacity of up to 200 TAF.

The initial engineering review described in this TM found no problematic issues that would inhibit physically constructing the potential facilities. Foundation conditions include competent bedrock; sufficient quantities of raw materials are nearby; the electrical grid is close; an existing road leads directly to the construction site; a landing strip is within 2 miles of the site; and staging areas are more than adequate.

Significant environmental concerns, however, would affect implementation of this option. At maximum pool, the reservoir would inundate about 4.5 miles of Mill Creek. Mill Creek, a broad alluvial plain with a braided streambed, sustains a SAW, a sensitive habitat type that hosts a diverse assemblage of wildlife, particularly birds. An extensive SAW is located in the lower reaches of Mill Creek near its confluence with the Kings River. Although sycamore trees are common, SAW has been described as a “very rare and essentially irreplaceable habitat type.” There are fewer than six viable occurrences and/or less than 2,000 acres of SAW in California and worldwide. Reservoir construction and water diversion are considered threats to SAW habitat, as sycamores have little tolerance to artificially manipulated water levels. Regeneration of SAW depends on substantial scour caused by flood events. Replacement of SAW is unlikely to be successful and its destruction is therefore unmitigable.

Fish species adapted to stream environments would also be negatively impacted, but fish suited to lake environments could benefit. The reservoir would provide excellent conditions for both cold-water and warm-water fisheries because its deep waters would likely stratify during the summer. The reservoir would inundate Wonder Valley Ranch Resort, a 75-acre resort, conference center, and summer camp that provides a wide variety of recreational facilities. In addition to the ranch, several houses and ranchettes would be inundated.

In sum, although site characteristics appear well suited to construction, environmental impacts due to a loss of SAW are considered unmitigable by resource agencies. Therefore, this option was dropped from further consideration in the Investigation.

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CHAPTER 9. LIST OF PREPARERS

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ACKNOWLEDGEMENTS

The preparers acknowledge the valuable assistance provided by Mr. Roy Proffitt and Mr. Frank Fonseca of the Corps Pine Flat Dam office; Mr. Jim Richards of the KRCD office at Pine Flat Dam; and Ms. Mary Moore at the Corps library in Sacramento.

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APPENDIX A

Engineering Trip Report

Mill Creek Reservoir

Field Trip Log			
Trip Log Number:	13	Project No.:	1003032.01180502
Dates:	6/13/02	Times:	1145-1210
Site Name:	New Mill Creek	Location:	Piedra
Prepared By:	DKR/JMH/WAM	Reviewed By:	
Date:	6/13/02	Date:	

Attendees/Visitors Name	Organization/Phone/Email
DKR	MWH, 925.685.6275 x125, david.k.rogers@mwhglobal.com
JMH	MWH, 925.685.6275 x143, james.m.herbert@mwhglobal.com
WAM	MWH, 425.602.4025 x1060, william.a.moler@mwhglobal.com

Weather Conditions:
 Clear, warm (low 80s), light breeze

Access Route (attach map):
 Highway 99, Ventura Av / State highway 180 (E) through Fresno to Centerville, to Trimmer Springs Rd (N), to Piedra Rd (E), to Elwood Rd, (N)

Attachments:	Yes	No
Photo Log		✓
Photos		✓
Video Log (available)	✓	
Dictation Log (available)	✓	
Topographic Map	✓	

Purpose:

Review potential location of new dam site.

Field Observations:

Existing Structures/Cultural Features:

A community known locally as Wonder Valley is located within the area just upstream of the potential dam. Also in Wonder Valley is reportedly California's oldest "dude ranch".

Rights of Way/Access Restrictions:

Public roads lead to the new Mill Creek Dam and Reservoir area known locally as Wonder Valley.

Overhead/Buried Utilities:

Overhead / underground utilities lead to and service the Wonder Valley community. A high voltage transmission line traverses the left abutment area.

Description of Potential Structures (attached a field sketch or sketch on a topo map):

The potential dam on Mill Creek would be located ~1.3 miles upstream of its confluence with Kings River. The dam would consist of a zoned earthfill embankment rising up to 500 feet above streambed level, that would store up to 1,000 TAF of water, and spillway and outlet works. Water would come from natural runoff from the 130 sq. mi. watershed, as well as, a 7,200-ft long, 10-ft diameter diversion tunnel from Pine Flat (URS, 2000).

An earlier alternative at the same location (IECO, 1974) consisted of a 240-ft high, 3,600-ft long zoned earthfill embankment dam with the spillway and outlet works positioned in the left abutment. Normal full reservoir capacity was estimated at 205 TAF. Water would be diverted to the Mill Creek Reservoir via an ~5,000-foot, 10-ft diameter tunnel from Pine Flat Reservoir (IECO, 1974).

Description of Appurtenant Features (spillways, tunnels, pumping plants, flood routing/coffer dams/dewatering during construction, outlet works, switch yards, transformer yards, transmission lines, conveyance pipelines/canals, access roads, security, operation/maintenance):

The potential dams (URS and IECO) would consist of a zoned earthfill embankments, spillway, and outlet works. In both cases, water would come from natural run-off, as well as, 10-ft diameter diversion tunnels from Pine Flat Reservoir.

Briefly Describe Geologic/Geotechnical Site Conditions:

New Mill Creek Dam and Reservoir would be located near the boundary of the Sierra Nevada foothills and the Great Valley. The state geologic map shows that Mesozoic granitics are exposed low on the valley walls, while Mesozoic basic intrusive rocks are exposed high on the left valley wall, and pre-Cretaceous granitics are high on the right valley wall. Recent alluvium fills the valley floor. Pre-Cenozoic meta-volcanic rocks make up most of Dalton Mountain and Bald Mountain in the upper reaches of the potential reservoir (CDMG, 1965).

The IECO report (1974) describes the high valley wall rocks as slightly weathered and fractured metamorphic rocks with aplite dikes and quartz seams. The left abutment basic and granitic rocks are mostly covered with slope wash. The gray basic rocks are described as hard, fractured and slightly weathered. Highly weathered and decomposed granitic rocks are exposed in the power line road cuts, which may extend to considerable depths. The alluvium in the valley floor is greater than 15 feet thick (USBR investigations), and consists of river-deposited sand and gravel with boulders with only a small percentage of silt (IECO, 1974).

As with most sites in the region, studies indicate that there are no faults in the area capable of producing ground motions greater than those generated by four known regional sources that include the San Andreas fault system, the Sierra Frontal fault system, the White Wolf fault, and the Garlock fault (USCOE, 1990).

Location/Description of Nearest Borrow Areas (attach map or show on topo map):

Previous investigations by the USBR and USCOE identified suitable concrete aggregate along Kings River and lower valley of Mill Creek. Impervious materials are located about 2 miles upstream of the potential IECO dam axis. The Mill Creek valley alluvium, both upstream and downstream of the potential dam axis, is considered the primary source of pervious and semi-pervious materials (IECO, 1974).

Location/Description of Equipment/Material Staging and Lay Down Areas (attach map or show on topo map):

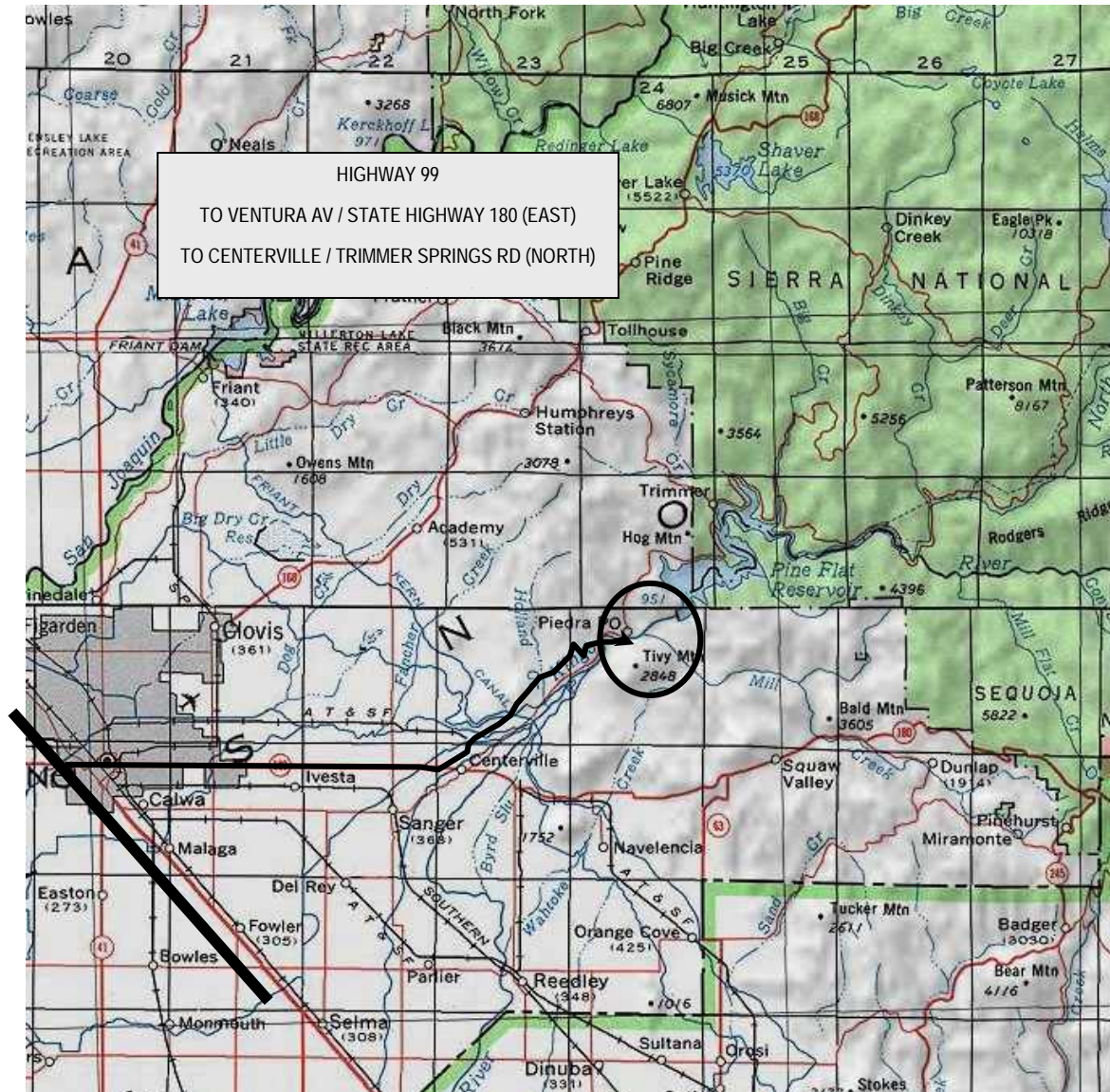
Potential staging and laydown areas are present within the Mill Creek valley.

Identification of Environmental Sensitive Areas (wetlands, springs, rivers, streams, endangered/threatened species habitats, etc.):

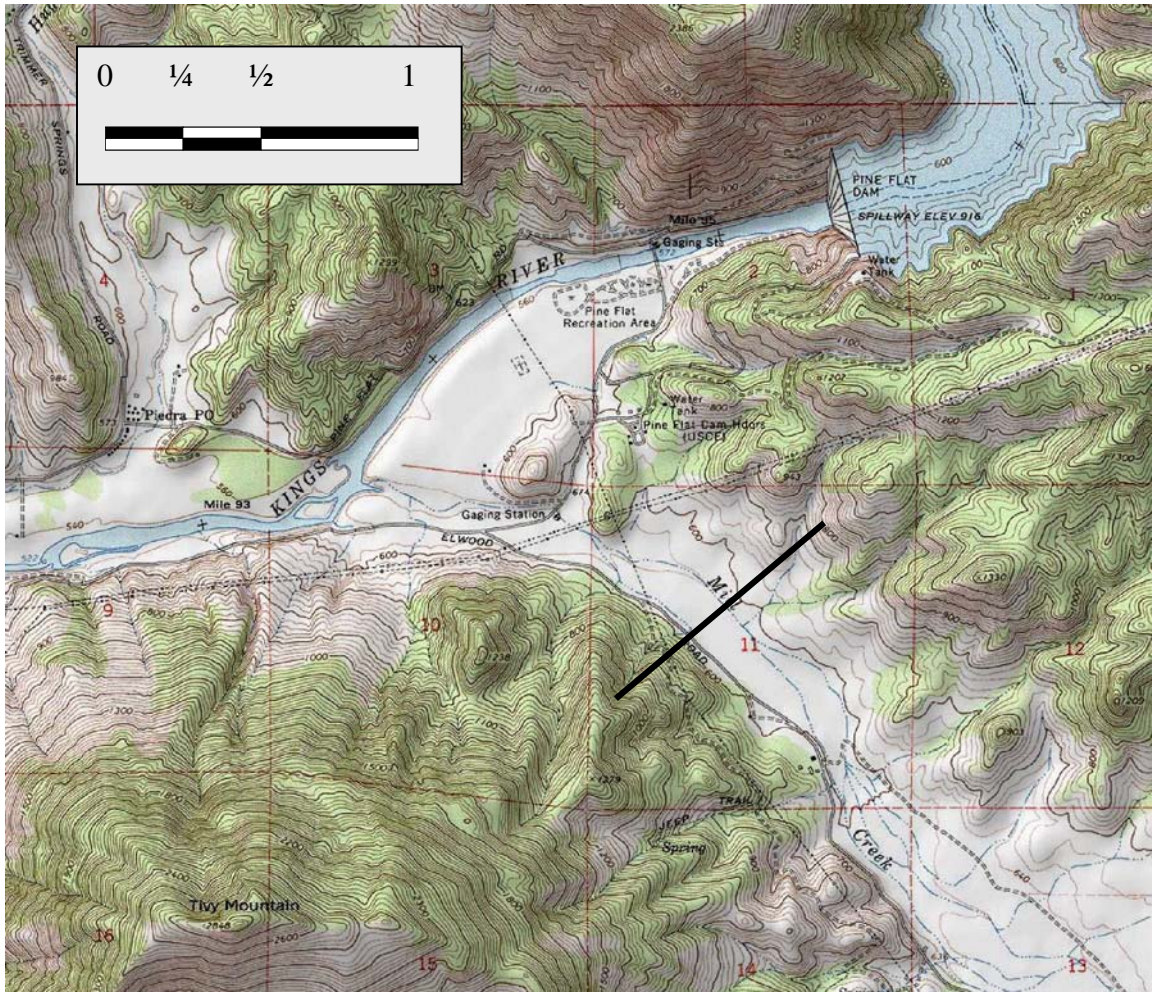
A riparian habitat is found along Mill Creek. Oak woodland habitats are found on the abutments and valley floor.

Description of Mining or Other Anthropologic Activities:

None were noted.



MILL CREEK SITE VICINITY MAP



LOCATION OF POTENTIAL DAM

APPENDIX B

Environmental Trip Report

Mill Creek Reservoir

ENVIRONMENTAL TRIP REPORT – MILL CREEK RESERVOIR

A team of environmental specialists completed an initial field trip to the potential Mill Creek Reservoir site on May 30, 2002. The field trip was the first task in the environmental study of several potential surface storage options identified for initial review during the Upper San Joaquin River Basin Storage Investigation. For initial consideration, the environmental review focused mainly on construction and potential upstream impacts associated with surface storage sites. The site visit provided an opportunity to conduct preliminary reconnaissance of existing resources at the various locations for the following resource areas: terrestrial biology; aquatic biology and water quality; recreation; cultural resources; and land use.

This appendix includes a brief overview of the resource specialists' observations, trip logs prepared by team members, photographs taken during the field trip, and maps used to identify and review existing resources.

SUMMARY OF FIELD OBSERVATIONS

This option would involve constructing a new dam on Mill Creek, which is a tributary to the Kings River located just downstream of Pine Flat Reservoir. The new dam site and reservoir would be situated on private property. Existing facilities include Elwood Road, which bisects Mill Creek valley and connects Trimmer Springs Road and Highway 180, a private landing strip, and various private buildings. The town of Wonder Valley is located upstream, where Mill Creek turns to the northeast.

Botany

- This is a braided stream bed fed by a number of ephemeral streams from adjacent watershed canyons.
- There is varying amounts of riparian habitat along the stream course.
- Would result in substantial habitat loss.
- Unknown amounts of riparian and wetland habitat would be affected.

Wildlife

- This area could support a number of sensitive species such as VELB, western pond turtles, and willow flycatcher.
- Potential losses include riparian, VELB habitat, willow flycatcher habitat, and deer winter range.

Aquatic Biology/Water Quality

- Mill Creek is an ephemeral stream with a braided channel; flow probably ceases by mid summer.
- Numerous small fish were observed in the stream, so pool habitat likely persists through the dry season.
- Bullfrog tadpoles and snails were abundant.
- Riparian vegetation was generally well developed along the existing channels.
- The creek likely contains no significant aquatic biological resources, but database and literature searches should be conducted to confirm.
- Construction of a reservoir would create new aquatic habitat and fisheries opportunities, primarily for exotic fish species.
- The reservoir would potentially affect Kings River downstream water temperatures with possible adverse effects on fisheries.
- Diversions from Pine Flat Reservoir would potentially affect fisheries and water quality of that reservoir.

Recreation

- The dam and reservoir would be located on private property. There are no developed recreation facilities in the area. As such, no recreation-related impacts are expected.
- Diversions from Pine Flat Reservoir could impact recreation facilities and opportunities at Pine Flat Reservoir by lowering water levels.

Cultural Resources

- Riparian woodland and adjacent Blue Oak woodland would have provided diverse resources.
- There is a high probability of prehistoric archaeological sites including bedrock mortar (BRM) stations, hunting and fishing camps, and possible seasonal village sites.
- Historic sites are likely, associated with mining, logging, recreation and other activities.

Land Use

- There are no residences in the immediate vicinity of the location proposed for the new dam.
- There are many residences and ranches along the road including a resort community called Wonder Valley.

Field Trip Log - Botany		
Trip Log Number:	S8	Project No. 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	Jeff Glazner/Barry Anderson/David Stevens	
Date:	June 5, 2002	

Weather Conditions:	Hot and dry
Areas Covered (attach map with notations)	
Attachments	
Photo Log	Yes
Photos	yes
Topographic Map(s)	No

Field Observations:

Existing Facilities:

None other than residences.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

Mills Creek is an intermittent, braided stream flowing into the Kings River. It supports riparian habitat. Surrounding areas are grassland and woodland. Wetlands could be present along stream channels and at seeps and springs along other drainages. This option would have substantial impacts on vegetation and wildlife habitat.

Need for additional (engineering/hydrological, or other) information on measures

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- Geology or soils information
 - Spillway elevation and the limits of inundation
 - Locations of any new diversion structures
 - Locations of realigned roads
 - Location of work pads, access roads, and other construction areas
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Additional data needs (within each specific discipline)

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- CNDDDB report
 - CNPS report
 - Ceres report
 - Field surveys for wetlands and special status species and habitats
 - Is a tree survey necessary?
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Field Trip Log – Wildlife		
Trip Log Number:	S8	Project No. 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	Dave Stevens, Stephanie Murphy	
Date:	June 5, 2002	

Weather Conditions:	Hot and dry
Areas Covered (attach map with notations)	
Attachments	
Photo Log	
Photos	
Topographic Map(s)	

Field Observations:

Existing Facilities:

There are no apparent existing facilities other than Pine Flat Dam.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

Braided stream bed fed by a number of ephemeral streams from adjacent watershed canyons. There is varying amounts of riparian habitat along the stream course. This area could support a number of sensitive species such as VELB, western pond turtles, and willow flycatcher. Possible constraints include loss of riparian, loss of potential VELB

habitat, loss of potential willow flycatcher habitat, and loss of potential deer winter range.

Need for additional (engineering/hydrological, or other) information on measures

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- Need inundation levels, seasonal storage regimes, etc.
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Additional data needs (within each specific discipline)

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- a. Need to coordinate with resource agency biologists and agency files on known distribution of sensitive species for this area.
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Field Trip Log – Fish and Water Quality		
Trip Log Number:	S8	Project No. 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	Philip Unger	
Date:	June 10, 2002	

Weather Conditions:	Hot and dry
Areas Covered (attach map with notations)	Mill Creek
Attachments	
Photo Log	No
Photos	No
Topographic Map(s)	Yes

Field Observations:

Existing Facilities:

Existing facilities include a road, a private landing strip, and various private buildings.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

Mill Creek has a wide, braided channel. It had a small flow at the time of our field trip, but probably ceases to flow by mid summer. Many small fish (probably minnows) were observed, which probably survive the late summer and fall in pools. Bullfrog tadpoles and snails were abundant. Riparian vegetation was generally well developed along the existing channels.

Need for additional (engineering/hydrological, or other) information on measures

Need information on exact area that would be submerged by a dam on Mill Creek.

Need information on range of seasonal flow conditions in Mill Creek.

Need the following estimates for potential reservoir:

- Mean depth for each month, April – October.
- Mean surface area of shallow water habitat (less than 15 feet deep) in each month, April – October.
- Mean rate of water level fluctuation for each month, April – October.

Need information on how Pine Flat Reservoir and the Kings River would be affected by diversions to Mill Creek Reservoir, including changes in water level, timing and duration, and river flows.

Additional data needs (within each specific discipline)

Need information on summer water temperatures and dissolved oxygen levels in Mill Creek and list of fish species likely present in the creek. Also, any other existing water quality information and information on the location and types of active and abandoned mines in the inundation zone of the potential reservoir.

Need information on fish species residing in Pine Flat Reservoir and the Kings River downstream.

Field Trip Log – Recreation		
Trip Log Number:	S8	Project No. 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	Sandra Perry	
Date:	June 3, 2002	

Weather Conditions:	Hot and dry	
Areas Covered (attach map with notations)	Mill Creek	
Attachments		
Photo Log	No	
Photos	No	
Topographic Map(s)	Yes	

Field Observations:

Existing Facilities:

This option would involve constructing a new dam on Mill Creek, which is a tributary to the Kings River located just downstream of Pine Flat Reservoir. The new dam and reservoir would be situated on private property. Existing facilities include Elwood Road, which bisects Mill Creek valley and connects Trimmer Springs Road and Highway 180, a private landing strip, and various private buildings. The town of Wonder Valley is located upstream, where Mill Creek turns to the northeast.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

There are no developed recreation facilities located in the immediate area. However, this option would involve diverting water from Pine Flat to the new Mills Creek Reservoir. Lower water levels at Pine Flat reservoir could affect recreation facilities such as boat ramps and marinas and recreation opportunities such as fishing and boating.

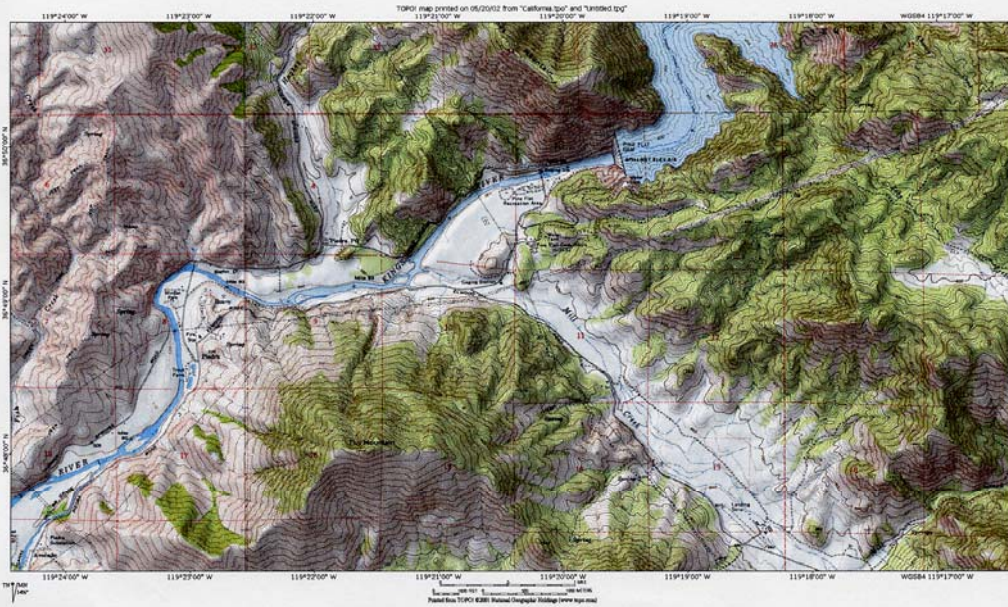
Need for additional (engineering/hydrological, or other) information on measures

Need information on exact area that would be submerged by a dam on Mill Creek.
Need information on how Pine Flat Reservoir would be affected by diversions to Mill Creek Reservoir, including changes in water level, timing and duration.

Additional data needs (within each specific discipline)

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- Need the following recreation-related information for Pine Flat Reservoir:
- Exact location of existing recreation facilities along the margins of Pine Flat Reservoir
 - General information about recreation activities and use levels.
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mill creek 7.5



private property (one large ranch?)
No recreation facilities
but divisions from Pine Flat could affect recreation
at Pine Flat.

Field Trip Log – Land Use		
Trip Log Number:	S8	Project No: 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	Irina Torrey	
Date:	June 3, 2002	

Weather Conditions:	Hot and dry
Areas Covered (attach map with notations)	Mill Creek
Attachments	
Photo Log	Yes
Photos	Yes
Topographic Map(s)	No

Field Observations:

Existing Facilities:

This option would involve constructing a new dam on Mill Creek, which is a tributary to the Kings River located just downstream of Pine Flat Reservoir. The new dam site and reservoir would be situated on private property. Existing facilities include Elwood Road, which bisects Mill Creek valley and connects Trimmer Springs Road and Highway 180, a private landing strip, and various private buildings. The town of Wonder Valley is located upstream, where Mill Creek turns to the northeast.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

There are no residences in the immediate vicinity of the new reservoir however there are many residences along the road including a resort community called Wonder Valley.

Need for additional (engineering/hydrological, or other) information on measures

Need information on exact area that would be submerged by a dam on Mill Creek.

Additional data needs (within each specific discipline)

Need to find out if there are any residences that would be within the inundation area.

Field Trip Log – Cultural Resources		
Trip Log Number:	S8	Project No. 8004094
Dates:	May 30, 2002	
Site Name:	Mill Creek Dam	
Location:	Mill Creek, which enters the Kings River just downstream of Pine Flat Reservoir	
Prepared By:	David White	
Date:	May 30 2002	

Weather Conditions:	Hot & dry
Areas Covered (attach map with notations)	Vehicular reconnaissance May 30, along Elwood Road
Attachments	
Photo Log	Yes – MWH 0205
Photos	Yes – nos. 77-80
Topographic Map(s)	Pine Flat Dam quad

Field Observations:

Existing Facilities:

No existing dam. Elwood road parallels Mill Creek; residences and horse ranches.

Existing Environmental Features as Appropriate to Discipline (hydrology; aquatic-water quality; terrestrial—plants; wildlife; recreation; cultural resources; land use; aesthetic)

Cultural resources:
Prehistoric: Riparian woodland and adjacent Blue Oak woodland would have provided diverse resources. High probability of prehistoric archaeological sites including BRM

stations, hunting & fishing camps, possible seasonal village sites.

Historic: Various sites likely, associated with mining, logging, recreation and other activities.

Need for additional (engineering/hydrological, or other) information on measures

Need precisely mapped footprint of reservoir, with various potential dam levels; also need footprint of all associated ground disturbance areas, to include but not be limited to offices and maintenance buildings, construction set-up and lay-down areas, access roads, electric transmission lines, water conveyance structures, and all other facilities.

Additional data needs (within each specific discipline)

Need archaeological records search with California Historic Resources Inventory System (CHRIS) information center. Clearinghouse: Southern San Joaquin Valley Info Center, CSU-Bakersfield.

Also need brief review of archaeological and ethnographic literature pertaining to the area. Minimal level of effort: (1) to identify types of archaeological remains expected, time periods represented; and (2) to identify Native American tribes historically occupying the area, along with published information on major named villages or other ethnographic sites.



Kings River, view NE upstream near mouth of Mill Creek, May 30, 2002, late afternoon



Kings River, view NE upstream near mouth of Mill Creek, May 30, 2002, late afternoon



Mill Creek, view NW (downstream) , May 30, 2002, late afternoon



Mill Creek, view SE (upstream), May 30, 2002, late afternoon



Mill Creek looking downstream just above confluence with Kings River



Mill Creek looking upstream just above confluence with Kings River



Mill Creek, May 31, 2002

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APPENDIX C

Cost Estimate Summary

Mill Creek Dam and Reservoir

Upper San Joaquin River Basin Storage Investigation	
Cost Estimate	
MILL CREEK DAM AND RESERVOIR	
Rock Fill Dam, 250 ft high 5000 ft tunnel from Pine Flat	
FIRST COST ITEMS	ESTIMATED COST (2002 DOLLARS)
DAMS Diversion Dam/Cofferdam	\$ -
Diversion Works/Tunnel	\$ -
Main Dam	\$ 131,700,000
Spillway	\$ 8,025,000
Outlet Works	\$ 6,500,000
SUBTOTAL	\$ 146,225,000
CONVEYANCE FACILITIES	
Power intake, tunnels & penstocks	\$ -
Diversion Tunnel	\$ -
Tunnel	\$ 15,000,000
Canals/Pipelines	\$ -
Pumping Stations	\$ -
Regulating Reservoirs	\$ -
SUBTOTAL	\$ 15,000,000
PERMANENT OPERATING EQUIPMENT	
Powerplants, generators & turbines	\$ -
Transmission Lines, switchyards, & substns.	\$ -
SUBTOTAL	\$ -
TOTAL, LISTED ITEMS (rounded)	\$ 161,200,000
UNLISTED ITEMS (15%; rounded)	\$ 24,200,000
TOTAL, CONSTRUCTION ITEMS (rounded)	\$ 185,000,000
CONTINGENCIES ON CONSTRUCTION (25%; rounded)	\$ 46,000,000
TOTAL, CONSTRUCTION COST	\$ 231,000,000
MITIGATION (5%; rounded)	\$ 12,000,000
TOTAL FIELD COSTS	\$ 243,000,000
INVESTIGATION, DESIGN, & CONSTRUCTION MNGMT (15%; round	\$ 36,000,000
LAND (rounded)	\$ 17,000,000
TOTAL FIRST COST	\$ 296,000,000

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