

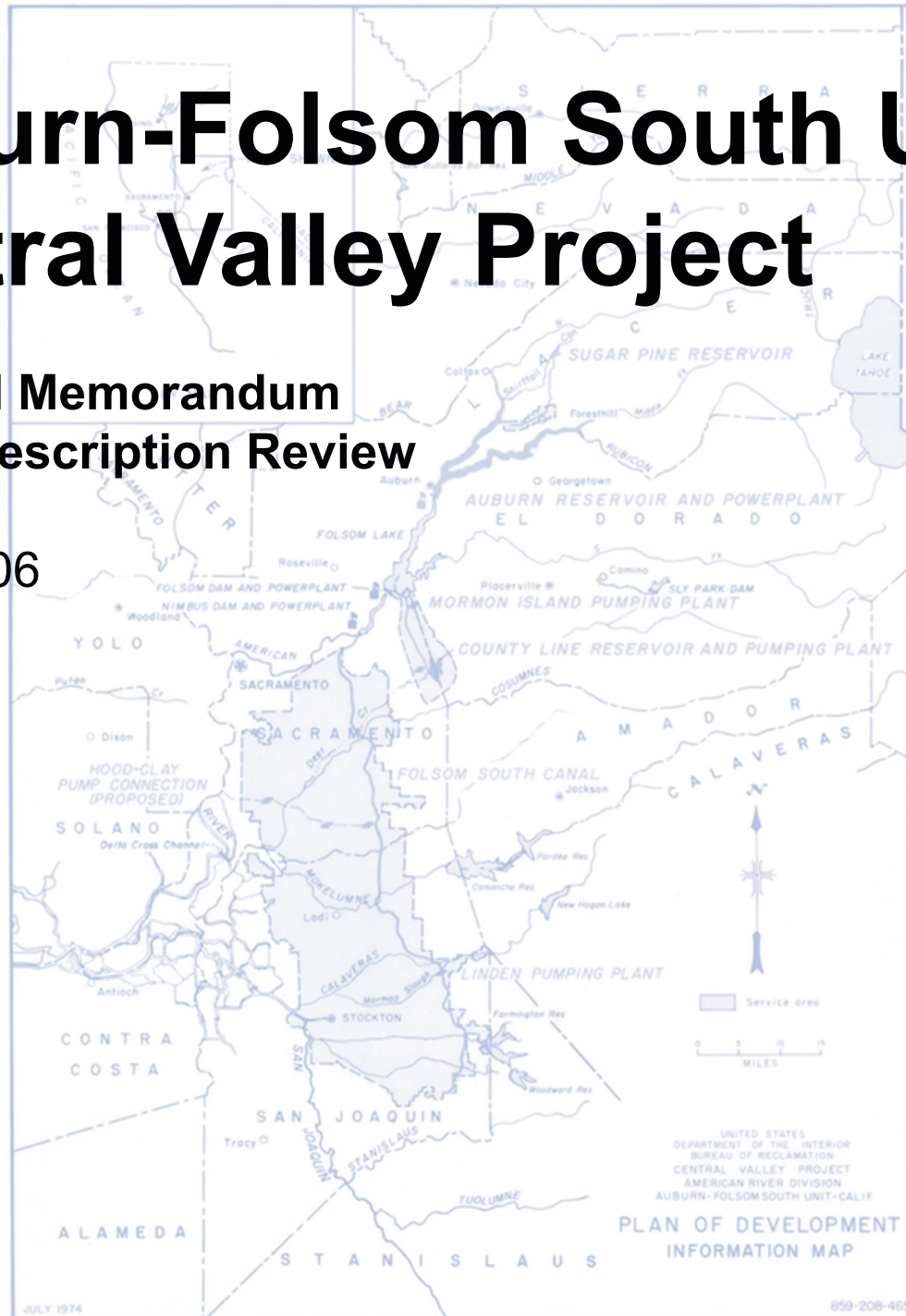
RECLAMATION

Managing Water in the West

Auburn-Folsom South Unit Central Valley Project

Technical Memorandum Project Description Review

March 2006



U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

AUBURN-FOLSOM SOUTH UNIT CENTRAL VALLEY PROJECT

TECHNICAL MEMORANDUM PROJECT DESCRIPTION

Conducted by:

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Division of Planning

Technical Memorandum prepared by:



March 2006

EXECUTIVE SUMMARY

BACKGROUND

The Auburn-Folsom South Unit was authorized in September 1965 by Public Law 89-161 as an operationally and financially integrated part of the Central Valley Project (CVP). Authorized features of the Auburn-Folsom South Unit include in the following:

- Auburn Dam, Reservoir, and Powerplant on the North Fork of the American River
- Folsom South Canal
- Sugar Pine Dam, Reservoir, and conveyance
- County Line Dam, Reservoir, and conveyance

Construction on the Auburn-Folsom South Unit was initiated in 1967. Sugar Pine Dam, Reservoir, and conveyance have been completed. Construction of the first two reaches of the Folsom South Canal, about 27 miles, was completed in 1973 but further construction has been suspended. Construction has not been initiated on the County Line Dam and associated features. Construction of the Auburn Dam portion of the Auburn-Folsom South Unit was deferred following an earthquake in 1975 near Oroville. In Section 209 of the Energy and Water Development Appropriations Act of 2005, the Secretary of the Interior was directed to complete a Special Report to update the costs and associated benefits of the Auburn-Folsom South Unit.

PURPOSE AND SCOPE

The primary purpose of this Technical Memorandum (TM) is to identify those project features included in the authorized Auburn-Folsom South Unit that would be applicable today if it were decided to continue with implementation of the project. It is recognized that each element of the Auburn-Folsom South Unit is relevant to effective water resources development in the CVP. However, the focus of this TM, to partially meet the goal of Congressional direction in 2005, is on the Auburn Dam element of the Auburn-Folsom South Unit. This is primarily because unless a multiple-purpose water supply project can be developed upstream from Folsom Reservoir, it is unlikely that any of the remaining elements of the Auburn-Folsom South Unit would be viable.

Although emphasis is placed in this TM on physical features of the Auburn Dam project from the authorization and subsequent reports, information also is included about how the project could be refined to accommodate current conditions, requirements, and opportunities. The scope of this TM primarily includes (1) gathering information about the authorized project from persons involved in the initial project planning and construction and (2) identifying likely major features to be included in an updated project to meet the Special Report purpose, based on discussions with persons involved in relevant past and current studies, and on other available documentation.

MAJOR CONSIDERATIONS

Included is a summary of major engineering and other technical considerations believed important to defining project features for the Special Report. These features and the scope and feasibility of an Auburn Dam project not only depend on existing conditions at and near the original project area, but on how certain conditions may change in the future should no further efforts be taken to implement Auburn Dam. Several important ongoing efforts that would influence future studies on Auburn Dam include (1) completion of dam safety upgrades at Folsom Dam and Reservoir, (2) implementation of the Folsom Dam Mini-Raise project, (3) completion of Auburn Dam site restoration, and (4) likely future recreation and related uses of the American River Canyon.

Major features and related technical considerations of an Auburn Dam and Reservoir project are listed below. In addition, estimates of significant Auburn Dam and Reservoir related features are summarized in **Table ES-1**.

- **Site Restoration** – Recognition of the need to restore Auburn Dam prior to resuming construction.
- **Main Dam** – Summary of major features to be included in the main structure of Auburn Dam.
- **Foundation and Appurtenances** – Pertinent foundation and related modifications.
- **Spillway and Appurtenances** – Summary of type, location, and number of spillway and appurtenance facilities.
- **Outlet Works and Diversions** – Highlights of identified outlet and related features.
- **Borrow Areas** – Summary of identified borrow area needs.
- **Construction Facilities and Considerations** – Summary of construction-related facilities.
- **Powerplant and Switching Facilities** – Summary of new powerplant, switchyard, and related needs.
- **Water Control** – Features to control basin runoff during construction.
- **Major Remaining Relocations** – Summary of needed major road, service facility, and related relocations.
- **Recreation Considerations** – Potential recreation and related facilities considerations.

TABLE ES-1
AUBURN DAM AND RESERVOIR – SUMMARY OF FEATURES

Project Location: North and Middle Forks of American River, in Placer and El Dorado Counties, near Auburn, California			
Project Purposes: Irrigation Water Supply, Municipal & Industrial Water Supply, Flood Control, Power, Recreation, Fish & Wildlife, Navigation			
Drainage Areas		Unimpaired Flows of Auburn Dam	
Auburn Dam (RM 20.1) ^[1]	970 square miles	Mean annual runoff (WYs 1922-1994) ^[4]	1,363,000 acre-feet
North Fork American R. at Auburn Dam ^[1]	355 square miles	Maximum annual runoff (1982 WY) ^[4]	3,256,000 acre-feet
N. Shirttail Cyn. Cr. at Sugarpine Dam ^[2]	9 square miles	Minimum annual runoff (1977 WY) ^[4]	229,000 acre-feet
Middle Fork American R. at North Fork ^[1] (excluding Rubicon River)	300 square miles	Spillway design flood ^[5]	
MF American R. at Fr. Meadows Dam ^[2]	47 square miles	Peak inflow	500,000 cfs
Rubicon River at MF American River ^[1]	316 square miles	1-day volume	758,000 acre-feet
Rubicon River at Hell Hole Dam ^[2]	112 square miles	5-day volume	1,700,000 acre-feet
Pilot Creek at Stumpy Meadows Dam ^[2]	15 square miles	Standard Project Flood ^[2]	
Gerle Creek at Loon Lake Dam ^[2]	8 square miles	Peak Inflow	306,000 cfs
American River at Folsom Dam ^[3]	1,875 square miles	100-year flood	
American River at Fair Oaks ^[3]	1,921 square miles	Peak Inflow	202,000 cfs
American River at H Street Bridge ^[3]	1,969 square miles	5-day volume	783,000 acre-feet
Auburn Dam		Auburn Reservoir	
Dam type	Conc curved-gravity (CG-3)	Elevations	
Location (North Fork American River)	River Mile 20.1	Top of dead storage	616.5 feet msl
Elevation, top of parapet	1,139.5 feet msl	Top of inactive	816.5 feet msl
Elevation, crest of dam	1,135.0 feet msl	Top of active conservation	1,083.1 feet msl
Structural height	685 feet	Top of joint use (gross pool)	1,131.4 feet msl
Total length of crest	4,150 feet	Area	
Width of crest at elevation 1135.0	40 feet	Gross pool	10,050 acres
Maximum base thickness	465 feet	Storage capacity	
Downstream face slope	0.68:1	Top of dead storage	29,000 acre-feet
Total concrete in dam	9,760,000 yd ³	Top of inactive	360,000 acre-feet
Diversion tunnel diameter (horseshoe)	33 feet	Top of active conservation	1,876,000 acre-feet
		Top of joint use (gross pool)	2,326,000 acre-feet
Spillway (service and auxiliary)		Length of shoreline	140 mi
Crest elevation	980 feet msl	Powerplant	
Discharge capacity at maximum water level	330,000 cfs	Number and size of units	4 @ 200 MW
Total orifice area	3,648 ft ²	Type of turbines	Francis
Crest gates (top-seal radial)		Discharge at rated speed & head	5,760 cfs
Number and size	8 @ 19x24 feet	Type of generators	vertical shaft
Plunge pool basin elev (service / auxiliary)	410 / 430 feet msl	Number and diameter of penstocks	4 @ 17 feet
Outlets		Penstock intake elevations	625 and 800 feet msl
River outlets (72-in dia. w/ 72-in ring-follower gates & hollow jet valves)		Other Project Features	
Number and intake elevation	2 @ 625 feet msl	Major relocations ^[7]	Highway 49, upstr. access roads
Discharge elevation	485.5 feet msl		
Capacity at top of inactive	4,000 cfs	Takeline lands ^[7]	43,473 acres
Capacity at gross pool / restr. capacity ^[6]	5,540 cfs / 4,200 cfs		

Key:

cfs – cubic feet per second	in – inches	R – River
Cr – Creek	MF Middle Fork	WY – water year
Cyn – Canyon	msl – above mean sea level	yd ³ – cubic yard
dia – diameter	MW – megawatt	
Fr – French	N - North	

Notes:

All information presented in Table 1 taken from *Feasibility Design Summary, Auburn Dam Concrete Curved-Gravity Dam (CG-3)* (US Dept. of the Interior, Water and Power Resources Service, August 1980) unless otherwise noted.

[1] California Watershed Map, CALWATER Version 2.2, September 1999, <http://gis.ca.gov/>

[2] *Design and Analysis of Auburn Dam Volume One*, Reclamation, August 1977

[3] *Reservoir Regulation Manual for Flood Control, Folsom Dam and Reservoir, Appendix II*, U.S. District, Army Corps of Engineers, March 1959

[4] Auburn annual inflow data from CALSIM II (CVP OCAP Study 5, June 2004)

[5] *Auburn Dam site Inflow Spillway Design Flood Study*, Reclamation, January 1967

[6] Restricted to a discharge of 4,200 cfs because of possible damages to the conduits caused by high-velocity flow

[7] *Final Report on the Evaluation of the Auburn Dam Project*, Bechtel National, Inc., November 1985

- **Environmental Mitigation** – Recognition of the need for significantly more environmental mitigation than considered previously.
- **Real Estate Requirements** – Summary of general real estate related needs.

FINDINGS

Several findings were developed as part of the TM and are believed important in current and future efforts on the Special Report:

- Future studies should evaluate alternative dam designs and alternate locations.
- A number of project elements would require significant attention in future studies:
 - Reservoir area road relocations
 - Flood space and related dam features (spillway configuration)
 - Mitigation for environmental, recreation, and related resources

Contents

	Page
Section I Introduction.....	I-1
Purpose and Scope	I-1
Authorization	I-1
Organization of Technical Memorandum.....	I-2
Section II Auburn-Folsom South Unit	II-1
Major Features of the Auburn-Folsom South Unit	II-1
Auburn Dam and Reservoir	II-1
Sugar Pine Dam and Reservoir	II-4
County Line Dam and Reservoir	II-4
Folsom South Canal.....	II-4
Accomplishments of the Auburn-Folsom South Unit	II-8
Major Unit Features for Inclusion in Current Evaluation	II-9
Other Relevant Information	II-10
Auburn Flood Control Dam.....	II-10
Placer County Water Agency Pump Station.....	II-10
Section III Auburn Dam and Reservoir Project Description Considerations.....	III-1
No-Action Condition	III-1
Folsom Dam Safety (Seismic and Seepage)	III-1
Folsom Dam Raise and Outlet Modifications.....	III-1
Combined Federal Project.....	III-2
Auburn Dam Site	III-2
Reservoir Area Recreation.....	III-2
Engineering and Other Technical Considerations	III-3
Site Restoration.....	III-3
Main Dam	III-3
Foundation and Appurtenances.....	III-5
Spillway and Appurtenances.....	III-5
Outlet Works and Diversions.....	III-6
Borrow Areas for Construction Materials (assuming CG-3).....	III-7
Powerplant and Related Features.....	III-7
Water Control.....	III-8
Other Permanent Operating Facilities.....	III-9
Major Remaining Relocations	III-10
Road Relocations	III-10
Highway 49 Relocation.....	III-10
Placer and El Dorado County Road Relocation.....	III-10
Access Roads	III-11
Other Roadways and Utilities	III-11

Trails and Equestrian Bridge	III-11
Recreation Considerations	III-11
Environmental and Related Features	III-12
Environmental Mitigation	III-12
Cultural Resources	III-13
Real Estate Requirements	III-13
Lands	III-13
Water Rights	III-14
Section IV Summary of Findings	IV-1
Section V References.....	V-1

LIST OF TABLES

Table III-1 Auburn Dam and Reservoir – Summary of Features	III-4
Table III-2 Summary – Recreation Facilities at Auburn Reservoir	III-12
Table III-3 Land Requirements.....	III-14

LIST OF PLATES

Plate 1	Auburn-Folsom South Unit Development Plan
Plate 2	Auburn Dam and Reservoir Area
Plate 3	Auburn Dam Drainage Area
Plate 4	Auburn Dam (CG-3) Plan and Elevations
Plate 5	Auburn Dam (CG-3) Partial Plan and Sections
Plate 6	Auburn Area Facilities
Plate 7	Road Relocations and Project Boundary
Plate 8	Auburn Reservoir General Plan
Plate 9	Auburn Reservoir Takeline Land Ownership

LIST OF ATTACHMENTS

Attachment A	Pertinent Authorizations
Attachment B	Auburn-Folsom South Unit Special Report Project Coordination Workshop Minutes

ABBREVIATIONS AND ACRONYMS

BLM	United States Bureau of Land Management
cfs	cubic feet per second
CG-3	Auburn Dam concrete curved-gravity dam design
CVP	Central Valley Project
DPR	California Department of Parks and Recreation
DWR	State of California Department of Water Resources
EBMUD	East Bay Municipal Utility District
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FERC	Federal Energy Regulatory Commission
FPUD	Foresthill Public Utility District
GDPUD	Georgetown Divide Public Utility District
IFA	Integrated Federal Project
M&I	municipal and industrial
MAF	million acre-feet
MIAD	Mormon Island Auxiliary Dam
msl	mean sea level
MW	megawatt
NEPA	National Environmental Policy Act
PCWA	Placer County Water Agency
PL	Public Law
PMF	Probable Maximum Flood
RCC	roller-compacted concrete
Reclamation	United States Department of the Interior, Bureau of Reclamation
RM	river mile
RMP	Resource Management Plan
SRA	State Recreation Area
SWRCB	California State Water Resources Control Board
TCD	temperature control device
TM	Technical Memorandum
USACE	United States Army Corps of Engineers
WAPA	Western Area Power Administration
WRDA	Water Resources Development Act of 1974

SECTION I

INTRODUCTION

The Auburn-Folsom South Unit was authorized in September 1965 by Public Law (PL) 89-161 as an operationally and financially integrated part of the Central Valley Project (CVP). As shown in **Plate 1**, the Auburn-Folsom South Unit includes (1) Auburn Dam, Reservoir, and Powerplant on the North Fork American River, (2) Folsom South Canal, (3) Sugar Pine Dam, Reservoir, and conveyance, and (4) County Line Dam, Reservoir, and conveyance. Construction of Auburn Dam was initiated by the United States Department of the Interior, Bureau of Reclamation (Reclamation) in 1967 and construction on Folsom South Canal was initiated in 1968. Construction on the project was deferred following an earthquake in 1975 near Oroville, California. Construction of the first two reaches of the Folsom South Canal, about 27 miles, was completed in 1973.

In Section 209 of the Energy and Water Development Appropriations Act of 2005, the Secretary of the Interior was directed to complete a Special Report to update the analysis of costs and associated benefits of the Auburn-Folsom South Unit.

PURPOSE AND SCOPE

The primary purpose of this Technical Memorandum (TM) is to identify those project features included in the Auburn-Folsom South Unit that would be relevant today if it were decided to continue with implementation of the project. Although emphasis is placed on physical features of the project from the authorization and subsequent reports, information also is included about how the project could be refined to accommodate current conditions, requirements, and opportunities. The scope of this TM primarily includes (1) gathering information about the authorized project from persons involved in the initial project planning and construction and (2) identifying likely major features to be included in an updated project to meet the Special Report purpose, based on discussions with persons involved in relevant past and current studies, and available documentation.

AUTHORIZATION

A number of Congressional actions relate to the Auburn-Folsom South Unit of the CVP or Auburn Dam. Three fundamental authorizations important to the Auburn-Folsom South Unit Special Report are listed below. A summarized copy of each is contained in **Attachment A**.

- **Auburn-Folsom South Unit, Central Valley Project** - The Auburn-Folsom South Unit was authorized in PL 89-161, 79 Stat, 615, dated 2 September 1965, as an operationally and financially integrated part of the CVP.
- **Auburn Dam Road Relocation** – In the Water Resources Development Act (WRDA) of 1974 (PL 93-251, dated 7 March 1994) the Secretary of the Interior was authorized to

provide for the cost of construction of an all-weather paved road extending from old U.S. Highway 40 near Weimar across the North and Middle forks of the American River to near Spanish Dry Diggings in El Dorado County.

- **Auburn-Folsom South Unit, Special Report** - Section 209 (a) of PL 109-103, dated 19 November 2005, authorized the Secretary of the Interior to complete a Special Report to update the analysis of costs and associated benefits of the authorized Auburn-Folsom South Unit. According to the authorization, this Special Report was to accomplish the following:
 1. Identify those project features that are still relevant
 2. Identify changes in benefit values from previous analyses and update to current levels
 3. Identify design standard changes from the 1978 Reclamation design which require updated project engineering
 4. Assess risks and uncertainties associated with the 1978 Reclamation design
 5. Update design and reconnaissance-level cost estimate for features identified under Item 1 above
 6. Perform other analyses that the Secretary deems appropriate to assist in the determination of whether a full feasibility study is warranted

ORGANIZATION OF TECHNICAL MEMORANDUM

This TM is organized into five sections and two attachments, as follows:

- **Section I: Introduction** – Describes the background of the Auburn-Folsom South Unit, and purpose and scope of this TM, and provides information on pertinent authorizations.
- **Section II: Auburn-Folsom South Unit** – Provides information about the major elements of the Auburn-Folsom South Unit, accomplishments of the unit, recent activities related to the Auburn Dam and Reservoir portion of the unit, and major unit features for inclusion in current evaluations.
- **Section III: Auburn Dam and Reservoir Project Description Considerations** – Identifies and summarizes major project elements that should be considered in the Special Report.
- **Section IV: Summary of Findings** – Summarizes the findings of this TM.
- **Section V: References** – Information from a number of sources, ranging from detailed reports, authorization language, and personal contacts, was reviewed preparing this TM. A list of significant references is included in this section. Several of these references were of

particular importance to this TM. Primary sources of project element identification and descriptions were obtained from the following:

- o *Feasibility Report on the Auburn Unit, Central Valley Project*. Bureau of Reclamation, January 1960.
- o *Design and Analysis of Auburn Dam, Volume One Design Data*. Bureau of Reclamation, August 1977.
- o *Feasibility Design Summary, Auburn Dam Concrete Curved-Gravity Dam Alternative (CG-3)*. United States Department of the Interior, Water and Power Resources Service, August 1980.
- o *Final Report on the Evaluation of the Auburn Dam Project*. Bechtel National, Inc., November 1985.
- o *Supplemental Information Report, American River Watershed Project, California*. United States Army Corps of Engineers, March 1996.

In addition, a major information source was a workshop held in Sacramento on 20 January 2006. The purpose of the workshop was to gather persons with knowledge about the Auburn-Folsom South Unit when it was initially being implemented, and Reclamation staff currently working on studies for the Special Report. **Attachment B** is the minutes for the workshop.

SECTION II

AUBURN-FOLSOM SOUTH UNIT

This section contains a brief description of the major features of the Auburn-Folsom South Unit, unit features for inclusion in the current evaluation, and other pertinent information.

MAJOR FEATURES OF THE AUBURN-FOLSOM SOUTH UNIT

Major features of the Auburn-Folsom South Unit are described below.

Auburn Dam and Reservoir

Auburn Dam, Reservoir, and Powerplant would be located about 40 miles northeast of Sacramento on the North and Middle forks of the American River upstream from Folsom Reservoir. The authorized project plan for Auburn Dam was a dam and reservoir with a maximum water surface elevation of 1,140 feet above mean sea level (msl) and a capacity of about 2.5 million acre-feet (MAF). Post authorization studies settled on a double-curvature arch dam about 685 feet high, with a crest length of about 4,200 feet (see **Figure II-1**). This reservoir would have a total capacity of 2.33 MAF. **Plate 2** shows the extent of Auburn Reservoir at this gross pool. The total average annual inflow at the Auburn Dam site is about 1.4 MAF. **Plate 3** shows the Auburn Dam drainage area, tributaries, and major upstream storage facilities. At gross pool, the project would inundate about 10,050 acres and 33 miles of the American River canyon (North and Middle forks). The project included a powerplant and relocation of major upstream facilities such as State Highway 49 and major recreation facilities. The Auburn Powerplant was to be built at the downstream toe of Auburn Dam on the north (right) abutment and would house five units, each with a capacity of 150,000 kilowatts. Other configurations for Auburn Dam and Powerplant have been considered since the authorized project plan.

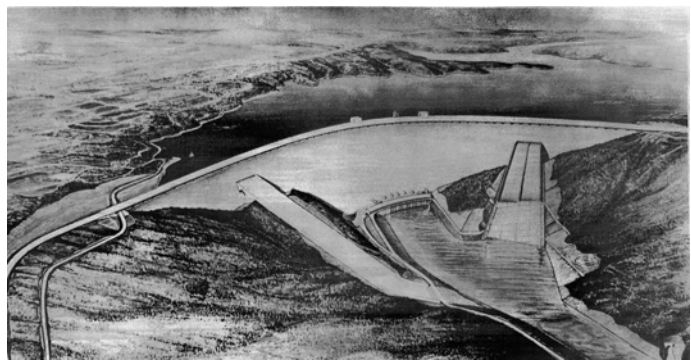


FIGURE II-1. ARTIST RENDITION OF DOUBLE CURVATURE CONCRETE ARCH AUBURN DAM AND POWER PLANT AT RIVER MILE 20.1 ON NORTH FORK AMERICAN RIVER

In conjunction with Folsom and Nimbus dams and other facilities of the CVP, Auburn Dam and Reservoir would control flows of the North and Middle forks of the American River. Regulated releases from the reservoir would generate power at Auburn Powerplant and would be used to supply the Folsom South Canal and downstream service areas.

Construction of Auburn Dam was initiated in 1967. Some of the initial work included road relocations such as the Auburn-Foresthill Bridge, which was completed in 1973. **Figure II-2** shows the completed bridge. The 33-foot - diameter, 2,400 - foot-long Auburn Dam diversion

tunnel was completed in November 1972. **Figure II-3** is a photograph of the Auburn Dam site showing some of the early construction activities.



FIGURE II-2. AUBURN-FORESTHILL BRIDGE LOOKING NORTH



FIGURE II-3. WORK AT AUBURN DAM SITE

The Auburn Dam site today looks much like it did when construction was suspended in the late 1970s. **Figure II-4** shows an aerial view of the site in April 2004. As can be seen from the photo, much of the original channel has been filled in with materials washed down the river from natural sources as well as from the upstream cofferdam.



FIGURE II-4. AERIAL VIEW OF AUBURN DAM SITE AND FOUNDATION

By 1975, work was well underway on the dam foundation and powerplant, and construction of a 265-foot-high cofferdam was completed. On August 1, 1975, an earthquake measuring 5.7 on the Richter Scale occurred near Oroville Dam, about 50 miles northwest of the Auburn site. The event raised concerns about the safety of dams such as the thin arch concrete dam proposed for the Auburn site. In April 1976, the Association of Engineering Geologists, Seismic Hazards Committee, issued a report stating that a moderate earthquake, similar to the 1975 event near Oroville, could cause the proposed dam at Auburn to fail. The seismic hazard analysis led to a reevaluation of the type of dam to be constructed. Consensus from knowledgeable and credible sources was that a safe dam based on updated designs could be constructed at the Auburn site. No further construction activities took place after 1979, when Reclamation accepted the foundation excavation and treatment contract work as substantially complete.

Various analyses of the arch dam design showed it could safely withstand even the most severe seismic loads anticipated at the site. However, the potential for significant foundation displacement caused the re-evaluation of the original arch design. By increasing the base thickness in the central portion of the dam, and adding zones of higher strength concrete within

the structure, a dam (CG-3) could safely handle foundation displacement. Even in the extremely unlikely event that the structure cracked from bottom to top, the separate segments would simply remain in place. Leakage would likely occur, but the dam would not suffer catastrophic failure. Other alternatives subsequently considered included rockfill and concrete-gravity-type dams at various locations near River Mile (RM) 20.1.

Sugar Pine Dam and Reservoir

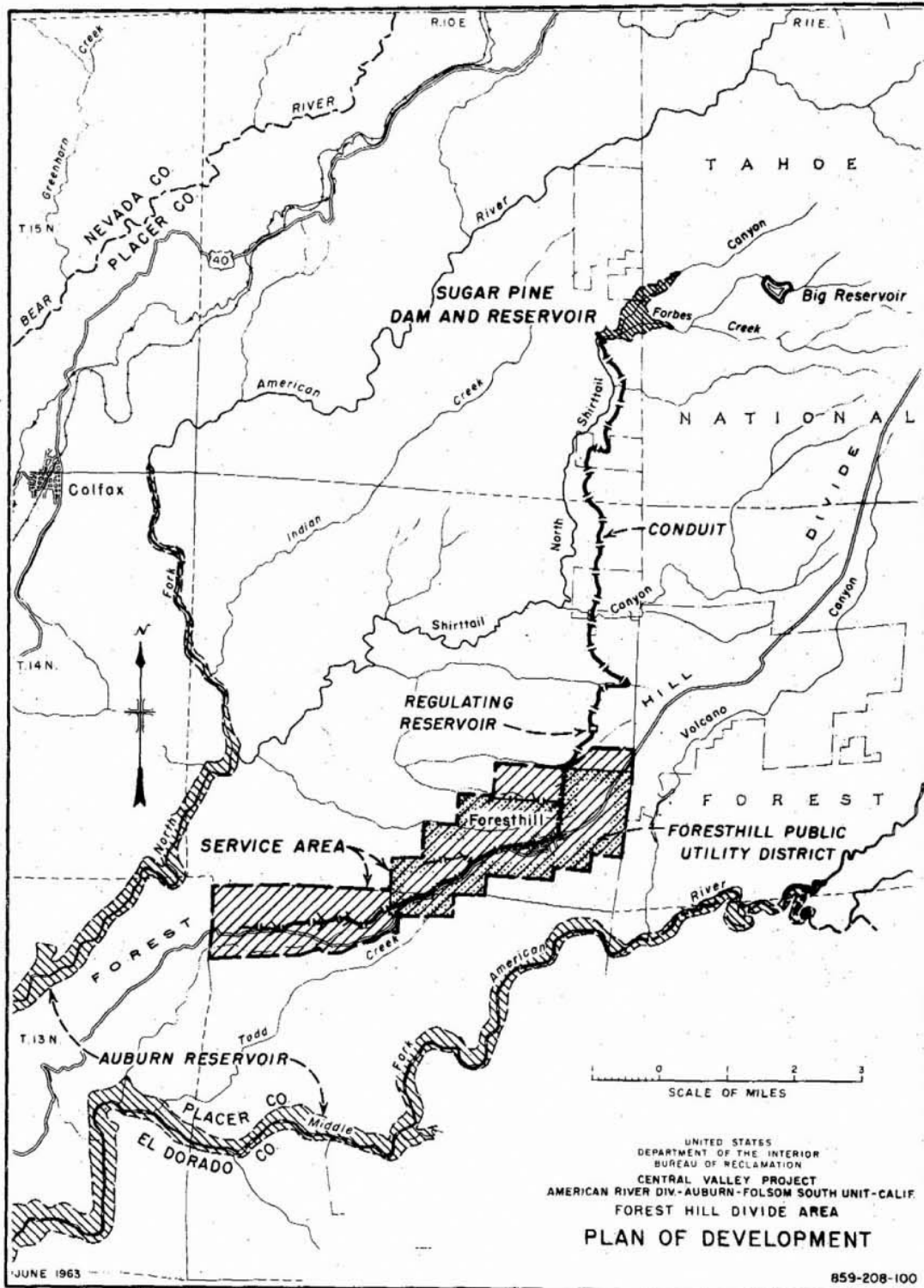
Sugar Pine Dam is located in North Shirttail Canyon approximately 7 miles north of Foresthill, California (see **Figure II-5**), and was completed in 1982. It is an earthfill and rockfill structure 205 feet high, with a crest length of 689 feet. The maximum base width from upstream toe to downstream toe is 984 feet; the total volume of material in the dam is 987,500 cubic feet. Reservoir capacity is 6,921 acre-feet with a surface area of 165 acres. Sugar Pine Pipeline is a steel and iron structure 8 miles long, and was completed in 1983. The diameter begins at 27 inches and reduces to 24 inches. The capacity of the pipeline is 13 cubic feet per second (cfs). The pipeline carries water from Sugar Pine Reservoir to the Foresthill Divide area. The Foresthill Public Utility District (FPUD) installed the pipeline to the service area downstream from the Regulating Reservoir shown in **Figure II-5**. Title to the dam and reservoir was transferred to the FPUD on 7 November 2003 and a Notice of Assignment was sent to the California State Water Resources Control Board (SWRCB) requesting the assignment of Water Right Application Number 21945 (Permit 15375) to the FPUD.

County Line Dam and Reservoir

If constructed, County Line Dam would be an earthfill structure 90 feet high with a crest length of 585 feet. The dam would be located on Deer Creek about 10 miles south of Folsom Dam, and create a reservoir with a capacity of 40,000 acre-feet (see **Figure II-6**). County Line Reservoir would operate in conjunction with pumping from Folsom Lake to provide water service in the Folsom-Malby area for municipal and industrial (M&I) use.

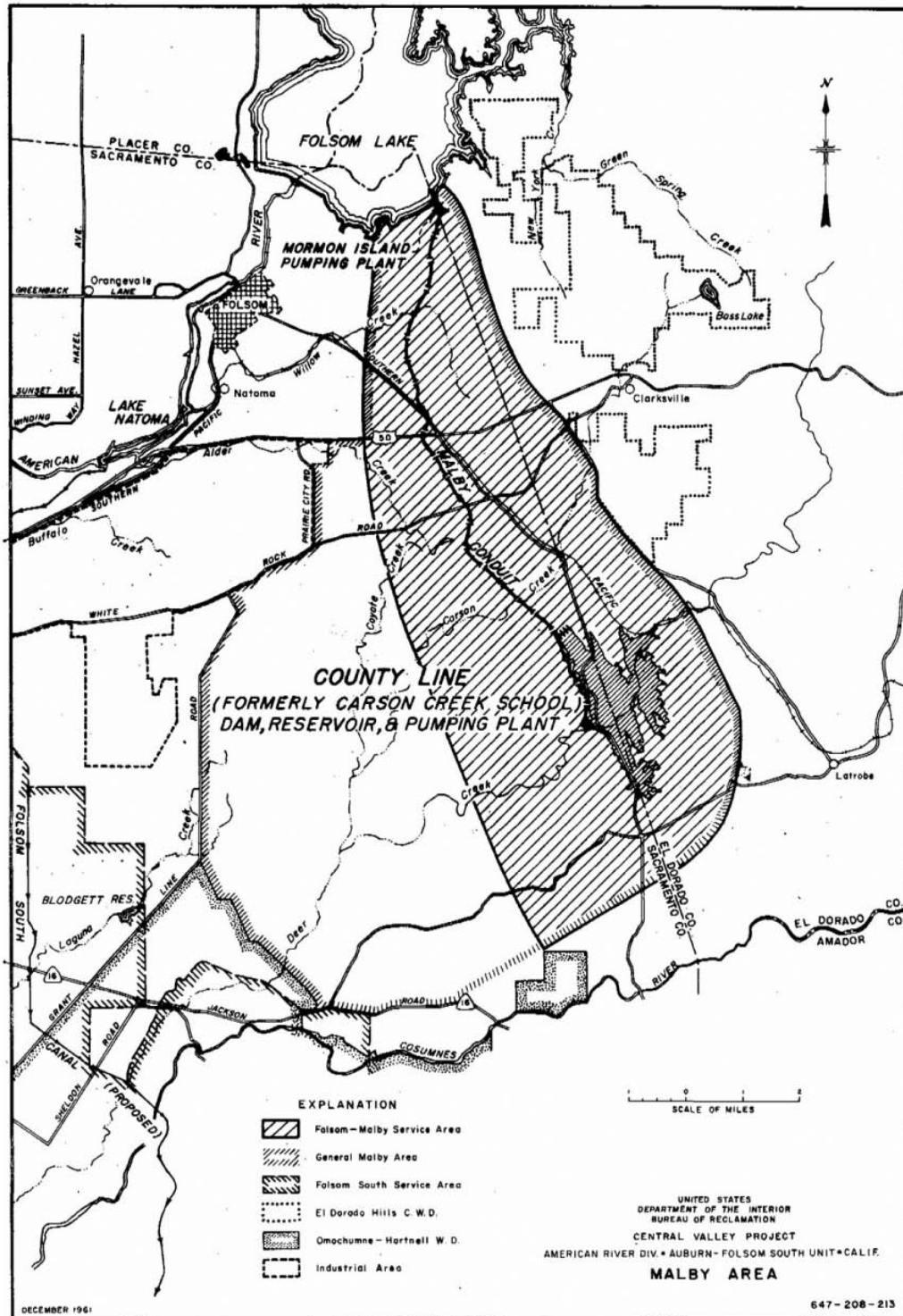
Folsom South Canal

The Folsom South Canal was planned to be constructed in five reaches for a total length of 68.8 miles. It was to convey water from the existing Nimbus Dam on the American River southward to serve a gross area of 500,000 acres and portions of Sacramento and San Joaquin counties (see **Figure II-7**). Only the first two reaches have been built, with a total length of 26.7 miles. The canal originates at Nimbus Dam (see **Figure II-8**) on the American River in Sacramento County and extends southward. As originally planned, the canal would terminate about 20 miles southeast of the city of Stockton. The first two reaches of this concrete-lined canal (see **Figure II-9**) have a capacity of 3,500 cfs. The canal has a bottom width of 34 feet, and the maximum water depth is 17.8 feet.



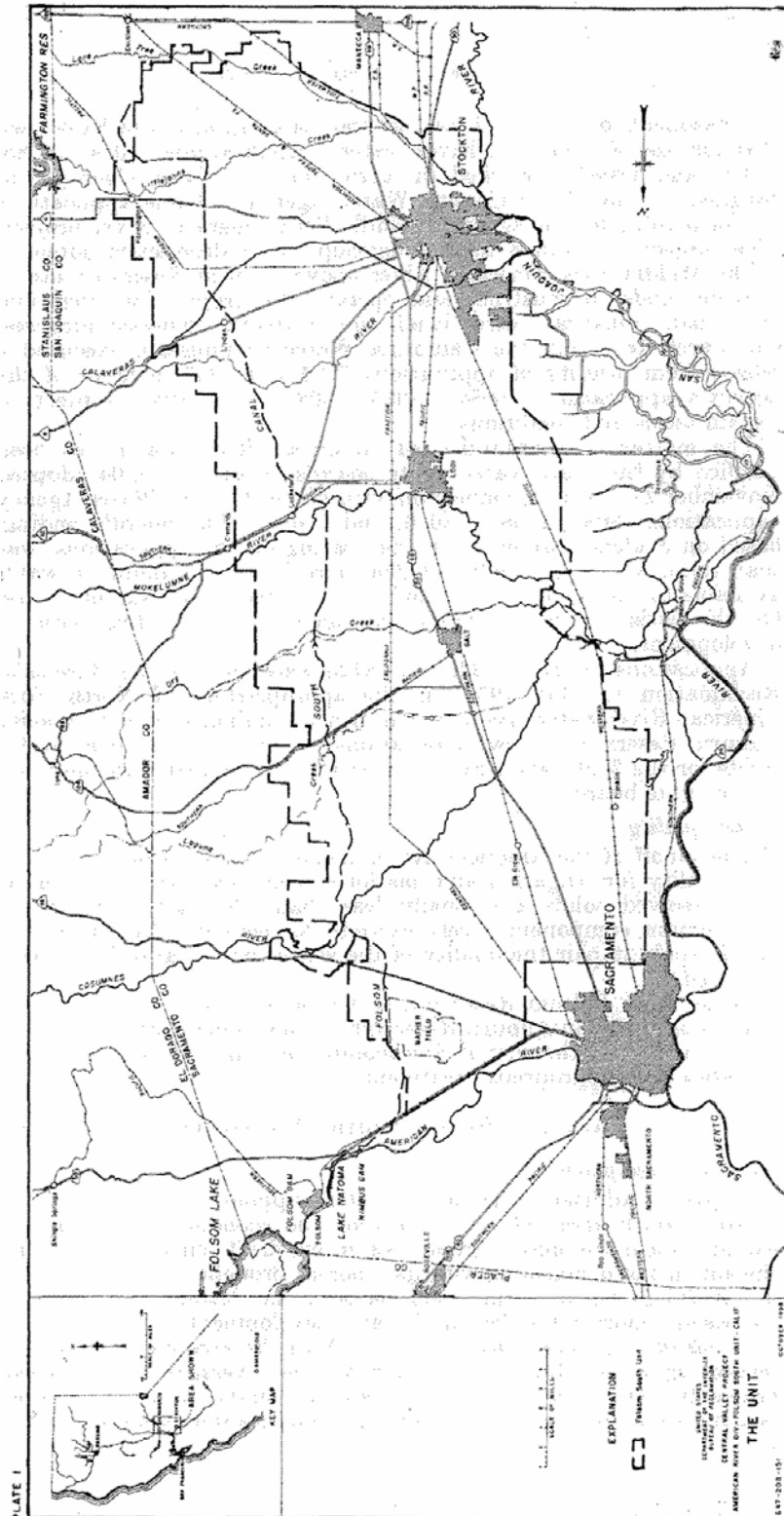
Source: October 22, 1963, Supplemental Report by the Secretary of the Interior on Auburn-Folsom South Unit

FIGURE II-5 – LAYOUT OF SUGAR PINE DAM, RESERVOIR, AND ASSOCIATED FACILITIES



Source: October 22, 1963, Supplemental Report by the Secretary of the Interior on Auburn-Folsom South Unit

FIGURE II-6 – LAYOUT OF COUNTY LINE DAM, RESERVOIR, AND ASSOCIATED FACILITIES

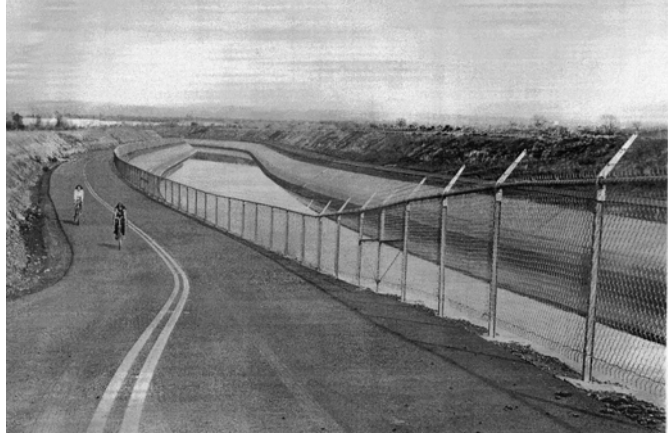


Source: October 22, 1963, Supplemental Report by the Secretary of the Interior on Auburn-Folsom South Unit

FIGURE II-7. FOLSOM SOUTH CANAL AND SERVICE AREA



**FIGURE II-8. UPSTREAM DIVERSION
OF THE FOLSOM SOUTH CANAL FROM
LAKE NATOMA LOOKING EAST**



**FIGURE II-9. FOLSOM SOUTH CANAL AND
RECREATION TRAIL**

Construction on the canal was suspended in 1973 pending the outcome of studies related to issues associated primarily with minimum flows in the American River downstream from Nimbus Dam for fishery and recreation purposes. Concern was raised after construction began that a minimum river flow greater than anticipated in the planning for the Auburn-Folsom South Unit was needed to support both the new diversion to the Folsom South Canal as well as maintaining resources conditions along the lower American River. SWRCB adopted Water Right Decision 1400 in 1972. This decision established flow and storage requirements for the Auburn-Folsom South Unit including minimum flows for various portions of the year from 1,250 cfs for fish and wildlife and 1,500 cfs for recreation purposes at Nimbus Dam. Maintenance of these flows would require completion of upstream storage at Auburn Dam and even then, would substantially reduce the anticipated amount of water available for diversion at Nimbus Dam. As a result, a number of petitions were filed requesting reconsideration and/or clarification of Decision 1400. Further, the Secretary of Interior stated that this problem would need to be resolved before work on the canal could be restarted. Reclamation subsequently developed a revised plan that includes recapture of the increased flows in the American River after they flow into the Sacramento River by construction of a pumping plant at Hood with conveyance back to the Folsom South Canal. To date, however, work on the Folsom South Canal has not been reinitiated primarily due to continuing unresolved issues related to completion of Auburn Dam and instream flows along the lower American River.

ACCOMPLISHMENTS OF THE AUBURN-FOLSOM SOUTH UNIT

The Auburn-Folsom South Unit was designed to provide new and supplemental water supply for irrigation and M&I needs, including improvement of depleted groundwater conditions in the Folsom South service area. The unit also was designed to provide significant increases in hydropower generation, fish protection and enhancement, and recreation facilities, including campsites, picnic areas, boat launching ramps, and swimming areas. In addition, in conjunction with Folsom Dam and Reservoir and downstream facilities, the unit could help provide increased flood protection for much of the Sacramento area.

If constructed, Auburn Reservoir would have been the point of diversion for future deliveries of water to western Placer County by the Placer County Water Agency (PCWA) through facilities already constructed by the agency. In addition, minimum pipeline intake and related facilities were being included in the Auburn Dam foundation to facilitate potential future service to the Georgetown Divide Public Utilities District (GDPUD) in El Dorado County.

MAJOR UNIT FEATURES FOR INCLUSION IN CURRENT EVALUATION

As mentioned, of the four major features of the Auburn-Folsom South Unit, only Sugar Pine Dam, Reservoir, and associated facilities have been fully constructed. Of the remaining three major features, Auburn Dam and Reservoir, County Line Dam and Reservoir, and remaining elements of the Folsom South Canal, only the Auburn Dam and Reservoir feature is considered a relevant feature for inclusion in evaluations for the Special Report. This is primarily because without implementing new storage in the American River watershed, the other Auburn-Folsom South Unit features would not provide the intended benefits. Accordingly, only Auburn Dam and Reservoir are considered further in this TM.

Although County Line Dam and Reservoir is an authorized feature of the Auburn-Folsom South Unit, it is not considered at this time to be a significant component that would influence a determination of whether or not to proceed with construction. County Line Dam and Reservoir is a separable element of the Auburn-Folsom South Unit. The physical facilities and service area of this element are removed from other unit facilities. Given changes in water needs and demands in California since the Auburn-Folsom South Unit was originally formulated, it is believed that a reformulation of County Line Dam and Reservoir would be needed to determine if it is still needed and feasible. However, on the basis of available information, it was determined that although this project is a significant feature of the Auburn-Folsom South Unit, it is not a relevant component for the Special Report at this time.

Completion of the remaining 42.1 miles of the Folsom South Canal would allow for full irrigation service to 28,000 acres, supplemental irrigation service to about 416,000 acres, and water for M&I purposes to areas in Sacramento and San Joaquin counties. This facility also would help to significantly address groundwater overdraft problems in the service area. Accordingly, completing the canal is an important component of the unit. However, similar to County Line Dam and Reservoir, major changes have occurred since the unit was originally formulated and full reformulation would be needed. As an example, East Bay Municipal Utility District (EBMUD) was to have been served from the Folsom South Canal. However, EBMUD is proceeding with an intake location off the American River to avoid diversion issues. Other portions of the Folsom South Canal Service Area could potentially also use this new diversion site. Accordingly, the reformulation would consider regional irrigation and M&I water need changes, desired flows in the American River, as well as other environmental concerns related to the canal and the area it would serve. Further, it is highly likely that significant benefits to water supply reliability within the CVP gained from a reservoir near Auburn could be achieved without completion of the canal. Accordingly, this feature of the unit is not considered a relevant feature for evaluation in the Special Report.

OTHER RELEVANT INFORMATION

Additional information relevant to issues in the special study is presented in this section.

Auburn Flood Control Dam

Following the floods of February 1986, the United States Army Corps of Engineers (USACE), California Department of Water Resources (DWR), and local flood control agencies evaluated alternatives to reduce the flood threat to Sacramento. USACE and DWR concluded that the most effective and efficient way to provide significant increased levels of flood protection would be through new storage at or near the Auburn Dam site. On two occasions (in 1991 and again in 1996), USACE published reports with recommendations including a flood detention dam in the upper American River Canyon (see

Figure II-10). On both occasions, however, Congress authorized elements of the recommendations, but none that included the flood detention dam. Since 1996, the focus of alternatives for increased flood protection for Sacramento has been on modifications to Folsom Dam and downstream facilities.

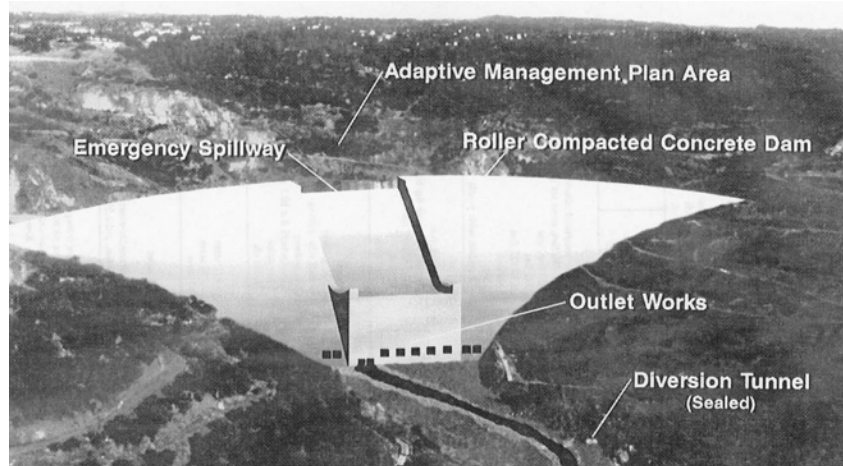


FIGURE II-10. ARTIST RENDITION OF FLOOD DETENTION DAM NEAR RIVER MILE 20.1 ON NORTH FORK AMERICAN RIVER, LOOKING EAST

Placer County Water Agency Pump Station

Prior to initiation of construction of Auburn Dam, PCWA built a 50 cfs pump station on the North Fork American River to convey water supply to the Auburn Ravine Tunnel for delivery to the PCWA service area. To facilitate construction of Auburn Dam, Reclamation removed the original pump station but has since installed a seasonal pump station and pipeline annually, as needed by PCWA, to meet water demands. Over time, however, it was found that this arrangement did not fully meet PCWA's growing water demands and it became necessary to construct a year-round permanent facility.

Reclamation is in the process of constructing a river diversion and intake structure, pump station, and associated facilities, including pipelines, access roads, power lines, and safety features in the American River Canyon within the Auburn Dam construction area. This project also will include restoring the American River segment near Auburn, which will allow for beneficial uses of water in what is now a dewatered river channel. Beneficial uses primarily include recreation and other instream uses. Additional modifications are anticipated, including closure of the Auburn Dam river bypass channel to ensure safe public access near the project area. A contract will eventually transfer ownership of the facilities and their operation and maintenance to PCWA.

SECTION III

AUBURN DAM AND RESERVOIR

PROJECT DESCRIPTION CONSIDERATIONS

This section summarizes major factors related to the Auburn Dam and Reservoir feature of the Auburn-Folsom South Unit to be considered in the Special Report. First, several significant no-action conditions are summarized that could influence the need for major elements of an Auburn Dam. Next, significant project features are described, including engineering and other technical consideration, major remaining relocation requirements, recreation considerations, environmental and related features, and real estate requirements. Major project features have been identified primarily from a review of the authorized project documentation and other relevant reports and project descriptions. These major features are believed to be the most significant in updating project costs and benefits. It should be mentioned that numerous generally minor project features are not specifically included in this TM but can be found in supporting documentation.

NO-ACTION CONDITION

Important to identifying major project elements is estimating potential no-action conditions in the primary Auburn Dam and Reservoir study area. This is primarily because a potential project would need to include features to account for changes in the local area that may not exist now but could significantly influence the design and/or extent of major features including, for example, flood control facilities and environmental mitigation and their costs. Accordingly, following is a list of likely future conditions, assuming no further Federal actions are taken to implement an Auburn Dam project.

Folsom Dam Safety (Seismic and Seepage)

As part of a Combined Federal Effort, an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is being prepared to provide information about a series of possible structural modifications to Folsom Dam, Mormon Island Auxiliary Dam (MIAD), and Dikes 1 through 8. Reclamation and USACE are currently investigating alternatives to improve public safety related to possible seepage, overtopping, and earthquake events. It is estimated that under the no-action condition, dam safety work at Folsom related to seepage and seismic restoration would be completed.

Folsom Dam Raise and Outlet Modifications

Section 128 of PL 108-137 (2004 Energy and Water Development Appropriations Act), dated 30 September 2004, directed the Secretary of the Army to carry out a project for flood damage reduction and environmental restoration, within the American River Watershed, California, substantially in accordance with the plans described in the Report of the Chief of Engineers, dated 5 November 2002. Recommendations in the Chief of Engineers report included raising Folsom Dam by 7 feet and increasing the flood control storage space by 95,000 acre-feet. Raising Folsom Dam by 7 feet, combined with a moderate change in advance flood releases,

would reduce the risk of flooding in Sacramento due to peak flows on the American River from about a 1-in-100 chance to approximately a 1-in-200 chance in any 1 year.

Currently, Folsom Dam can only pass approximately 70 percent of the Probable Maximum Flood (PMF). Accordingly, another element of the dam safety restoration at Folsom Dam mentioned above is to modify existing facilities to safely pass all of the PMF. In addition to increasing the level of flood protection along the American River, a project to raise Folsom Dam and dikes by 7 feet also would allow the reservoir to pass 100 percent of the PMF.

Combined Federal Project

Raising Folsom Dam as well as the above Folsom Dam safety work are part of an Integrated Federal Alternative (IFA). Also included in the IFA is construction of a new gated auxiliary spillway at Folsom Dam and ecosystem restoration features along the American River. These features are being combined by Reclamation and USACE to address the various Congressional authorizations and ongoing projects relating to Folsom Dam and Reservoir. The IFA is considered a most likely element of the no-action condition for the Special Report.

It is highly likely, however, that other potential no-action conditions related to Folsom Dam and Reservoir may be evaluated in the Special Report. One condition would likely include continuing with the existing conditions at Folsom Dam, which consist of a variable flood control space ranging from 400,000 acre-feet to 670,000 acre-feet depending on availability of upstream storage in existing reservoirs. Another condition would consist of returning the flood space in Folsom Reservoir to the authorized 400,000 acre-feet.

Auburn Dam Site

Reclamation is in the process of restoring the Auburn Dam site. This work includes developing a pump station and related facilities on the north bank of the North Fork American River at the Auburn Dam site to convey PCWA's Middle Fork Project water entitlement to the Auburn Ravine Tunnel to meet demands within its service area. To eliminate safety concerns associated with the Auburn Dam construction bypass tunnel, at best in the short term, the tunnel is to be closed, likely with a bulkhead structure on both the upstream and downstream ends. Current work also includes restoring the dewatered portion of the North Fork American River at the dam construction site and providing public river access in the project area. In the no-action condition, it is estimated that the pump station and its associated pipeline and other site restoration would be completed.

Reservoir Area Recreation

Many of the lands acquired to date by Reclamation for the Auburn Project are being managed by the California Department of Parks and Recreation (DPR) as the Auburn State Recreation Area (SRA). The SRA covers over 35,000 acres along 40 miles of the North and Middle forks of the American River. DPR is in the process of developing the Auburn SRA Resource Management Plan/General Development Plan EIS/EIR.

The existing General Plan for the Auburn SRA was completed in 1978 (DPR) (a combination document with the Folsom SRA General Plan). This plan assumed the Auburn Dam would be constructed and an Auburn Reservoir would be created. Because construction of the dam was

not completed, an Interim Resource Management Plan (RMP) was prepared in 1992 to address resources, conditions, and uses during this interim period. The interim RMP lacks sufficient detail or analysis of natural resources for management of the Auburn SRA as a river-based resource. It is estimated that a new plan would be developed and implemented under the no-action condition. However, for the Special Report, it also is estimated that the plan would not preclude the ability to resume construction of the authorized dam and reservoir.

ENGINEERING AND OTHER TECHNICAL CONSIDERATIONS

Following is a summary of major features and related technical considerations of an Auburn Dam project if it were to be considered today. To the extent practical, these features are the same or similar to features that were being considered for implementation when major construction activities ceased on Auburn Dam.

Site Restoration

As mentioned, under the no-action condition, efforts would be completed to construct the American River Pump Station and appurtenances, restore the river channel around the existing diversion tunnel, and implement other features to reclaim the canyon near the existing dam site. Project features would be to remove any constructed facilities, reopen the diversion tunnel, and construct other features needed to resume project construction that would have been modified under the no-action condition.

Main Dam

After authorization, studies were completed, a double-curvature concrete arch dam at RM 20.1 was selected, and construction was initiated on this design. Following cessation of major construction activities, various studies of alternative dam types and alignments were conducted. One study, initiated by Reclamation in 1977, focused on two options: a rockfill embankment with central impervious core slightly downstream from the RM 20.1 site, and a concrete curved-gravity dam (CG-3) at the RM 20.1 site. That study resulted in selection of the concrete-curved gravity dam for further consideration. In the mid-1980s, DWR, through a contract with Bechtel National, Inc., evaluated a number of dam types and locations (Bechtel, 1985). These studies concluded that a roller-compacted concrete (RCC) dam at RM 19.0 likely would be less costly than other dam types and locations. It should be mentioned, however, that less is known about foundation conditions at other sites, and unforeseen site conditions could significantly affect costs. For purposes of evaluations in the Special Report, the CG-3 dam design at RM 20.1 will be used, as documented in the *Feasibility Design Summary: Auburn Dam Concrete Curved-Gravity Dam Alternative* (Interior, 1980). This is primarily because a wealth of information is already available for the CG-3 design at RM 20.1, and a very high degree of certainty exists that a dam of this design and location can safely be constructed.

Table III-1 summarizes major features associated with Auburn Dam and Reservoir. The CG-3 concrete curved-gravity dam would have a structural height of 685 feet, and a crest length of 4,150 feet. The crest width would be 40 feet and have a maximum base thickness of 465 feet. The elevation of the crest would be 1,135.0 feet above msl, which would be topped by a parapet wall 4.5 feet high. A service road would be located on the crest of the dam.

TABLE III-1
AUBURN DAM AND RESERVOIR – SUMMARY OF FEATURES

Project Location: North and Middle Forks of American River, in Placer and El Dorado Counties, near Auburn, California			
Project Purposes: Irrigation Water Supply, Municipal & Industrial Water Supply, Flood Control, Power, Recreation, Fish & Wildlife, Navigation			
Drainage Areas		Unimpaired Flows of Auburn Dam	
Auburn Dam (RM 20.1) ^[1]	970 square miles	Mean annual runoff (WYs 1922-1994) ^[4]	1,363,000 acre-feet
North Fork American R. at Auburn Dam ^[1]	355 square miles	Maximum annual runoff (1982 WY) ^[4]	3,256,000 acre-feet
N. Shirttail Cyn. Cr. at Sugarpine Dam ^[2]	9 square miles	Minimum annual runoff (1977 WY) ^[4]	229,000 acre-feet
Middle Fork American R. at North Fork ^[1] (excluding Rubicon River)	300 square miles	Spillway design flood ^[5]	
MF American R. at Fr. Meadows Dam ^[2]	47 square miles	Peak inflow	500,000 cfs
Rubicon River at MF American River ^[1]	316 square miles	1-day volume	758,000 acre-feet
Rubicon River at Hell Hole Dam ^[2]	112 square miles	5-day volume	1,700,000 acre-feet
Pilot Creek at Stumpy Meadows Dam ^[2]	15 square miles	Standard Project Flood ^[2]	
Gerle Creek at Loon Lake Dam ^[2]	8 square miles	Peak Inflow	306,000 cfs
American River at Folsom Dam ^[3]	1,875 square miles	100-year flood	
American River at Fair Oaks ^[3]	1,921 square miles	Peak Inflow	202,000 cfs
American River at H Street Bridge ^[3]	1,969 square miles	5-day volume	783,000 acre-feet
Auburn Dam		Auburn Reservoir	
Dam type	Conc curved-gravity (CG-3)	Elevations	
Location (North Fork American River)	River Mile 20.1	Top of dead storage	616.5 feet msl
Elevation, top of parapet	1,139.5 feet msl	Top of inactive	816.5 feet msl
Elevation, crest of dam	1,135.0 feet msl	Top of active conservation	1,083.1 feet msl
Structural height	685 feet	Top of joint use (gross pool)	1,131.4 feet msl
Total length of crest	4,150 feet	Area	
Width of crest at elevation 1135.0	40 feet	Gross pool	10,050 acres
Maximum base thickness	465 feet	Storage capacity	
Downstream face slope	0.68:1	Top of dead storage	29,000 acre-feet
Total concrete in dam	9,760,000 yd ³	Top of inactive	360,000 acre-feet
Diversion tunnel diameter (horseshoe)	33 feet	Top of active conservation	1,876,000 acre-feet
		Top of joint use (gross pool)	2,326,000 acre-feet
Spillway (service and auxiliary)		Length of shoreline	140 mi
Crest elevation	980 feet msl	Powerplant	
Discharge capacity at maximum water level	330,000 cfs	Number and size of units	4 @ 200 MW
Total orifice area	3,648 ft ²	Type of turbines	Francis
Crest gates (top-seal radial)		Discharge at rated speed & head	5,760 cfs
Number and size	8 @ 19x24 feet	Type of generators	vertical shaft
Plunge pool basin elev (service / auxiliary)	410 / 430 feet msl	Number and diameter of penstocks	4 @ 17 feet
Outlets		Penstock intake elevations	625 and 800 feet msl
River outlets (72-in dia. w/ 72-in ring-follower gates & hollow jet valves)		Other Project Features	
Number and intake elevation	2 @ 625 feet msl	Major relocations ^[7]	Highway 49, upstr. access roads
Discharge elevation	485.5 feet msl		
Capacity at top of inactive	4,000 cfs	Takeline lands ^[7]	43,473 acres
Capacity at gross pool / restr. capacity ^[6]	5,540 cfs / 4,200 cfs		

Key:
cfs – cubic feet per second
Cr – Creek
Cyn – Canyon
dia – diameter
Fr – French
in – inches
MF Middle Fork
msl – above mean sea level
MW – megawatt
N - North
R – River
WY – water year
yd³ – cubic yard

Notes:

All information presented in Table 1 taken from *Feasibility Design Summary, Auburn Dam Concrete Curved-Gravity Dam (CG-3)* (US Dept. of the Interior, Water and Power Resources Service, August 1980) unless otherwise noted.

[1] California Watershed Map, CALWATER Version 2.2, September 1999, <http://gis.ca.gov/>

[2] *Design and Analysis of Auburn Dam Volume One*, Reclamation, August 1977

[3] *Reservoir Regulation Manual for Flood Control, Folsom Dam and Reservoir, Appendix II*, U.S. Army District, Corps of Engineers, March 1959

[4] Auburn annual inflow data from CALSIM II (CVP OCAP Study 5, June 2004)

[5] *Auburn Dam site Inflow Spillway Design Flood Study*, Reclamation, January 1967

[6] Restricted to a discharge of 4,200 cfs because of possible damages to the conduits caused by high-velocity flow

[7] *Final Report on the Evaluation of the Auburn Dam Project*, Bechtel National, Inc., November 1985

Plates 4 and 5 include plan, elevation, and section drawings of the CG-3 design. As shown, the dam design has a vertical upstream face and a slope of 0.68:1 on the downstream face. CG-3 is designed to accommodate and withstand earthquake ground acceleration and fault displacement (both 5 and 9 inches). The zoned design includes concretes of various strengths.

Auburn Reservoir would have a total capacity of 2.326 MAF. The normal maximum water surface elevation would be 1,131.4 feet above msl, at which elevation the reservoir would cover 10,050 acres. Inactive storage in the reservoir would total 360,000 acre-feet (up to 816.5 feet above msl), active conservation storage space would be 1,516,000 acre-feet (up to 1083.1 feet above msl), and joint use space (for flood control) would be 450,000 acre-feet (up to gross pool).

Foundation and Appurtenances

Excavation to lightly weathered rock would be required for the center portion of the dam. Treatment of the faults, shears, and weaker zones would be performed as necessary. Grout and drainage curtains would be drilled from the upstream drainage gallery to reduce hydrostatic uplift pressures and underseepage. Drill holes for the grout curtain would be completed in a single line at a spacing of 12 feet. Drill holes would range from 100 feet deep at the abutments to 280 feet deep at the maximum dam section. Holes for the drainage curtain would be drilled just downstream of the grout curtain at 12-foot centers and depths ranging from 75 to 210 feet. A downstream drainage curtain would be drilled from a second foundation gallery in the deeper portion of the dam below elevation 555 feet above msl and would have holes at 12-foot centers, 140 feet deep. The grouting program also would include consolidation grouting with holes 30 feet deep over the entire foundation on a 20-foot grid pattern. Additional excavation would be required at the powerplant site.

Spillway and Appurtenances

Features of the spillway and plunge pool are described in this section.

Spillway

The spillway would be located on two blocks near the center of the dam, and would consist of eight orifices. Each orifice would be approximately 456 square feet in area and extend from about elevation 980 to about elevation 1,004 above feet msl. Flow through the orifices would be controlled by a 19-foot by 24-foot top-seal radial gates, which would discharge into two chutes and terminate with a ski-jump flip bucket on each chute. The four central gates would be the service spillway and used for normal flood operations. The outer two gates on each side of the service spillway would constitute the auxiliary spillway and would be opened only during extreme flood events. Each of the service spillway gates would have a capacity of 41,250 cfs at a maximum water surface elevation of 1,135.0 feet. Each auxiliary spillway would have a capacity of 82,500 cfs. At the maximum water surface elevation, the auxiliary spillways and the service spillway would have a maximum discharge capacity of 330,000 cfs.

It is important to note that a new PMF would need to be developed for Auburn Dam and Reservoir. It is highly likely that the new PMF would be greater than the current PMF. Accordingly, the Auburn spillway design likely would change as a result of future studies. However, for the Special Report, the existing spillway design is to be used for cost-estimating purposes.

Early designs for Auburn Dam spillway operations were based on criteria that limited discharges up to 115,000 cfs from Folsom Dam during passage of the Standard Project Flood through Auburn, and protected Auburn Dam during passage of the Inflow Design Flood. These operations were based on a combined flood storage of 650,000 acre-feet for Auburn and Folsom reservoirs, of which 125,000 acre-feet were interchangeable between the two reservoirs. No-action condition operations for the IFA at Folsom Dam could include provisions to increase discharges to the lower American River above the 115,000 cfs considered in earlier studies. In addition, since the earlier studies, a new PMF has been developed at Folsom. Accordingly, future studies would likely include a reconsideration of the maximum storage capacity at Auburn in conjunction with Folsom to achieve higher levels of flood protection and reconsideration of the overall design of the spillways at Auburn Dam.

Plunge Pool

The plunge pool would be a two-level basin to accommodate the discharge from the service spillway and auxiliary spillways. The flow from the service spillway would be dissipated in the farthest downstream basin. This basin would be placed at elevation 410 feet above msl and concrete-lined to withstand impact loading at low discharges. The auxiliary spillway discharges would follow a trajectory underneath the service spillway jets and dissipate in the upstream basin. Accordingly, this basin would be placed at elevation 430.0 feet above msl and be unlined.

Outlet Works and Diversions

The outlet works would be located in a block near the center portion of the dam and consist of two bell-mouth circular intakes transitioning to two 72-inch-diameter steel pipes, followed by two 72-inch ring-follower gates. The outlet pipes would drop from a centerline elevation of 625 feet above msl to elevation 485.5 feet to enter the powerplant outlet bay. The outlets would discharge horizontally at a centerline elevation of 485.5 feet above msl through two 72-inch hollow-jet valves.

The outlet works were designed for a discharge of 4,000 cfs at a water surface elevation of 816.5 feet above msl to provide releases for downstream requirements. The river outlets would have a capacity of 5,540 cfs at gross pool (reservoir water surface elevation of 1,131.4 feet above msl) but would be restricted to a discharge of 4,200 cfs because of possible damages to the conduits caused by high-velocity flow.

Diversions from Auburn Dam and Reservoir would primarily include the PCWA Auburn Ravine (Ophir) Tunnel. The $\frac{3}{4}$ mile long Ophir Tunnel extends from near the north abutment of the dam to an outlet in Auburn Ravine. Its entrance would be inundated by about 200 feet at gross pool elevation in a 2.3 MAF Auburn Reservoir. The intent was for PCWA to use the tunnel to divert some of its North Fork and Middle Fork American River water rights to western Placer County. The project would include a gated structure at the entrance to the tunnel. This would be needed for PCWA to effectively manage the diversion of its water from Auburn Reservoir and for Reclamation to be able to store water above the inlet elevation to the Ophir Tunnel.

Although not initially included in the project, during construction, provisions were made for the potential future addition of a pipeline to extend from the dam to near Cool by GDPUD. To allow for a cost-effective future attachment of the pipeline, a small portion was constructed near

(downstream) the south abutment of the dam. Lift stations and any other pipeline and related facilities would be the responsibility of GDPUD.

Two other features have been suggested for possible consideration in future project designs. These features include sacrificial bulkheads on the outlet works and potential additional temperature control device (TCD) facilities. However, for the Special Report, these facilities should not be directly included in the design. The sacrificial bulkhead gates would not fit in the CG-3 design without other major structural changes such as widening the dam base, which would translate into a significant cost increase. Potential future detailed designs may reveal a more efficient way to consider the sacrificial gates without overall major cost increases. Future studies also are needed to assess if a TCD type structure would be a significant benefit in addition to Folsom Dam in helping improve water temperature conditions along the American River or a more significant benefit over the current multilevel outlet design.

Borrow Areas for Construction Materials (assuming CG-3)

A primary source for aggregate production is the area on the Middle Fork American River that would be inundated by the reservoir. Approximately 8 to 9 million cubic yards of tested concrete aggregate materials exist from Mammoth Bar upstream to Cherokee Bar. Additional materials could be available from development of a rock quarry near the possible site of the aggregate processing plant, or from river gravels located in the Middle Fork American River above the potential Ruck-A-Chucky Bridge site, extending to PCWA's Ralston Afterbay Dam (Reclamation, 1977). Other potential borrow sites include Lake Clementine and the Knickerbocker Creek area (which could impact potential recreation). Material for the original cofferdam came from the Salt Creek Boat ramp and foundation excavation.

Powerplant and Related Features

The 1965 authorization (PL-89-161) for the Auburn-Folsom South Unit included a hydroelectric powerplant at Auburn Dam with initial installed capacity of approximately 240 megawatts (MW) and transmission for interconnection with the CVP power system. Provision also was made for a potential ultimate development of up to approximately 400 MW. Other power configurations have been evaluated since the authorization. According to the August 1980 *Feasibility Design Summary* (Interior), the optimum size of the CG-3 powerplant was an installed capacity of 800 MW. An arrangement of four 200 MW generating units was selected due to the electrical design flexibility of having an even number of units. Each of the generating units has a minimum head of 356.5 feet, a maximum head of 626.0 feet, a rated head of 500.0 feet, and a design head of 548.5 feet. Each vertical shaft generator has a rotor diameter of about 31 feet and is directly connected to a Francis-type turbine with a spiral case width of about 44 feet. Water, from each turbine, flows through a concrete draft tube with an exit opening of 20 feet wide by 35 feet high. At rated speed and head, the discharge through each turbine is 5,760 cfs. An additional 4 MW generating unit located in the river outlet bay would be used to generate power needed in the dam itself.

The penstocks and their intakes would be located in the center portion of the dam. Each of the four 17-foot-diameter penstocks would have two intakes, one with a centerline at elevation 800 feet above msl and one with a centerline at elevation 625 feet above msl. This provides multilevel intake capability for each powerplant unit.

The tailrace would consist of the excavated river channel currently flowing through the floor of the canyon. Tailrace channel slopes would be protected with riprap to prevent erosion and slides.

Water Control

Control of river runoff water during construction at the Auburn Dam site would be maintained with an upstream and downstream cofferdam, and the existing river diversion tunnel.

Upstream Cofferdam

As mentioned, an enlarged cofferdam was constructed following suspension of construction of the dam. This cofferdam had a crest elevation of 715 feet above msl. This increased the total storage upstream from the cofferdam to 120,000 acre-feet. The crest at the right abutment was constructed several feet lower than the rest of the structure with an erodable dike and a downstream guide channel. At that time, it was thought that the cofferdam was sufficient to contain and safely pass through the river diversion tunnel, a flood peak with a recurrence interval up to about the 25-year flood event. During the February 1986 flood, which was significantly greater than the cofferdam design flood, the right abutment of the dam was overtopped and washed downstream. The cofferdam functioned as it was designed. To date, the structure has not been reconstructed. Low flows in the river are encouraged to flow through the diversion tunnel due to a berm constructed at the right abutment. As occurred in December 2005, this berm is occasionally overtopped and water flows through the Auburn Dam construction area (see **Figure III-1**).



Note the remnants of the original cofferdam at the right center of the photograph

**FIGURE III-1. AUBURN DAM SITE LOOKING UPSTREAM –
31 DECEMBER 2005**

If Auburn Dam proceeded as described in this TM, the cofferdam would need to be replaced. The proposed site would be at the existing remnant cofferdam site. For this TM, it is estimated that the crest height of the reconstructed cofferdam would be at about elevation 715 feet above msl, equivalent to the raised cofferdam and capable of storing up to about 120,000 acre-feet. Materials for the cofferdam would come from remnants of the original cofferdam, from the main dam foundation excavation, and from the left abutment side excavation.

Downstream Cofferdam

If Auburn Dam proceeded as described in this TM, a small cofferdam would be constructed at a site contemplated for this structure during the initial construction of Auburn Dam. It would be about 1,000 feet downstream from the axis of the main dam and upstream from the outlet of the existing river diversion tunnel.

Diversion Tunnel

Under the no-action condition, the existing river diversion tunnel would be closed at both the upstream and downstream ends for environmental, esthetic, and safety reasons. The closure devices would allow for future use of the tunnel. Accordingly, if Auburn Dam proceeded as described in this TM, the tunnel would be reopened. Debris around the upstream entrance and downstream exit of the tunnel would need to be removed. Possible modification of the tunnel may be needed; however, this modification will not be considered in the Special Report. Following completion of construction of the main dam, the tunnel is to be permanently sealed.

Other Permanent Operating Facilities

Other permanent operating facilities for the project would include a service road on the dam crest, a storage and equipment yard, and a visitor center at the existing overlook area.

Service Facilities

Reclamation has constructed several building to service its field staff during construction of the Auburn Area facilities. These buildings include an administration building, a geology building, materials laboratory, field engineering building, automotive shop and service station, and warehouse building. Several of these buildings are currently occupied by tenants and would need to be vacated to provide space for supporting project construction.

Visitor Center

Reclamation constructed a temporary overlook on Pacific Avenue upstream from the dam site to serve visitors to the project. It contains a parking area, pictorial display, and related minimum facilities. It is anticipated that the completed project would include a permanent visitor center and parking areas to be located at the site of the temporary visitor center.

Construction Facilities and Considerations

Construction facilities, including staging areas, a batch plant, temporary power, and an office and lab (if separate from existing), would be required for the project. The duration of material transporting and site hauling would be influenced by hours permitted in the project area. This would be different than anticipated for initial construction primarily because of the significant increase in urban development in and near the City of Auburn.

For the project, various other facilities would require removal, relocation, or modification. An additional project feature would be removal of the PCWA pump station. North Fork Dam (Lake Clementine) would not be removed. Existing project access roads would be maintained, and may need to be improved. Security considerations for the dam may include features such as cameras, fencing, bollards, and a water barrier (costs for these could be included in unlisted items). Guards also may be needed, but such an annual cost will not be included in the Special Report (which will contain construction costs only).

Much of the reservoir area would need to be cleared of existing vegetation prior to filling. For the Special Report, the reservoir-clearing plan adopted for the authorized project is to be considered. However, future studies likely would show that a more aggressive, selective clearing program could be considered as certain types of riparian vegetation may be allowed to remain in the upstream arms of inflowing creeks and streams.

MAJOR REMAINING RELOCATIONS

Remaining relocations would include roads, utilities, rails, and an equestrian bridge.

Road Relocations

Construction of Auburn Dam and Reservoir would require relocation of several county roads and a portion of State Highway 49. Replacement of these roads is generally contained under provisions of Section 207 of the Flood Control Act of 1960, as amended by Section 208 of the River and Harbors Act of 1962 (PL 87-874) and Section 36 of WRDA. The Auburn-Foresthill Road and Bridge replacement was completed in 1973 and is now in operation. The two remaining major road relocations are State Highway 49 and the Placer/El Dorado county upstream route. A general layout of these relocations is shown in **Plates 6 and 7** and highlighted below. Each relocation would need to be made to current State of California standards. Each of these and other minor road relocations would require significant additional evaluation.

Highway 49 Relocation

The original replacement of State Highway 49 was to begin at the intersection of Lincoln and College Way in Auburn and run in a southerly direction generally parallel to and slightly west of Sacramento Street to the intersection of the Auburn-Folsom and Shirland Tract roads. This portion of the highway relocation has been completed and is in use. From this intersection, Highway 49 replacement was to swing in a large arc toward the north (right) abutment of Auburn Dam. Maidu Drive, a part of the right abutment access road system, has been constructed in part on the eventual location for Highway 49 in this area. Highway 49 was to cross the North Fork American River canyon on the viaduct founded on the crest of Auburn Dam. From the south (left) abutment of the dam, the route was to continue in an easterly direction through the Salt Creek-Knickerbocker Recreation Area to an intersection with existing Highway 49 near Cool. The total length of the relocation would have been 6.5 miles, of which 1.9 miles has been completed.

Primarily on the basis of National security concerns, the current project plan would not include Highway 49 crossing the American River Canyon on top of Auburn Dam. In the mid-1980s, alternative relocations were considered by the State of California. A potential road relocation route, generally along the original relocation alignment with a river crossing bridge just downstream from Auburn Dam, is displayed in **Plates 2 and 6**. The plan also would include an access road from the relocated Highway 49 alignment to the south and north abutments and across the dam. Much of the potential relocation route of Highway 49, especially on the Auburn side of the American River Canyon, is now in residential development. Other potential routes would need to be evaluated in any future studies.

Placer and El Dorado County Road Relocation

The Special Report also is adopting the plan recommended in earlier studies to replace access in the eastern portion of Auburn Reservoir. This relocation includes a two-lane, all-weather, paved road extending from Old U.S. 40 between Colfax and Weimar to the El Dorado County road near Spanish Dry Diggings (see **Plate 7**). Two major bridges would be required, an 1,840-foot-long bridge crossing the North Fork (Colfax-Foresthill Bridge) and a 1,900-foot-long bridge crossing the Middle Fork (Greenwood Bridge). This relocation is referred to as “P-4” in **Plate 7**.

Access Roads

To date, nearly 12 miles of construction access roads have been completed. They include Pacific Avenue, Indian Hill Road, Auburn-Folsom road intersection, left and right abutment access roads, a connecting road, powerplant access road, and railhead access road. Where appropriate, these access roads, especially within the construction area, would need to be replaced. In addition, to facilitate construction, various additional site access roads would be required to facilitate construction.

Other Roadways and Utilities

Various other minor roads, bridges, and utilities in the Auburn Reservoir area could be candidates for relocation. Examples include United States Forest Service facilities, the Ponderosa Way access road and bridge, powerlines, and radio towers. It is not clear at this time, however, if these and several other minor roads/bridges were included in the original project or should be considered for relocation. Therefore, they are not identified in this TM. Future efforts would be needed to develop a detailed inventory of these facilities.

Trails and Equestrian Bridge

Numerous recreation trails used for hiking, running, biking, and equestrian purposes are located in the Auburn Reservoir area. New recreation facilities (described below) as part of the project would more than offset existing recreation uses in the American River Canyon. They would also offer an expanded array of recreation experience to a much broader population than under a no-action condition. Several specialty uses, however, may require separate relocation considerations. These include the Tevis Cup horse race and the Western States Run; both are 1-day, 100-mile events that use the Western States Trail from Auburn to Squaw Valley. These events draw entrants from around the world.

All cost estimates in the August 1980 *Feasibility Design Summary* (Interior) included a trail and equestrian bridge. Further, efforts are needed to identify the locations for these facilities. However, until the scope of this trail and bridge can be confirmed, it is believed that the previous cost adjusted to current price levels should be included in the special report.

RECREATION CONSIDERATIONS

Reclamation entered into an agreement with DPR in 1966 that governed the construction and operation of recreation and fish and wildlife enhancement facilities at the Auburn-Folsom South Unit. Under that agreement, DPR agreed to pay one-half of the separable costs for the recreation and fish and wildlife facilities that were to be constructed by Reclamation. The State also agreed to operate and maintain the completed facilities. In 1978, under this agreement, DPR developed a preliminary general plan for recreation facilities at Auburn and Folsom reservoirs and Lake Natoma.

Plate 8 shows major features in the 1978 plan. **Table III-2** summarizes recreation facilities to be provided at Auburn Reservoir. These facilities are sufficient to accommodate a maximum of 9,140 visitors at any one time, and about 1.6 million visitors annually.

TABLE III-2
SUMMARY – RECREATION FACILITIES AT AUBURN RESERVOIR ¹

Facility	Number	Capacity
Auto Campgrounds	2	280 Sites
Picnic Areas	10	245 Sites
Multi-use Areas	3	360 People
Bicycle Trails	-	12 Miles
Trail Staging Areas – Horseback Riding & Hiking	10	230 Cars
Riding & Hiking Trails	-	120 Miles
Trail Camps	5	50 People
Boat Launching Ramps	3	14 Lanes
Car Top Boat Launch Sites	5	95 Cars
Marina/Boat Rental	1	200 Cars
Boat Camps – On Shore (20 Sites Each)	3	60 Boats
Boat Camps – Off Shore (20 Boats Each)	3	60 Boats
Swimming Area – Floats	1	140 Cars
Motorcycle Trail Staging Areas (Plus Trails)	1	50 Cars
Four-Wheel Drive Route – Lake Access	1	4 Miles
Vista & Historic Sites	9	185 Cars
Interpretive, Orientation, & Administrative Areas	7	310 Cars

Note:

1. "Auburn Reservoir Project, Folsom Lake Site Recreation Area, Preliminary General Plan," DPR, October 1978.

As mentioned, many of the lands acquired to date by Reclamation for the Auburn Project are being managed by DPR, which is in the process of developing the Auburn SRA Resource Management Plan/General Development Plan EIS/EIR. Through this plan and other evaluations, should Auburn Dam and Reservoir be selected for implementation, it is likely that the recreation facilities listed above would change. However, for the purposes of the Special Report, it is estimated that the recreation facilities above, as described in the 1978 Preliminary General Plan, and shown in **Plate 8**, would still be included in the project.

ENVIRONMENTAL AND RELATED FEATURES

Environmental mitigation and cultural resources are described in this section.

Environmental Mitigation

Significant efforts went into the National Environmental Policy Act (NEPA) compliance process and documentation as part of the original project and it is recognized that much more work will be required should the Special Report proceed to the feasibility study phase. As described in Reclamation's 1987 *Auburn Dam Report (Auburn Dam Alternative Study)*, wildlife mitigation measures would be necessary to compensate for adverse effects on wildlife resources of the impoundment area. Through September 1986, about \$400,000 of Federal funds were spent to acquire lands in the Auburn Reservoir area to mitigate for impacts to wildlife resources. These lands are located on the Middle Fork American River near Volcanoville. It was stated that the

U.S. Fish and Wildlife Service would use funds appropriated to protect the habitat in these wildlife areas and restore plantings used by the wildlife for food and shelter. It is believed, based on the review of detailed resources evaluations by USACE in its studies regarding a flood detention dam at the Auburn Dam site, that the magnitude of mitigation requirements due to direct inundation impacts alone would be significantly larger than anticipated in the authorized project. A multiple-propose reservoir at the Auburn site would result in the total loss of over 10,000 acres of wildlife habitat. Impacts would occur to endangered species, primarily the valley elderberry beetle, resident fish species, and cultural resources. Further, surrounding recreation facilities and activities also could adversely impact the resources.

Cultural Resources

The Auburn Reservoir inundation area and lands required for roads and relocations and recreation facilities contain numerous sites of cultural significance. Many of these sites would be adversely impacted by construction and operation of the project. Surveys of historic and archaeological sites in the project area have been accomplished as part of previous studies and an archaeology recovery plan has been developed. It is believed that based on this information, estimates of costs to implement a recovery and mitigation project element of the impacted sites has been developed in previous studies. These costs are to be updated for the Special Report and no new surveys are planned as part of current efforts.

REAL ESTATE REQUIREMENTS

Lands to be acquired and water rights are discussed in this section.

Lands

It was originally estimated that total land requirements to implement the Auburn Dam Project would be 49,265 acres (see **Table III-3**). Of lands needed in the Auburn reservoir area, 12,820 acres would be acquired from private landowners and the remaining 36,431 acres would be withdrawn from public sources, respectively. **Plate 9** shows the anticipated takeline for Auburn Reservoir and areas remaining to be acquired. For the Special Report, this takeline would not change. However, future studies may identify that some of these remaining lands may not be required for the project because currently formulated studies now show that other, additional lands not now identified would be needed. This is especially the case if additional lands are required for environmental mitigation purposes.

The numbers in **Table III-3** are based on parcel information from El Dorado County updated, August 2005; Placer County data updated September 2005, and the Reclamation project takeline - Auburn Recreation Area, as revised in 1993 for development of the Auburn Project Interim Management Plan. Parcels were not subdivided along the takeline. Therefore, if the takeline crossed any portion of a parcel line, it was assumed that the parcel would need to be acquired in total. Additionally, parcels with no ownership information in Placer County, or considered as “no value” by El Dorado County, were considered Federal lands.

Water Rights

Completion of Auburn Dam would require continued coordination with the California State Water Resources Control Board (SWRCB) regarding the storage of water in Auburn Reservoir for beneficial uses, including irrigation, power, flood control, and environmental purposes. In 1959, water right applications were filed by the United States for storage and diversion of water supplies for the Auburn Unit. The current status of those applications requires additional investigation. However, it is estimated that Reclamation would need to prepare additional hydrologic evaluations requiring instream flow conditions and other issues to demonstrate that unappropriated water is available for appropriation.

TABLE III-3
AUBURN RESERVOIR AREA LAND REQUIREMENTS
(acres)

Location	Private Lands	Federal Lands	State & County Lands	Total
El Dorado County	4,142	12,432	181	16,755
Placer County	8,692	23,815	3	32,510
Total	12,820	36,247	184	49,265

Notes:

1. Acreage is rounded off to the nearest whole acre.

SECTION IV

SUMMARY OF FINDINGS

Following is a summary of several findings believed important in current and future efforts on the Special Report:

- Studies accomplished in the mid-1980s by DWR to evaluate alternative dam sites and types at Auburn, and in the early 1990s by USACE focusing on a flood detention dam at Auburn, identified the possibility of less costly dam designs.
- For various reasons, relocation of State Highway 49 on an alignment generally similar to that considered in original Auburn Dam project may not be feasible.
- Dam features primarily related to spillway configurations are sensitive to the estimated amount of flood space in Auburn Reservoir. It may be found in future studies that the required amount of flood space is significantly greater than previously considered, resulting in a different design.
- Numerous minor Auburn Dam and Reservoir features are not specifically identified in this TM. Previous reports by Reclamation, its consultants, and others have included detailed designs with lists of these features.
- Significant uncertainty exists regarding the potential nature and magnitude of features to mitigate environmental, cultural, recreational, and related resources.

SECTION V

REFERENCES

- Bechtel National, Inc. (Bechtel) 1985. Final Report on the Evaluation of the Auburn Dam Project. Prepared for California Department of Water Resources. November.
- Boyle Engineering Corporation. 1988. American River Authority. Development of a Multipurpose Auburn Dam. December.
- California Department of Parks and Recreation (DPR). 1978. Auburn Reservoir Project. Folsom Lake Site Recreation Area. Preliminary General Plan. October.
- Carlson, J. Wendell. 1990. Auburn Dam Interim Construction Geology Report. For U.S. Bureau of Reclamation, Auburn-Folsom South Unit Central Valley Project. November.
- Montgomery Watson with Jones and Stokes Associates. 1996. Final Report Preliminary Concept Plan Restoration and Management of the Auburn Dam Site. For the U.S. Bureau of Reclamation Mid-Pacific Region. April.
- Reclamation. 1960. Auburn Unit, Central Valley Project, A Report on the Feasibility of Water Supply Development. United States Department of the Interior, Bureau of Reclamation. January.
- Reclamation. 1967. Auburn Damsite Inflow Spillway Design Flood Study. January.
- Reclamation. 1975. Folsom South – Lower American River Alternatives, Central Valley Project, California. Special Report. November.
- Reclamation. 1977. Design and Analysis of Auburn Dam, Volume One Design Data. August.
- Reclamation. 1980a. Auburn Dam Seismicity and Dam Safety, Supplement No. 2 to the Final Environmental Statement, as Supplemented and Amended. Auburn-Folsom South Unit Central Valley Project. El Dorado and Placer Counties, California. May.
- Reclamation. 1980b. Auburn Dam Auburn-Folsom South Unit Central Valley Project, California. A Special Report on Seismic, Safety, and Other Issues Relating to Auburn Dam. Prepared for the Secretary of the Interior by R. Keith Higginson, Commissioner, Water and Power Resources Service. September.
- Reclamation. 1984. Options for Auburn-Folsom South Unit. Prepared for the Joint State-Federal Auburn Dam Task Force. June.
- Reclamation. 1987. Auburn Dam Report, Auburn Dam Alternative Study. July.

- Reclamation. 1999. Executive Summary. North Fork Cofferdam Project. Auburn Cofferdam Reconstruction Appraisal Study. June.
- Reclamation. 2004. Long-Term Central Valley Project Operations Criteria and Plan CVP-OCAP. June.
- Secretary of the Interior. 1963. Auburn-Folsom Unit Supplemental Report. October 22.
- United States Army Corps of Engineers, Sacramento District; the Reclamation Board, State of California; and the Sacramento Area Flood Control Agency. 1996a. Supplemental Information Report. American River Watershed Project, California. March.
- United States Army Corps of Engineers, Sacramento District; the Reclamation Board, State of California; and the Sacramento Area Flood Control Agency. 1996b. Supplemental Information Report. American River Watershed Project, California. Volume 2 – Appendix E (Part 1). March.
- United States Army Corps of Engineers, Sacramento District, South Pacific Division, and the Reclamation Board, State of California. 1991. Feasibility Report Appendixes. American River Watershed Investigation, California. Volume 2 – Appendixes F-L. December.
- United States Army Engineer District, Corps of Engineers, Sacramento, California. Revised 1959. Master Manual of Reservoir Regulation. Sacramento River Basin, California. Appendix II Reservoir Regulation Manual for Flood Control. Folsom Dam Reservoir, American River, California. March.
- United States Department of the Interior, Bureau of Reclamation, and Sacramento Metropolitan Water Authority. 1996. American River Water Resources Investigation. Planning Report and Draft Environmental Impact Report/Environmental Impact Statement. January.
- United States Department of the Interior, Water and Power Resources Service (Interior). 1980. Feasibility Design Summary, Auburn Dam Concrete Curved-Gravity Dam Alternative (CG-3), Auburn-Folsom South Unit, Central Valley Project California. August.
- United States Government Printing Office, Washington. 1962. 87th Congress, 2d Session. House Document No. 305. Auburn-Folsom South Unit, Central Valley Project, California. Letter from the Secretary of the Interior Transmitting a report on the Auburn-Folsom South Unit Proposing Expansion of the Central Valley Project in California, pursuant to Section 9 (a) of the Reclamation Project Act of 1939 (53 Stat. 1187), and Section 2 of the American River Basin Development Act of October 14, 1949 (63 Stat.852). January.
- United States Government Printing Office, Washington. 1964. 88th Congress, 1st Session. House Document No. 171. Auburn-Folsom South Unit. Letter from Secretary of the Interior Transmitting Supplemental Report on the Auburn-Folsom South Unit, Central Valley Project, California, Pursuant to Section 9 (a) of the Reclamation Project Act of 1939 (53 Stat. 1187). October 22, 1963. – Referred to the Committee on Interior and Insular Affairs and ordered to be printed with illustrations.

Plates

Plate 1 Auburn-Folsom South Unit Development Plan

Plate 2 Auburn Dam and Reservoir Area

Plate 3 Auburn Dam Drainage Area

Plate 4 Auburn Dam (CG-3) Plan and Elevations

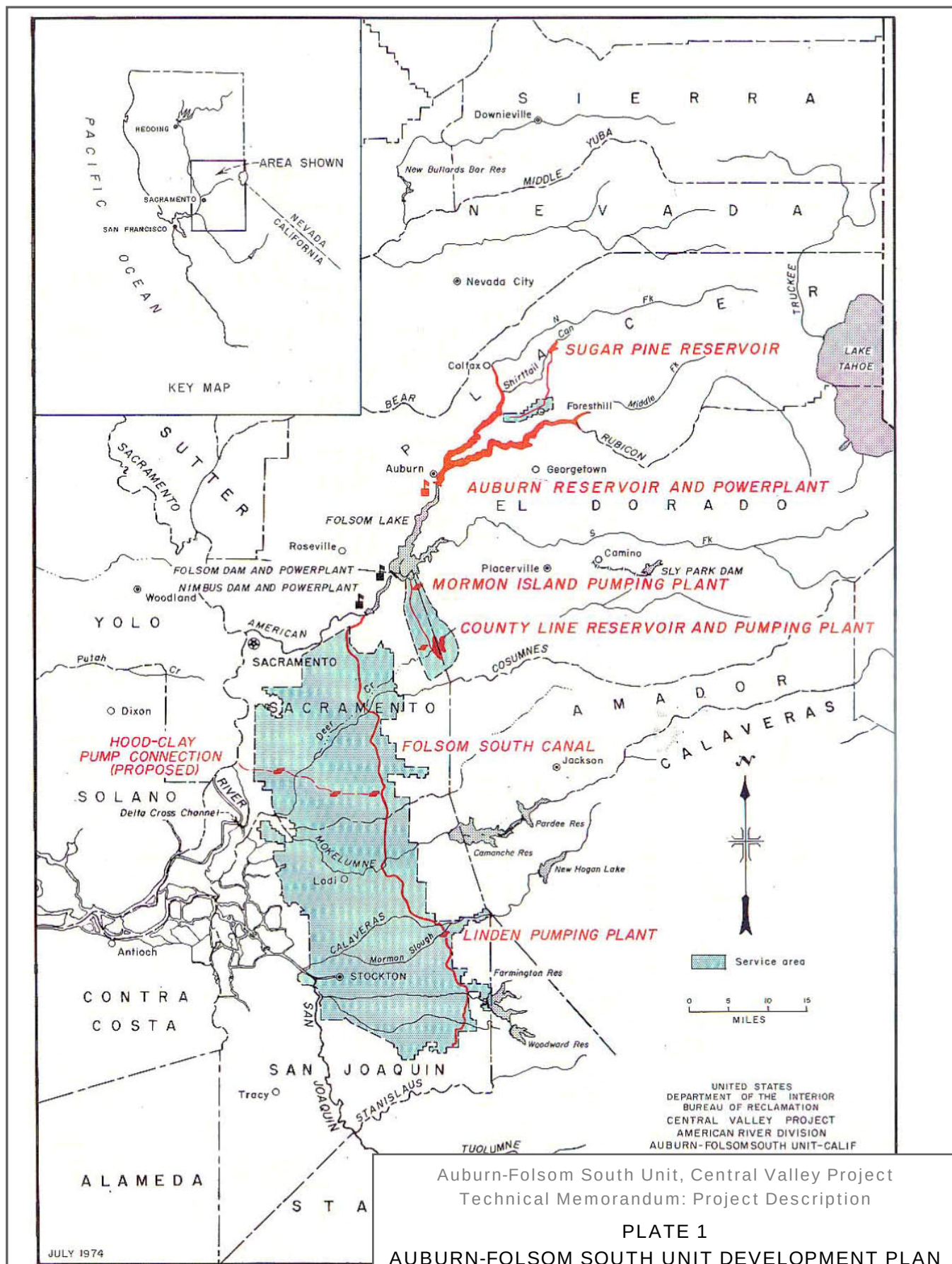
Plate 5 Auburn Dam (CG-3) Partial Plan and Sections

Plate 6 Auburn Area Facilities

Plate 7 Road Relocations and Project Boundary

Plate 8 Auburn Reservoir General Plan

Plate 9 Auburn Reservoir Takeline Land Ownership



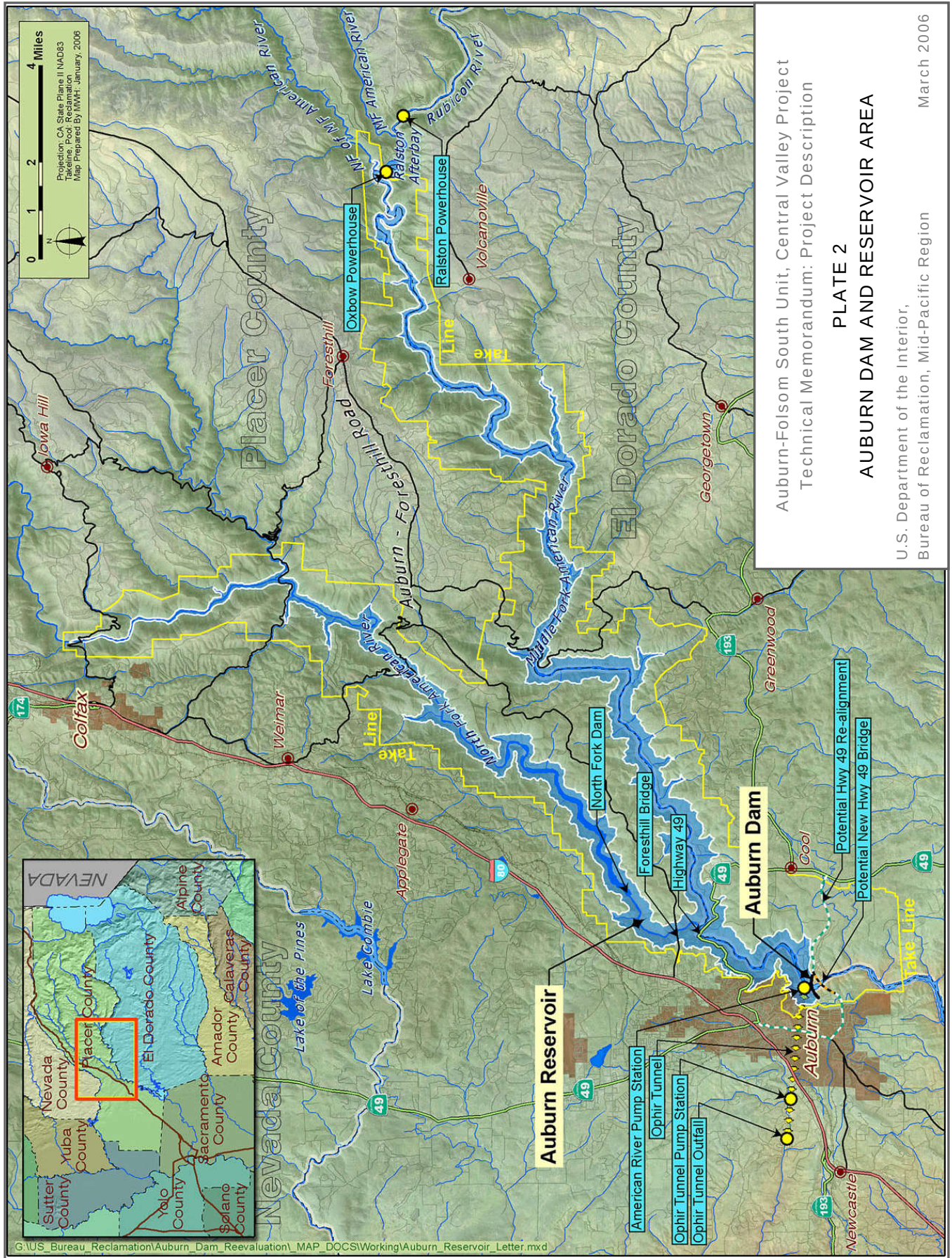
Auburn-Folsom South Unit, Central Valley Project
Technical Memorandum: Project Description

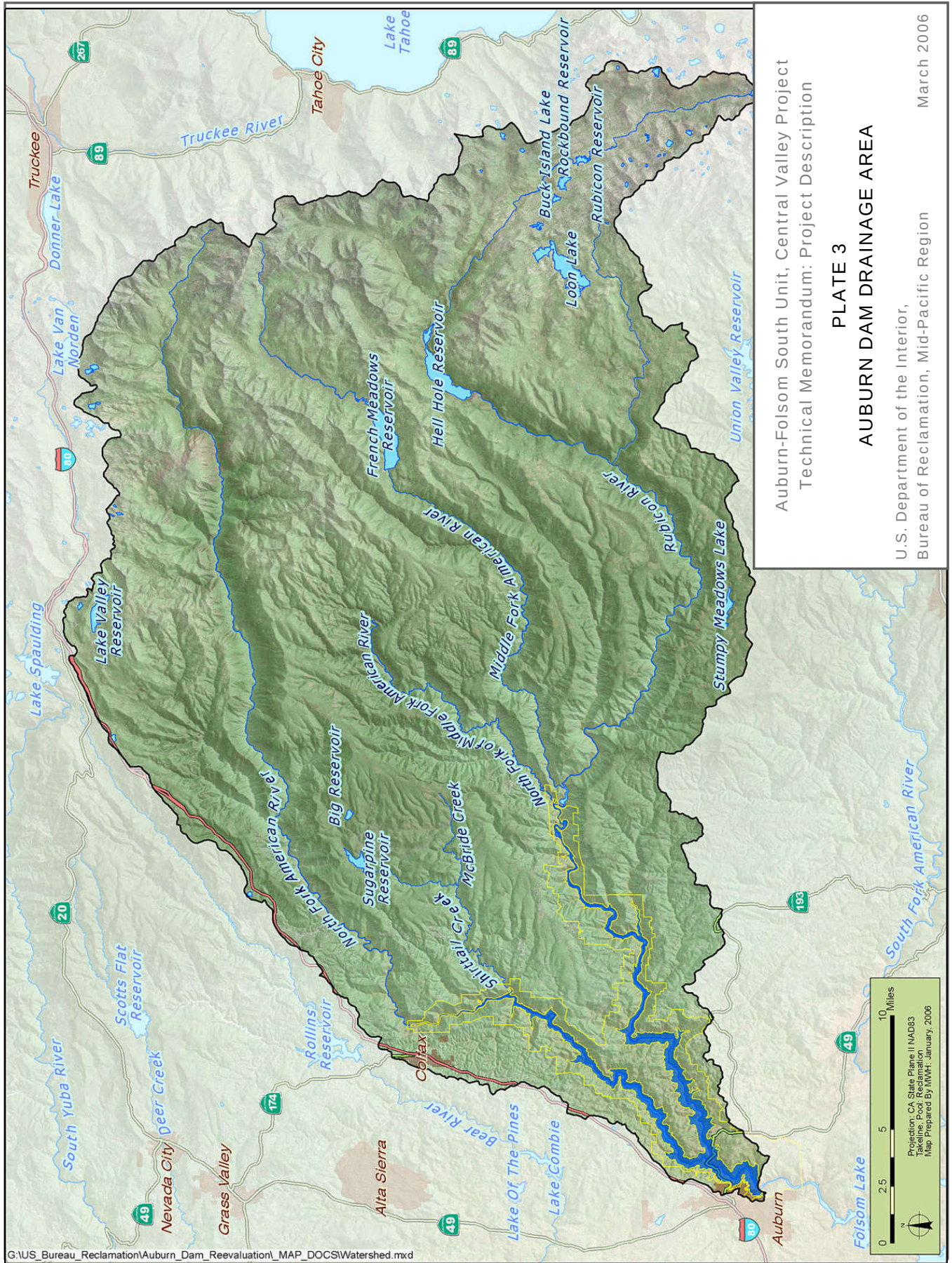
PLATE 1

AUBURN-FOLSOM SOUTH UNIT DEVELOPMENT PLAN

U.S. Department of the Interior,
Bureau of Reclamation, Mid-Pacific Region

March 2006





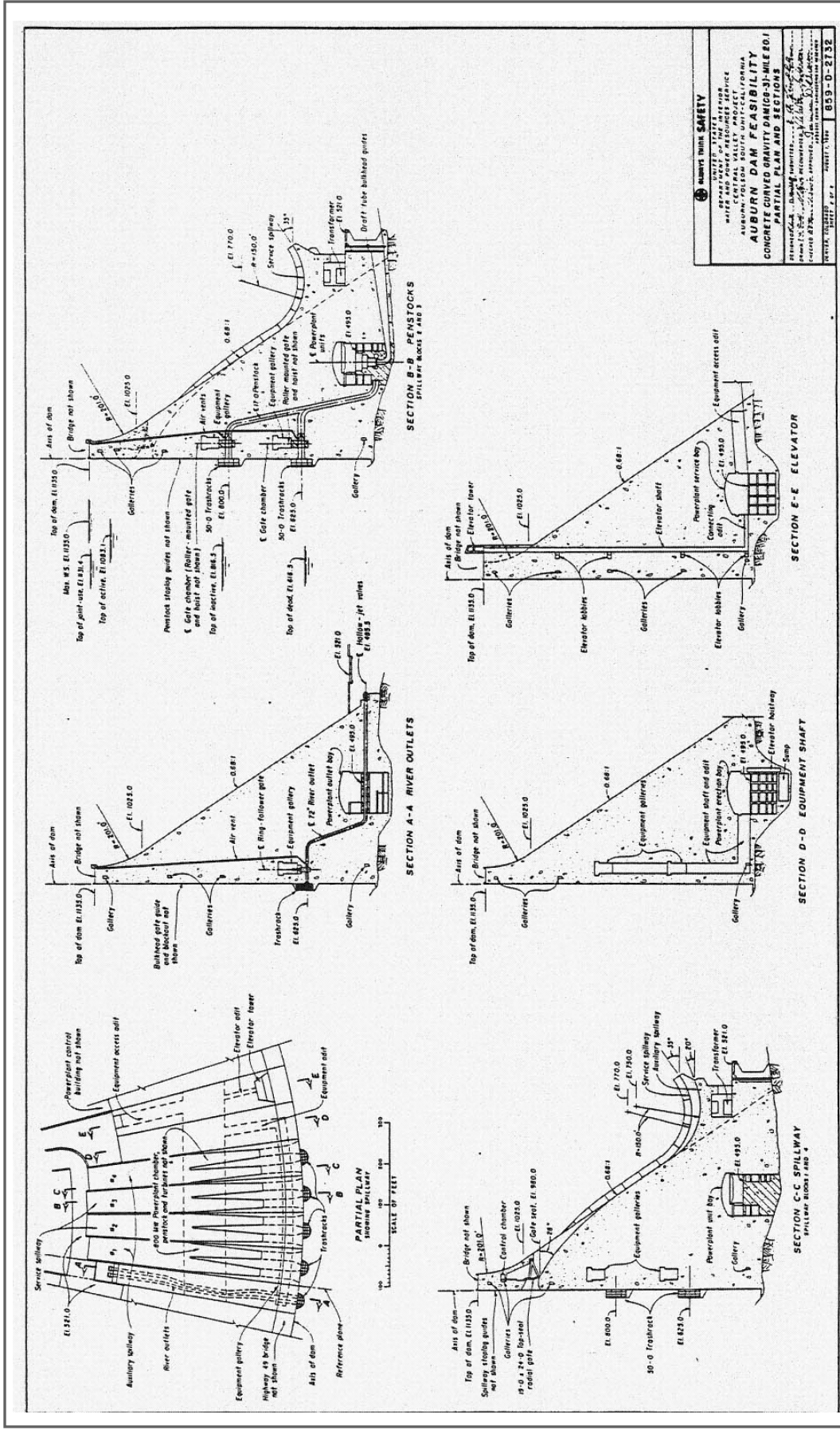
Auburn-Folsom South Unit, Central Valley Project
Technical Memorandum: Project Description

PLATE 3

AUBURN DAM DRAINAGE AREA

U.S. Department of the Interior,
Bureau of Reclamation, Mid-Pacific Region

March 2006



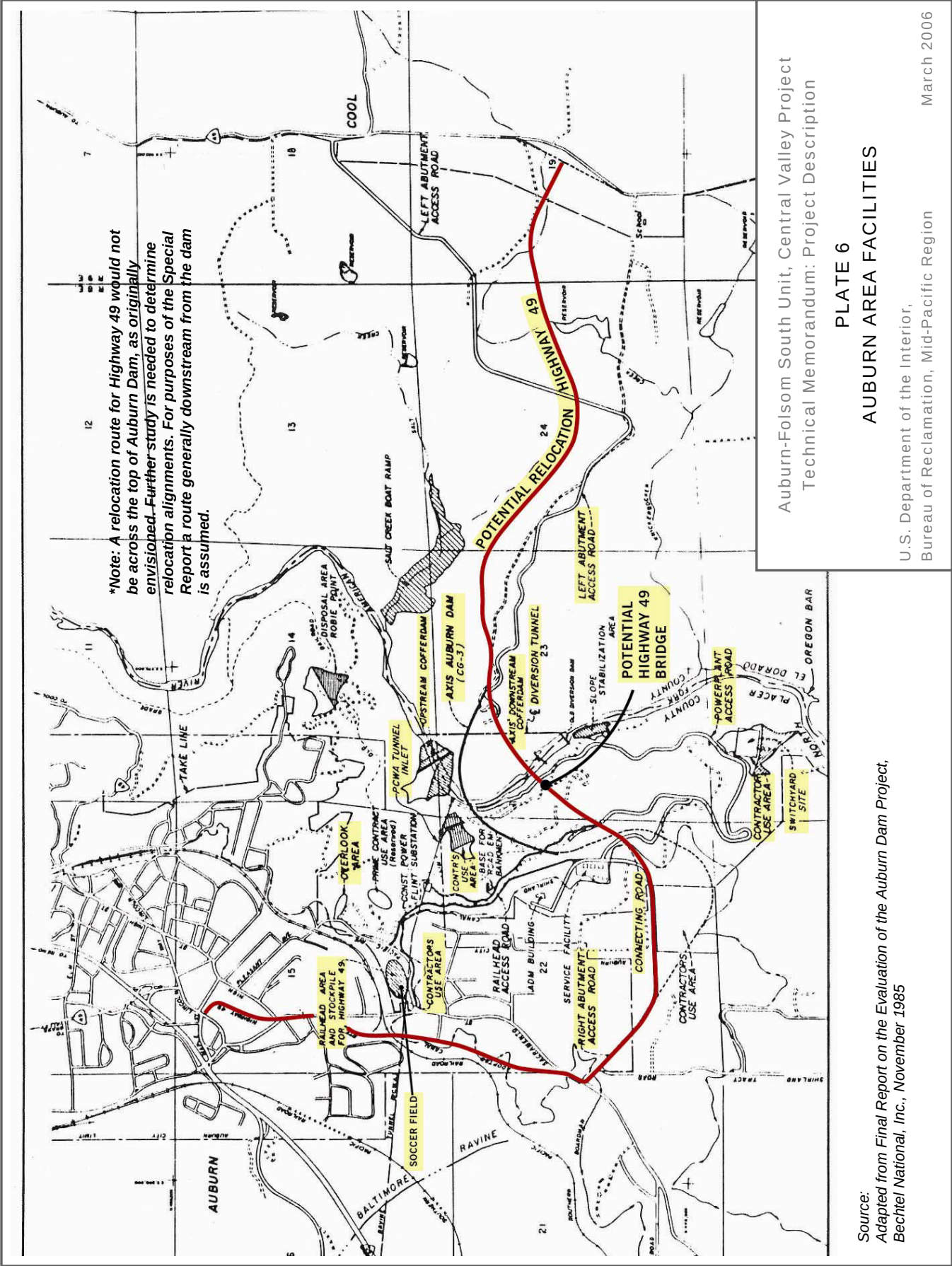
Source:
Feasibility Design Summary, Auburn Dam Concrete Curved-Gravity Dam (CG-3),
US Dept. of the Interior, Water and Power Resources Service, August 1980.

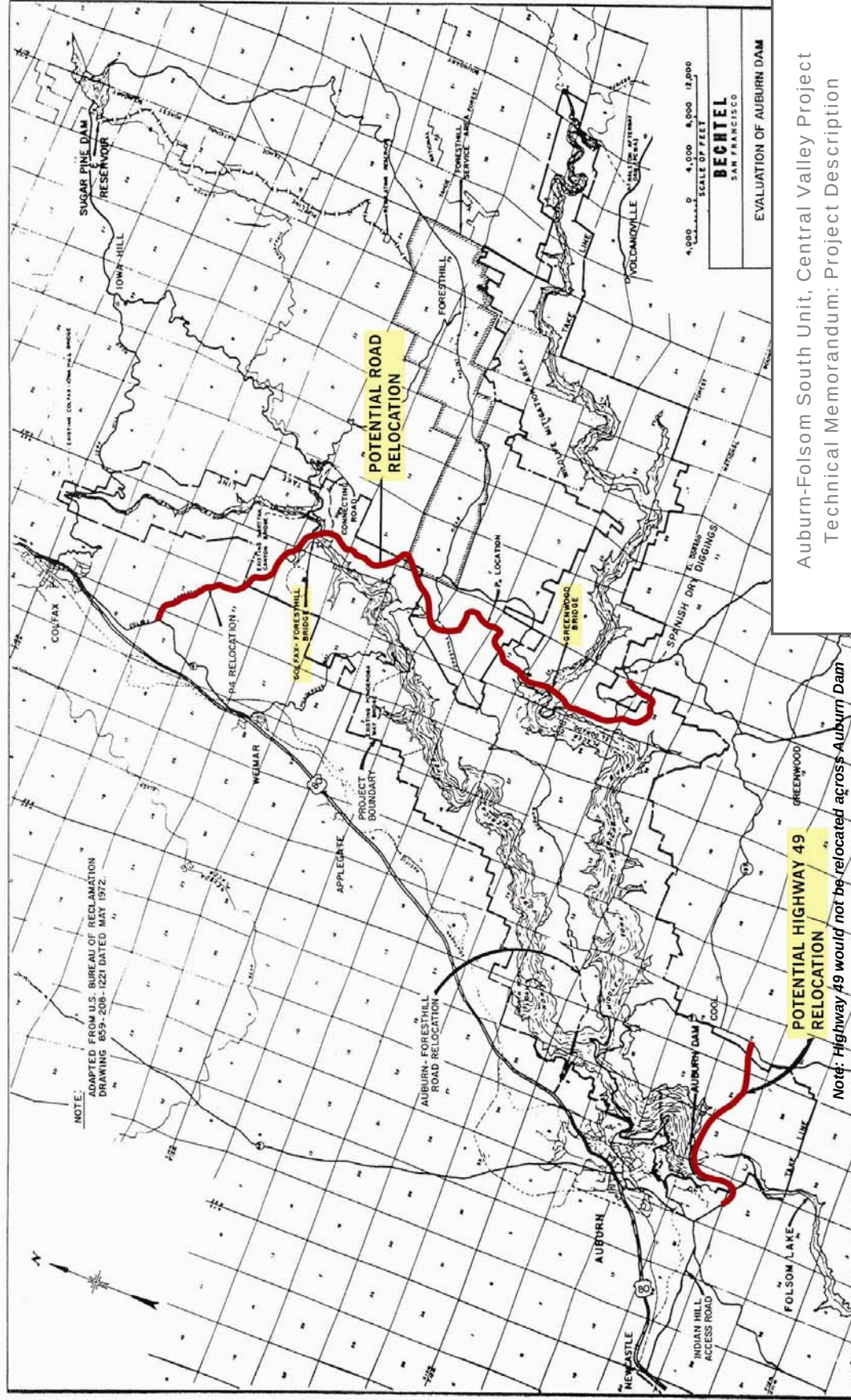
Auburn-Folsom South Unit, Central Valley Project
Technical Memorandum: Project Description

PLATE 5
AUBURN DAM (CG-3) PARTIAL PLAN AND SECTIONS

U.S. Department of the Interior,
Bureau of Reclamation, Mid-Pacific Region

March 2006





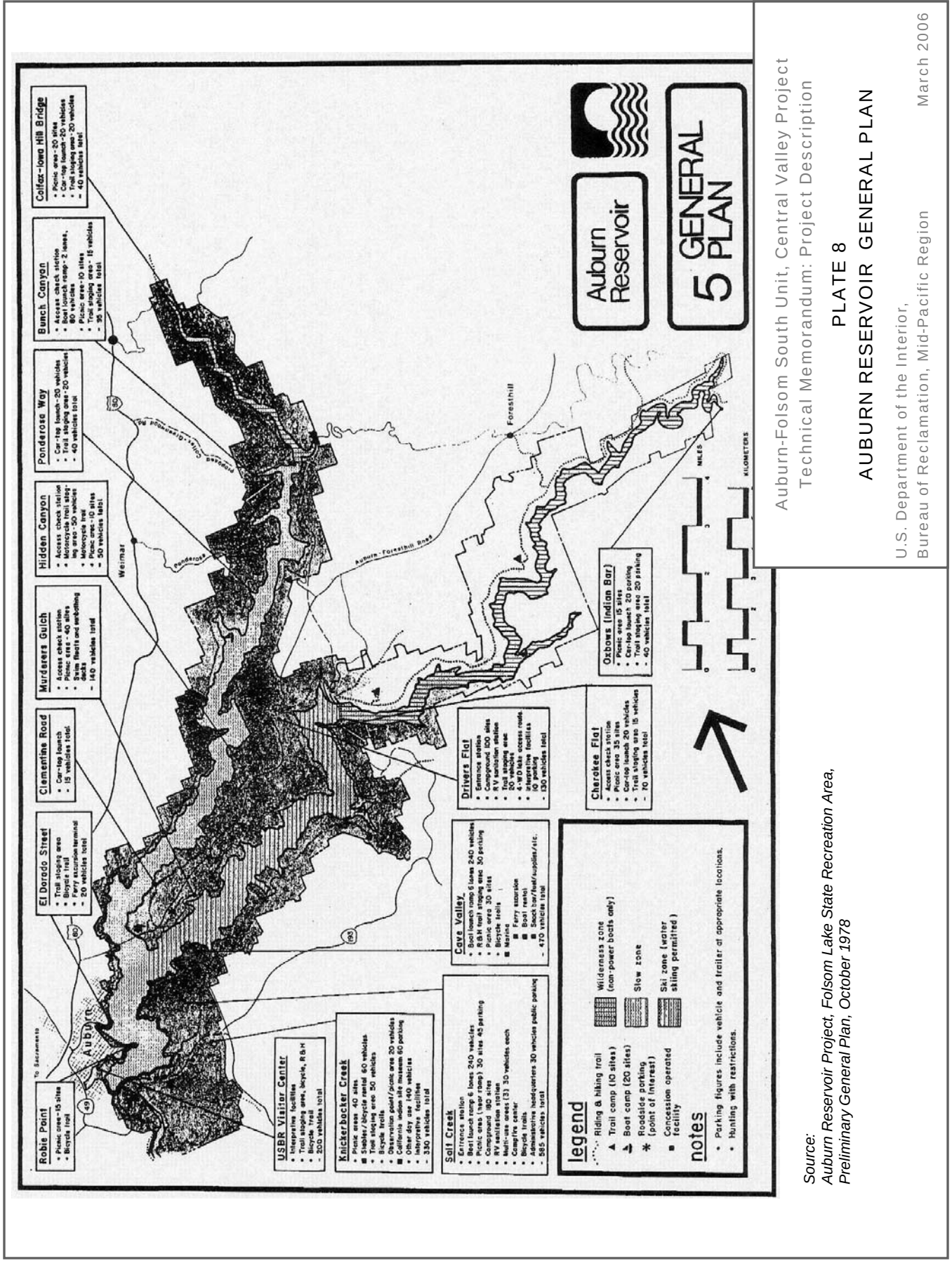
Source:
Adapted from Final Report on the Evaluation of the Auburn Dam Project,
Bechtel National, Inc., November 1985

Auburn-Folsom South Unit, Central Valley Project
Technical Memorandum: Project Description

PLATE 7

ROAD RELOCATIONS AND PROJECT BOUNDARY

U.S. Department of the Interior,
Bureau of Reclamation, Mid-Pacific Region March 2006



Source:
Auburn Reservoir Project, Folsom Lake State Recreation Area,
Preliminary General Plan, October 1978

Auburn-Folsom South Unit, Central Valley Project
Technical Memorandum: Project Description

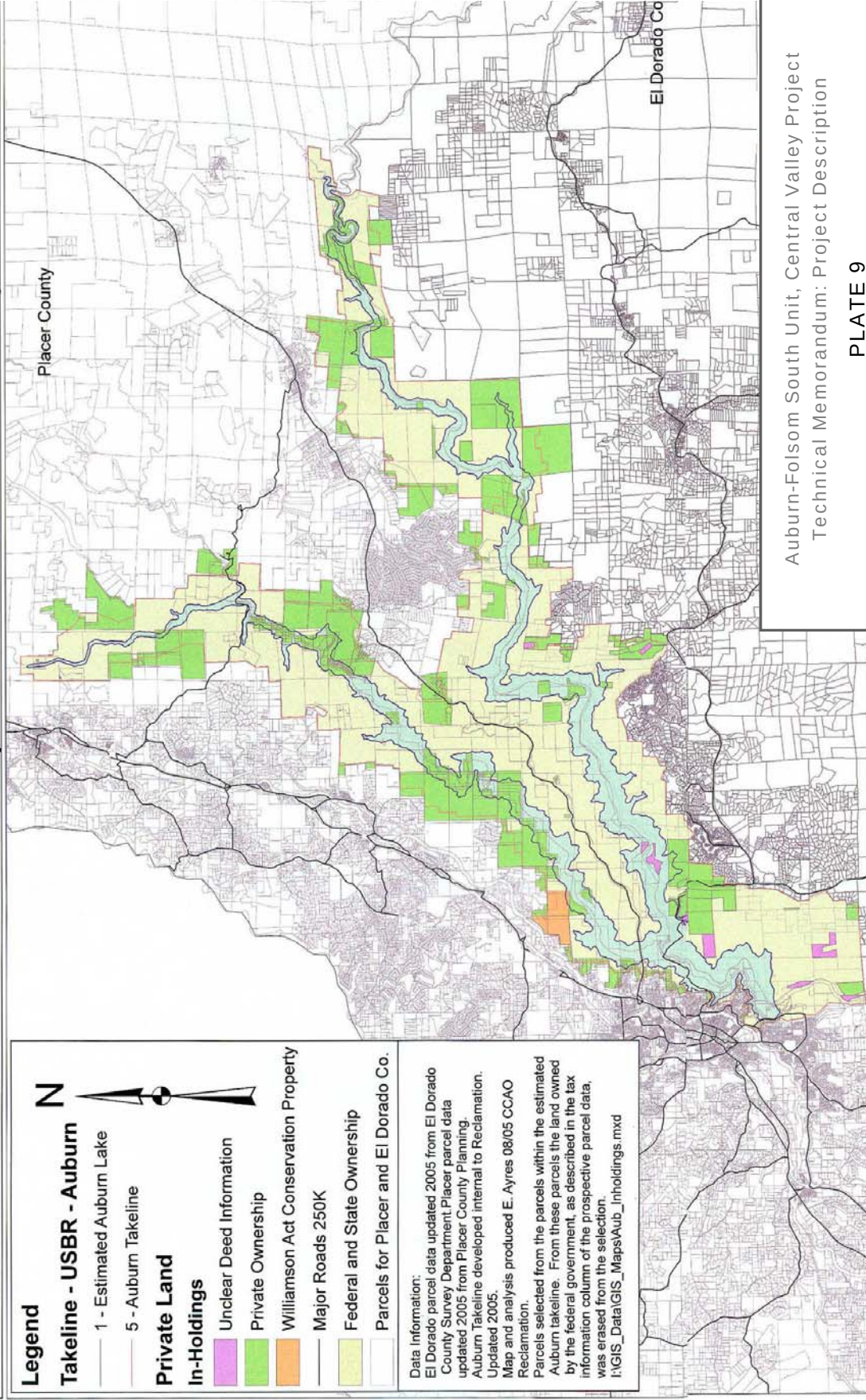
PLATE 8

AUBURN RESERVOIR GENERAL PLAN

U.S. Department of the Interior,
Bureau of Reclamation, Mid-Pacific Region

March 2006

Private Ownership within the Auburn Project



Source: US Department of the Interior, Bureau of Reclamation, Central California Area Office

Auburn-Folsom South Unit, Central Valley Project
 Technical Memorandum: Project Description

PLATE 9

AUBURN RESERVOIR TAKELINE LAND OWNERSHIP

U.S. Department of the Interior,
 Bureau of Reclamation, Mid-Pacific Region

March 2006

Attachments

ATTACHMENT A – PERTINENT AUTHORIZATIONSA1

**ATTACHMENT B – AUBURN-FOLSOM SOUTH UNIT SPECIAL REPORT,
PROJECT COORDINATION WORKSHOP MINUTESB1**

Attachment A

Pertinent Authorizations

- 2 SEPTEMBER 1965, PUBLIC LAW 89-161-AUBURN-FOLSOM SOUTH UNIT
- 7 MARCH 1994, PUBLIC LAW 93-251-AUBURN AREA ROAD RELOCATION
- 19 NOVEMBER 2005, PUBLIC LAW 109-103-AUBURN-FOLSOM SOUTH UNIT
SPECIAL REPORT

Attachment A

Pertinent Authorizations

2 SEPTEMBER 1965, PUBLIC LAW 89-161-AUBURN-FOLSOM SOUTH UNIT

September 2, 1965

1847

AUBURN-FOLSOM SOUTH UNIT, CENTRAL VALLEY PROJECT

An act to authorize the Secretary of the Interior to construct, operate, and maintain the Auburn-Folsom South unit, American River division, Central Valley project, California, under Federal reclamation laws. (Act of September 2, 1965, Public Law 89-161, 79 Stat. 615)

[Sec. 1. Construction—Principal works.]—For the principal purpose of increasing the supply of water available for irrigation and other beneficial uses in the Central Valley of California, the Secretary of the Interior (hereinafter referred to as the "Secretary"), acting pursuant to the Federal reclamation laws (Act of June 17, 1902; 32 Stat. 388, and Acts amendatory thereof or supplementary thereto), is authorized to construct, operate, and maintain, as an addition to, and an integral part of, the Central Valley project, California, the Auburn-Folsom South unit, American River division. The principal works of the unit shall consist of—

(1) the Auburn Dam and Reservoir with maximum water surface elevation of one thousand one hundred and forty feet above mean sea level, and capacity of approximately two and one-half million acre-feet;

(2) a hydroelectric powerplant at Auburn Dam with initial installed capacity of approximately two hundred and forty thousand kilowatts and necessary electric transmission system for interconnection with the Central Valley project power system: *Provided*, That provision may be made for the ultimate development of the hydroelectric capacity (now estimated at approximately four hundred thousand kilowatts) and such installation may be made when duly authorized by an Act of Congress: *Provided further*, That no facilities except those required for interconnecting the Auburn powerplant and the Folsom switchyard and those interconnecting the Folsom switchyard and the Elverta substation, shall be constructed for electric transmission or distribution service which the Secretary determines, on the basis of a firm offer of a fifty-year contract from a local public or private agency, can be obtained at less cost to the Federal Government than by construction and operation of Government facilities;

(3) the Sugar Pine Dam and Reservoir;

(4) the County Line Dam and Reservoir;

(5) necessary diversion works, conduits, and other appurtenant works for the delivery of water supplies to projects on the Forest Hill Divide in Placer County and in the Folsom-Malby area in Sacramento and El Dorado Counties;

(6) the Folsom South canal and such related structures, including pumping plants, regulating reservoirs, floodways, channels, levees, and other appurtenant works for the delivery of water as the Secretary determines will best serve the needs of Sacramento and San Joaquin Counties: *Provided*, That the Secretary is authorized to include in such canal and related operating structures such additional works or capacity as he deems

September 2, 1965

1848 AUBURN-FOLSOM SOUTH UNIT, CENTRAL VALLEY

necessary and economically justified to provide for the future construction of the East Side division of the Central Valley project, and the incremental costs of providing additional works or capacity in the Folsom South canal to serve the East Side division of the Central Valley project shall be assigned to deferred use for repayment from Central Valley project revenues. In the event that the East Side division is authorized, such costs shall be deemed a part of the cost of that division and shall be reallocated as the Secretary deems right and proper. (79 Stat. 615; 43 U.S.C. § 616aaa)

Sec. 2. [Integration with other Central Valley features.]—Subject to the provisions of this Act, the operation of the Auburn-Folsom South unit, American River division, shall be integrated and coordinated, from both a financial and an operational standpoint, with the operation of other features of the Central Valley project, as presently authorized and as may in the future be authorized by Act of Congress, in such manner as will effectuate the fullest, most beneficial, and most economic utilization of the water resources hereby made available. Auburn and County Line Dams shall be operated for flood control in accordance with criteria established by the Secretary of the Army as provided for in section 7 of the Flood Control Act of 1944 (58 Stat. 887; 33 U.S.C. 709). (79 Stat. 616; 43 U.S.C. § 616bbb)

EXPLANATORY NOTE

Reference in the Text. Extracts from the 1944, including section 7 which is referred Flood Control Act of 1944 (58 Stat. 887; 33 U.S.C. 709), enacted December 22, to in the text, appear herein in chronological order.

Sec. 3. [Recreation and fish and wildlife enhancement facilities.]—(a) Subject to the provisions of subsections (b), (c), (d), and (e) of this section, the Secretary is authorized in connection with the Auburn-Folsom South unit (i) to construct, operate, and maintain or provide for the construction, operation, and maintenance of public outdoor recreation and fish and wildlife enhancement facilities, (ii) to acquire or otherwise to include within the unit area such adjacent lands or interests in land as are necessary for present or future public recreation or fish and wildlife use, (iii) to allocate water and reservoir capacity to recreation and fish and wildlife enhancement, and (iv) to provide for the public use and enjoyment of unit lands, facilities, and water areas in a manner coordinated with other unit purposes. The Secretary is further authorized to enter into agreements with Federal agencies or State or local public bodies for the operation, maintenance, and replacement of unit facilities, and to transfer unit lands or facilities to Federal agencies or State or local public bodies by lease or exchange, upon such terms and conditions as will best promote the development and operation of such lands or facilities in the public interest for recreation and fish and wildlife enhancement purposes.

(b) Costs of recreation facilities at Sugar Pine Reservoir shall be nonreimbursable, and the provisions of subsections (c), (d), and (e) of this section shall not be applicable to such facilities.

(c)(1) If, before commencement of construction of the unit, non-Federal public bodies agree to administer unit land and water areas for recreation or fish and wildlife enhancement or for both of these purposes pursuant to the plan

September 2, 1965

AUBURN-FOLSOM SOUTH UNIT, CENTRAL VALLEY 1849

for the development of the unit approved by the Secretary and to bear not less than one-half the separable costs of the unit allocated to either or both of said purposes, as the case may be, and all the costs of operation, maintenance, and replacement incurred in connection therewith, the remainder of the separable capital costs so allocated shall be nonreimbursable.

(2) In the absence of such a preconstruction agreement recreation and fish and wildlife enhancement facilities (other than minimum facilities for the public health and safety at reservoir access points) shall not be provided, and the allocation of unit costs shall reflect only the number of visitor days and the value per visitor day estimated to result from such diminished recreation development without reference to lands which may be provided pursuant to subsection (e) of this section.

(d) The non-Federal share of the separable capital costs of the unit allocated to recreation and fish and wildlife enhancement shall be borne by non-Federal interests, under either or both of the following methods as may be determined appropriate by the Secretary: (i) payment, or provision of lands, interests therein, or facilities for the unit; or (ii) repayment, with interest, within fifty years of first use of unit recreation or fish and wildlife enhancement facilities: *Provided*, That the source of repayment may be limited to entrance and user fees or charges collected at the unit by non-Federal interests if the fee schedule and the portion of fees dedicated to repayment are established on a basis calculated to achieve repayment as aforesaid and are made subject to review and renegotiation at intervals of not more than five years.

(e) Notwithstanding the absence of preconstruction agreements as specified in subsection (c) of this section lands may be acquired in connection with construction of the unit to preserve its recreation potential, its fish and wildlife enhancement potential, or both.

(1) If non-Federal public bodies agree within ten years after initial unit operation to administer unit land and water areas for recreation and fish and wildlife enhancement pursuant to the plan for development of the unit approved by the Secretary and to bear not less than one-half the costs of land acquired therefor pursuant to this subsection and facilities and project modifications provided for those purposes and all costs of operation, maintenance, and replacement incurred therefor, the remainder of the costs of such lands, facilities, and project modification shall be nonreimbursable. Such agreement and subsequent development shall not be the basis for any allocation of joint costs of the unit to recreation or fish and wildlife enhancement.

(2) If, within ten years after initial operation of the unit, there is not an executed agreement as specified in paragraph (1) of this subsection, the Secretary may utilize the lands for any lawful purpose within the jurisdiction of the Department of the Interior, or may transfer custody of the lands to another Federal agency for use for any lawful purpose within the jurisdiction of that agency, or may lease the lands to a non-Federal public body, or may transfer the lands to the Administrator of General Services for disposition in accordance with the surplus property laws of the United States. In no case shall the lands be used or made available for use for any purpose in conflict with the purposes

September 2, 1965

1850 AUBURN-FOLSOM SOUTH UNIT, CENTRAL VALLEY

for which the project was constructed, and in every case preference shall be given to uses which will preserve and promote the recreation and fish and wildlife enhancement potential of the project or, in the absence thereof, will not detract from that potential.

(f) Subject to the limitations hereinbefore stated, joint capital costs allocated to recreation and fish and wildlife enhancement shall be nonreimbursable.

(g) Costs of means and measures to prevent loss of and damage to fish and wildlife shall be treated as unit costs and allocated among all unit purposes.

(h) As used in this Act, the term "nonreimbursable" shall not be construed to prohibit the imposition of entrance, admission, and other recreation user fees or charges. (79 Stat. 616; 43 U.S.C. § 616ccc)

Sec. 4. [State and local interests to be consulted.]—In locating and designing the works and facilities authorized for construction by this Act, and in acquiring or withdrawing any lands as authorized by this Act, the Secretary shall give due consideration to the reports upon the California water plan prepared by the State of California, and shall consult the local interests who may be affected by the construction and operation of said works and facilities or by the acquisition or withdrawal of lands, through public hearings or in such manner as in his discretion may be found best suited to a maximum expression of the views of such local interests. (79 Stat. 618; 43 U.S.C. § 616ddd)

Sec. 5. [Act not to be construed as allocating water.]—Nothing contained in this Act shall be construed by implication or otherwise as an allocation of water, and in the studies for the purposes of developing plans for disposal of water as herein authorized the Secretary shall make recommendations for the use of water in accord with State water laws, including but not limited to such laws giving priority to the counties and areas of origin for present and future needs. (79 Stat. 618; 43 U.S.C. § 616eee)

Sec. 6. [Appropriations.]—There is hereby authorized to be appropriated for construction of the Auburn-Folsom South unit, American River division, the sum of \$425,000,000 (1965 prices), plus or minus such amounts, if any, as may be justified by reason of ordinary fluctuations in construction costs as indicated by engineering cost indexes applicable to the types of construction involved herein. There are also authorized to be appropriated such additional sums as may be required for operation and maintenance of the project. (79 Stat. 618; 43 U.S.C. § 616fff)

EXPLANATORY NOTES

Cross Reference, Central Valley Project, California. The Central Valley project, referred to in the text, was authorized by a finding of feasibility by the Secretary of the Interior, approved by the President on December 2, 1935. The project was reauthorized by section 2 of the Act of August 26, 1937, 50 Stat. 850. The 1937 Act appears herein in chronological order. For references to other authorizations in the Central Valley project, California, see the

explanatory notes following section 2 of the 1937 Act.

Legislative History. H.R. 485, Public Law 89-161 in the 89th Congress. Reported in House from Interior and Insular Affairs May 6, 1965; H.R. Rept. No. 295. Passed House June 16, 1965. Passed Senate August 20, 1965. Companion bill S. 599. Reported in Senate from Interior and Insular Affairs June 10, 1965; S. Rept. No. 312.

7 MARCH 1994, PUBLIC LAW 93-251-AUBURN AREA ROAD RELOCATION



Public Law 93-251
93rd Congress, H. R. 10203
March 7, 1974

An Act

88 STAT. 12

Authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Water re-
sources devel-
opment and
preservation.

TITLE I—WATER RESOURCES DEVELOPMENT

SEC. 1. (a) The Secretary of the Army, acting through the Chief of Engineers, is hereby authorized to undertake the phase I design memorandum stage of advanced engineering and design of the following multi-purpose water resources development projects, substantially in accordance with, and subject to the conditions recommended by the Chief of Engineers in, the reports hereinafter designated.

MIDDLE ATLANTIC COASTAL AREA

The project for hurricane-flood protection at Virginia Beach, Virginia: House Document Numbered 92-365, at an estimated cost of \$954,000.

JAMES RIVER BASIN

The project for flood protection for the city of Buena Vista on the Maury River, Virginia: House Document Numbered 93-56, at an estimated cost of \$665,000.

SALT RIVER BASIN

The project for Camp Ground Lake on Beech Fork in the Salt River Basin, Kentucky, for flood protection and other purposes: House Document Numbered 92-374, at an estimated cost of \$330,000.

PASCAGOULA RIVER BASIN

The project for flood protection and other purposes on Bowie Creek, Mississippi: House Document Numbered 92-359, at an estimated cost of \$390,000.

PEARL RIVER BASIN

The project for flood control and other purposes on the Pearl River, Mississippi: House Document Numbered 92-282, at an estimated cost of \$310,000.

UPPER MISSISSIPPI RIVER BASIN

The project for flood control and other purposes on the Zumbro River at Rochester, Minnesota: Report of the Chief of Engineers, dated June 7, 1973, in House Document Numbered 93-156, at an estimated cost of \$150,000.

LOWER MISSISSIPPI RIVER BASIN

The project for Greenville Harbor, Greenville, Mississippi: Senate Document Numbered 93-38, at an estimated cost of \$200,000.

The project for flood protection for the east bank of the Mississippi River, Warren to Wilkinson Counties, Mississippi (Natchez area): House Document Numbered 93-148, at an estimated cost of \$150,000.

The project for flood control and other purposes on the east bank of the Mississippi River, Warren to Wilkinson Counties, Mississippi

March 7, 1974

- 11 -

Pub. Law 93-251

88 STAT. 22

(3) that reach of the Missouri River in North Dakota at or below the Garrison Dam; and

(4) the delta and hill areas of the Yazoo River Basin generally in accordance with the recommendations of the Chief of Engineers in his report dated September 23, 1972.

(d) Prior to construction of any projects under this section, non-Federal interests shall agree that they will provide without cost to the United States lands, easements, and rights-of-way necessary for construction and subsequent operation of the projects; hold and save the United States free from damages due to construction, operation, and maintenance of the projects; and operate and maintain the projects upon completion. Non-Federal interests, requirements.

(e) There is authorized to be appropriated for the five-fiscal-year period ending June 30, 1978, not to exceed \$25,000,000 to carry out subsections (b), (c), and (d) of this section. Appropriation.

SEC. 33. The flood control project for the Scioto River, Ohio authorized by section 203 of the Flood Control Act of 1962, as modified, is hereby further modified (1) to permit the construction of local protection works at Chillicothe, Ohio, prior to commencement of construction of the Mill Creek Reservoir, and (2) to permit the plan for such works to be revised by the Chief of Engineers so as to provide a degree of protection substantially equivalent to that provided by the project as originally authorized. Scioto River, Ohio, project modification. 76 Stat. 1188.

SEC. 34. The project for Newburgh lock and dam, authorized under authority of section 6 of the River and Harbor Act approved March 3, 1909, is hereby modified to direct the Secretary of the Army, acting through the Chief of Engineers, to perform bank protection works along the Ohio River at Newburgh, Indiana. Prior to construction, non-Federal interests shall agree that they will provide without cost to the United States lands, easements, and rights-of-way necessary for construction and subsequent operation of the works; hold and save the United States free from damages due to construction, operation, and maintenance of the works, and operate and maintain the works upon completion. Newburgh lock and dam, Ind., bank protection works. 35 Stat. 818. 33 USC 5.

SEC. 35. The Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to make a detailed study of such plans as he may deem feasible and appropriate for the removal and disposal of debris and obsolete buildings remaining as a result of military construction in World War II in the vicinities of Port Heiden, Cold Bay, Unalaska, and Unmak Island, in the Aleutian Islands, Alaska. Such study shall include an analysis of appropriate measures to restore these areas to their natural condition. The Secretary of the Army, acting through the Chief of Engineers, is directed to report the findings of such study to Congress within one year after the date of enactment of this section. Aleutian Islands, Alaska, debris removal, study. Report to Congress.

SEC. 36. Section 222 of the Flood Control Act of 1970 (Public Law 91-611) is amended by inserting at the end thereof the following: "The Secretary may also provide for the cost of construction of a two-lane, all-weather paved road (including appropriate two-lane bridges) extending from Old United States Highway 40, near Weimar across the North Fork and Middle Fork of the American River to the Eldorado County Road near Spanish Dry Diggings, substantially in accordance with the report of the Secretary entitled 'Replacement Alternative Upstream Road System, Auburn Reservoir—June 1970'." American River Calif., road, bridges. 84 Stat. 1831.

SEC. 37. The Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to review the requirements of local cooperation for the Santa Cruz Harbor project, Santa Cruz, California, authorized by the River and Harbor Act of 1958, with particular reference to cost sharing, review. Santa Cruz Harbor, Calif., cost sharing, review. 72 Stat. 299.

**19 NOVEMBER 2005, P.L. 109-103-AUBURN-FOLSOM SOUTH UNIT SPECIAL
REPORT**

PUBLIC LAW 109-103—NOV. 19, 2005

119 STAT. 2247

**Public Law 109-103
109th Congress**

An Act

Making appropriations for energy and water development for the fiscal year ending
September 30, 2006, and for other purposes.

Nov. 19, 2005
[H.R. 2419]

*Be it enacted by the Senate and House of Representatives of
the United States of America in Congress assembled, That the
following sums are appropriated, out of any money in the Treasury
not otherwise appropriated, for the fiscal year ending September
30, 2006, for energy and water development and for other purposes,
namely:*

Energy and
Water
Development
Appropriations
Act, 2006.

TITLE I

CORPS OF ENGINEERS—CIVIL

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS—CIVIL

The following appropriations shall be expended under the direc-
tion of the Secretary of the Army and the supervision of the Chief
of Engineers for authorized civil functions of the Department of
the Army pertaining to rivers and harbors, flood control, shore
protection and storm damage reduction, aquatic ecosystem restora-
tion, and related purposes.

INVESTIGATIONS

For expenses necessary for the collection and study of basic
information pertaining to river and harbor, flood control, shore
protection and storm damage reduction, aquatic ecosystem restora-
tion, and related projects, restudy of authorized projects, miscella-
neous investigations, and, when authorized by law, surveys and
detailed studies and plans and specifications of projects prior to
construction, \$164,000,000, to remain available until expended: *Pro-
vided*, That, notwithstanding any other provision of law, within
the funds provided under this heading, \$1,000,000 shall be available
for planning assistance to the state of Ohio for Stark County water-
shed basin study: *Provided further*, That using \$8,000,000 of the
funds provided herein, the Secretary of the Army, acting through
the Chief of Engineers, is directed to conduct a comprehensive
hurricane protection study at full Federal expense to develop and
present a full range of flood, coastal and hurricane protection meas-
ures exclusive of normal policy considerations for south Louisiana
and the Secretary shall submit a feasibility report for short-term

Reports.
Deadlines.

PUBLIC LAW 109-103—NOV. 19, 2005

119 STAT. 2269

(b)(1) Using amounts made available under section 2507 of the Farm and Security Rural Investment Act of 2002 (43 U.S.C. 2211 note; Public Law 107-171), the Secretary shall provide not more than \$10,000,000 for a water lease and purchase program for the Walker River Paiute Tribe.

(2) Water acquired under paragraph (1) shall be—

(A) acquired only from willing sellers;

(B) designed to maximize water conveyances to Walker Lake; and

(C) located only within the Walker River Paiute Indian Reservation.

(c) Using amounts made available under section 2507 of the Farm and Security Rural Investment Act of 2002 (43 U.S.C. 2211 note; Public Law 107-171), the Secretary, acting through the Commissioner of Reclamation, shall provide—

(1) \$10,000,000 for tamarisk eradication, riparian area restoration, and channel restoration efforts within the Walker River Basin that are designed to enhance water delivery to Walker Lake, with priority given to activities that are expected to result in the greatest increased water flows to Walker Lake; and

(2) \$5,000,000 to the United States Fish and Wildlife Service, the Walker River Paiute Tribe, and the Nevada Division of Wildlife to undertake activities, to be coordinated by the Director of the United States Fish and Wildlife Service, to complete the design and implementation of the Western Inland Trout Initiative and Fishery Improvements in the State of Nevada with an emphasis on the Walker River Basin.

(d) For each day after June 30, 2006, on which the Bureau of Reclamation fails to comply with subsections (a), (b), and (c), the total amount made available for salaries and expenses of the Bureau of Reclamation shall be reduced by \$100,000 per day.

Effective date.

SEC. 209. (a) The Secretary of the Interior is authorized to complete a special report to update the analysis of costs and associated benefits of the Auburn-Folsom South Unit, Central Valley Project, California authorized under Federal reclamation laws and the Act of September 2, 1965, Public Law 89-161, 79 Stat. 615 in order to—

Reports.

(1) identify those project features that are still relevant;

(2) identify changes in benefit values from previous analyses and update to current levels;

(3) identify design standard changes from the 1978 Reclamation design which require updated project engineering;

(4) assess risks and uncertainties associated with the 1978 Reclamation design;

(5) update design and reconnaissance-level cost estimate for features identified under paragraph (1); and

(6) perform other analyses that the Secretary deems appropriate to assist in the determination of whether a full feasibility study is warranted.

(b) There are authorized to be appropriated \$1,000,000 to carry out this section. The cost of completing this update shall be non-reimbursable.

Attachment B

Auburn-Folsom South Unit Special Report Project Coordination Workshop Minutes

(Note - Following is a general transcription of discussions, which occurred during a 20 January 2006 workshop on the Auburn-Folsom South Unit to the Central Valley Project. Reorganization of some of the discussions and discussion topics has been necessary for overall clarity and to avoid redundancy. In addition, efforts were made to include as much of the original discussion as possible without judgement at this time as to its relevance or accuracy.)

AUBURN-FOLSOM SOUTH UNIT SPECIAL REPORT PROJECT COORDINATION WORKSHOP MINUTES

Time/Date: 08:00 to 5:00 p.m. on Friday, 20 January 2006

Location: MWH, 3321 Power Inn Road, Sacramento, CA, Suite 300

Purpose: To develop an updated Auburn-Folsom South Unit Project Description

Workshop Participants:

Wendell Carlson	Principal Geologist, Auburn-Folsom South Unit, Reclamation (Retired)
Mike Catino	Regional Director, Reclamation (Retired)
Mike Schaefer	Principal Hydrologist and Recreationest, Auburn-Folsom South Unit, Reclamation (Retired)
John Turner	Principal Planner, Auburn-Folsom South Unit, Reclamation (Retired)
Bob Childs	USACE (Retired)
Al Candlish	Reclamation (Chief, Planning Division)
Dave Gore	Reclamation (Chief, Engineering Division)
Jay Emami	Reclamation (Project Manager– CCAO)
Elizabeth Ayres	Reclamation (CCAO)
Laura Caballero	Reclamation (CCAO)
Drew Lessard	Reclamation (CCAO)
Rick Johnson	Reclamation (Deputy Area Manager, CCAO)
Joel Sturm	Reclamation (MP-200)
Bill Peach	Reclamation (Project Manager – MP-700)
Russ Yaworsky	Reclamation (MP-710)
John Jordan	Reclamation (MP-740)
Tom Adams	USACE (Planning Section Chief)
Emily McAlister	MWH (Technical Writer/Editor)
Ryan Murdock	MWH (Engineer/Planner)
Merritt Rice	MWH (Engineer/Planner)

WORKSHOP SCOPE AND INTRODUCTIONS

Al Candlish, Reclamation, addressed the group regarding the scope of the workshop. USACE and Reclamation are studying modifying Folsom for flood control improvement. Congress has asked that the Auburn project be reviewed and updated.

In addition to Reclamation staff currently working on the response to Congress, the workshop includes attendees who were staff when the Auburn project was first formulated and when construction was initiated. These staff have knowledge of the original features intent of the project, and which features would still be necessary for the project today.

The first task in the authorization of the Special Report is to identify relevant features of the project for today. Many changes have occurred since the project was originally formulated in the

mid-1950s. Reclamation plans to work with the 1978 CG-3 cost estimates to update costs and benefits, not to make decisions or recommendations. At the end of the study, a report will be produced that contains the findings of the special study. Review of these findings may result in a request that the project be reformulated.

Attendees introduced themselves.

Merritt Rice, MWH, stated that MWH was tasked to host the workshop. Ryan Murdock, MWH, will annotate the list shown on the projector screen with details provided during the day. MWH will produce a Technical Memorandum that describes results from the meeting and from other information related physical features to be included in a potential project description. A notebook of materials was prepared for the workshop and a collection of older reports was available in the meeting room for reference.

BACKGROUND, REEVALUATION STATUS, AND AGENDA

Jay Emami, Reclamation, gave a presentation (see Section 2 of the workshop notebook for copies of the slides) that included background, study authorization for a special report, schedule for the study and report, current status of the study, and the agenda for the workshop.

The primary purpose for completing the special report, which will encompass updating the analysis of costs for, and associated benefits to, the Auburn-Folsom South Unit, is to determine whether a full feasibility study is warranted. The study is required to be completed by August 31, 2006.

CONCURRENCE ON MAJOR UNIT FEATURES

Major features of the Auburn-Folsom South Unit include: Auburn Dam, Reservoir, and Powerplant; County Line Dam and Reservoir; Sugar Pine Dam and Reservoir; and Folsom South Canal. The extended cost of the four features of the authorized project was originally \$425 million. Reclamation files contain a breakdown of costs for each of the four features (DC-1, estimate sheets, which would have details for all the features, and subdetails, such as costs for the Auburn-Foresthill Bridge). Reformulation of the project has not been requested.

County Line Dam and Reservoir

County Line Dam is a water distribution feature for water developed by both Auburn and Folsom dams and reservoirs; it does not develop a significant amount of new water supply of its own. The level of analysis for County Line was very rudimentary. Its service area is eastern Sacramento County and western El Dorado County. If the Auburn-Folsom South Unit project were reformulated today, County Line Dam and Reservoir would be a local feature, to supply water locally from Folsom Reservoir.

County Line Dam and Reservoir is not a relevant feature for purposes of the special study. Furthermore, not enough time is available to study County Line Dam to meet the schedule for the special study. It was agreed, however, that County Line Dam and Reservoir should be acknowledged as part of the original project.

Sugar Pine Dam and Reservoir

This feature was authorized and constructed, completed in 1982, and has been in operation for years. Title to the project was transferred to Foresthill Public Utility District in 1984.

Folsom South Canal

Two of five reaches down to the Cosumnes River (26.7 out of 68.8 miles) were completed in 1973. In the original authorization, Auburn Dam and Reservoir water supplies were to be operated integrally with the Central Valley Project (CVP). Water supplies would be sent down Folsom South Canal. The first reach of the canal was sized to carry water for the east side (this was in the authorizing language). The Sacramento Municipal Utility District (SMUD) is the only current user on the Folsom South Canal.

An important question is, what happens to the water after it leaves Auburn? Stockton East Water District (SEWD) is still interested in water from Auburn. The Folsom South Canal was built as far as it was to serve Rancho Seco.

Groundwater wells in the Elk Grove area have dried up. Farmers in the area say that if Cosumnes River was made a live stream, their groundwater would be enhanced, and they could pump at reasonable levels. There are many vineyards in that area, and eventually there will be municipal and industrial (M&I) uses. A professor at UC Davis advocated sending about 20,000 acre-feet (AF) down the Cosumnes River to replenish the groundwater and to help fish and wildlife on the lower part of the Cosumnes River where it enters the Delta. The way to replenish the groundwater in the Elk Grove area is to bleed some water from the Folsom South Canal into the Cosumnes River. A demonstration project was done last year of sending water from the canal down the Cosumnes River. Only about 5,000 AF were delivered to prewet the river. Because of the prewetting, some have claimed that flood damage has increased from high water this year.

The Folsom South Canal is not now relevant for the East Bay Municipal Utility District (EBMUD). EBMUD's water supply will be from Freeport. Some discussion has occurred between EBMUD and San Joaquin County regarding also using Freeport for San Joaquin County. How should benefits be measured for Auburn – splitting between the canal, or some conveyance and the dam? A service area needs to be assumed then back up benefits to a diversion point on the river or the Delta or elsewhere.

New requirements exist on the CVP in terms of operations since the Auburn-Folsom South Unit was originally formulated. It has been identified that less water supply is available now. Also, since the Central Valley Project Improvement Act (CVPIA) was passed, agreements about American River flows and new allocations on the American River have been made (which is now over-allocated). A benefit for water supply is that it is integrated with the rest of the CVP. A specific service area may not be needed other than being consolidated with CVP supplies. The San Joaquin County water supply will probably come from New Melones.

Similar to County Line, other measures have been advanced relative to what the Folsom South Canal was going to be using for delivery. The Folsom South Canal needs to be reconsidered, which cannot be done in 3 months. Reevaluation of the Folsom South Canal may need to be

deferred. It was agreed that the Folsom South Canal should just be acknowledged as part of the original project. However, the Folsom South Canal is not a relevant feature today for the project for the special study.

Auburn Dam, Reservoir, and Powerplant

The relevant dam type is a concrete gravity dam (CG-3). The original estimate was for an earthfill dam. Although an earthfill dam would have been cheaper, excavation was an issue – a shortage existed of impervious material. The concrete dam was favored from an ecological and environmental standpoint. Enough rock and gravel were available between the Auburn-Forest Hill Bridge and Clementine (North Fork Dam) for a concrete dam. In 1981, an estimate was made in Denver for a double curvature thin arch concrete dam.

The authorizing act in 1965 included Auburn Dam, Reservoir, and Powerplant but did not include a site, size, or type of dam. The powerplant size was suggested. The only size mentioned for the reservoir was a maximum water surface, not to exceed 1,140 feet above mean sea level (msl).

GENERAL DISCUSSION OF AUBURN-FOLSOM SOUTH UNIT

Much of the morning session was spent on various topics, with attendees contributing information from their past experience working on the Auburn-Folsom South Unit. [Portions of those discussions have been moved to the project description section and placed with respective project feature subsections.]

Two issues exist: relevant features and benefits. Benefit computations can be done based on CVPIA yield replacement and other things. Benefits can be discussed outside being linked to the Folsom South Canal. The direction is to update the costs and benefits of the relevant features. A fair evaluation needs to be made of what the system might be if Auburn goes forward.

Seismic Evaluations

In the 1970s and 1980s, evaluations of seismic conditions at the Auburn Dam site were conducted. At the request of Reclamation, the United States Geological Survey (USGS) performed a technical review of Woodward-Clyde Consultants' (WCC) 8-volume seismic report. No report by any prominent group said reservoir-induced seismicity could occur. The consensus of the five-member "Auburn Consultants" group could be summarized as follows: the Oroville earthquake remains a questionable case of reservoir-induced seismicity and the reservoir proposed for Auburn is estimated to have a 2 to 5 percent likelihood of a significant reservoir induced earthquake (WCC). Wendell Carlson wrote a report in 1990 that summarized all of the prior geology studies. This report and findings by other eminent consultants from the California Institute of Technology and Stanford University determined that a safe dam can be built at Auburn. Secretary of the Interior Cecil Andrus concurred in this, and the State Division of Safety of Dams also approved.

Transportation

Improvements to transportation such as Highway 49 relocation should be considered and discussed in the Special Report. Discussion occurred among the group as to whether or not transportation benefits can be included in project justification. It was recognized that sizeable benefits already have been realized from some road relocations that were completed, such as Foresthill Bridge.

A Highway 49 river crossing on top of the dam was included in the original project and the least-cost method at that time. However, security was not as much an issue then as it is today and no public highway would be allowed to cross on top of the dam now. It was recognized that any new Highway 49 crossing will not be decided by this workshop group. The actual relocation will need to be developed in future detailed evaluations with major support by Caltrans (California Department of Transportation).

Upstream bridges need to be relocated. Supplemental authorization was given for the Ruck-A-Chucky Bridge. Road and bridge relocations were included in the original project costs.

An estimate of \$48 million was made for a road from the Sisters of Mercy convent down the canyon, and back up, and a bridge down in the canyon. This cost was high because of 9 percent grades plus a low-level bridge; the road would be very winding.

The Division of Forestry may be opposed– it wanted a second bridge because the Georgetown fire station would be cut off from the rest of the canyon.

Advance replacement was suggested as a benefit (if 50 percent of a bridge's life is used up). However, this is not the same as a transportation benefit. The benefit is that the area can be traversed more efficiently. Exotic benefits can't be claimed that are not project purposes because problems will occur when cost allocations are done.

Cost Issues

Indexing Costs Versus Updating Costs

Because of the age of the previous cost estimates (over 20 years), it was stated that repricing/updating is preferred over indexing, using the CG-3 concrete gravity dam as the baseline. The design for the 1980 CG-3 concrete gravity dam included a series of cost estimate worksheets. The quantities will be taken from those worksheets as appropriate and repriced using current information.

Benefits Versus Cost

General discussions occurred regarding benefit categories, updating benefits, and benefit-cost comparisons. It was recognized that many of the rules for project justification have changed somewhat over the years. Today, Reclamation needs to comply with provisions in the Principles and Guidelines (P&Gs) as well as other Federal principles and policies, all of which provide guidance on benefit categories, cost-sharing, and many other planning issues.

WITHOUT-PROJECT CONDITIONS

It was recognized that at least two without-project conditions exist for Auburn with respect to Folsom Dam modifications: (1) recently authorized modifications at Folsom are completed, and (2) these modifications are not completed.

Auburn-Folsom Dam Operation Issues

One consideration discussed was the probable maximum flood (PMF). It was recognized that with an integrated Auburn-Folsom plan, a PMF modification at Folsom Dam and Reservoir may not be needed.

The magnitude of yield from an Auburn Dam and Reservoir would depend on various factors. Previous water supply yield estimates ranged from 300 thousand acre-feet (TAF) to as much as 700 TAF. It was recognized that it won't be known what the current water supply yield estimates will be until model studies are completed. These model studies will include a number of factors, with an important one being an increase in downstream flows for fish and recreation purposes on the lower American River, which would likely diminish the amount of water supply.

Flood Control

Flood control is to be discussed in the Special Report: (1) how much space will there be, (2) what size will the gates be, and (3) what is the resulting protection. This cannot be done to a significant level of detail in the study in the time available; therefore, some estimates of flood control storage space will have to be chosen. All of this will change, and will affect performance rather than cost. The old design was on the old PMF. There is a new PMF for Folsom. For the designs, the existing PMF will be used, recognizing there is a new PMF that will change slightly. It will be bigger, but not significantly bigger. A quick operations study may be done that would incorporate the current PMF because this would be the only way to update benefit values. Because the PMF has changed, Folsom operating criteria may have changed, and flow standards are potentially changing.

Reclamation is requesting USACE conduct a brief flood control study. Estimates of damageable property along the American and Sacramento rivers, including the City and much of the County of Sacramento, are sizeable at \$45 billion. Flood control allocation would be treated as a nonreimbursable expense and could be as much as 45 to 55 percent of the cost of the facility. Early documents estimated the amount of total space of 650 TAF between Folsom and Auburn. This is not a lot compared to total space requirements identified in recent studies for comparable levels of flood protection. The new spillway at Folsom could change this. Flood control should be concentrated between the two reservoirs, and how they will operate under modern conditions, including the spillway. Insufficient time will be available for detailed studies. The economists need the cost of the features, such as the gates.

Site Restoration

One of the benefits that should be considered is the Auburn Ravine Tunnel as a diversion point for all of the Placer County water; it wouldn't need to be pumped out of Auburn Reservoir.

Placer County is releasing down the river on a power pattern; this water is not available for water supply in western Placer County without some deregulation.

Work is underway by Reclamation and PCWA to construct a pump station and pipeline to the Auburn tunnel, close the river diversion tunnel, and restore the site. Assuming that is completed, one of the features of the cost estimate that has to be changed or added in is what needs to be done to reopen the diversion tunnel, and what would need to be removed from the pumping station. It might be possible to remove and salvage the pumps, and leave the structure there. Therefore, for without-project conditions, that is assumed to be completed. The amount in the cost estimate would be for reconstructing the site.

Safety of Dams

One of the without-project conditions for Auburn would be that the Folsom dam safety issues are resolved. That scenario needs to be completed, but Congress may want to compare the required extent of potential modifications at Folsom with an Auburn Dam. Two different dam safety issues exist: hydrologic and seismic. Seismic and static fixes at Folsom will be completely independent of Auburn; those fixes have to be done. Issues to be additional (but likely not resolved) in the Special Report include (1) how could Auburn be sized to reduce the PMF at Folsom, and (2) what would be the basis to accommodate the new PMF at Auburn.

The spillway would not be resized for the Auburn analysis. But the PMF would be discussed related to changes in design criteria. It would probably be cheaper to put additional flood control storage upstream at Auburn. This also would reduce the need to modify the PMF at Folsom.

Cost for Without-Project

There could be a cost to “walk away” from completing Auburn Dam, which has been estimated to range from \$60 million to \$200 million. A study exists on this. It has always been recognized that if Auburn was not built, that Folsom would have to be modified (i.e., enlarge the outlets, etc.). Because the Special Report is not an alternatives analysis, this cost would not be brought up. The cost for no project would fall on the benefits side because the site would be restored. The cost would be totaled and a cost reduction would be done. This cost is not a without-project feature because nothing will occur to the site until Congress takes an action.

PROJECT DESCRIPTION

A list of potential major project features was projected on a screen. It was recognized that the CG-3 dam at River Mile may not be the final dam design to be built. Technically, something slightly different likely would be done. The legislation specifies using the 1978 design. But an issue is, where is the line drawn for changes in the design in current studies? Reasons to change the 1978 design would be if it cost less or because of technical issues and design criteria.

Some things are very obvious that will be changed and quick cost estimates could be done because information is available on big ticket items.

Known changes would include moving Highway 49 off the top of the dam and adding an O&M road there, and the American River Pump Station. It also has been discussed whether a TCD would be needed on Auburn Dam. It can be identified that a TCD is not part of the design, and that multilevel outlets were considered at this time. In the CG-3 design, the river outlets are not multilevel and the power outlets have two intake levels.

This special study involves working with a design with some missing features, and attempting to update the design, not reformulate it. However, costs also should not be underestimated. Many contingencies could raise costs. Contractors will be asked to put contingencies on each line item, and identify potential contingencies that are associated with each line item. A percentage will appear on each line item. In total, contingencies can't be less than 30 percent at the bottom line. Unlisted items (could include bollards) should not be less than 20 percent.

Sacrificial bulkhead gates would not fit in unlisted items because the cost for these would be very great (they couldn't be done with the current design). It may be found in future studies that the base may need to be widened because of the earthquake analysis. Varying degrees of displacement could be an issue – 3 inches, the State wanted 9 inches, and the Secretary of the Interior accepted 9 inches. It was suggested that maybe costing the existing design with increased contingencies and adding to the description of the project that additional seismic studies may change the design would be better than describing new design criteria at this time. The existing design with contingencies “works,” but some facilities that are costly need to be added. It was recognized that even with contingencies, other items may be added that weren't included.

Main Dam

Most items in this section are defined in the 1978 design.

Type of Dam, Location, and Size

The CG-3 configuration is to be used. Tasks besides updating costs include 1) identifying design standard changes, and design criteria changes that would be different from the original, and 2) qualitatively discussing in the feasibility study what would be different today than from the original project. None of this would be costed, but would be discussed. A risk-based seismic analysis would be done to determine the maximum credible earthquake (MCE) versus the old standard. Design criteria would be similar to what is used at Folsom now. A bigger cross section will not be sized for this analysis, but needs to be identified as an issue. Dam alignments would be discussed – may not use the curved alignment – it might be straightened out. These kinds of issues all would need to be discussed.

CG-3 is at the same curvature as the original design. Because of the curvature, which is substantial, concrete needs increase from 6.9 million cy to 10.3 million cy. If the dam goes straight across, some of this concrete could be eliminated. The 1978 or 1980 estimate was based on the existing horizontal footprint. Bechtel was also looking at RCC.

The subject of materials could be quite significant depending on the type of dam. The original dam was an earthfill dam, at Oregon Bar. Later, it was decided that not enough earthfill materials

were available. Knickerbocker Creek area was considered after the earthquake, but this was in a recreation area. It was also an area the United States Fish and Wildlife Service belatedly decided it wanted for wildlife mitigation. Competition ensued for the only flat spot in the project area. For a concrete dam, aggregates are available in the canyon itself. (State Parks didn't want the dam at this location because Highway 49 would cross through the park, but had to accept it because it was in the original plan.)

The location of the dam is to be at the existing site at river mile 20.1. A cross section in the design has a dam crest elevation of 1,135 feet. Referring to Section 6 in the workshop notebook, various elevations were discussed. For the design that will be recosted, these elevations would be used. Top of the dam is 1,135 feet. Top of the parapet is 1139.5 feet. The maximum water surface is shown as 1,135 feet in some instances. The surcharge is 3.6 feet. Gross pool would be 1,131 feet. Mr. Emami had a map/drawing with the reservoir capacity on location.

The reservoir capacity is to be 2.4 million acre-feet (MAF). Volumes smaller than 2.4 MAF, were not considered until Reclamation considered single-purpose flood control and dry dams, etc. A simplistic benefit cost/study for a big dam was done for Auburn very early, indicating a somewhat smaller size than 2.4 MAF – 1.1 MAF. Later, when the need for more water arose, the maximum water surface elevation of 1,140 feet was advanced. The figure of 1,140 feet was selected solely because it would not flood Oxbow Powerhouse. For this study, there is no time to work with other sizes. It will be best to use the site needed for safety, seismic reasons, construction costs, type of dam. Similarly, for the powerplant, use what was planned originally. It was a small project with provisions for enlargement.

A crane will be needed. A nine-ton crane may not be large enough. A crane was in the estimate under the outlet costs.

Foundation and Appurtenances

This would be the same as at the CG-3 site based on the previous report, with some additional foundation excavation because the old excavation has been filled in. Changing the shape of the foundation will not be considered now; foundation shape will be determined in the future. Additional foundation work could be very expensive.

Spillway and Appurtenances

These will be as defined in the 1978 design. CG3 has a spillway in the center portion of the dam.

It is unknown if the original design had an auxiliary spillway. If the topic of PMF arises in the qualitative discussion, it may be desirable to add an auxiliary spillway. An auxiliary spillway would have to go through the dam; there is no location on the side for it.

Spillway gates will be as defined in the 1978 design.

O&M bulkhead gates will likely be included. Sacrificial gates were discussed; this might be a change-of-criteria discussion. Sacrificial gates would be a big cost item.

Outlet Works and Diversions

These will be as defined in the 1978 design.

Temperature Control

Two levels of outlets on the penstocks were included in the original project and in the 1980 estimate. No temperature control device (TCD) similar to Shasta was included. Would a lower level outlet be included in a reformulated project for temperature control? CG-3 includes only one level of river outlets.

Auburn Ravine (Ophir) Tunnel Connection

It is assumed that the American River Pump Station will be in place under without-project-conditions. At construction time for an Auburn Dam, the project harms PCWA's facility. PCWA will need to be provided a functional diversion to replace its lost diversion. Therefore, the Ophir Tunnel might need to be rehabbed. Only the headworks in the tunnel may need to be rehabbed. The headworks are about a thousand feet from the tunnel. The Auburn Ravine (Ophir) tunnel has a trash rack. The tunnel was concrete up to the trash rack and then opened up into an unlined rock tunnel until the outlets. Reclamation discovered that the tunnel was in very bad shape.

Al Candlish stated that the pump station included Reclamation temporary pumps. The Reclamation contract with PCWA was at the reservoir. However, Rick Johnson said that three pumps were constructed there for the Middle Fork Project, but were never hooked up or used. He said it was 1988 before the pumps were put in.

PCWA did have control gates at the tunnel. A box on top is the operating housing for the control gates. The control gates deteriorated under PCWA's watch. If Reclamation removes the pumping plant, some type of headworks control for the tunnel is needed for PCWA to get its water, or the tunnel needs to be sealed. Mitigation for the pump station may be needed. Cost for a complete project needs to be accounted for.

The PCWA tunnel was built on the basis that Auburn would be built, giving 200 feet of head pushing the water through. If the dam were raised, the tunnel would have to be gated; it needs to be determined if the gates (or other features) could be considered a project feature, or locally provided feature not in the Federal project cost estimate. Removal of the pumps must be paid for. The obligation is to deliver 40,000 AF per year. This may make the tunnel part of the project, even if it is not a Federal increment, because it must be dealt with if the project is built.

Nothing regarding this tunnel is in the authorization, but it is not known if it is in Reclamation's lands purchase agreement.

The existing condition is that the pumping plant is there. Therefore, to update the costs, the pumping plant is removed and something occurs in lieu of it, which at this point is assumed to be rehabilitating the headworks for the tunnel. This could be an unlisted item because no previous cost estimate exists for it, or it can be identified as not being in the cost estimate, or a simple appraisal estimate can be done such as for removing the PCWA facility, and a line item put in for it. Mr. Candlish prefers that the pumping plant be an unlisted item, or something that is not in the

cost estimate, to prevent creating new numbers. It has to be allowed for, but it does not need to be decided during the workshop how it is allowed for. Contingencies are not for items like this; instead, they are for unforeseen items that come up during construction. Reconstructing the Ophir Tunnel is not a contingency. The tunnel is a known feature. There was disagreement on this point. It was suggested that the solicitor be consulted

Georgetown Divide Pipeline

It was stated that the Georgetown Public Utility District (PUD) pipeline, located on the left abutment of the existing Auburn Dam site, was constructed for Georgetown's use. This pipeline was not in the original design or in cost estimates to date. It was discussed if this pipeline should be in future cost estimates. There is a connection across the spillway, which ends by the tunnel. It was concluded that both should be in the estimate. Georgetown has no contract to take water from Auburn.

River Diversion Tunnel

The site is being restored through closing off the existing river diversion tunnel with a temporary closure. The project would include opening up the tunnel during construction, and then at the end of construction, plugging it.

The diversion tunnel was good for the CG-3 dam. If the location of the dam moves upstream, the diversion tunnel would need to be extended.

Recreation use has been allowed all the way down around the tunnel and through the area. Either this area should be closed because it is a construction area, or outlets should be placed there so people are not drawn into the tunnel.

Borrow Areas

Estimates of overall quantities are probably a little off because of the cofferdam being breached. More excavation will be needed than would have been otherwise. A 100-foot hole excavated for the powerplant is all filled in. Some adjustments will need to be made for those quantities.

Material likely can be taken from upstream of the dam. No new borrow areas will be identified for this estimate. Haul distance needs to be known. Borrow areas are listed in the construction report. Borrow areas were in the upstream channel, and certain areas were specified for certain types of material. Some good quality sand was located upstream from Clementine; this sand was used for construction and was set aside for filters, etc. Many studies were likely done on quantities and availability of materials.

Water quality sampling was done at Lake Clementine, two-thirds or three-quarters of which is very shallow. USACE created this lake in the 1930s. The dam for Lake Clementine is a debris dam. Lake Clementine has a lot of sandy material. Sediment going into the lake was studied, and how long it would take for the lake to fill up (thousands of years). The plan for the dam was to use it for practice in dam demolition. It is not known if this is still viable, and who would pay for it. It was decided to allow Lake Clementine to continue to keep debris from building up at Auburn Dam. Lake Clementine Dam will be left in place like Old Melones Dam. Dam removal

would not be included in the costs. A recreation area and marina are present at Lake Clementine. The marina is not concession-operated; it's an exclusive-use facility, privately owned.

Staging Areas

Construction facilities, such as a batch plant, compressor plant (to grind up rock), power, or staging areas, do not appear in the cost estimate. An on-site office and lab would be included. It was pointed out that a government-constructed lab and offices are already there. The compressor plant was on the Knickerbocker side to keep the noise down. Rock crushing and screening were done there.

It is assumed that the project is being constructed in a similar way. It is presumed that using conventionally placed concrete rather than RCC would be included in the plan. Although conventional concrete will be used for this estimate, RCC would be included in a feasibility study. RCC estimates would be lower than estimates for conventional concrete.

Temperature could be a problem for RCC in the canyon because of high temperatures in the summer. It will be difficult to keep the aggregate and concrete at low enough temperatures to place RCC. It was suggested that John Hess be contacted on this topic. Tim Dolan in Denver also would be helpful. Several projects that used RCC were Clear Lake and Upper Stillwater.

Other smaller facilities are listed in Section 6 of the workshop notebook, from the Bechtel report. A railhead, stockpile at Highway 49, and a contractors' use area downstream were present. It is assumed that these facilities are being used for other purposes right now. These facilities could be reconstituted or redeveloped. Auburn Parks and Recreation has soccer fields on 11 acres that formerly were used for unloading railroad cars, and for storage.

Cofferdam(s)

Instead of doing design work for the cofferdam(s), costs should be included as they are now. Old cost estimates need to be reviewed to determine what was built, or not, and what needs to be rehabilitated.

A small downstream cofferdam was constructed at the site to prevent high flows out of the Diversion Tunnel from coming back into the service spillway excavation. The flood of February 1986 removed this dam.

The upstream cofferdam is more than half gone and should be rebuilt. When construction was halted in the mid 1970s and it was realized that it could be some time before it could be resumed, it was recognized that the original structure needed to be replaced with an earthfill structure with a total storage of about 120,000 acre-feet, which was then thought to provide up to about a 25-year level of protection to the downstream dam site. It was breached during the February 1986 flood and about half exists today. Borrow material for the earth filled upstream cofferdam was from the Salt Creek boat ramp and from the foundation excavation.

Construction of both upstream and downstream cofferdams are to be in the cost estimate. It should be assumed that the larger/higher upstream cofferdam would be built. Quantities for both cofferdams are in the construction report.

Replacing the upstream cofferdam with a permanent structure was considered in the late 1990s. Prices were estimated and included in a 1999 report. Major costs would have been incurred, almost \$300 million for a small permanent overflow dam at the upstream cofferdam site.

A footbridge was present for a while near the diversion tunnel. It has been removed. It was a way to cross the river during construction. The 1999 Reclamation Auburn Cofferdam-Reconstruction Appraisal Study contains additional information.

A survey triangulation system was set up by Reclamation downslope of the west abutment of the Foresthill Bridge. Its purpose was to monitor any future movement in the area where a slope failure had occurred sometime after construction. Is that embankment secure now, or has more movement occurred? Federal money was obtained for some rehabilitation work. Some slope stabilization may have been done in the past using Federal assistance to counties for upgrading bridges. Reclamation was contacted by prospective bidders to learn about this work. This work probably should not be added into the project costs.

Powerplant and Switching Facilities

These will be as defined in the 1978 design. The site was built for the switchyard.

The authorized powerplant was about 250 megawatts (MW), with the option to increase to 400 MW. With new machinery available for powerplants now, this could maybe be increased to 600 MW. A lot of water comes down from the North Fork and Middle Fork of the American River, with an outflow of water from Nimbus and Folsom dams of 2.7 MAF annually. Two-thirds of that flow comes from the North Fork and Middle Fork; flow in the South Fork is caught by Folsom. The 2.4 MAF reservoir, with an average inflow of about 2 MAF, equals a lot of water that could be handled through a powerplant. Average flow to Auburn would be 2 MAF.

The cost of bringing transmission lines to Elverta was included. Would the transmission lines be brought to Elverta now or to Roseville?

Relocations

Highway 49

For security reasons, Highway 49 cannot cross on top of the dam. The old cost estimate had costs for the Highway 49 bridge across the dam. The over-the-dam bridge cost estimate may have been documented in some letters. The total cost estimate in the 1978 report for the bridge was \$41 million. This cost need to be replaced with one not including the highway on top of the dam.

Section 6 in the workshop notebook shows some alternative alignments for Highway 49 (taken from the Bechtel report). For this report, a subappraisal cost is needed. This is a big cost item. USACE planned a road that went partway down to above gross pool for the dry dam, as opposed to a high bridge. The USACE estimate could be used for guidance. It can be decided if the estimate will be done per square foot of deck space or some other method. Bridge companies have rules of thumb for estimating costs depending on the bridge type.

Reclamation did do cost estimates for D1 and D2 alignments in the Bechtel report. It was thought that D1 went straight across the bridge below the dam. D1 actually crosses the dam for a concrete gravity design. D1 would be a placeholder. Correspondence took place between Placer County and the State on this. Costs for the road facility on the dam could be separated from the costs that bridge estimators would do for the D1 alignment, which would be downstream.

As mentioned, the least cost river crossing would be to construct an on-the-dam bridge, which cannot be accomplished today. Therefore, the least-cost alternative may be an alignment further downstream or possibly upstream, as considered for the USACE dry dam. It is important to understand, however, that no alternative river crossing alternative has been adopted.

Traffic today may require a six-lane road. For purposes of the study, the contractor will need to develop cost estimates for a bridge and relocated highway off the dam. For the special study, it is assumed that this would be a two-lane road, because Highway 49 is now two lanes in that area. In the risk and uncertainty section, it can be pointed out that two lanes may not be enough. The contractor can do the appraisal. Grades will have to meet current State standards.

Other Relocations

Road and bridge relocations were included in the original project cost. Upstream bridges would need to be relocated. This includes the No-Hands Bridge and trail that goes across it, which would need to be replaced. This was never estimated, and would need to be a new subappraisal estimate. This ties in with relocation of the other trails. Bridge contractors calculate “x” number of dollars per square foot to get a number for talking purposes.

The North Fork trail is a pedestrian bridge with a cost of \$2-3 million.

Some upstream bridges will be relocated; one is the Ponderosa, which was fixed in place. This relocation might not be in the previous estimate. If not, it can be listed as a new item, acknowledged, and noted qualitatively. Or it could be included in a road relocation plan.

Supplemental authorization was given to extend the south terminal of the Ruck-A-Chucky Bridge.

Impacts also may occur from removing Auburn Parks and Recreation from the Auburn construction office. PCWA will be moving from the maintenance area.

Recreation Facilities

Recreation facilities exist within the reservoir area, such as the Western States Trail, that weren't there before; these facilities would need to be relocated. These relocations may not need to be costed, just acknowledged in the report.

The current use of the reservoir area for recreation is probably much different than 20 years ago. For instance, Auburn Parks and Recreation has soccer fields at the Reclamation's switchyard; this lease was a temporary one. Also, goldmining, fishing, and river rafting take place, and an RV park is present. These recreation uses need to be acknowledged.

Recreation development, fish and wildlife mitigation, water quality, and water temperature need to be considered. When the project was formulated, recreation was not an authorized project purpose. Recreation is a bigger benefit now than what was originally envisioned. A lot of recreation verbiage was in the authorizing language. An agreement was required with the State before the project started to do the recreation. A good plan was done for the whole area. The recreation allocation for Folsom was about \$30 million for items such as boat ramps and swimming facilities. How recreation was set up then would not be what would happen today. Recreation needs to be reworked substantially.

Many trails will need to be relocated. Trail benefits can be shown, but no costs. A recreation plan was developed in 1978, with the reservoir in place, and a 1992 document, in addition to one being worked on currently.

Impacts to existing recreation use would be a negative benefit; it would not be considered from a cost perspective. A negative benefit will occur because something will have to be built. Cost will be in the plan for recreation development, based on the old recreation plan from 1978 (repricing this to get a cost), giving assumptions and methodologies, and stating that it might not reflect reality. The contractor can choose its own methods for this.

Cost-benefit analysis for recreation has changed dramatically since 1978; this caveat needs to be made. Qualitatively, loss of recreation such as whitewater rafting must be discussed.

Other Permanent Operating Facilities

This would include using existing construction facilities as an operating office, and maintenance yard, garages, and equipment storage yards. This should be mentioned, and design and costs would be as in the 1978 report.

Environmental Mitigation

Previous estimates of impacts and mitigation showed thinking from the 60s and 70s. In the original project, less than 1 percent of the cost was for USFWS wildlife mitigation. Costs also are available from other recent projects, including the USACE dry dam design, that are much greater. It must be determined what can be updated for costs for reasonableness. There is not enough time to develop a mitigation plan. A defensible approach is needed. Ratios from the USACE study could be used. A best estimate could be given and then state that it needs further study.

Environmental mitigation is an item that can't be drawn from the original project; it should be acknowledged that many more studies need to be done, then the approach described for the cost estimate number and caveated.

Materials will have to be hauled through Auburn either by truck or by railroad. Because the community is more developed now, more disturbance might occur from this. This would be a social affect; mitigation will be needed. Whether 24-hour haul is included in the estimate will need to be evaluated. For the original project, Reclamation had to agree to the hours materials could be brought in.

Cultural resources will be an issue. Some historic surveys have been done. An archaeology plan has been developed, and costs have been updated to implement the features of that plan. Formerly, an archaeological survey was done, resulting in an extensive report that can be found in the Folsom files. A line item on the program sheet gave the cost associated with this. Anne Peak did the work on the survey.

Wildlife lands were designated for mitigation. Mitigation for wildlife was due to inundation of 10,000 acres. Because the water drained towards the reservoir, the wildlife lands area went to the drainage divides. Safety was also an issue due to steep slopes. In addition, the wildlife area was meant to prevent developers from building such that people would be recreating close to homes. Acquiring square miles in the canyon was the mitigation for wildlife. However, USFWS didn't want a steep hillside but rather the Knickerbocker area, or even lands on the Yuba River.

The cost of any mitigation features is going to be problematic. Nothing was reconciled in the past because there was no mechanism for reconciling. The State Water Board will establish a standard for their water rights for the Water Forum.

A potential benefit attributable to Auburn Dam could be that flows along the lower American River could be further increased to enhance fish and recreation needs with the added system storage. Concern was expressed, however, that due to all the environmental issues along the American River that this potential benefit might better be just described, rather than quantified. It was cautioned that when water is captured, it is temporarily taken out of the system that had another natural uses and often it is not clear what the analysis would show. In some years, additional storage would help, and in other years it would not. A detailed analysis would be needed as part of the feasibility study.

Fish and Wildlife Enhancement

Enhancement features included downstream temperature control, water quality (settling basin), and greater flow downstream for water quality (original flow requirements at Folsom were 250 and 500 cfs; for Auburn, it went up to 1,500 cfs).

Fish enhancement was not a purpose. Increasing the fishing area was a benefit. The fishery in the American River upstream from Folsom Dam was not very good. Most of the current fishery is a result of PCWA projects. Fish enhancement is in the original authorization under Section 3, Recreation and Fish and Wildlife Enhancement. The enhancement for fish was more area for flat water fishing. The definition of enhancement for fish was different then.

The dam would create a very deep reservoir, with two and a half times the water at Folsom; this would cater to coldwater fisheries. This is either a subset of mitigation or a recreation activity.

Boating recreation at Auburn was going to be curtailed for fast boats. Part of the enhancement plan was a limit for boat speed of 5 miles per hour upstream. Faster boats would be allowed only in the bigger part of the lake.

Fish and wildlife enhancement might be better updated under the environmental mitigation section. The wildlife enhancement definition has changed (nomenclature). The scientific

community would expect an entirely different dialog than what was in the 1978 report if it was updated.

Real Estate Requirements

Acquiring some of the remaining real estate upstream would be considered. Currently, 26,000 acres have been acquired; the plan called for over 43,000 acres, so 17,000 acres have not been purchased or withdrawn. Some of that acreage may not need to be purchased – some reevaluation could occur on this. Some land at the bottom of the reservoir remain to be purchased, including a gold mine. It must be determined if any substantial land use changes have occurred within the takeline in the last 20 years, such as a subdivision being built, that would be dramatically different than what previous cost estimates showed.

When Auburn was being planned, a takeline committee was found. The rule of thumb used was if something could be seen from the far edge of a full lake, it was included in the takeline. This rule could not always be followed as such in the deep canyons. Sometimes easements were bought. Some land within the takeline is already public domain, controlled by the Bureau of Land Management and other agencies.

A lot of land already has been acquired, and it was either withdrawn or paid for, which is part of the expenditures to date. The new cost estimate would include updating the cost of acquiring remaining lands.

If ownership of parcels is unclear, it is assumed that they would need to be purchased.. Parcels with unclear ownership means the parcels may have changed, such as undergoing improvements; this would make the parcels more expensive.

Security Considerations

Although Highway 49 will not be on top of the dam for security reasons, an access road will be built for operation and maintenance as well as for security reasons.

Discussions are needed in the Special Report regarding topics such as preventing items from being thrown at transformers below, and other security issues. Costs may need to be added for bollards, pop-ups, and water barriers, etc. These design changes for security should be placed in unlisted items. These will not be big costs.

The biggest cost would be for guards, which is an annual cost that would not be included in the report.

RCC is a 24-hour operation, but because cool temperatures are needed for RCC, and summer temperatures may be very high in the canyon, work may not occur on a 24-hour basis.

Completed Facilities and Expenditures to Date

Overlook, Auburn-Foresthill Bridge, Access Roads, Project Administration Facilities, etc.

An extensive visitor facility was planned that would have had an elevator. This facility should be added to the cost estimate.

People may need access to areas that have not yet been discussed. Old roads might be in this category, or bridges such as the Ponderosa (this was a State Forest Service bridge), Iowa Hill, Ruck-A-Chucky, and Foresthill bridges. These bridges might not have been named in the 1978 report but they would have fallen under relocations.

Expenditures to Date

As of the end of Fiscal Year 2004 (September 30, 2004), direct costs for the Auburn – Folsom South Unit amounted to \$315,475,304.63. These costs do not include interest that is applicable, by law, to the functions of municipal and industrial water and power. Interest to date amounts to \$62,633,290.69. Costs of completed portions of the unit, such as Reaches 1 and 2 of the Folsom South Canal, are not included. Any new estimated project costs will have to include these direct costs. Data is taken from the CVP financial statement.

The total cost is composed of the cost of land and land rights, uncompleted construction (for the unit referred to as Construction in Abeyance), and interest during construction (IDC). The latter is computed while facilities are under construction and stops when a facility is substantially complete and transferred to plant in service. IDC is reported as a single value in the financial statement.

Costs to date are as follows:

Land and land rights	\$34,727,346.66
Uncompleted construction	218,114,667.28
IDC	62,633,290.69
Total	\$315,475,304.63

Other Elements

Other elements might include transmission lines, cell phone towers, and two radio towers (FM/AM) on the Knickerbocker side of the canyon.

A gold mine (Sleiger) near Spanish Dry Diggins is a potential point source for arsenic. If the mine is discharging hazardous fluids, such flows will have to be contained in some fashion and chemically treated or neutralized, which is usually the responsibility of the owner.

Potential Issues

Water rights were not settled. In 1970, Reclamation contracted for water to EBMUD. That water was to have been diverted from the American River into the Folsom South Canal. Reclamation had the right at that time to enter into the contract. Various parties sued EBMUD over concerns about how these increased diversions would further impact the lower American River fisheries. After years of study, in 1990 Judge Hodge reasoned (Hodge Decision) that because EBMUD had reasonable and feasible alternatives for meeting its needs, it could use the Folsom South Canal only when specified flows would remain in the river. The EBMUD board subsequently agreed to delay drawing on the American River and instead temporally turned to alternative sources

Permits are required to store water. The disposition of the water is still an issue. Questions were raised regarding whether or not the permits are still active. Other than recognizing that water rights acquisitions will be needed, water rights issues should not be included in the Special Report.

Future Actions

Merritt Rice described the following next steps in the Auburn-Folsom South Unit workshop process:

- A technical memorandum (TM) will be written summarizing a baseline project description and project features resulting from discussion during the meeting.
- Minutes of the meeting will be produced and included with the TM.

Regarding contents of the special study report, there is no time to reconsider benefits such as flood control, water, recreation, power – these benefits would be substantially greater now. Only facts should be presented in the special report. The report will include costs for today, weaknesses and strengths of the costs, and also weaknesses and strengths of the benefits.

Auburn-Folsom South Unit Central Valley Project

**Technical Memorandum
Project Description**

March 2006



U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region