FEASIBILITY REPORT ON

MIDDLE FORK
AMERICAN RIVER PROJECT

To Accompany Application of

Placer County Water Agency for

Recreational Grants Under Davis-Grunsky Act

Prepared for the
PLACER COUNTY WATER AGENCY
by
LEEDS, HILL AND JEWETT, INC.
CONSULTING ENGINEERS
SAN FRANCISCO, CALIFORNIA — OCTOBER 1964

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PLACER COUNTY WATER AGENCY

1115 HIGH STREET TELEPHONE 885-2411 AUBURN, CALIFORNIA—95603

October 14, 1964

Mr. William E. Warne, Director
Department of Water Resources
P. O. Box 388
Sacramento, California 95802

Dear Mr. Warne:

As authorized by Resolution No. 64-34, adopted by the Board of Directors of the Placer County Water Agency at its meeting of October 13, 1964, formal application is hereby made for grants under the Davis-Grunsky Act in the amount of $3,438,000 for those portions of the cost of the dams and reservoirs of the Middle Fork American River Project now under construction by the Agency which are properly allocated to recreation, and in the amount of $354,200 for the construction of water supply and sanitary facilities needed to serve the initial on-shore recreational development. Transmitted herewith is a copy of Resolution No. 64-34 and 25 copies of a "Feasibility Report on The Middle Fork American River Project to Accompany the Application of Placer County Water Agency for Recreation Grants Under the Davis-Grunsky Act," dated October, 1964, prepared by Leeds, Hill and Jewett, Inc., Consulting Engineers.

It will be noted that the requested amount of construction grant ($3,438,000) is in excess of that authorized to be granted to Placer County Water Agency by Chapter 1969 of the California Statutes of 1963. It is pointed out in the accompanying report that a construction grant in the amount requested is fully justified, and it is therefore respectfully requested that your Department, in reviewing the report, give consideration to the full amount. It is the intention of the Placer County Water Agency, through its legislative representatives, to seek authorization for a construction grant in the increased amount at the 1965 legislative session.

As indicated in the accompanying report, it is the intention of the Placer County Water Agency that on-shore recreational facilities will be available at the time the project is completed. In order that this may be accomplished, most on-shore facilities will have to be constructed during the 1965 construction season. Thus, an early review of this report by your Department would be greatly appreciated and would assure the successful accomplishment of the recreational development.

Very truly yours

PLACER COUNTY WATER AGENCY

Frank J. Paoli

Frank J. Paoli, Chairman
Board of Directors

JMB/eb

Enclosures
cc: Leeds, Hill and Jewett
Kronick, Moskovitz and Vanderlaan

C O P Y

RESOLUTION NO. 64-34 OF THE BOARD OF DIRECTORS OF THE PLACER COUNTY WATER AGENCY ADOPTING FEASIBILITY REPORT IN SUPPORT OF APPLICATION FOR GRANTS UNDER THE DAVIS-GRUNSKY ACT AND AUTHORIZING FILING OF AN APPLICATION FOR SUCH GRANTS

WHEREAS, on August 8, 1961, the Placer County Water Agency submitted to the State Department of Water Resources a request for a preliminary determination of eligibility for financial assistance under the Davis-Grunsky Act, and by a letter dated April 4, 1962, said Department of Water Resources acted favorably on said request; and

WHEREAS, a "Feasibility Report on Middle Fork American River Project to Accompany Application of Placer County Water Agency for Recreational Grants under Davis-Grunsky Act", dated October 1964, has been completed and the agency now desires to make a formal application for recreational grants under said Davis-Grunsky Act;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Placer County Water Agency that the "Feasibility Report on Middle Fork American River Project to Accompany Application of Placer County Water Agency for Recreational Grants under Davis-Grunsky Act", dated October 1964, be and the same is hereby adopted and approved, and that the Chairman of said agency, Frank J. Paoli, is authorized and directed to file said feasibility report and application for grants under the Davis-Grunsky Act in the amount of Three Hundred Fifty-Four Thousand Two Hundred Dollars ($354,200) for initial water supply and sanitary facilities and in the amount of Three Million Four Hundred Thirty-Eight Thousand Dollars ($3,438,000) for the part of the cost of construction of the dams and reservoirs properly allocated to recreation, all as supported by said feasibility report.

The foregoing resolution was duly passed and adopted by the Board of Directors of the Placer County Water Agency at a regular meeting thereof held on the 13th day of October 1964, by the following vote on roll call, to wit:

AYES DIRECTORS: Lambert, Radovich, Anderson, Briner, Paoli

NOES DIRECTORS: None

ABSENT DIRECTORS: None

Signed and approved by me after its passage this 13th day of October 1964.

Frank J. Paoli

Chairman, Board of Directors
Placer County Water Agency

ATTEST:

Evelyn Brazer

Clerk, Board of Directors
Placer County Water Agency

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October 13, 1964

Mr. Frank Paoli, Chairman
Board of Directors
Placer County Water Agency
1115 High Street
Auburn, California 95603

Dear Mr. Paoli:

We are pleased to transmit herewith our "Feasibility Report on The Middle Fork American River Project to Accompany the Application of Placer County Water Agency for Recreation Grants Under the Davis-Grunsky Act." The report contains a description of the Middle Fork Project and its associated plan for the development of the recreational potential of the Project area. The report also shows that the Middle Fork Project, with recreational features included, is engineeringly feasible, financially sound and economically justified. As such, it meets the tests of eligibility as required by the Davis-Grunsky Act and by Chapter 1969, Statutes of 1963.

Under provisions of the Davis-Grunsky Act the Project is eligible for a grant in the amount of the project construction costs properly allocated to recreation, less the costs of on-shore facilities. In the report it is shown that the total cost of constructing the Middle Fork Project, including the recreational facilities, will be $117,381,000, of which $4,537,000 are properly allocated to the recreation function. The costs of on-shore facilities will be $1,099,000. Thus, the justifiable grant under the Davis-Grunsky Act for the Placer County Water Agency would be $3,438,000. However, under the terms of Chapter 1969, Statutes of 1963, an upper limit of $3,000,000 has been placed on the amount of construction grant which can be made by the Department of Water Resources to the Middle Fork Project pending further authorization of the State Legislature.

Additional provisions of the Davis-Grunsky Act provide that the costs of water supply and sanitary facilities needed to serve the initial recreational development are eligible for a separate grant. Our report shows that a total of $354,200 will be required to construct such facilities.

We recommend that your Board adopt this report and authorize its submittal to the Department of Water Resources with formal applications for a construction grant under the Davis-Grunsky Act in the amount of $3,438,000 for project facilities and $354,200 for the water supply and sanitary facilities needed to serve initial on-shore recreational facilities.

It is further recommended that your Board initiate action to have the present limitation of $3,000,000 for a construction grant increased to $3,500,000 at the next legislative season. Finally, in order that all claim to recreational benefits may be supported, the on-shore recreational facilities should be constructed during 1965. Thus, it is required that your Board authorize immediate commencement of design and other activities preparatory to construction of on-shore facilities as set forth in the recreation plan incorporated in this report.

During the course of the investigation leading to this report, assistance was obtained from several public and private agencies. Special mention should be made of the Tahoe and El Dorado National Forests personnel who were especially cooperative during the course of this investigation. Regional forest service officers in San Francisco also provided assistance when requested. The California Department of Water Resources, California Department of Fish and Game, California Division of Beaches and Parks, California Division of Small Craft Harbors, the Placer County Recreation Commission, the Agency's consultants, McCreary-Koretsky Engineers, Kronick, Moskovitz & Vanderlaan, attorneys at law, and Stone & Youngberg, financial consultants, also provided all services requested of them. Doctor Andrew Trice, consulting economist, reviewed various economic matters in this report in its early stages. The help of these agencies, organizations and individuals is gratefully acknowledged.

It has been a pleasure to be of service to the Placer County Water Agency. If we can be of any assistance to the Agency during the processing of its formal application to the Department of Water Resources, we will be happy to do so.

Sincerely yours

Walter G. Schulz

WALTER G. SCHULZ

Harvey O. Banks

HARVEY O. BANKS

1. INTRODUCTION

The following section describes the purposes of this report, and introduces the Placer County Water Agency and the Middle Fork American River Project.

Purpose and Scope of Report

There is presented in this report information that will permit the Department of Water Resources, State of California, to evaluate applications of the Placer County Water Agency for grants pursuant to the Davis-Grunsky Act, Sections 12880-12898 of the California Water Code, for its Middle Fork American River Project.

Two separate grants are applied for: one for that part of the construction cost of the Project's dams and reservoirs properly allocable to the recreation functions, and the other for the construction of initial water supply and sanitary facilities needed for public recreation use at those dams and reservoirs. The amount requested under the recreation grant is $3,438,000, while that for water supply and sanitary facilities amounts to $354,200.

A showing of eligibility of the Agency and its Project to receive the grants, and of the engineering feasibility, economic justification, and financial feasibility of the Middle Fork American River Project is made herein. In addition, a Project cost allocation is presented, and the plan proposed by the Agency for the development and operation of the recreational features of the Project is described.

Supplementary Reports

Copies of studies and reports containing supplemental data pertinent to the evaluation of the Agency's grant request have been forwarded to the Department of Water Resources as follows:

"Report on Projections of Demand for Water in Western Placer County," by Leeds, Hill and Jewett, Inc., Consulting Engineers, October 1962.

"Report on Availability of Water from the American River," by Leeds, Hill and Jewett, Inc., Consulting Engineers, December 1962.

"Middle Fork American River Project Operation Studies," by McCreary-Koretsky Engineers, February 1963.

"Placer County Water Agency Middle Fork American River Project Specification No. 63-101" (Project plans and specifications prepared by McCreary-Koretsky Engineers)

"Official Statement Relating to $115,000,000 Middle Fork Project Revenue Bonds, Series A", by Stone and Youngberg and Blyth and Co., Inc., 1963

The Placer County Water Agency

Formation and General Purposes

The Placer County Water Agency was created by special act of the Legislature of the State of California in 1957. The Agency includes all of Placer County.

The purpose of the Agency is to develop water resources for present and future beneficial use within the County through the development of hydroelectric energy, control of flood and storm waters, and conservation of flood and storm waters. The Agency may obtain water from any source within or without the County.

Governing Board and Powers

The Board of Supervisors of Placer County is ex officio the Board of Directors of the Agency, and county officers are also ex officio officers of the Agency. These include the district attorney, county surveyor, county assessor, county tax collector, county auditor, and the county treasurer.

The powers of the Agency are broad and include the right to acquire or construct, hold, and use real and personal property of any kind necessary to carry out the objects or purposes of the act and to issue bonds to finance works of the Agency.

The governing board has the authority in any year to levy ad valorem taxes not to exceed $0.10 per $100 assessed valuation on all taxable property to carry out the objectives and purposes of the act of common benefit in the Agency. The Agency may also levy ad valorem taxes on all taxable property up to a maximum of $0.50 per $100 assessed valuation in any zone or zones, to pay the cost of carrying out the purposes of the act on behalf of such zone or zones. Taxes levied by the Agency are collected together with taxes for other county purposes. Placer County's current assessed valuation is some $153 million.

The Middle Fork American River Project

The Placer County Water Agency, as a first step toward meeting its assigned responsibilities, has undertaken a development known as the Middle Fork American River Project.

The first stage of construction includes water conservation and conveyance units in the high mountains, power plants, and diversion facilities at Auburn to convey water to western Placer County. It also includes the necessary lands and roads. The second stage will comprise additional distribution and terminal storage facilities in western Placer County that will be constructed in a manner required to satisfy the future growth of demand for water. Unless specified otherwise, the title "Middle Fork Project" as used hereinafter in this report will refer to only the first stage development of the Middle Fork American River Project.

For purposes of this report, the water and power features, together with the necessary lands, roads and trails, which are now being constructed are referred to as major project features, as differentiated from the on-shore recreation features. The major features of the Project are described in the following paragraphs.

Water and Power Facilities

The Middle Fork Project, as its name implies, is a development of the Middle Fork of the American River and its tributaries which, through a series of gravity diversions, reservoirs, tunnels and power plants will store about 340,000 acre-feet and provide 190,700 kilowatts of dependable hydroelectric capacity. Locations of the major facilities of the Project are shown on Plate I-A. Construction was commenced in July, 1963 and is scheduled for completion in 1967.

The Project has two major reservoirs: French Meadows Reservoir on the Middle Fork of the American River, with a capacity of 132,500 acre-feet, and Hell Hole Reservoir on the Rubicon River, with a capacity of 207,000 acre-feet. The Project has six tunnels, the combined length of which is more than 24 miles. The Project has four power plants: French Meadows (12,900 KW dependable capacity), Middle Fork (98,000 KW), Ralston (75,600 KW), and Oxbow (4,200 KW). It is anticipated that initial power deliveries will be made by July, 1966.

The Project also includes the pumps and other diversion works near Auburn necessary to lift water to a tunnel which will discharge into Auburn Ravine from whence it will be diverted and transported into western Placer County and beneficially used for agricultural, industrial and municipal purposes.

The uppermost dam on the Project will be located on Duncan Creek at an elevation of approximately 5,265 feet, where water will be diverted by gravity flow through the Duncan Creek Tunnel to French Meadows Reservoir on the Middle Fork of the American River. The waters of the Middle Fork as regulated in French Meadows Reservoir together with water diverted from Duncan Creek will flow through the French Meadows Tunnel to the French Meadows power plant, located on the north side of Hell Hole Reservoir. These facilities are referred to herein as the French Meadows complex.

Hell Hole Reservoir, on the Rubicon River, will be four miles southeast of French Meadows Reservoir. It will store and reregulate water from the French Meadows power plant, and impound the waters of the Rubicon River. Water from the north and south forks of Long Canyon Creek will be diverted by two small dams into a pipeline which will discharge into the Middle Fork Tunnel. The Middle Fork Tunnel will convey water from Hell Hole Reservoir to the Middle Fork power plant located on the Middle Fork American River about twelve miles downstream from French Meadows Reservoir. These facilities are referred to as the Hell Hole complex.

The Interbay Dam will be located about 4,000 feet downstream from the Middle Fork power plant and will serve to redivert water into the Ralston Tunnel leading to the penstock for Ralston power plant on the Rubicon River about one-half mile upstream from its confluence with the Middle Fork of the American River.

The Ralston Afterbay Dam will be located on the Middle Fork about 7,800 feet downstream from the Ralston power plant to reregulate water discharged by that plant. A small power plant (Oxbow) will be provided a short distance below the Afterbay to utilize the available head between the Ralston power plant and the maximum water surface elevation of the proposed Auburn Reservoir, an additional feature of the Central Valley Project.

The Auburn Ravine diversion works will be situated about thirty miles downstream from the Oxbow power plant at the approximate location of the proposed Auburn Dam. Until Auburn Dam is constructed, pumping will be required to divert water from the river into western Placer County, and the necessary facilities for this purpose are included in the initial construction plan. However, after the Auburn Reservoir becomes operative, the Agency's water can be diverted by gravity directly from the Auburn Reservoir into the Auburn Tunnel for service to western Placer County. The present target date for construction of the Auburn Dam is 1975.

Water and power facilities of the Middle Fork Project are listed in Table 1-A, and are shown on Plate I-A.

TABLE 1-A

Placer County Water Agency
Middle Fork American River Project

WATER AND POWER FACILITIES

	Capacity (Acre Feet)	Maximum Elevation (Ft. Above Sea Level)
Dams		
Duncan Creek Diversion	20	5,262
French Meadows	132,500	5,260
Hell Hole	207,000	4,630
N. Fork Long Canyon Diversion	2	4,716
S. Fork Long Canyon Diversion	10	4,640
Interbay	132	2,529
Ralston Afterbay	2,700	1,179
TOTAL (Rounded)	342,000	

	Dependable Capacity (K.W.)	H.P. Installed
Power Plants		
French Meadows	12,900	24,000
Middle Fork	98,000	164,000
Ralston	75,600	106,000
Oxbow	4,200	8,800
TOTAL	190,700	302,800

	Length (ft.)	Capacity (cfs)
Tunnels		
Duncan Creek	7,880	400
French Meadows	13,613	400
Middle Fork	55,034	836
Ralston	35,326	836
Oxbow	403	1,000
Auburn	15,757	375
TOTAL (Rounded)	128,000	

	Capacity (cfs)
Pumping Plant Auburn	50

Note: Data provided by McCreary-Koretsky Engineers.

Lands

Most of the lands physically affected by the Project are owned by the United States Government and are under the jurisdiction of the United States Forest Service. Placer County Water Agency has acquired title or easements to all private lands needed for Project purposes, and has obtained special use permits from the Forest Service for Project construction on Federal lands. Project boundaries are 200 feet above high water at all reservoirs. In the vicinity of French Meadows and Hell Hole Dams additional area has been acquired for Project purposes.

The pattern of post-Project land ownership, except tunnel easements, is shown on Plate 1-B.

Roads and Trails

A memorandum of understanding between the Forest Service and Placer County Water Agency for the conduct of work on the Middle Fork American River Project contains stipulations and conditions to be imposed on the Agency, pursuant to its Federal Power Commission license, as consideration for its use and occupancy of National Forest lands. Some of these conditions apply to roads and trails in the Project area.

In accordance with these requirements the relocation of the existing county road through French Meadows will be accomplished by provision of a roadway around the southern shore of the reservoir. The roadbed will be at least 28 feet wide with a 22-foot wide surfacing and a maximum grade of 7 per cent.

Access to the Duncan Creek Diversion will require construction of a road 16 feet in width, with ten-foot wide turnouts 100 feet in length and spaced approximately 500 feet apart. The maximum grade will be 12 per cent.

Access to Hell Hole Reservoir from Long Canyon is to be provided by a 28-foot wide, paved, road with a nominal maximum grade of 7 per cent. Access to the Ralston Afterbay will be to the same standards as the Duncan Creek road, while standards for access to the Interbay will be similar except that roadbed widths will be 14 feet and maximum grades will be 15 per cent. The memorandum of understanding stipulates that a 20-car public parking area will be provided at Ralston Afterbay.

The existing main access road from Foresthill to Long Canyon via French Meadows and French House will be improved, with the final roadway having a width of 22 feet.

It is also stipulated in the memorandum of understanding that the Agency will replace the portions of the Lagoon and Hell Hole trails which will be inundated by Hell Hole Reservoir. The replacement will consist of a trail along the south shore of the reservoir, beginning at Hell Hole Dam, circling the upstream end of the reservoir, and connecting with an existing trail on the north shore. The Agency must also replace that portion of the McGuire Trail which will be inundated by French Meadows Reservoir by constructing a trail across the dam which will connect with existing trails. In addition, the Agency has agreed to build a new foot trail along the north shore of French Meadows Reservoir commencing at point where the existing road in the reservoir leaves the inundated area and terminating at the existing McGuire Trail. The effect of these trail requirements will be to provide foot access completely around both French Meadows and Hell Hole Reservoirs.

The location of permanent roads and trails which must be constructed as part of the Project are shown on Plate 1-A.

2. ENGINEERING FEASIBILITY OF THE MIDDLE FORK PROJECT

The following section presents information which establishes the engineering feasibility of the Middle Fork American River Project.

In this chapter it will be shown that the Middle Fork Project can be designed, constructed, and operated, and thus meet the tests for engineering feasibility. The discussion herein relates to the major project features described in the previous chapter. Engineering feasibility of recreation facilities will be discussed separately in a following chapter.

Engineering Design

The design of the physical features of the Middle Fork American River Project has been carried out by McCreary-Koretsky Engineers (MKE) of San Francisco, consultants to the Placer County Water Agency. This firm has been in charge of Project formulation and design from its inception. (A complete set of the Project plans and specifications prepared by MKE has been made available to the Department of Water Resources as supplementary data to accompany the Agency's request for a Davis-Grunsky grant).

The State Supervisor of Dams, by letter dated February 5, 1963, approved the plans and specifications for construction of Project dams.

Project Construction

The Middle Fork Project has received all necessary construction approvals. On March 1, 1963, the Federal Power Commission issued a license to the Placer County Water Agency for construction of the Middle Fork Project. The Middle Fork Project is Federal Power Commission Project 2079. The Agency had previously (September 18, 1962) negotiated a Memorandum of Understanding with the United States Forest Service for use of National Forest lands needed for the Project. This Memorandum has been discussed previously in the description of roads and trails.

In March, 1963, the Agency accepted the low bid for construction of the Project submitted by American River Constructors, (ARC), a joint venture of Henry J. Kaiser Company; Perini Corporation; Morrison-Knudsen Company, Inc.; Macco Corporation; Richard Costain Limited; and Enterprises Campenon Bernard. Construction of the Project is under way and the completion of all elements necessary for the production of power is scheduled on or before September 1, 1966, with the entire Project to be completed no later than July 1, 1967. French Meadows and Hell Hole Dams are scheduled for completion by November 15, 1964, and November 15, 1965, respectively.

Project Operation

In order to demonstrate that the proposed method for operating the Middle Fork Project is engineeringly feasible, it must be shown that a market exists for the water and power developed by the Project, that there is sufficient water available, that the Agency has title to the water, and that the Project can be operated as proposed.

Demand for Water and Power

A separate study and report has been made of the future water requirements of Placer County. This report, entitled "Report on Projections of Demand for Water in Western Placer County," was prepared by Leeds, Hill and Jewett, Inc., in October 1962. The report contains the material presented before the State Water Rights Board in May and July 1962 in support of the Agency's water rights applications. (Copies of this report have been submitted to the Department of Water Resources as supplementary data to accompany the Agency's request for a Davis-Grunsky grant). In this report, it is shown that the need for imported water in western Placer County service area will increase from an estimated 8,000 acre feet in 1970 to almost 300,000 acre feet in the year 2020. The overall demand for water in the service area is projected to be 476,000 acre feet by 2020. The projections are discussed in more detail in the chapter of this report dealing with Economic Justification of the Middle Fork Project.

The existence of a demand for the power to be generated as part of the Project operations is shown by the agreement between Pacific Gas and Electric Company (PG & E) and the Placer County Water Agency for the sale of all Project power. (A copy of this agreement is included in the "Official Statement Relating to $115,000,000 Middle Fork Project Bonds, Series A" by Stone and Youngberg and Blyth and Co., Inc., a copy of which has been submitted to the Department of Water Resources.).

Availability of Water

Among the many water projects, both existing and proposed, in the American River Basin are those of the United States Bureau of Reclamation, the Sacramento Municipal Utility District, the City of Sacramento, the Carmichael Irrigation District, and the San Juan Suburban Water District. The Middle Fork American River Project must be operated compatibly with these, and must also satisfy conditions imposed by the State Water Rights Board for meeting fish release, Delta salinity control, and Delta consumptive use requirements.

The operation of the Project in consideration of these matters has been the subject of exhaustive study and negotiation between the Agency and the other interested parties, and is summarized in a report entitled "Report on the Availability of Water from the American River," by Leeds, Hill and Jewett, Inc., December 1962. (Copies of this report have been submitted to the Department of Water Resources as supplementary data to accompany the Agency's request for a Davis-Grunsky grant). The data compiled in this report were also a part of the Agency's testimony before the State Water Rights Board.

In that report it was shown that coordinated operation of the Middle Fork Project and the Bureau of Reclamation's Folsom Reservoir could provide:

1. Mandatory downstream releases of 319,000 acre feet annually for American River water rights, fish preservation, and Delta consumptive use and salinity control,

2. Contractual obligations of 68,000 acre feet annually for settlement of prior rights by the Bureau of Reclamation,

3. Permitted rights of 245,000 acre feet annually for the City of Sacramento,

4. Contractual commitments of 150,000 acre feet annually for Central Valley Project customers,

5. Folsom South Canal normal year requirements of 440,000 acre feet, and

6. A yield of 120,000 acre feet annually from the Middle Fork Project for diversion to Western Placer County.

By letters dated February 23, 1962 and July 16, 1962, the Bureau of Reclamation gave tacit approval to these conclusions, and indicated its intention to negotiate an agreement with the Agency on this basis. (See Appendix B to the "Report on the Availability of Water from the American River").

Water Rights

On January 10, 1963, the California State Water Rights Board issued Permits 13855, 13856, 13857 and 13858 pursuant to its Decision D-1104, adopted November 21, 1962, which had approved Placer County Water Agency Applications 18084, 18085, 18086 and 18087. These permits authorized the Agency to store each year up to 133,700 acre feet of water in the French Meadows Reservoir, and up to 208,400 acre feet in the Hell Hole Reservoir for later use in generating hydroelectric power and for consumptive use thereafter in the service area in western Placer County in accordance with agreements with the United States Bureau of Reclamation. The permits also authorize the direct diversion of natural stream flow up to the full generating capacity of the various hydroelectric power plants in the Project.

The permits issued by the Board were contingent upon the agreement between the Placer County Water Agency and the California Department of Fish and Game. This agreement, among other things, sets forth minimum reservoir storages and downstream releases to be maintained by the Agency at the various dams of the Middle Fork Project. The conditions to be maintained as part of this agreement are summarized in Tables 2-A and 2-B.

Project Operation Studies

Final Project operation studies were prepared by McCreary-Koretsky Engineers and presented in a report dated February, 1963. (Copies of this report have been submitted to the Department of Water Resources as supplementary data to accompany the Agency's request for a Davis-Grunsky grant). These operation studies indicate that, within the limitations of the water rights permits and the existing and proposed agreements with the Bureau of Reclamation, the Middle Fork Project can be operated to meet its objectives.

TABLE 2-A

Placer County Water Agency
Middle Fork American River Project

MINIMUM ALLOWED RESERVOIR STORAGES
PERMITTED UNDER AGREEMENT BETWEEN
PLACER COUNTY WATER AGENCY AND
CALIFORNIA DEPARTMENT OF FISH AND GAME

	Storage, Acre Feet	
Wet Year 1/	June - Sept. 30	Oct. - May 31
French Meadows	60,000	50,000
Hell Hole	70,000	50,000
Duncan Creek Diversion	5,259*	5,259*
Dry Year 2/		
French Meadows	60,000	25,000
Hell Hole	70,000	25,000
Duncan Creek Diversion	5,259*	5,259*
Critical Year 3/		
French Meadows	28,000	8,700
Hell Hole	26,000	5,500
Duncan Creek Diversion	5,259*	5,259*

1/ Forecasted water-year inflow to Folsom Reservoir more than 2,000,000 acre-feet.

2/ Forecasted water-year inflow to Folsom Reservoir between 2,000,000 and 1,200,000 acre-feet.

3/ Forecasted water-year inflow to Folsom Reservoir less than 1,200,000 acre-feet.

* Water surface elevation, not storage.

TABLE 2-B

Placer County Water Agency
Middle Fork American River Project

MINIMUM STREAM FLOW RELEASES REQUIRED UNDER AGREEMENT BETWEEN PLACER COUNTY WATER AGENCY AND CALIFORNIA DEPARTMENT OF FISH AND GAME

DAM	Minimum Release, cfs	
	Normal Year 1/	Dry Year 2/
Duncan Creek Diversion	8*	4*
French Meadows	8	4
Hell Hole Dam		
June 1 - July 25	20	8
July 26 - August 5	15	8
August 6 - October 31	10	8
November 1 - December 31	14	8
January 1 - January 31	14	6
February 1 - March 25	20	6
March 26 - May 31	20	8
South Long Canyon Diversion	5*	2.5*
North Long Canyon Diversion	2*	2*
Interbay Dam	23*	12*
Ralston Afterbay Dam 3/	75	75
Auburn Diversion	75	75

1/ Forecasted water year inflow to Folsom more than 1,000,000 acre feet.

2/ Forecasted water year inflow to Folsom less than 1,000,000 acre feet.

3/ Measured below confluence of Middle Fork and North Fork of the Middle Fork.

* At times when required minimum release is greater than natural flow, only natural flow must be released.

3. RECREATION PLAN FOR THE MIDDLE FORK PROJECT

This chapter describes the demand for recreation expected to accompany construction of the Middle Fork American River Project, the plan proposed by the Placer County Water Agency for facilities to meet the demand, and the costs associated with recreational facilities.

Potential Demand for Recreation Under Project Conditions

The method used to predict the potential demand for recreational facilities in the Middle Fork Project area is described in this section. It is not anticipated that there will be enhancement of recreation in the western portion of Placer County, even though the Middle Fork American River Project will deliver water to that area. Recreation planning associated with the Project has been limited to the portion of Placer County east of the longitude of Auburn.

Factors Affecting Demand

The area of major recreational impact of the Middle Fork American River Project has the natural Sierra Nevada features that are so attractive to those seeking outdoor recreation. The headwaters of the Middle Fork American River are on the western slopes of Granite Chief Mountain which reaches an elevation slightly over 9,000 feet. The summits of other mountains in the watersheds of the Middle Fork and Rubicon Rivers exceed 8,000 feet in elevation. In many places the river canyons have been incised more than 1,000 feet below the general level of the surrounding country. These steep, rugged canyons are both an attraction and a detriment to recreation in the area - the attraction being the general beauty and massiveness of the topography, and the detriment being the difficult problems of access imposed by the terrain. In the French Meadows and Hell Hole areas there are extensive areas of heavily forested lands interspersed with rugged granites and volcanics typical of the Sierra Nevada. The main access road to the French Meadows area passes by the Placer County Grove of Sierra Redwoods, the northern most grove of such trees in the Sierra.

The climate within the Project area is typical of the mountain areas in the Sierra Nevada. It is mostly in the Transition life zone but blends into the Alpine zone in the high peaks. The approaches to the area are typically Upper Sonoran. The general recreational season in the higher project area will extend for about 100 days, from mid-June through mid-September. Precipitation usually occurs as snow in the winter at the higher reservoirs on the Project and remains on the ground until spring and early summer on occasion. No snow measurements are available. Precipitation is heavy as measured at Foresthill Ranger Station and averages about 49.88 inches, of which 97 per cent falls during the months of October through May. The summer recreation season is warm and dry, but may be interrupted by occasional thunder showers.

It is to be expected that the natural attractions of the project area to recreationists will be enhanced by the Middle Fork Project. The reservoirs that will be created as part of the Project will attract those persons who enjoy clear blue mountain lakes and the Sierra Nevada surroundings. It is expected that most recreational development will center about French Meadows Reservoir. This will not only be the largest lake in the Project, but will have the least average drawdown during the recreation season (23 feet) of either water storage reservoir. Hell Hole Reservoir will also be attractive with its surface area when full of about 1300 acres. Its recreation season drawdown will be about 42 feet. The smaller reservoirs - Duncan Creek, South Fork Long Canyon Creek, and Ralston Afterbay - are also expected to be attractive to recreationists. The Project, through the construction and improvements of roads and trails, will facilitate access to this area. Reservoir operating characteristics for the recreationally significant reservoirs on the Middle Fork Project are shown in Table 3-A.

TABLE 3-A

Placer County Water Agency
Middle Fork American River Project

RESERVOIR OPERATING CHARACTERISTICS

Reservoir	Maximum Water Surface Elevation, Feet	Maximum Water Surface Area, Acres	Maximum Length of Shoreline, Miles	RECREATION SEASON CHARACTERISTICS		
				Average Mid-June Elevation, Feet	Average Mid-Sept. Elevation, Feet	Average Drawdown, Feet
French Meadows	5260	1430	9	5246	5223	23
Hell Hole	4630	1250	11	4592	4550	42
Duncan	5262	1	-	5260	5260	0
South Fork Long Canyon Creek Diversion	4640	1	-	4637	4637	0
Ralston Afterbay	1179	30	3	--	--	*

* Ralston Afterbay operated to minimize fluctuations in river below dam; seasonal fluctuation not significant.

Existing Recreational Developments and Usage

A limited amount of recreational development has already taken place in the Project area such as at French Meadows where the Forest Service has constructed and operates five campgrounds. Also, camping and picnicking take place along the rivers and at various locations throughout the area at undeveloped camp sites. The generally poor access into the area, prior to construction of the Project, has limited the amount of use. The 1962 level of use at French Meadows was approximately 6,000 visitor days according to estimates made by Tahoe National Forest. Estimated angler use along the two miles of streams immediately below the proposed Project facilities is estimated at about 650 angler-days per year under present, non-project conditions.

Estimated Potential Demand

The potential demand for recreation on the Middle Fork American River Project has been estimated in two parts: (1) the demand for recreation that will develop in the upper reaches of the Project, referred to herein as the "French Meadows-Hell Hole area" and (2) the demand for recreation that will develop in the area between Auburn and the French Meadows-Hell Hole area, referred to herein as the "downstream area".

The potential demand for recreation facilities in the French Meadows-Hell Hole area after completion of the Middle Fork Project has been estimated by comparison with recreational use at similar reservoirs. For this purpose, data for Sly Park, Ice House and Spaulding Reservoirs were used since they are similar in location, in distance from population centers, and in the availability of facilities to be comparable to the proposed French Meadows and Hell Hole Reservoirs.

The 1963 visitation records at Sly Park, Ice House, and Lake Spaulding were studied in order to determine the distribution of visitors to these facilities according to their area of residence. The relationships brought out by these studies were then modified on the basis of judgment in order to establish a pattern for the French Meadows-Hell Hole area. (The distribution occurring at Sly Park, Ice House, and Lake Spaulding is described in the more detailed discussion of visitation in the section of this report on recreation benefits.) The adopted pattern indicates that 10 per cent of the overnight visitors to the French Meadows-Hell Hole area will reside in southern California, 20 per cent in the Bay Area, 40 per cent in Sacramento and Yolo Counties, 17 per cent in Placer County, and smaller percentages in other locations.

Recreational use at the Sly Park development was increased from essentially zero to about 70,000 visitor days annually within four years after completion of that project. The increase might have been even greater had more adequate facilities been provided. As indicated previously, present recreation use in the French Meadows-Hell Hole area amounts to about 6,000 visitor days per year. Based on the experience at Sly Park, it is anticipated that on completion of the Project reservoirs, and provision of adequate camping and boating facilities, there will be a large influx of recreationists to the area which will result in some 90,000 visitor days of overnight and one-day use by the year 1970.

The areas of residence for the expected 90,000 visitor days of use were distributed in accordance with the modified pattern resulting from the study of Ice House, Sly Park and Lake Spaulding. It should be noted that any difference in the residence pattern between one-day and overnight visitors was not considered in the analysis. It is felt that this simplification would not introduce error since day use will represent only a minor part of the total future visitation in the French Meadows-Hell Hole area.

The predicted 1970 population for each area of residence was taken from projections made in September 1960 by the Department of Water Resources, Division of Resources Planning. The population of each residence area was divided into the predicted visitation from that area, resulting in a predicted 1970 unit visitation (visitor days per capita) for each country group. These computations are shown in Table 3-B.

The assumption was then made that the unit amount of visitation to the French Meadows-Hell Hole area from each area of residence would increase in the future at the same rate as that predicted for overall statewide outdoor recreation use of state parks, national parks, and national forests in California. Table 3-C, taken from unpublished data obtained from the California Department of Water Resources, shows these predictions by decades for such unit outdoor recreation use.

The figures derived for 1970 unit visitation and set forth in Table 3-B were increased by the ratios shown in Table 3-C to arrive at predicted unit values in future years. These computations are shown in Table 3-D.

TABLE 3-B

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1970 UNIT VISITATION TO FRENCH MEADOWS-HELL HOLE AREA WITH THE PROJECT FOR VARIOUS AREAS OF RESIDENCE

Area of Residence	Predicted Distribution of Visitation to French Meadows-Hell Hole Area 1/ (Per Cent)	Predicted 1970 Visitation (Visitor Days)	Projected 1970 Population 2/	Predicted 1970 Visitor Days per Capita
Southern California	10	9,000	13,191,000	0.000684
Bay Counties	20	18,000	4,950,000	0.00364
San Joaquin County	3	2,700	335,000	0.00807
Sutter-Yuba Counties	3	2,700	78,000	0.0346
Sacramento-Yolo Counties	40	36,000	812,000	0.0443
El Dorado County	3	2,700	42,000	0.0619
Nevada County	2	1,800	22,000	0.0818
Placer County	17	15,300	81,000	0.189
All Other	2	1,800	2,189,000	0.000822
Total	100	90,000	21,700,000	

1/ Based on 1963 visitation to Sly Park, Ice House, and Spaulding Reservoirs.

2/ From population projections made by Department of Water Resources.

TABLE 3-C

Placer County Water Agency
Middle Fork American River Project

PREDICTED RECREATION USE OF STATE PARKS, NATIONAL PARKS, AND NATIONAL FORESTS IN CALIFORNIA

Year	Visitor Days per Capita	Percentage of 1970 Use
1970	3.57	100
1980	4.34	121
1990	5.11	143
2000	5.88	165
2010	6.65	186
2020	7.42	208

The unit visitation values thus derived were applied to the aforementioned population projections made by the Department of Water Resources to obtain the predicted total potential recreation demand in the French Meadows-Hell Hole area. These computations are set forth in Table 3-E. It can be seen that the anticipated demand reaches about 640,000 visitor days of use by the year 2020.

For purposes of this report, "downstream" use has been taken as that picnicking, hiking or other outdoor activity associated with improved access to the Rubicon and Middle Fork American Rivers brought about by construction of the Middle Fork Project. Most of this recreation will be in the vicinity of the Interbay and Ralston Afterbay, with the greatest portion centered about the latter location. Ralston Afterbay will be a lake approximately two miles in length situated at the confluence of the Middle Fork and Rubicon Rivers. It will only be 32 miles from Auburn and should provide a great attraction for persons on sight-seeing trips, or other one day excursions. Access to the Interbay will be limited since the general public will not be allowed to drive cars down the steep grade from Mosquito Ridge Road to the dam. However, fishermen willing to walk the five miles each way could use this remote stretch of river. Heretofore, there had been no means of public access.

TABLE 3-D

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1980-2020 UNIT VISITATION
TO FRENCH MEADOWS-HELL HOLE AREA
WITH THE PROJECT FOR VARIOUS AREAS OF RESIDENCE

Residence (a)	Predicted 1970 Visitor Days per capita (b)	1980 =1.21x(b) (c)	1990 =1.43x(b) (d)	2000 =1.65x(b) (e)	2010 =1.86x(b) (f)	2020 =2.08x(b) (g)
Southern California	0.000684	0.000828	0.000978	0.00113	0.00127	0.00142
Bay Counties	0.00364	0.00440	0.00520	0.00601	0.00677	0.00757
San Joaquin Co.	0.00807	0.00976	0.0115	0.0133	0.0150	0.0168
Sutter-Yuba Co.	0.0346	0.0419	0.0495	0.0571	0.0644	0.0720
Sacramento-Yolo Co.	0.0443	0.0536	0.0633	0.0731	0.0824	0.0921
El Dorado Co.	0.0619	0.0749	0.0885	0.102	0.115	0.129
Nevada Co.	0.0818	0.0990	0.117	0.135	0.152	0.170
Placer Co.	0.189	0.229	0.270	0.312	0.352	0.393
All Other	0.000822	0.000995	0.00118	0.00136	0.00153	0.00171

TABLE 3-E

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1970-2020
POTENTIAL RECREATIONAL DEMAND ON MIDDLE FORK PROJECT
FROM VARIOUS AREAS OF RESIDENCE

Area of Residence	1970			1980			1990		
	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days
Southern California	13,191	0.68	9,000	16,958	0.83	13,900	20,066	0.98	19,500
Bay Counties	4,950	3.64	18,000	6,310	4.40	27,800	7,715	5.20	40,200
San Joaquin	335	8.07	2,700	470	9.76	4,600	640	11.5	7,400
Sutter-Yuba	78	34.6	2,700	103	41.9	4,300	147	49.5	7,300
Sacramento-Yolo	812	44.3	36,000	1,146	53.6	61,300	1,579	63.3	100,100
El Dorado	42	61.9	2,700	62	74.9	4,600	86	88.5	7,600
Nevada	22	81.8	1,800	27	99.0	2,700	34	117.	4,000
Placer	81	189.	15,300	118	229.	27,000	170	270.	45,900
All Other	2,189	0.82	1,800	3,006	0.99	3,000	4,563	1.18	5,300
Total			90,000			149,200			237,300

TABLE 3-E (Cont'd)

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1970-2020
POTENTIAL RECREATIONAL DEMAND ON MIDDLE FORK PROJECT
FROM VARIOUS AREAS OF RESIDENCE

Area of Residence	2000			2010			2020		
	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days	Projected Population (Thousands)	Visitor Days per Thousand	Demand, Visitor Days
Southern California	23,253	1.13	26,000	26,155	1.27	33,200	28,700	1.42	40,900
Bay Counties	9,145	6.01	54,900	10,515	6.77	71,200	11,800	7.57	89,200
San Joaquin	810	13.3	10,800	995	15.0	14,900	1,220	16.8	20,500
Sutter-Yuba	206	57.1	11,700	270	64.4	17,400	348	72.0	25,000
Sacramento-Yolo	1,989	73.1	145,200	2,423	82.4	199,700	2,914	92.1	268,100
El Dorado	113	102.	11,500	140	115.	16,100	168	129.1	21,700
Nevada	43	135.	5,800	56	152.	8,500	74	170.	12,600
Placer	228	312.	71,100	291	352.	102,400	374	393.	147,000
All Other	6,213	1.36	8,400	8,155	1.53	12,400	10,332	1.71	17,600
Total			345,400			475,800			642,600

Downstream recreation demand has been estimated as 10 per cent of the total recreation demand projected for the French Meadows-Hell Hole area. This estimate, which is deliberately low, is based on the consideration that only publicly-owned lands in the vicinity of these two reservoirs will be available for general use. There is considerable private land in close proximity to both the Ralston Afterbay and the Interbay on which public trespass has not been restricted in the past. However, the Placer County Water Agency does not intend to obtain assurances that such entry will be allowed during the next fifty years. Thus, no account is taken of the increased recreational use that might take place on these private lands as a result of the construction of the Middle Fork Project. A total of six miles of stream channel in the vicinity of these two reservoirs in public ownership has been included as being in the downstream area.

Combining the downstream potential demand with that for the French Meadows-Hell Hole area indicates that total demand for recreation in the Project area after completion of the Middle Fork Project will increase from about 99,000 visitor days in 1970 to 707,000 visitor days by the year 2020. The total expected potential demand on the Middle Fork Project is summarized in Table 3-F.

TABLE 3-F

Placer County Water Agency
Middle Fork American River Project

TOTAL POTENTIAL DEMAND FOR RECREATION
WITH THE PROJECT

Year	French Meadows-Hell Hole Demand, Visitor Days	Downstream Demand, Visitor Days	Total Demand, Visitor Days
1970	90,000	9,000	99,000
1980	149,200	14,900	164,100
1990	237,300	23,700	261,000
2000	345,400	34,500	379,000
2010	475,500	47,600	523,100
2020	642,600	64,300	706,900

Facility Requirements

The total potential demand which the Agency expects to accommodate, and the composition and nature of the recreation anticipated in the Project area is described in this section. Planning standards used in formulating a recreation plan for the Project, and the number of facilities required by use of these standards are defined.

Portion of Demand to be Accommodated

The Placer County Water Agency proposes to provide on-shore recreation facilities which will accommodate a major portion of the potential demand. It does not expect to satisfy the entire potential demand since there are other agencies able to supply recreational facilities in the area.

In the French Meadows-Hell Hole area, the Agency proposes to accommodate about 345,000 visitor days of use which is the amount expected to occur in the year 2000. Facilities needed to serve this visitation will be constructed in increments as the demand increases. Studies indicate that the most desirable schedule would involve four construction dates: 1965, 1980, 1990, and 2000. The 1965 date would constitute the date of construction of initial facilities, which would be constructed to serve the 1970 demands.

In the downstream area, the limited amount of space available will preclude the development of extensive facilities. The Agency proposes to accommodate only 6000 visitor days of use. All these facilities will be constructed at one time in 1965.

Pattern of Use

In order to prepare recreational development plans, it is necessary to subdivide the demand to be accommodated into overnight and day use components. For purposes of this report, day use refers to all those one-day trips made to the project recreational facilities; and overnight use refers to any use of recreational opportunities on the Middle Fork Project in which the visitors spend one or more nights in the Project area.

It is anticipated that both types of use will occur in the French Meadows-Hell Hole area of the Middle Fork Project. Studies at Ice House Reservoir, which has been taken as a comparable recreational development, showed that about 15 per cent of the total visitation

during 1963 resulted from day use. Due to the somewhat greater distance of the French Meadows-Hell Hole area from main population centers, it is estimated that one-day use will approximate only 10 per cent of the total demand in this area.

In the downstream area of the Middle Fork Project, it is anticipated that the entire demand will be by one-day use, since there will be little opportunity for camping and no overnight accommodations.

The following tabulation, Table 3-G, presents a summary of the expected growth in one day and overnight use on the Middle Fork Project. It will be seen that overnight use accounts for most of the recreational use on the Middle Fork Project, increasing from approximately 84 per cent of the total in 1964 to 88 per cent in the year 2000.

TABLE 3-G

Placer County Water Agency
Middle Fork American River Project

DISTRIBUTION OF TOTAL RECREATIONAL DEMAND BETWEEN OVERNIGHT AND ONE-DAY ACTIVITIES 1/

Type of Use	Location	1970	1980	1990	2000
Overnight	French Meadows-Hell Hole Area	81,000	134,000	213,000	310,000
	Downstream	0	0	0	0
One-Day	French Meadows-Hell Hole Area	9,000	15,000	24,000	35,000
	Downstream	6,000	6,000	6,000	6,000
TOTALS		96,000	155,000	243,000	351,000
Percentage overnight use		84	86	88	88

1/ Portion of total demand to be accommodated.

Types of Recreation to be Accommodated

It is expected that the Middle Fork Project will attract persons interested in camping, picnicking, boating, water sports, fishing and hunting, hiking and riding, and other outdoor pursuits. Some of these activities will require special facilities, others will not.

As indicated in the previous section, overnight use is expected to account for about 84 - 88 per cent of the total projected recreational use of the project. In the past such overnight users have been provided or created a camping unit for the family group. A recent trend has been toward the development of group camps set aside specifically for use by clubs, church groups, youth associations, or other organizations. These campgrounds are equipped with multiple stove units, large tables, work tables, fire rings and other special facilities adapted to group camping. It is expected that about 20 per cent of the total overnight use on the Middle Fork Project will be of the group-camping variety.

Another type of camping facility that is becoming increasingly popular is the organization camp. It differs from a group camp in that the organization itself constructs, operates and maintains the facilities on lands obtained under use permit from the Forest Service. It is anticipated that about 10 per cent of the overnight use on the Middle Fork Project will occur at organization camps. Forest Service representatives indicate that several contacts have been made already by various organizations interested in constructing such facilities. There appears to be little question but that such facilities will be constructed soon after the Project is completed.

The remaining 70 per cent of demand will be served by family camping units. Most family campers prefer to drive directly to camping sites. A small minority, however, prefers to hike or boat to camps farther removed from signs of civilization.

As indicated previously, it is anticipated that about 15 per cent of the total visitation on the Middle Fork Project will be accounted for by persons on one-day trips. Such one-day visitors normally make use of picnic facilities. In the French Meadows-Hell Hole area, picnic facilities also may be used by campers in the area traveling to different locations during the day for hiking, boating, or other outdoor activities.

It is expected that French Meadows and Hell Hole Reservoirs will be especially attractive to boat owners. Boating activity will be of two general types: pleasure boating and boating associated with fishing. Launching ramps will be required to accommodate the anticipated

number of boats making use of these reservoirs. It was found that during the 1963 season of operation at Ice House Reservoir, approximately 15 per cent of all recreation parties purchased boat launching tickets from the vending machine installed by the United States Forest Service. Statistics developed by the U. S. Bureau of Reclamation for the four-year period 1959 through 1962 show that boating represents about 30 per cent of all recreation activity at Sly Park. It is expected that construction of the proposed Auburn Dam will have a moderating effect on the boating activity in the French Meadows-Hell Hole area, due to its being closer to the centers of population. In preparing the recreation plan for the Middle Fork Project, it has been assumed that prior to construction of Auburn Reservoir, about 30 per cent of all recreation parties visiting the French Meadows-Hell Hole area will bring a boat, and that thereafter the ratio will reduce to 20 per cent.

Derivation of the estimated number of boats for which launching facilities would be required on peak days in the future is shown in Table 3-H. In making this derivation, it was assumed that the peak-day demand for facilities would be three times the average demand, even though the statewide ratio of peak to average demand for launching facilities is actually closer to five times the average. It is felt that the reduced ratio in the French Meadows-Hell Hole area is justified, since this area will be heavily used by vacationers and have only limited one-day use. Thus, there will be a tendency to reduce the peak load factors for all on-shore facilities.

It is expected that swimming, water skiing and other similar water activities will be popular. All of the reservoirs on the Middle Fork Project will be open for body-contact sports since none will be a terminal domestic use facility. Specific areas are being cleared of all stumps at Duncan, French Meadows, Hell Hole and South Fork Long Canyon during the reservoir clearing operations to create attractive swimming areas. Water skiers will also need cleared beach areas for starting their runs. It is anticipated, however, that swimming will take place at all locations around reservoir perimeters unless specifically prohibited for safety reasons near tunnel outlets and intakes, and powerhouses or in boating areas considered unsafe. Log booms or other safety devices and marker buoys will be provided in hazardous areas, around swimming beaches and in special speed zones.

Large numbers of recreationists are interested in hiking and horseback riding in mountain country. As part of the Middle Fork Project, trails will be provided which, together with existing roads and trails, will provide access completely around both French Meadows and Hell Hole Reservoirs. These trails will also connect with other

trails in the area which provide access to camps and lakes outside the Project area. The California Riding and Hiking Trail, a statewide loop trail approximately 3,000 miles in length, is being constructed under auspices of the State Division of Beaches and Parks. It passes through the heart of the French Meadows-Hell Hole area (see Plate 3-A). The projected plans for trail camps along the California Riding and Hiking Trail were considered in preparing the recreational plan for the Middle Fork Project. However, the camping or picnicking facilities to be built by the Placer County Water Agency as part of its Middle Fork Project will not be specifically set aside for users of the Riding and Hiking Trail, although they would be available for their use.

TABLE 3-H

Placer County Water Agency
Middle Fork American River Project

ESTIMATED NUMBER OF BOATS
REQUIRING LAUNCHING FACILITIES

	1970	1980	1990	2000
(a) Annual visitation to French Meadows-Hell Hole, visitor days	90,000	149,000	237,000	345,000
(b) Average daily visitation, visitors[1]	900	1,490	2,370	3,450
(c) Average number of parties per day[2]	225	372	592	863
(d) Average number of boats per day[3]	68	74	118	173
(e) Number of boats on peak day[4]	204	222	354	519

[1] Based on 100-day season; line (b) = line (a) ÷ 100

[2] Based on 4 persons per party; line (c) = line (b) ÷ 4

[3] Line (d) = 0.3 × line (c) up to 1975, = 0.2 × line (c) thereafter

[4] Line (e) = 3 × line (d)

All of the foregoing types of recreation - camping, picnicking, boating and water sports, riding and hiking - require some type of special facilities. There will be a great number of other outdoor recreational activities available in the Project area for which no special facilities will have to be provided. These include fishing, hunting, sight-seeing, nature study, photography and other miscellaneous activities. The California Department of Fish and Game has indicated that the Middle Fork American River and the Rubicon River below French Meadows and Hell Hole Reservoirs will support about 10 angler days per mile average throughout the recreation season. Based on a 180-day fishing season, this amounts to about 1800 angler days per mile per season, or about 10,800 angler days per year over the six stream miles in public ownership adjacent to Project facilities. As indicated previously, the Placer County Water Agency does not intend to guarantee public access along streams crossing private lands. However, Placer County has passed an ordinance (No. 312, Series B) which requires that existing trails be kept open for public use. Many of these trails in the Project area traverse private land. Thus, fishermen can, if prohibited from following along streams on private land, follow the public trail until reaching public land, and then return to the stream. It is not probable, however, that private lands will be closed to fishermen, especially in the higher areas.

The Department of Fish and Game also expects that French Meadows and Hell Hole Reservoirs will support approximately 3500 angler days annually based upon natural reproduction rates.

The entire French Meadows Reservoir and surrounding recreational area lies within a State Wildlife Reserve. Thus, no hunting will be allowed. The area around Hell Hole Reservoir, however, will be open to public hunting and the recreational facilities in the French Meadows-Hell Hole area may be used as bases for hunting operations. Hunting is not anticipated in connection with Agency projects in the downstream area.

Sight-seeing, nature study, photography and other leisurely pursuits are also expected to attract visitors to the Project area. The U. S. Forest Service has already developed an informational type overlook at the site of Ralston Afterbay. As the Project becomes better known, and as the access roads are improved, the number of casual visitors will continue to grow. The proximity of Ralston Afterbay to Auburn and Sacramento should make it attractive to residents of those communities.

Facility Planning Standards

All recreational facilities proposed to be constructed in connection with the Middle Fork Project will be on public lands administered by the United States Forest Service. For this reason the standards adopted by the Placer County Water Agency for determining the number and type of facilities to be provided are those used by the Forest Service. For some types of facilities, additional standards were developed and adopted as required for the special case.

Standards used in determining the quantity and location of camp and picnic areas are summarized briefly as follows:

Family camp and picnic units:

Maximum annual use per acre	1,000 visitor days
Density, units per acre	3
Capacity, persons per unit	4

Group camping units:

Maximum annual use per acre	1,000 visitor days
Density, units per 5-acre site	3
Capacity, persons per unit	25
Maximum ground slope	15 per cent

Standards used in planning swimming beaches and boat launching facilities are summarized as follows:

Maximum beach slope	15 per cent
Launching ramp capacity	50 boats per day per lane
Launching Ramp Parking	25 cars and trailers per lane

Engineering standards on which construction plans and specifications for the recreational facilities will be based are summarized in the following paragraphs:

1. Access and Circulatory Roads. One-lane and two-lane road systems within picnic and camping areas. Lanes ten feet wide with two-foot shoulders. Access and circulatory roads will be graded and will be given a surface treatment to prevent dust. Culverts will be constructed where the roads interrupt natural drainage. Access and circulatory roads will have perimeter barriers to prevent driving and parking off of pavement. Maximum gradient 8 per cent. Minimum radius of curvature 50 feet.

2. Service Roads. One-lane graded roads ten feet wide. No surfacing. Maximum gradient 15 per cent. Minimum radius of curvature 30 feet.

3. Parking Spurs. Surface treatment same as access roads. Width 12 feet. Length 40 feet for trailer spurs, 24 feet for automobile spurs and angled at 135 degrees to the direction of traffic flow. Will have barriers to prevent parking off spur. Maximum gradient 4 per cent. Campgrounds will contain 50 per cent trailer spurs and 50 per cent auto spurs.

4. Parking Lots. Surface treatment same as access roads and parking spurs. Lots intended to serve cars with boat trailers will be designed on a drive-through basis where feasible. Drive-through parking lots will average 700 square feet per car and trailer space. Other types will average 600 square feet per car and trailer and 500 square feet per car alone. Lots will have barriers to prevent parking off of pavement.

5. Group camp. Each group camp will have equipment for multiples of 25 people. Equipment to serve one 25-person group will include three Klamath stoves, four 8-foot tables with benches, two tables without benches for work and washing, a fire circle and two-unit toilet. Each group camp will have area available for 6 to 10 tents. Group camps will be served by central parking area. The central parking area will be connected to each camp unit by means of a locked service road. Authority to use the service road will be obtained upon making reservation with the District Ranger for use of the camp. The service road is for delivery of equipment and supplies to the camping area, all parking will be in the central parking lot.

6. Family Camp. Facilities consists of one table, stove, parking spur, and space for tent. Located about 50 feet from circulatory roads, and at least 100 feet from the reservoir, steams, and access roads. Spaced 100 feet apart, minimum.

7. Picnic Sites. Equipment consists of one table and stove. Location and spacing requirements same as for camp sites. Picnic areas will be served by group parking areas located centrally within the site.

8. Launching Ramps. Maximum slope 15 per cent; optimum slope 13 per cent. All ramps to be two-lane, each 15 feet wide. Turn-arounds provided to avoid backing trailer more than 200 feet. Minimum 6-inch reinforced concrete slab (roughened surface) on structural base. Base requirements will be determined from field conditions. All stumps within 100 feet of ramps to be removed.

10. Power. No electric power will be provided.

11. Water Facilities. All camps and picnic areas to be provided with treated water supply, when feasible. One hose bibb for each 4 or 5 camp and picnic units. Drinking fountains to be provided at day-use areas where no cooking fires are anticipated. All hose bibbs and drinking fountains to be served by gravel-filled drain sump. Fire hydrants to be located in each camp and picnic ground at closest turn-around area near main entrance. (See also section of this chapter on plan for water supply and sewerage facilities.)

12. Sanitary Facilities. Flush toilets to be provided at all practicable locations. To provide for off-season use when water supply must be shut off, pump-out or vault type facilities to be provided in each camp and picnic area. At remote camps where pump-out services are not feasible, pit toilets will be used. One seat provided for each 20 persons. Normal distance between facility locations 600 feet, maximum distance from camping or picnic unit to nearest facility 300 feet. (See also section of this chapter on plan for water supply and sewerage facilities.).

Number of Facilities Required to Meet Demands

The number of camping facilities required to meet the demands is a function of the number of visitor days of overnight use. In Table 3-I there is set forth a computation for the 1970 camping facility requirements for the Middle Fork American River Project. The projected total visitor days of overnight use were prorated into families, groups and organizations on the basis of the percentage distribution assumed for the Middle Fork Project. The area required to serve these projected visitor days was determined on the basis of the adopted standards, and then the number of units required was computed from the total acreage. Similar computations were carried out for 1980, 1990 and 2000 in order to determine the number of camping units required in each of these stages of development.

The number of picnicking facilities is a function of the number of visitor days, of day use, and the computation of the required number of such units is also set forth in Table 3-I, since the method of computation is identical.

TABLE 3-I

Placer County Water Agency
Middle Fork American River Project

COMPUTATION OF THE NUMBER OF CAMPING AND PICNICKING FACILITIES REQUIRED TO SERVE 1970 DEMANDS

Camping Facility Requirements

Type of Use	Per Cent of Total	Projected Visitor Days	Requirements Area 1/	Requirements Units 2/
French Meadows-Hell Hole Overnight Uses				
Families	70	56,700	57	171
Groups	20	16,200	16	10
Organizations	10	8,100	8	--
TOTAL	100	81,000	81	

Picnicking Facility Requirements

French Meadows-Hell Hole Day Users	100	9,000	9	27
Downstream Day Users	100	2,000 3/	2	6

1/ Required area based on maximum allowable use of 1,000 visitor days per acre.

2/ Number of units of family camps and picnic sites based on 3 units per acre, group camps on 3 units per 5 acres.

3/ Portion of downstream day users expected to make use of picnic facilities.

The total number of camping and picnicking units required to serve that portion of the total demand which the Placer County Water Agency expects to accommodate is set forth in Table 3-J.

TABLE 3-J

Placer County Water Agency
Middle Fork American River Project

NUMBER OF CAMPING AND PICNICKING FACILITIES REQUIRED

	1965	1980	1990	2000
Camping Facilities				
Family Camps	171	282	447	652
Group Camps	10	16	26	37
Picnic Facilities*	33	51	78	110

* Includes 6 units required in downstream area.

The number of lanes of boat launching ramp which is required has been determined by the estimated number of boats to be accommodated. In a previous section of this report, the number of boats expected to use French Meadows and Hell Hole Reservoirs on a peak day was shown to increase from 216 in 1965 to 519 in 2000.

Rather than attempting to provide launching facilities for the maximum daily demand, it is deemed adequate to accommodate 80 per cent of the maximum, since it is expected that some boats will be left in the water overnight, and not all will be launched on the same day. On this basis, it is anticipated that 173 boats per day should be acommodated by launching facilities in 1965 and 415 at full development in the year 2000.

As indicated in the section on facility standards, one lane of launching ramp can accommodate about 50 boats per day (in and out). Thus, the total number of lanes required on French Meadows and Hell Hole Reservoirs will increase from four in 1965 to eight in 2000. The computation of required lanes of launching ramp is summarized in Table 3-K.

TABLE 3-K

Placer County Water Agency
Middle Fork American River Project

NUMBER OF LAUNCHING RAMP LANES REQUIRED

	1965	1980	1990	2000
Number of Boats on Peak Day	216	228	354	519
Portion to be Accommodated 1/	173	183	283	415
Lanes Required 2/	4	4	6	8

1/ Accommodated portion equals 80 per cent of peak day demand.

2/ Number of lanes based on capacity of 50 boats per lane.

The Recreation Plan

This section describes the recreation plan proposed by the Placer County Water Agency for development of the recreation potential of the Middle Fork Project. This plan has five components: (1) a land use plan, (2) plans for on-shore facilities, (3) a water-use plan, (4) a plan for water supply and sanitary facilities, and (5) a plan for operating the on-shore facilities.

The Placer County Water Agency arranged for the United States Forest Service, specifically the Tahoe and El Dorado National Forests, to prepare the land use plan and site plans for initial recreational development at French Meadows and Hell Hole Reservoirs. These plans of the Forest Service have been adopted except for minor modifications by the Agency and are those described herein.

Land Use Plan

In the previous section it was shown that the ultimate requirement for recreational facilities on the Middle Fork Project will be 652 family camp units, 37 group camps and 110 picnic units. These facilities will occupy approximately 275 acres of land under Forest Service land use standards. All but two acres of that total will be required in the French Meadows-Hell Hole area. An analysis by the U. S. Forest Service

of lands in the immediate vicinity of reservoirs in the French Meadows-Hell Hole area indicates that there is ample National Forest land suitable for recreational development. On Plate 3-A there are shown those areas which the Forest Service has stated are best adapted for recreational development. The site numbers attached to these lands by the Forest Service are also shown. All lands on which development of recreational facilities is proposed by the Placer County Water Agency are located within about one mile of one or more of the various Project reservoirs. The following paragraphs describe the various recreation sites and their suitability for development of facilities.

The facilities comprising the French Meadows complex of recreational sites include those at the Duncan Creek Diversion as well as those along French Meadows Reservoir. At the Duncan Creek Diversion (Site No. 53.1 T), there is area available for development of about 12 family camp sites. Access to this camp ground would be provided by the road being constructed as part of the Project.

At the Chipmunk site on French Meadows Reservoir (Site Nos. 64.1 T, 64.5 T), the Forest Service has identified lands suitable for commercial development. It is anticipated that a concessionnaire will be sought to provide rental boating, fuel, supplies, groceries, and possibly house-trailer accommodations.

At the French Meadows picnic ground (Site No. 3.1 T) there is space for approximately 7 picnic units. This area is adjacent to the French Meadows boat launching site (Site No. 3.2 T) where construction of four lanes of launching ramp and the required parking area is contemplated. There is also a large area (Site No. 3.8 T) adjacent to the launching ramp site that is suitable for development of 76 family camping units. There is also available in this locality an area suitable for development of a swimming beach (Site No. 3.2 T). Stumps have been removed below the high water line in the area offshore for both the launching ramp and swimming beach locations.

Proceeding upstream along the south shore of French Meadows Reservoir, the Mildred Campground (Site No. 3.6 T) has space for approximately 26 family camping units and also has an area suitable for development as a swimming beach.

Farther upstream is a site suitable for development of a large picnic ground. The Mt. Mildred site (Site No. 3.5 T) has space for approximately 24 picnic sites. In addition, the Forest Service intends to have its administrative center at this location which will be used by personnel assigned to operation and maintenace of recreational facilities in the French Meadows area.

At the upper end of the French Meadows Reservoir, there is a large valley suitable for development of all types of recreation facilities. The Forest Service has set aside several hundred acres of land in this area for recreational development. The Placer County Water Agency proposes to limit its facilities to those lands which are south of Rice Creek and not farther than about one mile from French Meadows Reservoir. The existing Ahart Campground (Site No. 42.6 T) can be expanded to serve approximately 119 family camping units. The Dolly Campground (Site No. 42.7 T) has space for approximately 136 family camping units. The Gates area (Site No. 42.5 T) is suitable for development of group camp sites, and approximately 21 such camps could be fit into the available area without encroaching upon those lands reserved for other recreational development.

On the shore of French Meadows Reservoir, the Coyote group camp site (Site No. 2.8 T) has space for development of five group camps. In this same general area, and more specifically at that point where the new access road along the south shore of French Meadows Reservoir intersects the pre-project road along the north shore, the Forest Service has set aside several acres for additional commercial development at the Lewis site (Site No. 2.7 T). The type of commercial development would probably be similar to that previously described for the Chipmunk site except that rental boats would not be appropriate. It is intended that the commercial development at the Lewis site will serve the extensive recreational development expected in the upper French Meadows valley.

On the north shore of French Meadows Reservoir there are several sites suitable for development of recreational facilities. At the Lewis site (Site No. 2.6 T) there is an area capable of supporting approximately 80 family camping units, and at the McGuire site (Site No. 2.5 T) there is space for 41 camping units. The latter site is also well adapted to the development of a picnic ground, boat launching ramp and swimming beach. At the McGuire picnic site (Site No. 2.1 T), space is available for development of 30 such units. There is ample space for a two-lane launching ramp and parking lot at the McGuire Site (Site No. 2.2. T). It is also expected that the McGuire site will serve as a base for hikers traveling along the McGuire trail on the north shore of French Meadows Reservoir and space is available to provide parking for this purpose. The French Meadows vista observation point adjacent to the McGuire area (Site No. 2.9 T) can be developed as a fine overlook for the entire French Meadows Reservoir.

At the Poppy site (Site No. 44. T) there is space for development of 12 camping units. Access would be by boat or by the McGuire Trail.

All the facilities which will constitute the Hell Hole recreation complex will be located near the South Fork Long Canyon Diversion and near Hell Hole Dam. No suitable areas exist near the North Fork Long Canyon Diversion.

There are extensive areas available for development of recreational facilities in the South Fork of Long Canyon. In the Lower Meadow area (Site No. 153.5 E) there is space for at least 36 family camping units. At the Middle Meadows site (Site Nos. 144a E, 144.1 E and 144.5 E) there is space for 12 family camps, 9 group camps and 10 picnic sites. These facilities would be close to the South Fork Long Canyon diversion. In the Big Meadows area (Site Nos. 136.5 E, 136a E) there is space for 66 family camping units and for an administrative center to be utilized by El Dorado National Forest personnel servicing recreational facilities in the Long Canyon and Hell Hole areas.

The perimeter of Hell Hole Reservoir provides but little land suitable for recreational development. The canyon walls are steep, and access is limited. However, at the Hell Hole site (Site No. 118 E), overlooking the reservoir, there is space for development of approximately 27 picnic units, and at the Hell Hole Dam site (Site No. 113 E) there is space for approximately six more. Boat launching access to Hell Hole Reservoir is severely restricted, the only site available being the approach channel to the spillway (Site No. 109. E). A two-lane launching ramp could be constructed in the approach channel, and sufficient parking space would be available by the ramp. An overlook can be developed above the dam (Site No. 101 E).

Camping sites around Hell Hole Reservoir are limited to the upper reaches of the reservoir. The only site proposed for development by the Placer County Water Agency is the Upper Hell Hole site (Site No. 150.5 E) where 15 camping units could be installed. The only access would be by boat or by foot along existing and Project trails. On the shores of Lagoon Lake (Site No. 122. E) overlooking Hell Hole Reservoir there is space for 21 family camping units. Access to this campground would also be by trail.

In the downstream area of the Middle Fork Project there is little area available for camping or picnicking facilities. It is proposed that a picnic ground be established adjacent to the Ralston Afterbay Dam and Oxbox Powerhouse. Primary purpose of this picnic area will be to

serve fishermen and other recreationists making use of this body of water. Space is available for installation of only about 6 picnic tables. (Site RA. This identification number not assigned by Forest Service). The relatively high fire danger at this location precludes the use of stoves and open fires would be prohibited. Also, this site may be subject to flooding during winter months or, eventually, by back water from Auburn Dam. Thus, table would be removed to higher ground during the off-season.

Plans for On-shore Recreational Facilities

Placer County Water Agency intends to supply camping, picnicking, and boating facilities to meet the requirements previously set forth. For purposes of this report, these facilities, together with the necessary access, circulatory and service roads, parking lots and spurs, and water supply and sanitary facilities, are referred to herein as "on-shore recreation facilities." It should be noted that, in addition to these on-shore works, additional recreation-oriented facilities are being provided as part of the construction of the major project features, the roads, parking areas, and trails which are to be constructed or improved pursuant to the Agency's memorandum of understanding with the Forest Service have an important bearing on the Project's recreation accomplishments. These are not considered as on-shore facilities.

For purposes of presenting the Agency's recreation plan, the recreational facilities and water supply and sanitary facilities are discussed separately. This section deals with the recreational facilities.

In order to determine the optimum sequence and timing of construction of on-shore recreational facilities, it is necessary to compare the requirements previously set forth for camping and picnicking facilities and for boat launching ramps with the capabilities of the various available sites.

There is set forth in Table 3-L the proposed schedule of on-shore recreation and support facilities to be provided by the Placer County Water Agency on the Middle Fork Project. The areas where first-stage facilities are to be provided have been indicated by special identification on Plate 3-A.

It will be noted that the total of 664 family camps to be developed exceeds the number previously shown to be required by 12 units, and that the number of facilities to be provided in the initial stage will also slightly exceed the number required. At the same time it will be noted that the number of group camps is less than that number computed earlier. In planning the type of facilities to best fit the available locations,

it was determined that the sites available for camping sites were better suited to family camp units than to group camp units. On the basis that one group camp unit was equivalent to approximately six family camp units, the number of family units was increased and the number of group units decreased from the projected requirement. It should be borne in mind that the computation of the required number of facilities was based on an assumed division among the overnight users of 70 per cent families, 20 per cent groups and 10 per cent organizations. The number of facilities to be provided will not deviate substantially from these assumed percentages and no particular difficulty is expected. Also, adjustments may be made from time to time if appropriate.

TABLE 3-L

Placer County Water Agency
Middle Fork American River Project

SCHEDULE OF ON-SHORE RECREATION AND SUPPORT FACILITIES TO BE PROVIDED BY PLACER COUNTY WATER AGENCY

Location 1/	Site Name	Site Number 2/	Year of Construction 1965	1980	1990	2000	Total Facilities
		FAMILY CAMPS					
FM	Duncan	53.1 T		12			12
FM	French Meadows	3.8 T	76				76
FM	Mildred	3.6 T		26			26
FM	Dolly	42.7 T				136	136
FM	Ahart	42.6 T			85	34	119
FM	Lewis	2.6 T	39		41		80
FM	McGuire	2.5 T		41			41
FM	Poppy *	44. T	12				12
HH	Lower Meadow	153.5 E			36		36
HH	Middle Meadow	144a E				12	12
HH	So. Fork Long Canyon	136.8 E				12	12
HH	Big Meadow	136.5 E	24				24
HH	Big Meadow	136a E	31			11	42
HH	Lagoon Lake *	122. E		21			21
HH	Upper Hell Hole*	150.5 E	15				15
	TOTALS		197	100	162	205	664

* Trail Camp

TABLE 3-L (Cont'd)

SCHEDULE OF ON-SHORE RECREATION AND SUPPORT FACILITIES
TO BE PROVIDED BY PLACER COUNTY WATER AGENCY

Location 1/	Site Name	Site Number 2/	Year of Construction 1965	1980	1990	2000	Total Facilities
		GROUP CAMPS					
FM	Coyote	2.8 T	5				5
FM	Gates	42.5 T		4	7	10	21
HH	Middle Meadow	144.5 E	3	2	2	2	9
	TOTALS		8	6	9	12	35
		PICNIC UNITS					
FM	French Meadows	3.1 T	7				7
FM	Mt. Mildred	3.5 T		7	14	3	24
FM	McGuire	2.1 T	10	5		15 *	30
HH	Middle Meadow	144.1 E		10			10
HH	Hell Hole	118. E	10			17	27
HH	Hell Hole Dam	113. E			6		6
R	Ralston Afterbay	RA	6				6
	TOTALS		33	22	20	35	110

* Includes 2 Group Picnic Sites each equal to 5 Family Picnic Sites

		BOAT LAUNCHING RAMPS (LANES)					
FM	French Meadows	3.2 T	2			2	4
FM	McGuire	2.2 T	2				2
HH	Hell Hole	109. E	2				2
	TOTALS		6			2	8

TABLE 3-L (Cont'd)

SCHEDULE OF ON-SHORE RECREATION AND SUPPORT FACILITIES TO BE PROVIDED BY PLACER COUNTY WATER AGENCY

Location[1]	Site Name	Site Number[2]	Year of Construction 1965	1980	1990	2000	Total Facilities
		SWIMMING BEACH (ACRES)					
FM	Duncan	53.2 T		0.3			0.3
FM	French Meadows	3.2 T		1.2			1.2
FM	Mildred	3.2 T		0.8			0.8
FM	McGuire	2.2 T	1.5				1.5
	TOTALS		1.5	2.3			3.8
		RECREATION SUPPORT FACILITIES[3]					
FM	Mt. Mildred	3.7 T	x	x	x	x	--
HH	Big Meadow	136.7 E	x		x		--

1/ FM - French Meadows Complex, HH - Hell Hole Complex, R - Ralston Afterbay Dam

2/ Site Number as shown on Recreation Land Use Plan, Plate 3-A. T refers to Tahoe National Forest and E to El Dorado.

3/ Support Facilities will consist of Residences, Warehouses, Garages, and Offices for Forest Service Personnel assigned to Operation and Maintenance of Recreation Facilities.

The capacity of the camping and picnicking facilities to be provided are set forth in Table 3-M. In Plate 3-B there is a comparison of total potential demand for recreation in the Project area after completion of the Project with the capacity of the planned facilities. It will be noted that only in the first few years after construction of the initial on-shore facilities is the capacity in excess of the total demand.

MIDDLE FORK AMERICAN RIVER PROJECT
COMPARISON OF POTENTIAL DEMAND FOR RECREATION AND CAPACITY OF ON-SHORE RECREATIONAL FACILITIES

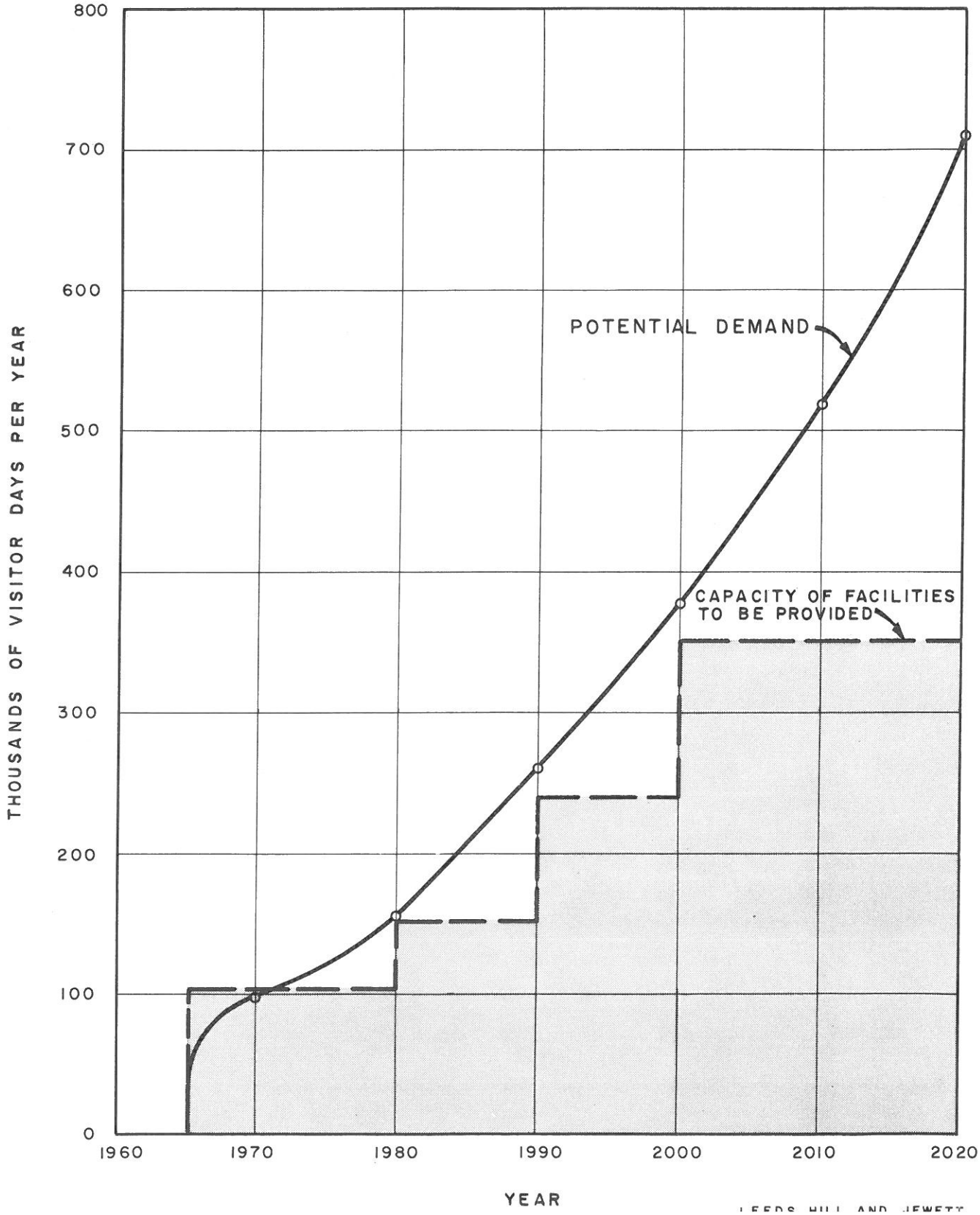


TABLE 3-M

Placer County Water Agency
Middle Fork American River Project

CAPACITY OF CAMPING AND PICNICKING FACILITIES TO BE PROVIDED
(Annual Visitor Days)

	French Meadows-Hell Hole Area				Downstream Area	
Year	Family Camps	Group Camps	Organization Camps 1/	Picnic Grounds	Picnic Grounds	Total
1965	65,500	13,300	8,100	9,000	6,000	101,900
1980	98,900	23,400	13,500	16,300	6,000	158,100
1990	153,000	38,400	21,200	23,000	6,000	241,600
2000	221,000	58,400	31,200	34,600	6,000	351,200

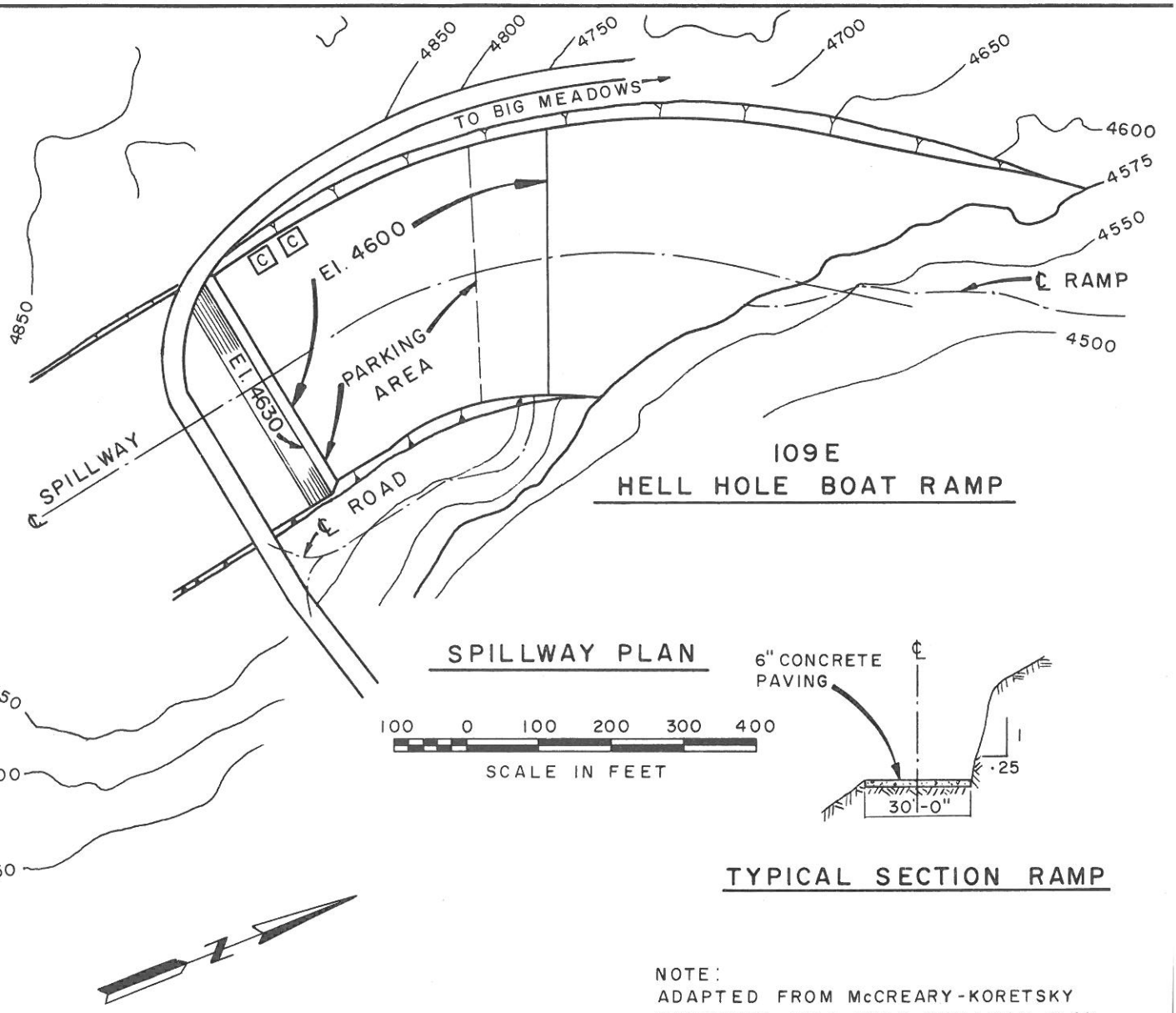
1/ Not built by Placer County Water Agency

In computing the number of lanes of launching ramp required, it was shown that four lanes would be adequate to serve the expected demand up to 1990 when six lanes would be required. As previously indicated, only one site (the spillway channel) is available on Hell Hole Reservoir for construction of launching ramps. Two lanes of launching ramp will be constructed at this site as part of the excavation of the channel. On French Meadows Reservoir it is believed desirable to have launching ramps on both the south and north shore. It is also more convenient to construct launching ramps before the reservoir fills. Thus, for purposes of scheduling construction of launching ramps, four lanes have been provided at French Meadows Reservoir making a total of six lanes to be provided in the initial stage.

As has been indicated in Table 3-L, first-stage facilities will be provided at the French Meadows, Coyote, Lewis, McGuire, and Poppy sites abutting French Meadows Reservoir, within the French Meadows complex. First-stage facilities will also be provided within the Hell Hole complex at the Middle Meadow, Big Meadow, Hell Hole, and Upper Hell Hole sites. First-stage facilities will also be provided at Ralston Afterbay in the downstream area.

There are presented in Plates 3-C through 3-L schematic plans for placement of camping units, picnic units, roads, and other features at the sites selected for first-stage construction. It should be borne in mind that these plans are representational only and that modifications may be necessary when detailed maps are available for the various sites. Schematic plans have not been prepared for future stage developments.

PLATE 3-J



NOTE:
ADAPTED FROM McCREARY-KORETSKY ENGINEERS. HELL HOLE SPILLWAY PLAN DWG. No. 61-07-201

LEGEND

[C] TOILET (SINGLE UNIT CHEMICAL)

PLACER COUNTY WATER AGENCY

MIDDLE FORK AMERICAN RIVER PROJECT

RECREATION DEVELOPMENT SITE 109E (HELL HOLE DAM)

LEEDS, HILL AND JEWETT, INC. CONSULTING ENGINEERS	SAN FRANCISCO, CAL.
	SEPTEMBER 1964

Water Use Plan

The next element of the overall recreation plan of the Placer County Water Agency is a plan for safe use of the water surfaces created by the Middle Fork Project. None of the reservoirs of the Middle Fork Project will be used for terminal service in a domestic water supply system. Thus, all may be used without restriction for body-contact sports.

In addition to the normal water sports such as boating, fishing, and swimming, it is anticipated that water skiing will take place on French Meadows and Hell Hole Reservoirs. In order to eliminate hazards to children and others swimming along the shores, and to avoid conflict with fishermen, it is desirable to provide to the maximum possible extent, separate areas for such activities. All major campgrounds and picnic areas will be located near the upstream end of French Meadows Reservoir. It is near these concentrations of people where there would be the most serious risks from high speed boating activities. For this reason, the Agency proposes to limit boat speeds to five miles per hour in that portion of the French Meadows Reservoir upstream from about the line connecting the launching ramps at the French Meadows site and the McGuire site. Such a restriction will not adversely affect use of the lake for water skiing, since most of the lake surface will still be available for such use, particularly nearer the dam where there is the least effect from drawdown.

No speed zoning is proposed at Hell Hole reservoir since potential hazards and conflicts among uses are of little consequence.

Another aspect of the water use plan is the need for safety markers and/or booms near tunnel intakes and outlets at the powerhouses or other locations where hazardous conditions will be present. The following comments describe conditions and proposed safety measures at various locations:

(a) Duncan Creek Tunnel Inlet: The inlet structure is plainly visable, and will be protected by a steel grating trash screen that would preclude persons entering the tunnel. A warning sign will be placed at the facility to advise of a potential hazard.

(b) Duncan Creek Tunnel Outlet: Marker buoys with signs to advise of the hazard will be placed at the outlet in French Meadows Reservoir.

(c) French Meadows Tunnel Inlet: The structure is located in French Meadows Reservoir and will be entirely submerged at all but extreme low water conditions. The structure is not considered a hazard to boaters. In order to protect waders along the shore who could step unwittingly into the excavated access channel, warning signs and marker buoys will be installed.

(d) French Meadows Spillway: A safety boom will be provided across the channel to prevent boater access during high reservoir stages.

(e) French Meadows Powerhouse: This structure on Hell Hole Reservoir will be plainly visible, and will be above high water line. Warning signs describing the nature of facility will be installed.

(f) Middle Fork Tunnel Intake: The intake structure in Hell Hole Reservoir will be completely submerged at all times. No special safety signs or booms are required.

(g) Hell Hole Spillway: A barrier will be provided to prevent access to the launching ramp at high reservoir stages.

(h) Long Canyon Diversions: Both intake structures will be fully protected by steel gratings and no other safety precautions are deemed necessary.

(i) Middle Fork Interbay: This structure will be open only to those persons willing to walk several miles, and heavy use is not expected. Warning signs will be posted.

(j) Ralston Afterbay: Warning signs advising of the nature of the facility and any hazards will be posted.

Plans for Water Supply and Sanitary Facilities

Water supply and sanitary facilities to service recreational facilities on the Middle Fork Project will be constructed in accordance with current Forest Service standards and will conform to the Forest Service Water Development and Sanitation Handbook.

Water supply systems will be designed to meet the following criteria:

Facility	Minimum Operating Pressure	Minimum Operating Demand
Hose Bibb	10 p. s. i.	3 g. p. m.
Toilet	15 p. s. i.	3 g. p. m.
Fire Hydrant	40 p. s. i.	40 g. p. m.

Water sources will be streams with a history of continual flow throughout the recreational season. All water systems will deliver by gravity flow to the area of use.

The selection of pipe sizes for water mains and laterals will be based upon the water supply demand for either fire flows or for the simultaneous use of all hose bibbs, drinking fountains and toilets (including both initial and future development), whichever is greater. Forest Service policy is for recreational facilities to be closed during a fire. Therefore, fire and domestic demands will not occur simultaneously. On systems having more than one fire hydrant, the pipe size will be determined on the assumption that no more than three hydrants are in use at one time. The recreational fire system is designed to serve the needs in a local area. Three closely spaced fire hydrants would be sufficient for protection during small fires, but during a major fire, additional water could be pumped directly from the lakes and streams.

Galvanized iron pipe will be used for distribution systems within campgrounds and picnic areas or for small water mains where pipe will be 1-1/2-inch diameter or less. Asbestos cement pipe will be used for water mains of four inches or greater diameter. The only exception to this policy would be where existing water pipes are incorporated into a new system. All newly installed pipe will have twenty-four inches minimum cover. The system will be drained during winter months.

All surface water supplies will be collected and filtered by an infiltration gallery similar to the Forest Service standard shown in Appendix A. Surface water treatment will be by a chlorinator equal to a Wallace & Tiernan Inc., series A-429 automatic hypo-chlorinator.

The Placer County Water Agency will supply water and sanitary facilities only to those camping, picnicking and boating areas where facilities will be constructed by the Agency. Organizational groups and concessionnaires providing additional recreational facilities will supply their own water and sewerage facilities.

The following paragraphs describe the water supply facilities to be built by the Placer County Water Agency for various camping and picnicking areas in the initial-stage and in the future developments. There are delineated on Plate 3-M the water systems planned to serve the various initial recreational sites. Distribution systems, including the locations of fire hydrants, hose bibbs, and drinking fountains for each site where recreational facilities will be provided in the initial stages have been indicated schematically on Plates 3-C through 3-L.

The proposed French Meadows water system as shown on Plate 3-M will have the capacity to serve facilities at the French Meadows picnic ground, camp ground and boat ramp (Plate 3-C) as well as future development at Mildred campground. The water source will be an unnamed stream in Section 32, T. 15 N., R. 14 E., MDB & M. Water will be diverted from this stream at approximately an elevation of 5470 feet and filtered and chlorinated prior to storage in a 10,000 gallon tank. A 4-inch main will transport the water from storage to the distribution system as shown on Plate 3-C.

The water main for the French Meadows system will be oversized to provide capacity for future demands at Mildred Campground. Also, the point of diversion will be at a higher elevation than required for the initial development at French Meadows. This will require approximately 250 feet additional 4-inch pipe. Another 410 feet will be oversized from 1-1/2-inch to 4-inch pipe in anticipation of service to the future Mildred Campground.

The Mt. Mildred Administrative Center and the future Mt. Mildred picnic area will be served by the development of springs near the site of the administrative center in Section 27, T. 15 N., R. 14 E. The water will be collected by means of an infiltration gallery similar to that shown in Appendix A. Spring water will not be chlorinated unless tests indicate the need therefor. After collection it will be delivered to a 10,000 gallong storage tank, from which a 1-1/2-inch main will deliver water to the Administrative Center.

A major water supply system (North Shore system) as shown on Plate 3-M is proposed for service to recreation facilities on the north shore of French Meadows Reservoir. The North Shore system will divert water from Dolly Creek in Section 15, T. 15 N., R. 14 E., MDB&M and will supply the demand of the initial development at Coyote Campground, Lewis Campground, McGuire Picnic Area and McGuire boat ramp. The distribution systems for these camps are shown on Plates 3-D, 3-E, and 3-F, respectively. The system will be oversized to have sufficient capacity to meet the domestic demands of the future

developments at Gates, Lewis, and McGuire campgrounds. This will require an increase in diameter from 4-inch to 6-inch for a distance of 8150 feet. The point of diversion will be at about an elevation of 5500 feet. Water will be filtered and chlorinated prior to delivery to two 10,000 gallon tanks. A 6-inch pipe from the storage tanks will service the Coyote site where the size will be reduced to 4-inch from Coyote Campground to the McGuire site.

It is not feasible to develop a water supply at the Poppy Trail camp because of the absence of springs in the vicinity. Although there is a creek that flows through the camp ground that has a history of continual flow, the cost of developing a water system using this source (about $25,000) is not justified for a remote campground having only 12 units. It is anticipated that the campers using these facilities will make use of stream or lake water.

Dolly and Ahart campgrounds are part of the future stage development upstream from French Meadows Reservoir. It is anticipated that a separate water system will be developed with the capacity to serve both of these facilities. The source will be surface water and will require filtering and chlorination prior to use.

The Middle Meadow water system as shown on Plate 3-M will divert water from the South Fork of Long Canyon Creek (Section 18, T. 14 N., R. 14 E. MDB&M) to supply the Middle Meadow group campground. The system will have sufficient capacity to meet the future domestic water demands for the Middle Meadow group and family campgrounds, and the Middle Meadow picnic grounds. The point of diversion will be at approximately an elevation of 4800 feet. Water will be filtered and chlorinated prior to delivery to a 10,000 gallon tank, from where it will be transported through to the Middle Meadow distribution system, as shown on Plate 3-H, by means of a 4-inch water main.

An existing water system being used during construction of Hell Hole Dam will be incorporated into the proposed Big Meadows water system as shown on Plate 3-M. The capacity of the system will be sufficient to meet the future domestic demands for Big Meadows and South Fork Long Canyon campgrounds, Hell Hole picnic grounds and Hell Hole Dam picnic area. The water diverted from the South Fork Long Canyon Creek in Section 9, T. 14 N., R. 14 E. MDB&M at approximately an elevation of 5480 feet will be filtered and chlorinated prior to storage in a 10,000 gallon tank. The proposed 4-inch water main supplying Big Meadows campground distribution system as shown on Plate 3-I, will connect with the previously mentioned existing pipe line

approximately 1000 feet from the point of diversion. As may also be seen on Plate 3-I, a 4-inch main from the Hell Hole picnic ground distribution system will connect with the existing water main approximately 4000 feet from the point of diversion. The existing water main continues to the Hell Hole Dam site and will provide water supply to facilities in that area.

The Administrative Center planned for Big Meadows will use an existing water system developed several years ago when the area was a CCC camp. This system, which now serves the Big Meadows guard station, is adequate for the planned administrative site.

The Upper Hell Hole Trail camp will be served by the development of a spring near the campground in Section 12, T. 14 N., R. 14 E. MDB&M. There will be no chlorination unless later field investigation indicates a need therefor, nor will there be a distribution system.

The future development at Lower Meadow Campground will have a separate water system utilizing the South Fork Long Canyon Creek as a source.

Future developments at Lagoon Lake and Duncan Campgrounds will each have complete water supply systems by diversion from nearby streams. Filtration and chlorination will be provided prior to storage and distribution.

Ralston Afterbay picnic ground will have water supplied from the Oxbow powerhouse as shown on Plate 3-L.

Sanitary facilities will also be provided for the recreational areas. Sewage disposal will be by individual septic tanks and leaching fields, by pit percolation, or by pumpage into tank trucks for transport to suitable disposal areas. Such pumpage and disposal will be performed by service personnel or their contractors, but no specific plans for the location of waste disposal areas or facilities can be made at this time. Local health regulations will govern the manner and locations of disposal.

As indicated previously, flush toilets will be provided at all camping and picnicking areas where feasible. Sewage disposal from such facilities will be by septic tanks and leaching fields. A typical layout for the leaching fields is shown in Appendix A. The number and length of leaching lines will be determined in accordance with Placer County Health Department standards.

Both flush type and pumpout toilets will be used at the French Meadows, Coyote, Lewis, McGuire, Middle Meadow and Big Meadow sites as shown on Plates 3-C, 3-D, 3-E, 3-F, 3-H and 3-I, respectively.

The lack of a developed water supply and the inaccessability of the Poppy and Upper Hell Hole trail camps (Plates 3-G and 3-K) requires that only pit toilets be provided.

At Hell Hole Dam, chemical toilets will be provided near the launching ramp for convenience of boaters. This site, and the Ralston Afterbay picnic area, where similar facilities will be provided, are subject to periodic inundation, and permanent facilities are not deemed advisable.

Plan for Operation of Recreation Facilities

The Placer County Water Agency intends to contract with the United States Forest Service for operation and maintenance of on-shore recreation facilities. Preliminary negotiations have been held with the Forest Service, and its representatives have indicated willingness and intention to undertake this responsibility (Appendix B). The specific terms of an agreement have not been completed, but it is expected that the usual Forest Service procedures will be followed.

Recreation facilities will be open each year for use by the general public without regard to race, color, or creed. The Forest Service now has a program of charging for use of recreational facilities on Forest Service lands to defray at least a part of the operating costs. It is anticipated that standard Forest Service fees will be charged and the collections will be deposited in the United States Treasury. The Placer County Water Agency will not receive any remuneration from the Forest Service resulting from the collection of use fees.

The following fee schedule for use of recreational facilities is that currently in use by the Forest Service:

Family Camp	$ 1.00 per day per camp
Picnic Unit	$ 0.50 per day per unit
Group Camp	$ 10.00 per day per camp (or $50.00 per week)
Boat Launching Ramp	$ 1.00 per day (parking)

If fees are collected, it will be the responsibility of the Forest Service to install whatever devices are required. These costs are not considered herein.

The Forest Service intends to place a staff in Tahoe National Forest at the French Meadows area during the recreational season in order to properly service and maintain the various on-shore facilities. Likewise, the El Dorado Forest intends to have its staff in the Hell Hole area. The provision of housing and support facilities for these personnel are the responsibility of the Agency and are properly considered a part of the on-shore facilities and a charge to its recreational program.

The Tahoe National Forest supervisory personnel have asked for construction of the following facilities at the Mt. Mildred site (Site No. 3.7 T) on French Meadows Reservoir.

1965	1 residence 1 ten-man barracks 1 ten-bay garage-warehouse with 2 office bays adequate water and sewerage facilities for ultimate development
1980	1 residence
1990	5 trailer pads with Forest Service standard trailers and utilities
2000	1 four-bay warehouse

At the Big Meadows administrative site (Site No. 136.7 E), El Dorado Forest personnel have requested the following facilities:

1965	1 residence 1 office 1 four-bay garage adequate water and sewerage systems for ultimate development
1990	3 trailer pads with Forest Service standard trailers and utilities

Costs Associated with Recreation

The provision of on-shore recreational facilities and water supply and sanitary facilities described in the previous sections will require expenditures both for development and operating costs. These costs are set forth in this section.

Land Acquisition

All on-shore recreational facilities will be constructed on public lands, thus, no costs for land acquisition are anticipated. Water supply facilities which cross private lands may require small expenditures for easement rights. However, such costs are believed to be negligible and are given no further consideration in this report.

Development of On-shore Facilities

A detailed estimate has been prepared of the costs of developing the first-stage on-shore recreational facilities on the Middle Fork Project. This estimate is presented in Appendix A to this report. The quantities contained in the estimate were determined from the schematic plans or on the basis of facility standards previously presented.

Data on unit costs of facilities were obtained from a number of sources, primarily the United States Forest Service and the Department of Water Resources. The final unit values used for estimating the cost of first-stage recreational developments are set forth in Table 3-N. All values are the estimated installed price in the French Meadows-Hell Hole area. Some items, such as buoys, signs, pipe fittings are not included in Table 3-N but are estimated on a lump-sum basis for individual locations. Particular attention is directed to the unit costs for development of family camps, group camps and picnic sites. The unit costs for these items, as set forth in Table 3-N, are only for the stoves, tables, tent spaces and prorated costs of signs, garbage cans, fire rings and other miscellaneous items. The costs of parking areas, access roads, sanitary facilities and water supply systems are estimated separately.

The unit costs set forth in Table 3-N and the quantities required for each site provided the basis for computing the total costs of constructing first-stage recreational facilities. These are set forth in Table 3-O. It is shown that the cost of developing the first-stage recreational facilities in the French Meadows complex will be $499,350, in the Hell Hole complex $168,430, and at Ralston Afterbay $3,600, for a total of $671,380 including the water supply and sewerage facilities.

TABLE 3-N

Placer County Water Agency
Middle Fork American River Project

ESTIMATED UNIT COSTS FOR FIRST-STAGE RECREATIONAL FACILITIES

Item	Unit	Cost Per Unit
Family Camp (Stove, Table, Tent Space, etc.) *	Each	$ 300.00
Group Camp (Stoves, Tables, Tent Spaces, etc.) *	Each	1500.00
Picnic Site (Stove, Table, etc.) *	Each	200.00
Site Cleanup (Slash removal)	Acre	200.00
Access and Circulatory Roads **	Sq. Foot	1.00
Service Roads (non-surfaced)	Sq. Foot	0.05
Parking Spurs, Parking lots **	Sq. Foot	0.15
Launching Ramps	Sq. Foot	1.00
Water Supply Systems		
Collection Dam and Gallery	Each	3500.00
Chlorinator	Each	1500.00
Storage Tank (10,000 gal.)	Each	4200.00
Asbestos Cement Pipe 6-inch	Foot	4.50
Asbestos Cement Pipe 4-inch	Foot	3.25
Galvanized Pipe, 1-1/2-inch	Foot	1.75
Galvanized Pipe, 3/4-inch	Foot	1.50
Hose Bibbs with drain, riser	Each	60.00
Fire Hydrant with valve, riser	Each	200.00
Drinking Fountain with drain, riser	Each	100.00
Sanitary Facilities		
Building and Fixtures, 4-unit flush	Each	6500.00
Septic Tank and Leaching Field	Each	1500.00
Building Fixtures and Vault, 4-unit Pumpout	Each	4000.00
Building, Fixtures and Vault, 2-unit Pumpout	Each	2000.00
Building, Fixtures and Pit, 2-unit Pit	Each	1000.00
Chemical Toilet, 1-unit	Each	1000.00

* Includes prorated costs of signs, garbage cans, fire rings, perimeter barriers, and other miscellaneous items, excludes roads and parking areas.

** Includes costs of minor drainage structures, directional signs, and other miscellaneous items.

TABLE 3-O

Placer County Water Agency
Middle Fork American River Project

SUMMARY COSTS OF CONSTRUCTING
FIRST-STAGE ON-SHORE RECREATIONAL FACILITIES[1/]

Site	Cost
French Meadows Complex	$ 499,350
Hell Hole Complex	168,430
Ralston Afterbay	3,600
TOTAL	$ 671,380

1/ Costs include all water supply and sanitary facilities constructed during first stage.

A separate estimate has been made of the cost of the initial water supply and sanitary facilities for the purpose of computing the amount of a grant under the Davis-Grunsky Act. It was noted earlier that some of the initial water supply systems will be designed for capacity beyond that required for the initial development. The incremental costs of this additional capacity has been subtracted from the total first-stage costs of water supply and sanitary facilities in order to obtain the net amount of $354,200 as shown in Table 3-P.

TABLE 3-P

Placer County Water Agency
Middle Fork American River Project

COMPUTATION OF COSTS OF WATER SUPPLY
AND SANITARY FACILITIES TO SERVE
FIRST-STAGE RECREATION FACILITIES

Item	Cost
Total Cost Water and Sanitary Facilities in first-stage construction	$ 367,670
Amount allocated to future use	13,470
Net cost of first-stage water supply and sanitary facilities	$ 354,200

The costs of future on-shore recreational facilities, were estimated by using typical unit values for various types of facilities as determined in the detailed estimates for first-stage facilities. These typical development costs are set forth in Table 3-Q. For example, the typical cost for developing family campgrounds is about $1,000 per camp unit, which includes the cost of the camp facilities, roads, parking spurs, sanitary facilities and other miscellaneous items, but not the water supply system. Typical costs for group campgrounds on the same basis are $6,000 per unit; for picnic grounds, $700 per unit; and for trail camps, $550 per unit. Water Supply systems were estimated separately for each site since some camps will be served by systems provided in earlier stages of development. As shown in Table 3-Q, each additional collection system was estimated to cost approximately $25,000. The distribution system in family camps averages $90 per camp unit, in group camps $750 per camp unit, and in picnic grounds about $160 per picnic unit.

TABLE 3-Q

Placer County Water Agency
Middle Fork American River Project

ESTIMATED UNIT COSTS FOR FUTURE RECREATIONAL FACILITIES

Item	Unit	Cost Per Unit
Family Campgrounds (Camp facilities, roads, parking spurs, sanitary facilities)	Camp Unit	$ 1,000
Group Campgrounds (Camp facilities, parking areas, sanitary facilities)	Camp Unit	6,000
Picnic Grounds (Picnic facilities, roads, parking, sanitary facilities)	Picnic Unit	700
Trail Camps (Camping facilities, sanitary facilities)	Camp Unit	550
Water Supply Systems		
Collection System (collection dam and gallery, chlorinator, storage tank, supply main)	Each	25,000
Distribution system, family camp	Camp Unit	90
Distribution system, group camp	Camp Unit	750
Distribution system, picnic ground	Picnic Unit	160

The estimated construction costs of all on-shore facilities, initial and future, based on 1964 price levels, are set forth in Table 3-R. Also indicated in Table 3-R is the present worth (in 1966) of the development costs, $1,099,000. It is to be noted that no escalation factor has been applied to these costs for anticipated inflationary trends.

TABLE 3-R

Placer County Water Agency
Middle Fork American River Project

SUMMARY OF CONSTRUCTION COSTS FOR RECREATION FACILITIES

Year of Construction	Development Costs 1/	Present Worth In 1966
1965	$ 671,380	$ 671,380
1980	271,900	167,980
1990	383,530	149,620
2000	416,880	109,890
	$1,743,690	$1,098,870
		(Say 1,099,000)

1/ Future costs computed on the basis of present price levels

Operation, Maintenance and Replacement Costs

Data developed by the United States Forest Service indicate that the costs of operation, maintenance and replacement of on-shore recreational facilities in the French Meadows-Hell Hole area will average about $0.40 per visitor day of use. The estimated annual use of on-shore recreational facilities in the project area is discussed later in this report under the heading of recreational benefits. Suffice to say at this point that the annual use is expected to increase after each increment of facility capacity is added. The maximum capacity of a facility is expected to be attained five years after completion. Applying the unit operation and maintenance cost just mentioned to the estimated actual use and discounting future annual costs to present worth (in 1966) results in an estimated present value of operation, maintenance and replacement of on-shore recreational facilities of $1,451,000.

As indicated earlier in this chapter, Forest Service personnel will be operating the on-shore facilities. The Placer County Water Agency will be obligated to provide support facilities for these personnel. The costs of these facilities, which are operational in character, have been included in the estimated costs of on-shore recreational facilities.

Summary

The total costs of on-shore recreational facilities, including water supply and sanitary facilities, together with the capitalized costs of operation, maintenance and replacement, indicates that the total costs associated with recreation features of the Middle Fork Project will amount to $2,550,000 (including present worth of future costs discounted to 1966). That portion of the cost of the first-stage water supply and sanitary facilities is estimated at $354,200.

4. FINANCIAL FEASIBILITY OF THE MIDDLE FORK PROJECT

The following section presents information demonstrating the financial feasibility of the Middle Fork American River Project.

In order to demonstrate financial feasibility it is necessary to show that the Project can be financed and that annual revenues will exceed the annual costs of reimbursable items.

Capital Costs of Middle Fork Project

The capital costs of the Middle Fork Project can be considered in two parts: land acquisition, construction, and indirect costs of the major Project features, and costs of on-shore recreational facilities.

Land Acquisition for Major Project Features

As indicated previously, the Agency has obtained easements or title to those lands necessary for construction and operation of major Project features. The Agency has acquired special use permits from the Forest Service that permit Project construction on the Federal lands. However, claims to mineral rights have been filed by individuals on many parcels of these lands, and the Agency has (or will) compensate owners of such claims as are still valid.

The actual costs of acquisition of lands and rights of way for the Project cannot be known until titles to the lands have been taken by the Agency. However, a figure of $625,000 has been estimated as being a reasonable maximum for such costs, including appraisals, court fees and related expenses. This figure was used for estimating purposes in the Official Statement relating to sale of the revenue bonds for the Project.

The amount of Federally-owned and privately-owned land contained in each Project unit is shown in Table 4-A.

Construction Costs of Major Project Features

The contract for construction of the major features of the Middle Fork American River Project was based on a guaranteed maximum cost of $91,750,000. The bid prices on individual units of the Project are itemized in Appendix C, and are summarized in Table 4-B.

It can be ssen that the sum of the bid prices on the individual units exceeds the guaranteed maximum; thus the latter will control.

TABLE 4-A

Placer County Water Agency
Middle Fork American River Project

ACREAGE OF LANDS AND RIGHTS
TO BE ACQUIRED FOR MAJOR PROJECT FEATURES

Feature	Federally-Owned (Acres)	Privately-Owned (Acres)	Proportion of Total Privately-Owned (Per Cent)
Reservoirs [1]			
Duncan Creek	15	0	-
French Meadows	1,714	64	6.3
Hell Hole	1,094	571	56.1
Long Canyon	12	0	-
Interbay	17	18	1.8
Afterbay	219	7	0.7
Tunnels [2]			
Duncan Creek	33	0	-
French Meadows	21	16	1.6
Middle Fork	127	129	12.6
Ralston	79	87	8.6
Auburn	0	18	1.8
Conduit [1]			
French Meadows	19	4	0.4
Middle Fork	5	5	0.5
Long Canyon	0	10	1.0
Auburn	0	7	0.7
Borrow Areas [1]			
Hell Hole	66	17	1.7
Long Canyon	0	2	0.2
Roads and Trails [2]			
Duncan Creek	7	0	-
French Meadows	50	0	-
Hell Hole	12	29	2.8
Interbay	30	0	-
Brushy Canyon	4	6	0.6
Afterbay	10	2	0.2
Auburn	0	25	2.4
	3,534	1,017	100.0

1/ To be acquired in fee.

2/ Rights of way only to be acquired.

Source: Basic data provided by Kronick, Moskovitz and Vanderlaan, Attorneys at Law.

TABLE 4-B

Placer County Water Agency
Middle Fork American River Project

SUMMARY OF CONSTRUCTION BID PRICES FOR MAJOR PROJECT FEATURES

Unit	Bid Price
French Meadows Dam	$ 6,353,417
Hell Hole Dam	16,729,135
Duncan Creek Diversion Dam	90,308
Long Canyon Diversions	635,902
Auburn Diversion	3,281,970
Ralston Afterbay Dam	1,317,187
Interbay Dam	591,874
Ralston Tunnel	11,917,178
Oxbow Tunnel	2,681,076
Middle Fork Tunnel	21,004,077
French Meadows Tunnel	4,309,153
Duncan Creek Tunnel	1,702,065
Oxbow Powerhouse	1,178,850
Ralston Powerhouse	4,513,150
Middle Fork Powerhouse	6,795,057
French Meadows Powerhouse	2,121,900
Roads and Bridges	5,272,000
Residences and Service Buildings	451,000
Miscellaneous	1,388,411
	$92,332,000 (rounded)
Guaranteed Maximum	91,750,000

Indirect Costs of Major Project Features

The indirect costs associated with major features of the Project were estimated in some detail in connection with the preparation of the Official Statement relating to sale of the revenue bonds for the Project, and are presented therein. These costs are summarized and also expressed as percentages of the total Project construction bid price in Table 4-C.

TABLE 4-C

Placer County Water Agency
Middle Fork American River Project

ESTIMATED INDIRECT COSTS OF MAJOR PROJECT FEATURES

	Estimated Cost	Percentage of Construction Cost
Engineering Services	$ 7,700,000	8.34
Other Fess and Services	965,000	1.05
Insurance and Admin.	1,075,000	1.16
Contingencies	1,838,750	1.99
Interest During Construction	10,828,500	11.73
Initial Deposit to O.M. & R. Fund	1,500,000	1.62
Total	$ 23,907,250	25.89

Total Capital Costs of Middle Fork Project

The total costs of land acquisition, construction, and indirect expenses associated with major Project features is $116,282,250. These costs together with those of on-shore recreational facilities set forth in the preceding chapter establish the total capital cost of the Middle Fork Project at $117,381,250. This summary is presented in Table 4-D. It should be noted that under the proposed method of financing, the costs of on-shore facilities will not be a reimbursable item.

TABLE 4-D

Placer County Water Agency
Middle Fork American River Project

ESTIMATED TOTAL CAPITAL COSTS OF PROJECT

Feature	Estimated Cost	
Land Acquisition, Major Features	$ 625,000	
Construction, Major Features	91,750,000	
Indirect Costs, Major Features	23,907,250	
Sub-Total		$116,282,250
On-shore Recreation Facilities (Non-reimbursable)		1,099,000
Total		$ 117,381,250

Method of Financing

The total capital costs of land acquisition, construction and indirect charges of the major features of the Middle Fork Project were paid from the proceeds of a sale of revenue bonds. The Agency, at an election held on June 20, 1961, was authorized by a vote of 7,550 to 313 to issue revenue bonds in an amount not to exceed $140,000,000 to finance the Project. On May 1, 1963, $115,000,000 of revenue bonds were sold for an actual amount of $116,282,251, with an effective interest rate of 3.57%. The issuance of these bonds was authorized pursuant to the Placer County Water Agency Act and the Revenue Bond Law of 1941 and by Resolution No. 63-11 of the Board of Directors of the Agency, adopted April 16, 1963. It will be noted that the amount of revenue bonds sold exceeded by $1.00 the total capital costs of the major Project features set forth in Table 4-D. Thus, bond funds are not available for construction of on-shore recreation facilities nor is there an indicated need for other funds required for debt service.

Section 14.1 of the Placer County Water Agency Act permits the Agency to levy an ad valorem tax not to exceed $0.10 per $100 assessed valuation which, for the County's current tax base, would yield $153,000 per year. Such funds become a part of the Agency's general funds and may be used for any legal purpose including bond debt service. The Agency has no plans to use these tax revenues for any purpose other than administrative and indirect Project costs. Similarly, any State financial grants under the provision of the Davis-Grunsky Act, any revenues from the sale of water, or moneys from any source other than revenues from the sale of power become a part of the general fund from which the Agency intends to finance the construction of its on-shore recreational facilities. Ordinarily, Davis-Grunsky monies are not used for constructing on-shore facilities. However, in this case, this requirement is not appropriate, since construction of the major features is guaranteed by the power repayment contract.

In any event, the on-shore facilities would be constructed with Agency general fund monies regardless of source.

Annual Project Costs

The annual costs of operating the Middle Fork Project can be considered in four separate parts:

(1) Costs of operating, maintaining and replacing major Project features, (2) debt service on the bonds sold to build the major Project features, (3) pumping costs at the Auburn Diversion, and (4) operation, maintenance, and replacement costs of on-shore recreational facilities. Of these, the first three are considered to be reimbursable Project charges, while the fourth has no affect on the financial feasibility of the Project.

Operation, Maintenance and Replacement Costs of Major Project Features

The annual operation, maintenance and replacement costs of major Project features (exclusive of pumping charges at Auburn Diversion) have been estimated by McCreary-Koretsky Engineers, and are summarized in Table 4-E.

TABLE 4-E

Placer County Water Agency
Middle Fork American River Project

ESTIMATED ANNUAL COSTS OF MAJOR PROJECT FEATURES *

Item	Estimated Annual Cost
Operation and Maintenance:	
Structures	$ 78,000
Power Plants	210,000
Replacement	50,000
Administration	25,000
Land Use Charges	37,000
Insurance	75,000
	$ 475,000

* Exclusive of pumping costs at Auburn Diversion

These estimates have been accepted by both the Federal Power Commission and Pacific Gas and Electric Company.

Debt Service on Construction Fund Bonds

The bond service schedule, based on the interest rates, maturities and sinking fund requirements stated in the notice of sale is shown in Table 4-F.

The contract for purchase of power provides that the Agency may accumulate one-half of the regular semi-annual power payment over the service requirement in a reserve account, until a total of $50,000 has been so accumulated. This reserve account, which is separate from the fund specifically established for Project operation, is to be used as needed to supplement semi-annual payments in certain succeeding years when such payments are slightly less than bond service requirements. Table 4-F also shows the accumulation and disposition of this sinking fund reserve account.

All semi-annual payments for power except the aforementioned $50,000 in excess of current bond service requirements are to be deposited in a Project Operation and Maintenance Fund which is described in a later section.

Pumping Costs at Auburn Diversion

The aforementioned costs for operation, maintenance and replacement of major Project features do not include the costs of pumping at Auburn Diversion. Prior to the completion of Auburn Dam, presently scheduled for 1975, water diverted into western Placer County must be pumped. McCreary-Koretsky Engineers have made studies to determine the probable magnitude of these pumping costs and have indicated that the costs will range from $2.50 to $4.00 per acre foot, depending on how the plant is operated. For purposes of the report, a figure of $3.00 has been adopted.

The amount of water to be diverted into western Placer County by the Middle Fork Project is discussed fully in a succeeding chapter. Applying the unit pumping cost to the amounts diverted between 1966 and 1975 provides the estimated annual Project pumping costs. This computation is presented in Table 4-G.

TABLE 4-F

Placer County Water Agency
Middle Fork American River Project

BOND SERVICE SCHEDULE

$ 21,915,000	Serial 3¼% due semiannually 1/1/68 to 7/1/82, inclusive
9,520,000	Serial 3½% due semiannually 1/1/83 to 7/1/87, inclusive
42,015,000	Term 3½% due 1/1/2003 (Sinking Fund from 1/1/88 to 1/1/2003, inclusive)
39,125,000	Term 3¾% due 7/1/2012 (Sinking Fund from 7/1/2003 to 7/1/2012, inclusive)
2,425,000	Serial 3¾% due 1/1/2013 (Non-callable)
$115,000,000	

Date Due	Interest Payable①	Principal Payments	Total Bond Service	Semi-Annual Payment Under Power Contract	One-half of Balance to Sinking Fund Reserve Account	Accumulated Sinking Fund Reserve Account
1/1/1968	$2,037,045	$575,000	$2,612,045	$2,612,500	$ 227	$ 227
7/1/1968	2,027,701	580,000	2,607,701	"	2,399	2,626
1/1/1969	2,018,276	590,000	2,608,276	"	2,112	4,738
7/1/1969	2,008,689	600,000	2,608,689	"	1,905	6,643
1/1/1970	1,998,939	610,000	2,608,939	"	1,780	8,423
7/1/1970	1,989,026	620,000	2,609,026	"	1,737	10,160
1/1/1971	1,978,951	630,000	2,608,951	"	1,774	11,934
7/1/1971	1,968,714	640,000	2,608,714	"	1,893	13,827
1/1/1972	1,958,314	650,000	2,608,314	"	2,093	15,920
7/1/1972	1,947,751	660,000	2,607,751	"	2,374	18,294
1/1/1973	1,937,026	675,000	2,612,026	"	237	18,531
7/1/1973	1,926,058	685,000	2,611,058	"	721	19,252
1/1/1974	1,914,926	695,000	2,609,926	"	1,287	20,539
7/1/1974	1,903,633	705,000	2,608,633	"	1,933	22,472
1/1/1975	1,892,176	720,000	2,612,176	"	162	22,634
7/1/1975	1,880,476	730,000	2,610,476	"	1,012	23,646
1/1/1976	1,868,614	740,000	2,608,614	"	1,943	25,589
7/1/1976	1,856,589	755,000	2,611,589	"	455	26,044
1/1/1977	1,844,320	765,000	2,609,320	"	1,590	27,634
7/1/1977	1,831,889	780,000	2,611,889	"	305	27,939
1/1/1978	1,819,214	790,000	2,609,214	"	1,643	29,582
7/1/1978	1,806,376	805,000	2,611,376	"	562	30,144
1/1/1979	1,793,295	815,000	2,608,295	"	2,102	32,246
7/1/1979	1,780,051	830,000	2,610,051	"	1,224	33,470
1/1/1980	1,766,564	845,000	2,611,564	"	468	33,938
7/1/1980	1,752,833	855,000	2,607,833	"	2,333	36,271
1/1/1981	1,738,939	870,000	2,608,939	"	1,780	38,051
7/1/1981	1,724,801	885,000	2,609,801	"	1,349	39,400
1/1/1982	1,710,420	900,000	2,610,420	"	1,040	40,440
7/1/1982	1,695,795	915,000	2,610,795	"	852	41,292
1/1/1983	1,680,926	880,000	2,560,926	2,562,500	787	42,079
7/1/1983	1,665,526	895,000	2,560,526	"	987	43,066
1/1/1984	1,649,864	910,000	2,559,864	"	1,318	44,384
7/1/1984	1,633,939	925,000	2,558,939	"	1,780	46,164
1/1/1985	1,617,751	940,000	2,557,751	"	2,374	48,538
7/1/1985	1,601,301	960,000	2,561,301	"	599	49,137
1/1/1986	1,584,501	975,000	2,559,501	"	863②	50,000②
7/1/1986	1,567,439	995,000	2,562,439	"	...②	...②
1/1/1987	1,550,026	1,010,000	2,560,026	"	...②	...②
7/1/1987	1,532,351	1,030,000	2,562,351	"	...②	...②
Sub-Total		$31,435,000				

① Interest payable on all bonds outstanding at rates specified above and in notice of sale. Cents are omitted.

② No further accumulations required. Full reserve of $50,000 accumulated, such reserve to be applied commencing 1/1/88 to fulfill periodic semi-annual sinking fund requirements.

TABLE 4-F (Cont'd)

BOND SERVICE SCHEDULE

Date Due	Interest Payable①	Sinking Fund or Principal Payments	Total Bond Service	Semi-Annual Payment Under Power Contract	Withdrawals from Sinking Fund Reserve Account	Sinking Fund Reserve Account Balance②
1/1/1988	$1,514,326	$1,050,000	$2,564,326	$2,562,500	$1,826	$48,174
7/1/1988	1,495,951	1,065,000	2,560,951	"	...	...
1/1/1989	1,477,314	1,085,000	2,562,314	"	...	...
7/1/1989	1,458,326	1,105,000	2,563,326	"	826	47,348
1/1/1990	1,438,989	1,125,000	2,563,989	"	1,489	45,859
7/1/1990	1,419,301	1,140,000	2,559,301	"	...	...
1/1/1991	1,399,351	1,165,000	2,564,351	"	1,851	44,008
7/1/1991	1,378,964	1,185,000	2,563,964	"	1,464	42,544
1/1/1992	1,358,226	1,200,000	2,558,226	"	...	...
7/1/1992	1,337,226	1,225,000	2,562,226	"	...	...
1/1/1993	1,315,789	1,250,000	2,565,789	"	3,289	39,255
7/1/1993	1,293,914	1,265,000	2,558,914	"	...	...
1/1/1994	1,271,776	1,295,000	2,566,776	"	4,276	34,979
7/1/1994	1,249,114	1,310,000	2,559,114	"	...	...
1/1/1995	1,226,189	1,340,000	2,566,189	"	3,689	31,290
7/1/1995	1,202,739	1,360,000	2,562,739	"	239	31,051
1/1/1996	1,178,939	1,380,000	2,558,939	"	...	...
7/1/1996	1,154,789	1,410,000	2,564,789	"	2,289	28,762
1/1/1997	1,130,114	1,430,000	2,560,114	"	...	...
7/1/1997	1,105,089	1,445,000	2,550,089	"	...	...
1/1/1998	1,079,801	1,430,000	2,509,801	2,512,500	...	...
7/1/1998	1,054,776	1,455,000	2,509,776	"	...	...
1/1/1999	1,029,313	1,485,000	2,514,313	"	1,813	26,949
7/1/1999	1,003,326	1,510,000	2,513,326	"	826	26,123
1/1/2000	976,901	1,535,000	2,511,901	"	...	...
7/1/2000	950,038	1,560,000	2,510,038	"	...	...
1/1/2001	922,738	1,590,000	2,512,738	"	238	25,885
7/1/2001	894,913	1,615,000	2,509,913	"	...	...
1/1/2002	866,651	1,645,000	2,511,651	"	...	...
7/1/2002	837,863	1,675,000	2,512,863	"	363	25,522
1/1/2003	808,551	1,685,000	2,493,551	"	...	...
Sub-Total		$42,015,000				
7/1/2003	779,063	1,735,000	2,514,063	2,512,500	1,563	23,959
1/1/2004	746,532	1,765,000	2,511,532	"	...	...
7/1/2004	713,438	1,800,000	2,513,438	"	938	23,021
1/1/2005	679,688	1,835,000	2,514,688	"	2,188	20,833
7/1/2005	645,282	1,865,000	2,510,282	"	...	...
1/1/2006	610,313	1,905,000	2,515,313	"	2,813	18,020
7/1/2006	574,594	1,935,000	2,509,594	"	...	...
1/1/2007	538,313	1,975,000	2,513,313	"	813	17,207
7/1/2007	501,282	2,010,000	2,511,282	"	...	...
1/1/2008	463,594	2,050,000	2,513,594	"	1,094	16,113
7/1/2008	425,157	2,090,000	2,515,157	"	2,657	13,456
1/1/2009	385,969	2,125,000	2,510,969	"	...	...
7/1/2009	346,125	2,165,000	2,511,125	"	...	...
1/1/2010	305,532	2,210,000	2,515,532	"	3,032	10,424
7/1/2010	264,094	2,245,000	2,509,094	"	...	...
1/1/2011	222,000	2,290,000	2,512,000	"	...	...
7/1/2011	179,063	2,330,000	2,509,063	"	...	...
1/1/2012	135,375	2,375,000	2,510,375	"	...	...
7/1/2012	90,844	2,420,000	2,510,844	"	...	...
Sub-Total		$39,125,000				
1/1/2013	45,469	2,425,000	2,470,469	2,512,500	...	...
Grand Total		$115,000,000				

① Interest payable on all bonds outstanding at rates specified above and in notice of sale. Cents are omitted.

② Reserve Account starts at $50,000 prior to 1/1/88 payment.

TABLE 4-G

Placer County Water Agency
Middle Fork American River Project

ESTIMATED COSTS OF PUMPING AT AUBURN DIVERSION

Year	Amount Pumped Acre-Feet*	Pumping Cost**
1966	0	$ 0
1967	5,000	15,000
1968	5,000	15,000
1969	5,000	15,000
1970	5,000	15,000
1971	5,000	15,000
1972	5,000	15,000
1973	9,000	27,000
1974	11,000	33,000
1975	13,000	39,000
1976 on	0	0

* Net diversion taken from Table 5-B.

** Based on unit pumping cost of $3.00 per acre foot.

Operation, Maintenance, and Replacement Costs of Recreational Facilities

The Placer County Water Agency intends to contract with the United States Forest Service for operation, maintenace and replacement of the on-shore recreational facilities. The basis of negotiations has been that the Forest Service will assume all expenses of operation, maintenance, and replacement in consideration of which the Agency will give title to all on-shore recreation facilities to the Forest Service and construct certain support facilities. Thus, the Agency will not be obligated for any annual costs associated with the recreation facilities, and these costs are therefore considered to be non-reimbursable and do not affect the Project's financial feasibility. The costs of support facilities for operations personnel have been included with the costs of on-shore recreational facilities.

Annual Project Income

Project income will be derived from sale of power and water. Users fees for recreational facilities will not be available to the Agency for Project expenses.

Power Revenues

The power purchase contract of April 30, 1963, between Placer County Water Agency and Pacific Gas and Electric Company[1] provides, in essence, that P. G. & E. will purchase all power generated by the Project, and will in return make payments to the Agency in accordance with the following schedules:

(a) at the semi-annual rate of $2,612,500 from full operation date through June 30, 1982; $2,562,500 from July 1, 1982 through June 30, 1997; and $2,512,500 after July 1, 1997; and, in addition,

(b) at the monthly rate of $41,667 through June 30, 1982; $50,000 from July 1, 1982 through June 30, 1997; and $58,333 after July 1, 1997.

Payments under paragraph (a) above, will be used to retire the Project bond debt. Payments under paragraph (b), plus surplus payments under paragraph (a) and certain other sources, will be used for operation and maintenance of major Project features. These payments by P. G. & E. total $5,725,000, annually.

In Table 4-F it is shown that revenue derived under paragraph (a) is sufficient to retire the $115,000,000 in bonds issued to build the Project.

Costs of Project operation and maintenance will be met from an Operation and Maintenance Fund. Sources of income to this fund will be:

1) $1,500,000 deposited by the Agency from the proceeds of its bond sale.

2) Any balance remaining in the Project Construction Fund upon completion of the Project and not required to pay in full the total cost of construction and incidental expenses.

(1) Appendix A, "Official Statement Relating to $115,000,000 Middle Fork Project Revenue Bonds, Series A", Stone and Youngberg and Blyth and Co.

3) One-half of the amount by which semi-annual payments received by the Agency from sale of power exceed the amount of interest and principal due on the revenue bonds, until a total of $50,000 has been accumulated from the other half of the excess, after which all such excess shall accrue to the operation fund.

4) Monthly deposits by P. G. & E. in accordance with the power purchase contract.

5) Receipts from certain insurance policies should they become payable.

It is anticipated that the Operation and Maintenance Fund will at all times be sufficient to pay the Project operation, maintenace and replacement costs. However, in the event the fund is insufficient, P. G. & E. may, under certain circumstances, either increase its monthly deposits to the fund or take over Project operation and maintenance.

Revenues From the Sale of Water

A water pricing policy is now being developed by the Placer County Water Agency, which will form the basis for the sale of the Project yield. Repayment contracts will be entered into with municipalities and public districts of various types.

The prices of water will be such that, at a minimum, payment will be made for all costs of pumping or delivery through the Auburn Ravine tunnel plus any other costs incurred by the Agency to transport water to the turnout of a contracting entity. It is anticipated that the pricing policy will provide for additional revenues for other water developments or water associated purposes. Thus, no definitive estimate of income from the sale of water can be made at this time. The only costs attached to the Project yield at the point of delivery into Auburn Ravine are the pumping costs until 1975. These have been shown to be $3.00 per acre foot and are the minimum that could be charged if no other works were provided.

Revenues from Use of Recreation Facilities

Any income derived from fees charged for the use of recreational facilities would be collected by the United States Forest Service and deposited in the United States Treasury. None will be available to the Agency. This income will not accrue to the Agency and does not affect the financial feasibility of the Middle Fork Project.

Financial Feasibility

The foregoing data demonstrate that the Project can be financed and that the annual income resulting from sale of power from the Middle Fork American River Project will be sufficient to provide for operation, maintenance and replacement costs, and for debt service on construction fund bonds for major Project features. Appendix D of this report is a letter from Stone & Youngberg, financing consultants to the Agency, which is submitted as evidence of financial ability and plans of the Agency to carry out the Project. Revenues from the sale of water will be more than adequate to offset the pumping costs at Auburn Diversion. Thus, it is shown that the Middle Fork Project is financially feasible.

5. ECONOMIC JUSTIFICATION OF THE MIDDLE FORK PROJECT

The following section contains an analysis of Project benefits, and establishes the economic justification of the Middle Fork American River Project.

The primary purposes of the Middle Fork American River Project are production of hydroelectric energy and conservation of water for irrigation and municipal and industrial use. Of the two conservation purposes, municipal and industrial water supply is by far the more significant. Agricultural use of Project water will be minor, and is not predicted to occur at all until the year 2007. The most significant secondary result of the Project will be the creation of a recreation attraction, particularly in the French Meadows-Hell Hole area.

In the calculation of the present worth (1966) of all benefits, as described hereafter, a 50-year payout period, beginning in 1966 and ending in 2016, and a 4.0 per cent interest rate have been used, in accordance with current practice of the Department of Water Resources.

Power Benefits

The benefits attributable to the power function of a project are evaluated as being equal to the cost of producing, by investor-owned steam-electric generation, the same dependable capacity and amount of energy as the project will produce.

For purposes of this report, the contract between Placer County Water Agency and Pacific Gas and Electric Company for sale of Project power has been taken as the basis for determining the value of alternative production costs. Payments by the company to the Agency will be for two purposes: (1) semi-annual payments to be used for debt service of the bonds, and (2) monthly payments to be used for Project operations. The annual sum of these payments amounts to $5,725,000. This sum represents total annual payments by P.G. & E. for all capacity and energy produced by the Project. Thus, it represents the value to P.G. & E. for these items at the high voltage side of the Project switchyards. If a steam-electric plant of a capacity equivalent to that of the Middle Fork Project could have been obtained and operated at a different annual cost to P.G. & E., with full consideration in each case of losses between the point of generation and load center, then the value of Project power would have changed proportionately. Therefore, $5,725,000 has been taken as the annual power benefit of the Middle Fork Project. The present worth of this annual benefit of $5,725,000 over a 50-year period commencing in 1966 is $122,984,000. The Project will produce 762,450,000 kilowatt-hours annually and the dependable capacity is 190,700 kilowatts at a 34 per cent capacity factor.

Conservation Benefits

The benefit of the Middle Fork Project resulting from its water conservation functions has been taken as the sum of the benefits resulting from development of supplemental municipal and industrial supplies, and from provision of additional agricultural water supplies.

In estimating Project benefits created by the provision of water for irrigation and for municipal and industrial use, the values derived are the net benefits of water at the terminus of the diversion tunnel at Auburn Ravine. This procedure is followed since the first stage Project does not include facilities for delivering water from Auburn Ravine to the consumer; these will be installed as the second stage of the total Middle Fork American River Project.

Demands for Water

Separate studies have been made to determine the future demand for water in western Placer County.(1) In these studies it was estimated that the total demand for supplemental water in western Placer County would increase from 8,000 acre feet per year in 1970 to 292,000 acre feet per year in 2020. Prior to the year 2000, all demand for supplemental water will be from municipal and domestic customers. The projected growth of demand for agricultural and municipal water supplies and the need for supplemental water to meet these demands are summarized in Table 5-A.

Use of Project Yield to Meet Demands

Under terms of the letter of understanding from the United States Bureau of Reclamation to the Placer County Water Agency, dated February 23, 1962,(2) and in accordance with its water right permits, the Agency will be able to divert annually into western Placer County up to 120,000 acre feet in accordance with the following schedule:

---

(1) "Report on Projections of Demand for Water in Western Placer County," Leeds, Hill & Jewett, Inc.

(2) Appendix B, "Report on the Availability of Water From the American River" Leeds, Hill & Jewett, Inc.

TABLE 5-A

Placer County Water Agency
Middle Fork American River Project

PROJECTED DEMAND FOR WATER
AND
NEED FOR SUPPLEMENTAL SUPPLIES
IN WESTERN PLACER COUNTY
(Thousands of Acre Feet)

Year	Total Projected Demand	Portion to be Supplied From Local Supplies *	Amount of Supplemental Water Required
1. MUNICIPAL			
1960	12	13	0
1970	21	13	8
1980	36	13	23
1990	54	13	41
2000	80	13	67
2010	104	13	91
2020	126	13	113
2. AGRICULTURAL**			
1960	110	116	0
1970	126	126	0
1980	142	151	0
1990	166	167	0
2000	217	168	49
2010	295	170	125
2020	350	172	178
3. TOTAL **			
=1+2 1960	122	129	0
1970	147	139	8
1980	178	164	23
1990	220	180	41
2000	297	181	116
2010	399	183	216
2020	476	185	292

* Present 13,000 acre foot use of local supplies for M&I purposes assumed to remain constant.

** Excludes service area of Nevada Irrigation District. Data abstracted from p. 49 and Fig. 5 of "Report on Projections of Demand for Water in Western Placer County' by Leeds, Hill and Jewett, Inc., October 1962.

Period	Maximum Permitted Diversion
1967 thru 1971	5,000 acre feet
1972 thru 1976	15,000 "
1977 thru 1981	20,000 "
1982 thru 1986	25,000 "
1987 thru 1991	30,000 "
1992 thru 1996	40,000 "
1997 thru 2001	55,000 "
2002 thru 2006	70,000 "
2007 and thereafter	120,000 "

These amounts of water are used as the total Project conservation yield for purposes of this report. This supply will be used to satisfy a major portion of the growing municipal, industrial and irrigation demands in western Placer County, with the Central Valley Project (CVP) and local supplies providing the remainder. Water supplies from these three sources will be managed by the Agency on an integrated basis so as to provide water to the consumers at the lowest possible cost.

The Agency intends to purchase CVP water up to 117,000 acre feet of water annually, and, pursuant to the agreement with the Bureau of Reclamation, must purchase the following minimum amounts during normal years:

Period	Minimum Required Purchase
1967 thru 1971	0
1972 thru 1976	0
1977 thru 1981	0
1982 thru 1986	0
1987 thru 1991	0
1992 thru 1996	15,000 acre feet
1997 thru 2001	35,000 acre feet
2002 thru 2006	85,000 acre feet
2007 thru 2011	117,000 acre feet

Purchases of CVP water may be made in greater quantities or at earlier dates than shown in the foregoing tabulation.

The Agency will be able to use CVP water for municipal or agricultural purposes as it sees fit, and will be charged for the water in accordance with the use to which it is put.

Present plans of the Agency are to use CVP water for agricultural uses and Middle Fork Project water for municipal and industrial purposes, insofar as possible. Such an operating procedure will reduce to a minimum the amount of CVP water which must be purchased at the higher rate established for municipal and industrial water. This procedure will minimize the overall cost of water to consumers in Placer County, consistent with the Agency's policy.

Table 5-B is a projection of the anticipated disposition of supplemental supplies developed by the Middle Fork Project under the foregoing assumptions. Plates 5-A and 5-B portray graphically the projected municipal and agricultural water demands and the source of the supplies which will serve these demands.

Municipal and Industrial Benefit

The benefit per acre foot of the Middle Fork Project in providing a municipal and industrial water supply has been taken as the difference in the costs of such water from the Project and from the least costly alternative source.

Water developed by the Middle Fork Project will be free of any obligation to pay any portion of the capital costs of the major Project features . All works to the point of delivery in Auburn Ravine are amortized by revenues from the sale of Project generated power. Similarly, all Project operations, except those for diverting water through the Auburn tunnel, will be paid from power revenues. Prior to the construction of Auburn Dam, there will be an additional cost for pumping Project water from the American River to Auburn Ravine of $3.00 per acre foot; after construction of Auburn Dam by the Bureau of Reclamation Project water will flow by gravity through the Auburn Diversion tunnel.

The most likely alternative source of supply of municipal and industrial water would be the proposed Auburn Reservoir. The letter of understanding between the U. S. Bureau of Reclamation and Placer County Water Agency [1] sets the base cost of municipal and industrial water from Auburn Reservoir at $9 per acre foot at the point of diversion from the American River to which is added a surcharge that averages $0.26 per acre foot.

(1) Appendix B, "Report on the Availability of Water From the American River," Leeds, Hill and Jewett, Inc.

TABLE 5-B

Placer County Water Agency
Middle Fork American River Project

ANTICIPATED DISPOSITION OF YIELD FROM MIDDLE FORK AMERICAN RIVER PROJECT

(Thousands of Acre Feet)

Year	Project Yield	Amount To Municipal and Industrial	Amount To Agriculture	Amount Not Used
1967	5	5	0	0
1968	5	5	0	0
1969	5	5	0	0
1970	5	5	0	0
1971	5	5	0	0
1972	15	10	0	5
1973	15	12	0	3
1974	15	13	0	2
1975	15	14	0	1
1976	15	15	0	0
1977	20	17	0	3
1978	20	18	0	2
1979	20	20	0	0
1980	20	20	0	0
1981	20	20	0	0
1982	25	25	0	0
1983	25	25	0	0
1984	25	25	0	0
1985	25	25	0	0
1986	25	25	0	0
1987	30	30	0	0
1988	30	30	0	0
1989	30	30	0	0

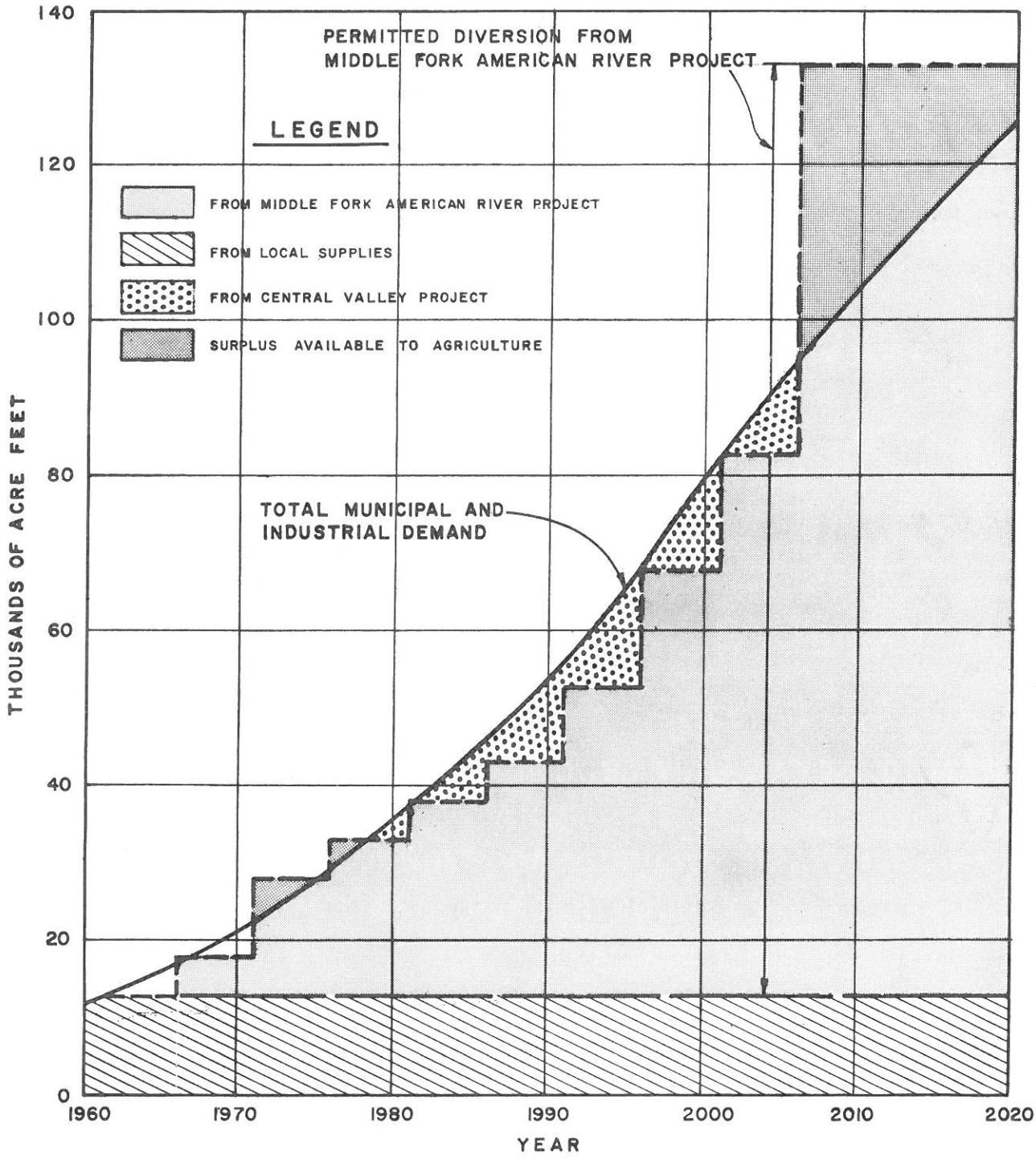
TABLE 5-B (Cont'd)

ANTICIPATED DISPOSITION OF YIELD
FROM
MIDDLE FORK AMERICAN RIVER PROJECT
(Thousands of Acre Feet)

Year	Project Yield	Amount To Municipal and Industrial	Amount To Agriculture	Amount Not Used
1990	30	30	0	0
1991	30	30	0	0
1992	40	40	0	0
1993	40	40	0	0
1994	40	40	0	0
1995	40	40	0	0
1996	40	40	0	0
1997	55	55	0	0
1998	55	55	0	0
1999	55	55	0	0
2000	55	55	0	0
2001	55	55	0	0
2002	70	70	0	0
2003	70	70	0	0
2004	70	70	0	0
2005	70	70	0	0
2006	70	70	0	0
2007	120	82	38	0
2008	120	84	36	0
2009	120	86	34	0
2010	120	89	31	0
2011	120	92	28	0
2012	120	94	26	0
2013	120	96	24	0
2014	120	98	22	0
2015	120	100	20	0
2016	120	103	17	0

Source: Studies by Leeds, Hill and Jewett, Inc.

PROJECTED MUNICIPAL & INDUSTRIAL WATER DEMAND AND SOURCES OF SUPPLY WESTERN PLACER COUNTY

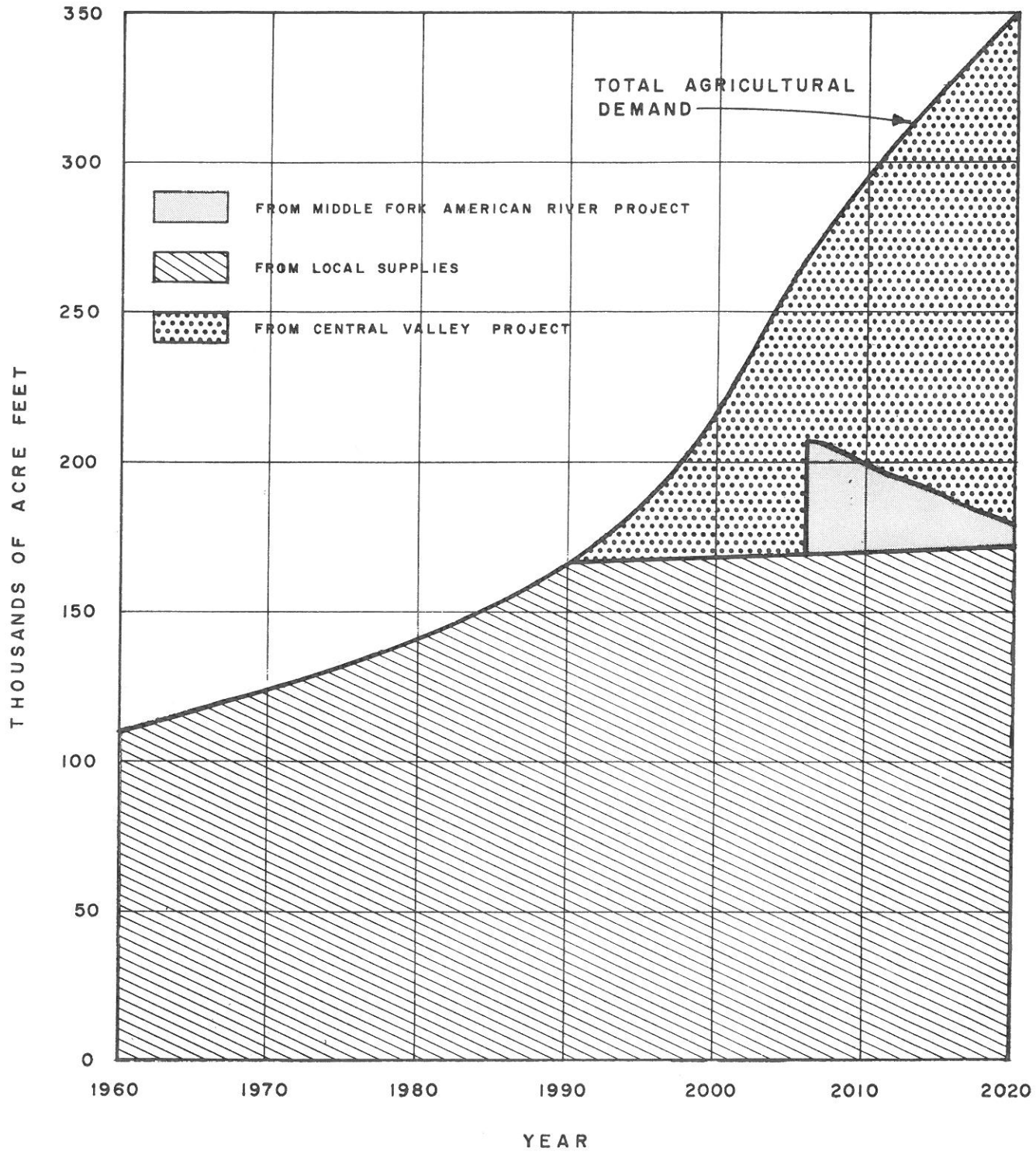


LEEDS, HILL AND JEWETT, INC.

PROJECTED AGRICULTURAL WATER DEMAND AND SOURCES OF SUPPLY

WESTERN PLACER COUNTY

(EXCLUSIVE OF NEVADA IRRIGATION DISTRICT SERVICE AREA)



A structure to deliver the water to Auburn Ravine would also be necessary and the least costly method would be by constructing a tunnel similar to that being built as part of the Middle Fork Project.

The contractor's bid price for the Auburn tunnel is $3,281,970. The estimated indirect costs allocable to this facility plus the present worth of allocable operation, maintenance and replacement charges (exclusive of pumping costs) amount to an additional $1,100,000, for a total capitalized value for the facility of $4,380,000 (rounded). This sum would have to be recovered by application of a flat charge on the quantities of municipal and industrial water set forth in Table 5-B. Discounting future revenues thus derived to present worth at 4.0 per cent, establishes a unit charge of $7.03 per acre foot. The total cost of municipal and industrial water from Auburn Reservoir delivered to Auburn Ravine would be $9.00 + $0.26 + $7.03 = $16.29 per acre foot.

Thus, the net cost of alternative water at Auburn Ravine, and therefore the net Project municipal and industrial benefit, amounts to $16.29 - $3.00 = $13.29 per acre foot through 1975, and $16.29 thereafter.

Application of the unit benefits derived above to net water deliveries, and discounting future benefits to present worth in 1966 at 4.0 per cent, results in a Project benefit for municipal and industrial water supply of $10,783,000.

Agricultural Benefits

Water from the Middle Fork American River Project available for irrigation purposes is that portion of the total Project conservation yield not needed to satisfy municipal and industrial demands. The amount thus available, and for which there is a demand, varies from 38,000 acre feet in the year 2007 to 7,000 acre feet in the year 2020. On Plate 5-B there was shown the total agricultural demand for water and the sources of supply which are expected to serve this demand. It can be seen that the Middle Fork Project contribution to the total agricultural supply in the western Placer County service area is relatively minor.

The agricultural benefits of the Middle Fork Project have been computed as that percentage of total agricultural benefits from irrigated agriculture in western Placer County attributable to irrigation water developed by the Project. The following paragraphs describe the method.

Projections of the future area to be devoted to irrigated agriculture in the western Placer County service area were published in the previously mentioned report, "Report on Projections of Demand for Water in Western Placer County," by Leeds, Hill and Jewett, Inc. In that report (Fig. 4) the total irrigated area in western Placer County was projected through year 2020. Also shown were the projections for major subareas: Valley, Loomis Basin (or "Foothill"), and Placer Division of Nevada Irrigation District. Project water will be applied only to the Valley and Foothill subareas. The total projected future irrigated acreage in these two subareas is summarized as follows:

TABLE 5-C

Placer County Water Agency
Middle Fork American River Project

PROJECTED GROSS IRRIGATED AREA IN PROJECT SERVICE AREA
(Acres)

Year	Valley Area	Foothill Area	Total
1960	11,000	16,000	27,000
1970	12,000	19,000	31,000
1980	14,000	22,000	36,000
1990	17,000	25,000	42,000
2000	28,000	23,000	51,000
2010	43,000	18,000	61,000
2020	56,000	16,000	72,000

On page 46 of the aforementioned report there was set forth the following summary of the anticipated future cropping patterns in the service area:

TABLE 5-D

Placer County Water Agency
Middle Fork American River Project

PROJECTED CROPPING PATTERN IN PROJECT SERVICE AREA
(In Per Cent of Total of Each Area)

Crop	Valley Area	Foothill Area
Irrigated Pasture	45%	50%
Rice	30	-
Orchard	5	40
Truck Crops	5	-
Field Crops	15	-
Vines	-	10
	100%	100%

Application of these percentages to the projected irrigated acreage in the Valley and Foothill subareas shown in Table 5-C results in the following distribution of total irrigated acreage among crop types during years in which Project water will be available for agricultural use:

TABLE 5-E

Placer County Water Agency
Middle Fork American River Project

PROJECTED DISTRIBUTION OF IRRIGATED CROPS IN PROJECT SERVICE AREA
(Thousands of Acres)

Crop	Year 2000	2010	2020
Irrigated Pasture	24.1	28.4	33.2
Rice	8.4	12.9	16.8
Orchard	10.6	9.4	9.2
Field Crops	4.2	6.3	8.4
Truck Crops	1.4	2.2	2.8
Vines	2.3	1.8	1.6
Total	51.0	61.0	72.0

By applying appropriate unit farm delivery factors to the various acreages, and allowing for canal and other minor losses, the total agricultural demand in western Placer County, exclusive of the area served by Nevada Irrigation District, is projected to increase from 110,000 acre feet annually in 1960 to 350,000 acre feet in 2020. This growth in demand has been set forth in Table 5-A and shown on Plate 5-B.

As can be seen from Plate 5-B, most of the water needed to meet these demands will be local supplies available at very low cost, or will be CVP water at a price of $1.50, plus transportation charges. Hence, it is not anticipated that cost of water will be a limiting factor in the development of irrigated agriculture in western Placer County.

The percentage of the total agricultural water demand to be provided by the Middle Fork Project through the end of the Project payout period is summarized in Table 5-F.

TABLE 5-F

Placer County Water Agency
Middle Fork American River Project

PERCENTAGE OF TOTAL AGRICULTURAL WATER DEMAND TO BE SERVED BY PROJECT

Year	Total Demand	Project Supply	Percentage
1966 - 2006	-	0	0
2007	271	38	14
2008	279	36	13
2009	286	34	12
2010	295	31	11
2011	300	28	10
2012	305	26	9
2013	311	24	8
2014	316	22	7
2015	322	20	6
2016	328	17	5

The net benefit from irrigation is taken to be the so-called "return to land and water" from the farming enterprise, which is defined as the difference between the market value of the produce per acre and the sum of all ownership and production expenses except the cost of irrigation water and the interest on the value of the land. Values for the unit return to land and water for representative crops in western Placer County have been developed with the assistance of the Placer County Farm Advisor and the University of California Agricultural Extension Service. These values are set forth in Table 5-G. Plums have been taken to represent orchard crops, and corn to represent field crops. While certain small plantings of truck crops and vines are predicted to occur in western Placer County, discussions with the Placer County Farm Advisor indicate that these crops will be of little, if any, importance in the total agricultural economy of the area. Hence the returns to land and water for truck crops and vines have been neglected in the computation of agricultural benefits.

TABLE 5-G

Placer County Water Agency
Middle Fork American River Project

UNIT RETURNS TO LAND AND WATER FOR SELECTED CROPS IN WESTERN PLACER COUNTY

	Irrigated Pasture	Rice	Orchard (Plums)	Field Crops (Corn)
Production, per acre	10 a.u.m.	5,000 lbs.	4.5 tons	5,000 lbs.
Price per unit	$ 6.00	$0.0475	$ 150.00	$ 0.03
Revenue, per acre	$60.00	$237.50	$ 675.00	$150.00
Production costs, dollars per acre:				
Fixed investiment, except land & water	12.08	37.80	111.17	5.70
Cultural costs, except water	12.25	43.20	244.59	22.42
Water system costs	8.00	----	13.00	7.75
Irrigation, excluding cost of water	11.75	5.00	30.00	7.50
Harvesting costs	---	41.40	133.25	30.00
Management allowance*	3.00	12.40	33.75	7.50
Taxes	6.00	7.00	20.00	6.00
Miscellaneous	1.70	5.00	21.75	1.65
TOTAL	54.78	151.80	607.51	88.52
Unit returns to land & water, per acre	5.22	85.70	67.49	61.48
(Unit irrigation benefits) rounded to	5.00	85.00	67.50	60.00

* Management allowance computed at 5 per cent of total revenue.
Source of Data: Placer County Farm Advisor and University Extension Service

The application of these unit irrigation benefits to the corresponding crop projections provides the total irrigation benefit. For simplicity, the crop projection for the year 2010 (Table 5-E) has been taken as representative of the period when Middle Fork Project water will be available for irrigation purposes, 2007 - 2016. The average annual irrigation benefit during this period for the Valley and Foothill areas of western Placer County are shown in Table 5-H. These values represent the benefits measured at the farm, since they do not take account of water costs.

TABLE 5-H

Placer County Water Agency
Middle Fork American River Project

AVERAGE ANNUAL AGRICULTURAL BENEFIT
DUE TO ALL IRRIGATION IN WESTERN PLACER COUNTY, 2007-2016 *

Crop	Irrigated Area (Thousands of Acres)	Unit Benefit (Dollars per Acre)	Total Annual Benefit (Thousands of Dollars)
Irrigated Pasture	28.4	5.00	142.0
Rice	12.9	85.00	1,096.5
Orchard	9.4	67.50	634.5
Field	6.3	60.00	378.0
TOTAL			2,251.0

* Exclusive of area served by Nevada Irrigation District.

Projected irrigated area for year 2010 is taken as representative of period 2007-2016.

The projection of the total irrigation benefit creditable to the Middle Fork Project is taken as equal to that portion of the total agricultural demand met by Project supplies. These percentages have been set forth in Table 5-F. In order to obtain the net agricultural benefit of water delivered at Auburn Ravine, the "on-farm benefits" attributable to the Project must be reduced by the estimated charges for transporting Project water from Auburn Ravine to the farm. It is anticipated that the capital costs of secondary facilities to be constructed in western Placer County will be met by revenues from the sale of municipal water, and that the only charges levied on the relatively minor quantities of agricultural water will be to recover some operating expenses. For purposes of this study, a transportation charge of $1.00 per acre foot has been adopted. Applying this charge to the quantities of delivered water and deducting the product from the "on-farm" benefit produces the net agricultural benefit. These computations are summarized in Table 5-I.

The annual net irrigation benefits for the period 2007 through 2016 reduced to present worth in 1966 at 4.0 per cent results in a Project irrigation benefit of $324,000.

Total Water Conservation Benefits

Combining the Municipal and Industrial benefit of $10,783,000 with the irrigation benefit of $324,000 gives a total water conservation benefit to the Middle Fork Project of $11,107,000.

Recreation Benefits

The recreation benefits resulting from construction of the Middle Fork Project have been computed as the difference between the sums of the present worths of the annual benefits resulting from the recreational use of the Project area after the Project is built over that which would have occurred had the Project not been built.

Recreational Use Without the Project

The procedure followed is estimating future recreation use of the Project area which would occur "without the Project" is basically the same as that used to estimate the potential future demand for recreation facilities in the area after Project construction (see Chapter 3). In this method, the present visitation of the Project area is subdivided into the various areas of residence of the recreationists, the per capita visitation from these areas is computed, and future visitation is projected by applying population growth factors and outdoor recreation factors to the individual areas. In computing use with the Project, the pattern of

TABLE 5-I

Placer County Water Agency
Middle Fork American River Project

ANNUAL AGRICULTURAL BENEFITS DUE TO MIDDLE FORK AMERICAN RIVER PROJECT

Year	Total "On Farm" Benefits From All Irrigation (Thousands of Dollars)	Percentage Creditable to Project (See p.5-12)	"On Farm" Benefits Creditable to Project (Thousands of Dollars)	Water Transportation Costs (Thousands of Dollars)	Net Agricultural Benefit at Auburn Ravine (Thousands of Dollars)
2007	$ 2,251	14	$ 315.1	$ 38.0	$ 277.1
2008	2,251	13	292.6	36.0	256.6
2009	2,251	12	270.1	34.0	236.1
2010	2,251	11	247.6	31.0	216.6
2011	2,251	10	225.1	28.0	197.1
2012	2,251	9	202.6	26.0	176.6
2013	2,251	8	180.1	24.0	156.1
2014	2,251	7	157.6	22.0	125.6
2015	2,251	6	135.1	20.0	115.1
2016	2,251	5	112.6	17.0	95.6

visitation at similar reservoirs was used for projecting future use. For computing future use in the area without the Project, the present residence pattern of visitors to the area was taken as the basis.

The 1962 level of use of the French Meadows-Hell Hole area was approximately 6,000 visitor days annually, according to estimates by officials of the Tahoe National Forest. No specific field surveys have been conducted to determine the areas of residence of persons presently using the area. Such information as the United States Forest Service and the Placer County Recreation Commission have available indicates that about one-half of the users live no further away than western Placer County and most of the remainder originating at distances no greater than Oakland.

Based on this information, the following residence pattern has been assumed:

TABLE 5-J

Placer County Water Agency
Middle Fork American River Project

ASSUMED DISTRIBUTION AMONG AREAS OF RESIDENCE
FOR PRESENT VISITORS TO FRENCH MEADOWS-HELL HOLE AREA

Area of Residence	Distribution (Per Cent)
Southern California	5
Bay Counties	5
San Joaquin County	1
Sutter-Yuba Counties	2
Sacramento-Yolo Counties	35
El Dorado County	3
Nevada County	2
Placer County	45
All Other	2
	100

The unit visitations (visitor days per capita) without the Project for years 1960, 1970, 1980, 1990, 2000, 2010, and 2020 for the various areas of residence have been computed in a manner similar to that shown in Tables 3-B and 3-D for visitation with the Project.

The recreation use of the French Meadows-Hell Hole area, without the Project, has been determined by combining the projected unit visitation with projected population in each area of residence. This computation, which is presented in Table 5-K, is based on the assumption that facilities would have been provided to accommodate the increased usage. It will be seen that use in the French Meadows-Hell Hole area, without the Project would be expected to increase from 6000 visitor-days annually in 1960 to about 89,000 visitor-days in 2020.

It is also assumed that the total visitation in the French Meadows-Hell Hole area without the Project would be divided into overnight and day use in the same proportions as assumed for Project visitors; that is 90 per cent overnight, 10 per cent day use.

Present use in the downstream area of the Project is estimated at 650 visitor days, annually. This use, without the stimulus to be created by the Project, is not expected to increase greatly and has been projected by direct proportion to the total use forecasted for the French Meadows-Hell Hole area without the Project.

The projected recreation use of the Middle Fork Project area, without the Project is set forth by decades in Table 5-L.

TABLE 5-L

Placer County Water Agency
Middle Fork American River Project

PROJECTED RECREATIONAL USE OF PROJECT AREA
WITHOUT THE PROJECT
(Visitor-Days per Year)

	French Meadows-Hell Hole Area			Downstream Area	Project Area
Year	Overnight	One-Day	Total	One-Day	Total
1960	5,400	600	6,000	650	6,650
1970	9,630	1,070	10,700	1,150	11,850
1980	16,650	1,850	18,500	2,000	20,500
1990	27,360	3,040	30,400	3,300	33,700
2000	40,770	4,530	45,300	4,900	50,200
2010	57,780	6,420	64,200	7,000	71,200
2020	80,100	8,900	89,000	9,600	98,600

TABLE 5-K

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1960-2020
RECREATION USE OF FRENCH MEADOWS-HELL HOLE AREA
WHICH WOULD HAVE OCCURRED "WITHOUT THE PROJECT"
FROM VARIOUS AREAS OF RESIDENCE

Area of Residence	1960			1970			1980			1990		
	Actual Population (Thou.)	Visitor-Days per Thousand	Use, Visitor-Days	Projected Population (Thousands)	Visitor-Days per Thousand	Use, Visitor-Days	Projected Population (Thousands)	Visitor-Days per Thousand	Use, Visitor-Days	Projected Population (Thousands)	Visitor-Days per Thousand	Use, Visitor-Days
Southern California	9,399	0.032	300	13,191	0.041	540	16,958	0.050	850	20,066	0.059	1,180
Bay Counties	3,639	0.082	300	4,950	0.104	510	6,310	0.127	800	7,715	0.150	1,160
San Joaquin Co.	250	0.24	60	335	0.31	100	470	0.37	170	640	0.44	280
Sutter-Yuba Co.	67	1.79	120	78	2.28	180	103	2.78	290	147	3.28	480
Sacramento-Yolo Co.	569	3.70	2,100	812	4.70	3,820	1,146	5.74	6,580	1,579	6.77	10,690
El Dorado Co.	29	6.20	180	42	7.88	330	62	9.61	600	86	11.4	980
Nevada Co.	21	5.70	120	22	7.24	160	27	8.84	240	34	10.4	350
Placer Co.	57	47.4	2,700	81	60.1	4,870	118	73.4	8,660	170	86.6	14,720
All Other	1,686	0.071	120	2,189	0.090	200	3,006	0.110	330	4,563	0.130	590
Total			6,000			10,710			18,520			30,430

Leeds, Hill and Jewett, Inc.

TABLE 5-K (Cont'd)

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF PROJECTED 1960-2020
RECREATION USE OF FRENCH MEADOWS-HELL HOLE AREA
WHICH WOULD HAVE OCCURRED "WITHOUT THE PROJECT"
FROM VARIOUS AREAS OF RESIDENCE

Area of Residence	2000			2010			2020		
	Projected Population (Thou.)	Visitor Days per Thousand	Use, Visitor-Days	Projected Population (Thousands)	Visitor-Days per Thousand	Use, Visitor-Days	Projected Population (Thousands)	Visitor-Days per Thousand	Use, Visitor-Days
Southern California	23,253	0.067	1,560	26,155	0.076	1,990	28,770	0.085	2,450
Bay Counties	9,145	0.172	1,570	10,515	0.195	2,050	11,800	0.218	2,570
San Joaquin Co.	810	0.50	400	995	0.57	570	1,220	0.64	780
Sutter-Yuba Co.	206	3.76	770	270	4.26	1,150	348	4.74	1,650
Sacramento-Yolo Co.	1,989	7.77	15,450	2,423	8.80	21,320	2,914	9.81	28,590
El Dorado Co.	113	13.0	1,470	140	14.8	2,070	168	16.5	2,770
Nevada Co.	43	12.0	520	56	13.6	760	74	15.1	1,120
Placer Co.	228	99.4	22,660	291	113	32,880	374	126	47,120
All Other	6,213	0.149	930	8,155	0.169	1,380	10,332	0.188	1,940
Total			45,330			64,170			88,990

Recreational Use With the Project

The recreation use which is anticipated to occur in the French Meadows-Hell Hole area after construction of the Project has been estimated by comparison with other similar reservoirs in the Sierra Nevada.

It is expected that there will be a brief build-up period after the addition of each increment of facility capacity, during which the actual annual use will increase from its previous level to the new capacity. A study of the visitation records at Ice House Reservoir for 1963 showed that the overnight use of the 37-unit campground for the year amounted to about 8,000 visitor-days. The theoretical capacity of that facility is 12,500 visitor-days per season. Thus, 1963 use was 65 per cent of capacity.

This figure was adopted as a guide for determining first year use of recreational facilities to be provided in the French Meadows-Hell Hole area. It was assumed that each increment of recreation facilities constructed in the French Meadows-Hell Hole area would be operating at full capacity starting the fifth year after its installation, provided that the capacity is less than the total potential demand. Application of these assumptions to the capacity to be accommodated by both overnight and day-use facilities which will be installed in the French Meadows-Hell Hole area results in the anticipated use of recreation facilities set forth in Table 5-M.

In the downstream area, it is anticipated that actual use of picnic facilities will be at maximum capacity from the very beginning, since, as explained earlier in this report, it is impossible to provide sufficient facilities to meet the demand within the area available. Thus, actual use of the facilities in the downstream area will be 6000 visitor-days, annually, from 1966 through 2016. The number of sightseers, fishermen, and others who do not wish to make use of the picnic facilities (or cannot because of the limited capacity) are expected to increase annually as population growth in the surrounding area continues. The expected downstream use by decades is shown in Table 5-N.

Unit Recreation Benefit

In accordance with currently accepted procedures, the so-called "Trice-Wood" method has been used to derive the estimated unit benefit resulting from overnight and one-day recreation use. In using this method, it is necessary to compute the difference between the 50th and 90th percentile unit travel costs incurred by visitors to the area.

TABLE 5-M

Placer County Water Agency
Middle Fork American River Project

ANTICIPATED RECREATIONAL USE
OF FRENCH MEADOWS-HELL HOLE AREA WITH THE PROJECT

Year	Use of Incremental Capacity, Per Cent	Capacity of Overnight Facilities To Be Provided, 1/ Visitor-Days	Anticipated Use of Overnight Facilities, Visitor-Days	Capacity of Day Use Facilities To Be Provided, Visitor-Days	Anticipated Use of Day-Use Facilities, Visitor-Days	Total Use, Visitor-Days
1966	65	86,900	53,000*	9,000	5,800	58,800
1967	85	86,900	69,000*	9,000	7,600	76,600
1968	90	86,900	73,000*	9,000	8,100	81,100
1969	95	86,900	77,000*	9,000	8,500	85,500
1970	100	86,900	81,000*	9,000	9,000	90,000
1971-1980	100	86,900	86,900*	9,000	9,000	95,900
1981	65	135,800	118,700	16,300	13,700	142,400
1982	85	135,800	128,500	16,300	15,200	143,700
1983	90	135,800	130,900	16,300	15,600	146,500
1984	95	135,800	133,300	16,300	15,900	149,200
1985	100	135,800	135,800	16,300	16,300	152,100
1986-1990	100	135,800	135,800	16,300	16,300	152,100
1991	65	212,600	185,700	23,000	20,700	206,400
1992	85	212,600	201,100	23,000	22,000	223,100
1993	90	212,600	204,900	23,000	22,300	227,200
1994	95	212,600	208,800	23,000	22,700	231,500
1995	100	212,600	212,600	23,000	23,000	235,600
1996-2000	100	212,600	212,600	23,000	23,000	235,600
2001	65	310,600	276,300	34,600	30,500	306,800
2002	85	310,600	295,900	34,600	32,900	328,800
2003	90	310,600	300,800	34,600	33,400	334,200
2004	95	310,600	305,700	34,600	34,000	339,700
2005	100	310,600	310,600	34,600	34,600	345,200
2006-2016	100	310,600	310,600	34,600	34,600	345,200

1/ Includes Organizational Camps

* Use limited by potential demand through 1971

TABLE 5-N

Placer County Water Agency
Middle Fork American River Project

ANTICIPATED RECREATIONAL USE IN DOWNSTREAM AREA WITH THE PROJECT
(Visitor-Days)

Year	Picnickers	Sightseers, Others	Total
1966	6,000	2,000	8,000
1970	6,000	3,000	9,000
1980	6,000	8,900	14,900
1990	6,000	17,700	23,700
2000	6,000	28,500	34,500
2010	6,000	41,600	47,600
2020	6,000	58,300	64,300

In order to estimate the travel costs of visitors to the French Meadows-Hell Hole area, it is necessary to know the number of visitors to be expected from various areas. The pattern of visitation at Sly Park, Ice House, and Spaulding reservoirs was studied in some detail to assist in making the estimate of travel costs. These lakes have certain significant similarities to the proposed French Meadows-Hell Hole development, principally in that they have water-associated camping facilities, are in the same general region as French Meadows-Hell Hole, and draw from the same population centers.

Visitation records for the 1963 season for these three areas were examined, and the proportion of total visitor-days originating from various areas throughout the State were determined. The data examined gave the point of origin, number of people in party, and length of stay of 470 camping parties at Sly Park, 280 at Ice House, and 141 at Lake Spaulding. This represented the entire recorded visitation for the season at Ice House and Lake Spaulding, and three complete weeks of visitation at Sly Park. The total study sample aggregated more than 10,000 visitor-days of overnight visitation originating from within the State.

The distribution of overnight visitors to these three recreation areas from various points of origin was found to be as shown in Table 5-O. Each of the cities of residence listed in Table 5-O was selected as representing several cities in its vicinity; thus, "Vallejo" would include all visitors originating between Napa and Martinez. The total list of 22 cities accurately reflects the distribution of overnight visitation from the entire state at each of the existing areas.

TABLE 5-O

Placer County Water Agency
Middle Fork American River Project

1963 OVERNIGHT VISITOR RESIDENCE DISTRIBUTION
AT EXISTING RECREATION FACILITIES

City of Residence	Distribution of Overnight Visitors, Per Cent		
	Sly Park	Ice House	Lake Spaulding
Southern California			
El Centro	-	0.1	-
San Diego	1.9	0.8	2.9
Barstow	0.6	0.2	4.7
Los Angeles	8.8	3.4	4.2
Bay Counties			
"Peninsula"	6.5	4.4	6.6
"East Bay"	8.7	6.5	13.9
San Francisco	1.4	1.0	1.2
"North Bay"	1.0	0.8	1.9
Vallejo	4.3	2.3	4.3
San Joaquin County			
Stockton	5.6	2.2	-
Sutter-Yuba County			
Marysville-Yuba City	-	-	3.3

TABLE 5-O (Cont'd)

1963 OVERNIGHT VISITOR RESIDENCE DISTRIBUTION
AT EXISTING RECREATION FACILITIES

City of Residence	Distribution of Overnight Visitors, Per Cent		
	Sly Park	Ice House	Lake Spaulding
Sacramento-Yolo Counties			
Davis-Woodland	0.5	1.0	-
Sacramento Metropolitan	51.5	69.7	33.0
El Dorado County			
Placerville	7.0	6.1	1.6
Nevada County			
Nevada City	-	-	5.9
Placer County			
Auburn	0.4	1.1	11.7
All Other			
Bakersfield	-	-	0.4
Eureka	0.7	-	-
Salinas	0.2	-	1.5
Jackson	0.4	-	-
Lake Tahoe	0.2	0.1	1.1
Oroville	0.3	0.3	1.8
	100.0	100.0	100.0

Source: Studies by Leeds, Hill and Jewett, Inc.

For use in connection with studies of the French Meadows-Hell Hole area, the points of residence were condensed into areas of residence by county group. A predicted pattern of visitation for overnight visitors to the French Meadows-Hell Hole area was established based on the pattern at the three reservoirs for which data were studied, with modification for location and accessibility differences. The condensed pattern of visitors' residence to Sly Park, Ice House, and Lake Spaulding is set forth in Table 5-P, together with the pattern projected for the French Meadows-Hell Hole area.

TABLE 5-P

Placer County Water Agency
Middle Fork American River Project

DISTRIBUTION OF OVERNIGHT VISITORS
ACCORDING TO AREA OF RESIDENCE
(Per Cent)

Area of Residence	Distribution at Existing Facilities (1963)			Predicted For French-Meadows Hell Hole Area
	Sly Park	Ice House	Lake Spaulding	
Southern California	11.3	4.5	11.8	10
Bay Counties	21.9	15.0	27.9	20
San Joaquin County	5.6	2.2	0	3
Sutter-Yuba Counties	0	0	3.3	3
Sacramento-Yolo Counties	52.0	70.7	33.0	40
El Dorado County	7.0	6.1	1.6	2
Nevada County	0	0	5.9	2
Placer County	0.4	1.1	11.7	17
All Other	1.8	0.4	4.8	2
	100.0	100.0	100.0	100

It is shown in Table 5-P that in the case of Sly Park and Lake Spaulding, 10 per cent or more of the total use originated from southern California while the use at Ice House from southern California amounted to only about four per cent. This difference represents a significant group, but it is believed that the proportion of visitation from southern California will increase during the next few seasons as the new Ice House facility becomes better known.

The projected pattern of visitation given in Table 5-P has been used previously in Chapter 3 to project future recreation use in the French Meadows-Hell Hole area.

In order to compute the unit travel costs it is also necessary to know the average number of visitor-days per party. The sample data from the three study areas gave the following information regarding the average number of visitor-days per party of campers:

	Average Visitor-Days Per Party
Sly Park	10.6
Ice House	13.0
Lake Spaulding	16.9

In applying these data to the French Meadows-Hell Hole area, the figure derived for average visitor-days per party at Sly Park was discarded. The reasons for this are that Sly Park is much more accessible to one-day visitors, and the facilities are of lower standard than those existing at Ice House and Lake Spaulding or contemplated at French Meadows-Hell Hole. Both of these factors would tend to reduce the average length of stay at Sly Park below that to be expected in the French Meadows-Hell Hole area. The combined figures for Ice House and Lake Spaulding amount to 6,030 visitor-days resulting from 421 trips, for an average of 14.35 visitor-days per camping-party trip. A figure of 14.5 visitor-days per camping-party trip has been adopted for the French Meadows-Hell Hole area.

Since it is probable that visitors from distant locations may not spend their entire vacation at one location, a special study was made in the three sample areas of the visitors originating from southern California to determine what proportion of a total trip was actually spent at the recreation area. The total length of the average trip for a southern

Californian camping in the High Sierra was assumed to consist of ten days away from home, four of which were spent travelling and the remaining six of which were spent in the recreation area. This is in general agreement with the findings of the California Public Outdoor Recreation Plan Survey, which found that the typical trip of this type was about one week long (Part 1, p. 40). On the basis of this special study, it was found that the percentage of the total trip spent by people from southern California at each of the three study areas was as follows:

	Per Cent of Trip Spent at Location
Sly Park	49.0
Ice House	63.2
Lake Spaulding	67.5

Based on these figures, only 60 per cent of the travel costs incurred by projected recreationists originating from southern California was credited to the French Meadows-Hell Hole facilities in making the Trice-Wood analysis.

Table 5-Q is a summary of computation of unit travel costs incurred by overnight users in reaching the French Meadows-Hell Hole area from various areas of the State. For ease of computation, visitors from each area of residence have been assumed to originate in the major city in each of the areas. Travel costs have been computed at $0.075 per mile, round trip, and the unit costs have been derived by assuming 14.5 visitor days per trip.

The cumulative percentage visitation as predicted for the overnight users of the French Meadows-Hell Hole area (Table 5-P) have been plotted against the round trip travel distances shown in Table 5-Q, and a smooth curve fitted to the points. It has been determined by this procedure that the 50th percentile represents a travel distance of about 180 miles while the 90th percentile represents a distance of 950 miles. The corrsponding unit travel costs for these distances are $0.93 and $2.95. The difference, $2.02, represents the unit recreation benefit attributable to overnight use of the French Meadows-Hell Hole area. This value has been rounded to $2.00.

TABLE 5-Q

Placer County Water Agency
Middle Fork American River Project

DERIVATION OF UNIT TRAVEL COSTS
FOR OVERNIGHT VISITORS
TO FRENCH MEADOWS-HELL HOLE AREA

Area of Residence	City of Residence [1]	Round Trip Distance to French Meadows (Miles)	Trip Cost [2] (Dollars)	Unit Travel Costs Allocated to French Meadows-Hell Hole Area [3] (Dollars per Visitor-Day)
Southern California	Los Angeles	950	71.25	2.95 [4]
Bay Counties	Oakland	350	26.25	1.81
San Joaquin County	Stockton	280	21.00	1.45
Sutter-Yuba Counties	Yuba City	200	15.00	1.03
Sacramento-Yolo Counties	Sacramento	180	13.50	0.93
El Dorado County	Placerville	170	12.75	0.88
Nevada County	Nevada City	170	12.75	0.88
Placer County	Roseville	145	10.88	0.75
All Other	(Other)	--	---	---

1. Assumed location for computing travel distance

2. Computed at 7-1/2 cents per mile

3. Computed at 14.5 visitor days per trip

4. 60 per cent of total trip cost to French Meadows-Hell Hole Area

For comparative purposes, a similar analysis was performed on the data gathered for Sly Park, Ice House, and Lake Spaulding, resulting in the following unit benefits for overnight recreation use at these locations:

	Recreation Benefit Dollars per Visitor Day (Overnight Visitors)
Sly Park	2.20
Ice House	2.10
Lake Spaulding	2.12

For day use, it has been assumed that the 50th percentile of visitors will originate at Roseville, and the 90th percentile at West Sacramento. The round trip distance to French Meadows from Roseville is 145 miles, and from West Sacramento it is 200 miles. By comparison, the 50th and 90th percentiles for one-day visitors at Sly Park were found to be located at Sacramento and San Francisco, respectively. Sacramento is 125 miles round trip from Sly Park, while San Francisco is 305.

Application of the Trice-Wood procedure, assuming an average of four visitor-days per party, yields a unit benefit of $1.00 per visitor day for use at French Meadows-Hell Hole.

In the downstream area, the unit benefit assignable to that portion of the use for which facilities will be provided has been taken as the same as the day-use benefit in the French Meadows-Hell Hole area; namely, $1.00 per visitor-day. For that portion of the use for which no facilities will be provided (sightseers, etc.), the unit benefit has arbitrarily been taken as $0.25 per visitor day.

The unit benefits computed for Project conditions were based on the anticipated residence pattern for visitors to the area after the Project is built. An entirely different pattern of residence distribution among recreationists in the Project area would prevail under non-Project conditions. The residence distribution pattern for use under non-Project circumstances has been presented in Table 5-J. Applying the same method of analysis used for computing the unit recreation benefit with the Project, yields a value of $1.03 (say $1.00) per visitor day for overnight use under non-Project conditions. This value is considerably less, since the great bulk of the visitation without the Project would be from the local area. For purposes of this analysis, it is believed that the residence pattern of day users in the French Meadows-Hell Hole area and in the downstream area would not be significantly different under Project and non-Project conditions. Thus, the unit benefits computed for these users under Project conditions are assumed applicable to non-Project circumstances.

Total Recreational Benefits

The total recreational benefits resulting from the construction of the Middle Fork Project is the difference between the total of the overnight and day use of the Project area times the appropriate unit benefit under Project and non-Project conditions for each year from 1966 through 2015. The present worth of the total net benefit for each year computed in this manner was then determined, and the sum of these present worths, $6,250,000, represents the recreational benefit attributable to the Middle Fork Project.

Economic Justification

Table 5-R is a summarization of all costs associated with the Middle Fork Project and all benefits presented either as the capital expense incurred or the present worth in 1966 where appropriate of the individual items of cost or benefit. The Project costs are those previously presented in Chapter 4 of this report and the benefits were developed earlier in this chapter. It is shown in Table 5-R that the Project has a favorable ratio of benefits to costs of 1.08 and is thus economically justified.

TABLE 5-R

Placer County Water Agency
Middle Fork American River Project

COMPARISON OF TOTAL PROJECT BENEFITS AND COSTS [1/]

Project Benefits	Amount
Power Generation	$ 122,984,000
Water Conservation	11,107,000
Recreation	6,250,000
Total Benefits	140,341,000
Project Costs	
Construction of Major Features	$ 116,282,250
Construction of On-shore Facilities	1,099,000
Operation of Major Features	10,204,000
Operation of On-shore Facilities	1,451,000
Operation of Auburn Diversion	151,000
Total Costs	$ 129,187,250
Ratio of Benefits to Costs	1.08:1

1/ All benefits and costs given in terms of 50-year present worth in 1966 at 4.0 per cent interest.

6. ALLOCATION OF COSTS AMONG VARIOUS FUNCTIONS OF THE MIDDLE FORK PROJECT

This chapter contains an allocation of the costs of the Middle Fork American River Project to the power, water conservation and recreation functions of the Project. The cost allocation has been made in accordance with the Separable Cost-Remaining Benefits Method.

The estimated costs of planning, constructing and operating the Middle Fork American River Project have been allocated to the various Project functions in accordance with the separable costs-remaining benefits method, as described in "Proposed Practices for Economic Analysis of River Basin Projects," a report to the Federal Inter-Agency River Basin Committee by the Subcommittee on Benefits and Costs, dated May 1950.

Separable Costs

The separable cost of any function of a multiple-purpose project is defined as the difference between the cost of the total project and the cost of a similar project with that particular function omitted. The derivation of the separable cost attributable to each function of the Middle Fork Project is described in the following paragraphs.

A summary of the total estimated multiple-purpose project costs, together with the estimated costs of projects in which each of the three functions is individually omitted, is set forth in Table 6-A, presented later in this section.

The total Project construction cost to be paid to the contractor has been limited to $91,750,000. This amount is less than the sum of the unit bid prices for individual construction items multiplied by the number of units in each item. The total of the latter would be $92,332,000. It has been necessary in the computation of the separable costs of specific functions of the Project to reduce the unit costs of included features by the same percentage that the limiting total costs for the entire project bears to the amount computed on the unit cost basis, namely 0.63 per cent.

Cost of Project Without Power Function

If the power function were to be omitted in the Middle Fork American River Project, then the objective would be to provide only recreation and water conservation. A project for these purposes would be comprised of dams at French Meadows and Hell Hole identical to those proposed in the multiple-purpose project. Cursory studies indicate that the conservation yield could be developed by these reservoirs and that the Duncan Creek and Long Canyon Diversions would not be required. None of the tunnels or power houses nor the Interbay Dam would be required, since these features serve only the power purpose. However, the Auburn Diversion works and the Ralston Afterbay Dam would be a portion of the limited project since they serve respectively the water conservation and recreation functions. The total construction costs of these major project facilities that would be omitted is $57,540,000 on the basis of unit bid prices.

In addition to the deletion of the foregoing major features, the access roads to the power facilities would not be required, many of the automatic controls for operation of the power features could be deleted, and only a single operating headquarters would be required at the French Meadows Dam. These three items further reduce the capital costs of the limited purpose Project by $3,236,000 on a unit bid price basis.

Thus, the total construction costs of a project constructed for conservation and recreation purposes only, would be $31,556,000 on a unit bid price basis and $31,357,000 when the percentage reduction is applied to reduce construction costs to the guaranteed maximum.

There would be further savings in costs on a project without the power function in land acquisition, other indirect costs and project operation maintenance replacement. The percentage of the land required for a conservation-recreation project as compared to the multiple purpose project, has been computed from the information set forth in Table 4-A, and is in the ratio of 713 to 1017, or 70.2 per cent. Applying this percentage to the total land acquisition costs indicates that the capital savings in land acquisition costs for a conservation-recreation project would be $187,000. The other indirect costs of the conservation-recreation project were computed as the percentage that the capital cost of the limited purpose project bears to the capital cost of the multiple purpose project (34.2 per cent). It should be noted that these other indirect costs do not include the on-shore recreation facilities which have been computed separately.

In a limited purpose conservation-recreation project, it is assumed that no initial deposit is required in a project operation maintenance and replacement fund, since such a fund is to be established primarily for the purpose of insuring operation of the power features of the multiple-purpose project.

The capitalized costs of operating, maintaining and replacing recreational facilities has been previously shown to be $1,451,000. The annual costs of operating the conservation features of the project exclusive of pumping costs at Auburn Diversion, are estimated to be $103,000 and the present worth thereof is $2,225,000. The present worth of the anticipated pumping charges at the Auburn Diversion have been previously computed to be $151,000. The sum of the foregoing three items is $3,827,000, which represents the total of operation maintenance and replacement costs of the conservation-recreation project.

The second column of Table 6-A is a listing of the individual items of cost of the conservation-recreation project, which can be compared with the amount shown in the first column of Table 6-A, for the entire multiple purpose project. The total capital cost of a project without the power features is $44,379,000.

TABLE 6-A

Placer County Water Agency
Middle Fork American River Project

ESTIMATED COSTS OF COMPARABLE PROJECTS WITH VARIOUS FUNCTIONS OMITTED

(Millions of Dollars)

Item	Multiple-Purpose Project	Project Omitting Power Function	Project Omitting Conservation Function	Project Omitting Recreation Function
Direct Costs				
French Meadows Dam & Res.	6.353	6.353	6.353	6.353
Hell Hole Dam & Res.	16.729	16.729	16.729	16.679
Diversions (Duncan and Long Canyon)	0.726		0.726	0.726
Auburn Diversion	3.282	3.282		3.282
Ralston Afterbay Dam	1.317	1.317	1.317	1.317
Interbay Dam	0.592		0.592	0.592
Tunnels	41.613		41.613	41.613
Powerhouses	14.609		14.609	14.609
Roads & Bridges	5.272	3.657	5.152	3.323
Residences	0.451	0.050	0.451	0.451
Miscellaneous	1.388	0.168	1.388	1.388
Subtotal	92.332	31.556	88.930	90.333
Guaranteed Maximum Construction Cost	91.750	31.357	88.370	89.764
Indirect Costs				
Lands and Rights of Way	0.625	0.438	0.594	0.625
Engineering Services	7.700	2.632	7.401	7.532
Other Fees and Services	0.965	0.330	0.927	0.944
Insurance and Admin.	1.075	0.367	1.033	1.052
Contingencies	1.839	0.628	1.768	1.799
Interest During Const.	10.828	3.701	10.408	10.593
Deposit to OM&R	1.500		1.500	1.500
Recreation On-shore Facilities *	1.099	1.099	1.099	
Subtotal	25.631	9.195	24.730	24.045

TABLE 6-A (Cont'd)

ESTIMATED COSTS OF COMPARABLE PROJECTS
WITH VARIOUS FUNCTIONS OMITTED
(Millions of Dollars)

Item	Multiple-Purpose Project	Project Omitting Power Function	Project Omitting Conservation Function	Project Omitting Recreation Function
Total Construction Costs	117.381	40.552	113.100	113.809
Operation, Maintenance and Replacement Costs **				
On-Shore Facilities	1.451	1.451	1.451	
Other Project Units	10.204	2.225	9.950	10.204
Pumping at Auburn Diversion	0.151	0.151		0.151
Total OM&R Costs	11.806	3.827	11.401	10.355
Total Project Costs	129.187	44.379	124.501	124.164

*Includes present worth of future construction costs.

** Present worth of annual costs.

Project Costs Without Conservation Function

If the Middle Fork Project were to be constructed and operated for power and recreation only, the effect on construction and total project costs would be minor and relate only to the Auburn Diversion.

The same procedures have been used as in the previous section for computation of the project without power features. The guaranteed maximum construction costs reduces to $88,370,000 by elimination of the Auburn Diversion works. The cost of lands and rights of way would only be 4.9 per cent less than for the total project; other indirect costs

would be reduced by approximately 3.7 per cent. Operation maintenance and replacement costs would be reduced by the amount of the total Project operating costs attributable to the Auburn Diversion, and by the pumping costs at that facility.

The total of the foregoing deductions reduces the total cost of the power-recreation project by only 4 per cent to $124,501,000. The details are indicated in the third column of Table 6-A.

Project Cost Without Recreation Function

If the Middle Fork Project were to be constructed without a recreation function, the on-shore facilities would be eliminated, as would the launching ramp at Hell Hole Dam. The main project access roads could be constructed to considerably lower standards. It has been previously indicated that the access roads to Ralston Afterbay, Interbay, Duncan Creek Diversion, and Hell Hole Reservoir are being constructed to higher standards to accommodate anticipated recreation use than would be required for maintenance and operation of a limited purpose conservation-power project. Similarly, the road relocation around French Meadows Reservoir is being built to higher standards than the existing road, and improvements are being made to the principal access roads to the French Meadows area.

It is estimated that the increased costs of road construction or improvement in the project area attributable to recreation accounts for about $2,000,000 of the total road and bridge costs of $5,272,000. The elimination of the launching ramp at the Hell Hole Dam, which is not considered a part of the on-shore facilities since it is being constructed with the major project works, would result in a further saving of $50,000.

Elimination of the recreation function would not have any effect on Project operating costs since such costs are largely related to the operation of the power facilities. The operation costs of the on-shore recreation facilities have been considered as a separate item of cost throughout this analysis and are so indicated in Table 6-A.

The total Project costs of the limited purpose power-recreation project are listed in detail in the fourth column of Table 6-A. The total cost of such a project is shown to be $124,164,000 which is approximately the same as the power-recreation project and about 3.7 per cent less than the multiple-purpose project.

Separable Costs of Project Functions

The computation of separable costs assignable to each of the three functions, power, conservation, and recreation, of the Middle Fork Project is set forth in Table 6-B.

TABLE 6-B

Placer County Water Agency
Middle Fork American River Project

SEPARABLE COSTS OF PROJECT FUNCTIONS
(Millions of Dollars)

Item	Function		
	Power	Conservation	Recreation
Construction Costs			
Multiple-Purpose Project Cost	117.381	117.381	117.381
Less Project Cost Omitting Function	40.552	113.100	113.809
Separable Cost of Function	76.829	4.281	3.572
Operation, Maintenance and Replacement			
Multiple-Purpose Project Cost	11.806	11.806	11.806
Less Project Cost Omitting Function	3.827	11.401	10.355
Separable Cost of Function	7.979	0.405	1.451
Total Separable Costs	84.808	4.686	5.023

Alternative Single-Purpose Project Costs

The maximum benefit which may be attributed to any function of a multiple-purpose project for purposes of cost allocation cannot exceed the cost of the most economical alternative single-purpose project which would provide the same accomplishments as the multiple-purpose project. Derivation of estimated alternative single-purpose project costs for each Project function is described in the following paragraphs.

Alternative Power Project

In order to determine the most economical single-purpose alternative power project, both a privately operated steam plant and a hydroelectric system were investigated. As indicated previously, the Middle Fork Project will develop 762,450,000 KWH annually of salable energy with a dependable capacity of 190,700 KW. Current annual costs of constructing steam plants are in the neighborhood of $19.00 per KW of firm capacity; operating costs are approximately $0.003 per KWH. Applying these costs to the Middle Fork Project statistics, and converting annual costs to present worth, reveals that the least costly steam power generation project would cost $126,960,000.

The least costly hydroelectric project would be identical with the Middle Fork Project as proposed, except that the Auburn Diversion works, the on-shore recreation facilities, and the launching ramp at Hell Hole Dam would not be constructed. Also, certain Project roads could be built to lower standards, since recreation travel would not be accommodated. The total construction costs of such a project is estimated to be $108,790,000. The present worth of annual operation maintenance and replacement costs for that project would be $9,950,000.

Thus, the least costly alternative single-purpose project would be a hydroelectric project, with a capital value of $118,740,000.

Alternative Conservation Project

It is recognized that the damsites suitable for conservation at Auburn and American Bar will be inundated by the proposed Auburn Reservoir. Thus, the most likely alternative conservation project which would develop an additional supply of 120,000 acre feet annually for use in western Placer would be dams at the French Meadows and Hell Hole sites, with a diversion facility near Auburn. The combined active storage of the French Meadows and Hell Hole Reservoirs of the Middle Fork Project is 327,600 acre feet. A preliminary investigation indicates that this amount of storage is sufficient to provide a firm supply of very nearly 120,000 acre feet annually. Therefore, the alternative single-purpose conservation project is considered to consist of dams at French Meadows and Hell Hole identical to those proposed for the multiple-purpose Project, plus the diversion facilities near Auburn and such roads as would be necessary for construction access. Other works that divert into these reservoirs from smaller streams are not required.

The guaranteed maximum construction costs for such a project would be $30,048,000; and indirect costs would be $8,096,000. The present worth in 1966 of annual operation, maintenance, and replacement costs for such a project would be $2,376,000, including the costs of pumping at the Auburn Diversion until 1975. Thus, the total cost of a single-purpose conservation project is estimated to be $40,520,000.

Recreation

Because of the unique environment and scenery in the area where the Middle Fork Project is being constructed, it is believed that the only possible alternative project which could provide the same recreation accomplishments would be a project located in the same area.

Such benefits could be provided by single-purpose reservoirs at the French Meadows and Hell Hole sites. In order to provide equivalent recreation benefits, a single-purpose French Meadows reservoir should maintain a constant pool at an elevation equal to the average mid-September reservoir level provided by the proposed multiple-purpose reservoir. The mid-September level was selected as coinciding with the approximate end of the recreation season and would provide the least costly project. The mid-September level was determined from reservoir operation studies to be at an elevation of 5223. Allowing a ten-foot freeboard, the crest of the hypothetical single-purpose dam would be at an elevation of 5233, compared with an elevation of 5275, the design crest elevation of the proposed multiple-purpose dam. The hypothetical reservoir would have a storage capacity of approximately 84,000 acre feet, which is in excess of that required under the Agency's agreement with the Department of Fish and Game.

Pleasure boating at Hell Hole reservoir will be less extensive than at French Meadows, due to the more limited access to the shore line. For this reason, maintenance of the mid-September reservoir level is not deemed as essential for provision of an equivalent recreation benefit at Hell Hole as it is at French Meadows; in fact, it is felt that recreation benefits would be enhanced if part of the Hell Hole valley were not flooded, so that pleasure boaters might land and camp around the upper end of the reservoir. The single-purpose recreation facility which would accomplish these objectives at the Hell Hole site would be a 120-foot high mass concrete dam, with spillway section crest at an elevation of 4350. However, under terms of the Agency's agreement with the Department of Fish and Game, a minimum pool of 70,000 acre-feet must be maintained at this site during all but the most critical dry years. This pool requires a dam with a crest at an elevation of 4480 feet, or approximately 240 feet above stream bed.

Costs of alternative single-purpose dams at French Meadows and Hell Hole are estimated to be $5,258,000 and $6,830,000 respectively. The total construction cost of an alternative single-purpose recreation project is estimated to be $20,795,000. The present worth of operation, maintenance and replacement of dams and on-shore facilities is estimated at $3,339,000. Thus, the total costs of a single purpose recreation project is estimated to be $24,134,000.

Cost Allocation

The allocation of costs of the Middle Fork American River Project to the three Project functions by the separable costs - remaining benefits method is shown in Table 6-C. It will be seen that the allocated costs of each Project function are less than the benefits to be derived from that function. Thus, the Middle Fork Project meets all criteria for economic justification.

TABLE 6-C

Placer County Water Agency
Middle Fork American River Project

PROJECT COST ALLOCATION
(Millions of Dollars)

Item	Multiple-Purpose Project	Allocation to Project Functions		
		Power Generation	Water Conservation	Recreation
Total Benefits	140.341	122.984	11.107	6.250
Alternative Single-Purpose Project Cost	183.394	118.740	40.520	24.134
Maximum Allowable Benefits	136.097	118.740	11.107	6.250
Separable Costs, Total	94.517	84.808	4.686	5.023
Construction	(84.682)	(76.829)	(4.281)	(3.572)
OM & R	(9.835)	(7.979)	(0.405)	(1.451
Remaining Benefits	41.580	33.932	6.421	1.227
Percentage Distribution	100.00	81.61	15.44	2.95
Allocated Joint Costs, Total	34.670	28.294	5.353	1.023
Construction	(32.699)	(26.686)	(5.049)	(0.965)
OM & R	(1.971)	(1.608)	(0.304	(0.058)
Total Allocated Costs	129.187	113.102	10.039	6.046
Construction	(117.381)	(103.515)	(9.330)	(4.537)
OM & R	(11.806)	(9.587)	(0.709)	(1.509)

7. APPLICATION OF DAVIS-GRUNSKY ACT TO THE MIDDLE FORK PROJECT

The following section sets forth the amounts of the construction and initial facilities grants that are justified for the Middle Fork Project pursuant to the Davis-Grunsky Act, and the eligibility of Placer County Water Agency to receive such grants.

Eligibility of the Agency to Receive a Davis-Grunsky Act Grant

On August 8, 1961 the Placer County Water Agency filed with the Department of Water Resources a request for a preliminary determination of eligibility for financial assistance under the Davis-Grunsky Act. The Department's letter of reply dated April 4, 1962 stated that, according to preliminary findings on the basic conditions of eligibility for assistance under the Davis-Grunsky Act, "The Placer County Water Agency is an eligible public agency as defined in the Act."

Eligibility of the Project to Receive a Davis-Grunsky Act Grant

The aforementioned letter from the Department of Water Resources to the Placer County Water Agency also contained the following statements:

> "The Middle Fork American River Project satisfies the definition of project as contained in the act.
>
> "The proposed project will substantially conform to The California Water Plan, provided:
>
> a. The American Bar Dam and Powerplant is designed to operate under the tailrace conditions which will be imposed by construction of a future Auburn Reservoir of 1 million acre-foot capacity.
>
> b. The transbasin diversion of American River water to western Placer County does not preclude the feasibility of the proposed Auburn-Folsom South Unit of the Central Valley Project.
>
> "The proposed project has statewide interest."

The American Bar dam and reservoir, and appurtenant facilities have been eliminated from the Middle Fork American River Project in order to permit construction by the United States of an Auburn Dam capable of impounding some 2.5 million acre-feet of water. Therefore item (a) above, is no longer a factor.

That the Middle Fork Project will not adversely affect the feasibility of the proposed Auburn-Folsom South Unit (item (b)), is evidenced by the agreement reached between the Placer County Water Agency and the U. S. Bureau of Reclamation as set forth in letters from the Bureau to the Agency dated February 23, 1962 and July 16, 1962. (1)

(1) Appendix B, "Report on the Availability of Water From the American River," Leeds, Hill and Jewett, Inc.

Legislative Authorization for a Davis-Grunsky Act Grant

The Davis-Grunsky Act, as amended in the 1963 legislative session requires that grants in excess of $400,000 may be made by the Department of Water Resources only upon specific authorization of the Legislature. The Placer County Water Agency therefore petitioned the Legislature to make such authorization.

On July 19, 1963, the Governor approved Chapter 1969 of the California statutes, authorizing the Department to make a grant to the Agency not to exceed $3,000,000. Chapter 1969 reads as follows:

> Section 1. The Department of Water Resources is hereby authorized to make a grant to the Placer County Water Agency, pursuant to the Davis-Grunsky Act (Chapter 5 (commencing with Section 12880), Part 6, Division 6, Water Code), of such amount as may be determined by the department upon approval of an application therefor pursuant to said act, but not exceeding the amount of three million dollars ($3,000,000), for recreational functions incidental to the construction of the Middle Fork American River Project in Placer and El Dorado Counties.
>
> No further legislative approval shall be required with respect to the grant authorized to be made to the agency by this act; but such grant shall not be made to the agency until the agency can actually demonstrate the nature and extent of the project, the urgency of the need, and the engineering feasibility, economic justification, and the financial feasibility of the project.

Justifiable Amounts of Davis-Grunsky Act Grants

Construction Grant

Paragraph (2) of subdivision (c), Section 12880 of the California Water Code, as amended in the 1963 session of the Legislature, provides that a grant under the Davis-Grunsky Act may be made "For the part of the construction cost of any dam and reservoir of the proposed project properly allocated to recreational functions of statewide interest."

As is shown in Table 6-C, the part of the construction cost of the Middle Fork Project properly allocable to the Project recreation functions amounts to $4,537,000. From this must be deducted the construction cost of the on-shore facilities, or $1,099,000, so that the total cost of construction of the "dams and reservoirs" allocated to recreation is $3,438,000, the justifiable amount of the recreation grant to be requested by the Agency. This is greater than the $3,000,000 authorized by Chapter 1969. The Legislative limit controls the grant that can be made without further legislative action.

Initial Water Supply and Sanitary Facilities Grant

Paragraph (3) of subdivision (c), Section 12880 of the Water Code, as amended, provides that grants may be made "For the construction of initial water supply and sanitary facilities which are needed for public recreational use of each dam and reservoir of the proposed project."

According to the previously presented estimated costs of construction for on-shore facilities, the cost of the water supply and sanitary facilities to be constructed in 1965 at the French Meadows and Hell Hole Complexes and at Ralston Afterbay is $367,670. Of this, $13,470 is the incremental cost of works sized for future stages of construction. The net cost of initial water supply and sanitary facilities is $354,200.

APPENDIX A

Estimated construction costs of on-shore recreational facilities.

ESTIMATED COSTS TO PCWA FOR CONSTRUCTING FIRST-STAGE

ON-SHORE RECREATIONAL FACILITIES

(1965)

French Meadows Complex

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
French Meadows (3.8T)	Family Camp	Site cleanup	19 ac.	$ 200.00	$ 3,800
		Camp Facilities (stoves, tables, tent spaces)	76	300.00	22,800
		Campground access road (20' wide)	1400 ft.	2.00	2,800
		Campground circulation roads (10' wide) (including trailer and auto spurs)	6720 ft.	1.00	6,720
		*Toilets (four unit, flush type) Buildings	4	6,500.00	26,000
		Septic tanks (1800 gal. w/leach lines 300'-400')	4	1,500.00	6,000
		*Toilets (two unit, vault type)	2	2,000.00	4,000
		*Water supply (Campground distribution only - see below for French Meadows water supply)			
		3/4" galvanized pipe	1500 ft.	1.50	2,250
		1-1/2" galvanized pipe	1770 ft.	1.75	3,100
		Fire hydrant	1	200.00	200
		Hose bibb	16	60.00	960
			Total rounded to nearest $10		$78,630
French Meadows (3.1T)	Picnic Sites	Site cleanup	2 ac.	200.00	400
		Picnic facilities (stoves, tables)	7	200.00	1,400
		Picnic ground service road (10 ft. wide, graded)	500 ft.	0.50	250
		Parking area (7 cars)	3500 sq.ft.	0.10	350
		*Toilets (two unit, vault type)	1	2,000.00	2,000
		*Water supply (picnic ground distribution only - see below for French Meadows main system)			
		3/4" galvanized pipe	540 ft.	1.50	810
		Hose bibb	2	60.00	120
			Total rounded to nearest $10		$ 5,330

French Meadows Complex (con't.)

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
French Meadows (3.2T)	Boat Ramp	Site cleanup	6 ac.	$ 200.00	$ 1,200
		Access road (20' wide)	600 ft.	2.00	1,200
		Parking area (46 cars and trailers)	27600 sq.ft.	0.10	2,760
		Circulation road (10' wide)	1900 ft.	1.00	1,900
		Ramp (30' wide, 500' long, 6" reinforced conc.)	2100 sq.ft.	1.00	21,000
		*Toilet (four unit, flush type)			
		Building	1	6,500.00	6,500
		Septic tank (1800 gal. w/leach lines 300'-400')	1	1,500.00	1,500
		*Water supply (distribution only - see below, water supply)			
		3/4" galvanized pipe	110 ft.	1.50	170
		1-1/2" galvanized pipe	230 ft.	1.75	400
		Fire hydrant	1	200.00	200
		Hose bibb	2	60.00	120
			Total rounded to nearest $10		$ 36,950
French Meadows Site	Water Supply	*Water supply system for French Meadows campground, picnic ground, and boat ramp and future Mildred campground			
		Collection dam and gallery	1	3,500.00	3,500
		Chlorinator	1	1,500.00	1,500
		Storage tank (10,00 gal.)	1	4,200.00	4,200
		4" asbestos cement pipe	4620 ft.	3.25	15,020
		Misc. valves, fittings, etc.		L.S.	1,500
			Total rounded to nearest $10		$ 25,720
Mt. Mildred (3.7T)	Administrative Center	Site Cleanup	10 ac.	200.00	2,000
		Buildings: Residence (two bedroom)	600 sq.ft.	12.00	7,200
		Barracks (ten man dormitory)	1000 sq.ft.	12.00	12,000
		Office & garage (10 bays)	2000 sq.ft.	8.00	16,000
		Parking (10 cars)	5000 sq.ft.	0.10	500
		*Water supply			
		Collection box	1	2,000.00	2,000
		Storage tank (10,000 gal.)	1	4,200.00	4,200
		1-1/2" galvanized pipe	1715 ft.	1.75	3,000
			Total rounded to nearest $10		$ 46,900

French Meadows Complex (con't.)

LOCATION	FEATURE	ITEMS	QUANTITY	UNIT COST	AMOUNT
Coyote (2.8T)	Group Camp	Site cleanup	8 ac.	$ 200.00	$ 1,600
		Camp facilities (stoves, tables, tent spaces, etc)	5	1,500.00	7,500
		Campground access roads (20 ft. wide)	400 ft.	2.00	800
		Parking areas (15 cars & 10 cars)	12500 sq.ft.	0.10	1,250
		Campground service roads (10', graded)	2000 ft.	0.50	1,000
		*Toilets (four unit, flush type) Building	1	6,500.00	6,500
		Septic tanks (1800 gal. w/leach lines 300' - 400')	1	1,500.00	1,500
		*Toilets (two unit vault type)	3	2,000.00	6,000
		*Water supply (campground distribution only - see below for North Shore water system)			
		3/4" galvanized pipe	740 ft.	1.50	1,110
		1-1/2" galvanized pipe	1280 ft.	1.75	2,240
		Fire hydrant	2	200.00	400
		Hose bibb	9	60.00	540
			Total rounded to nearest $10		$ 30,440
Lewis (2.6T)	Family Camps	Site cleanup	13 ac.	200.00	2,600
		Camp facilities (stoves, tables, tent spaces)	39	300.00	11,700
		Campground access road (20 ft. wide)	900 ft.	2.00	1,800
		Campground circulation roads (10'wide) (including trailer and auto spurs)	3400 ft.	1.50	3,400
		*Toilets (four unit, flush type) Building	2	6,500.00	13,000
		Septic tanks (1800 gal. w/leach lines 300'-400')	2	1,500.00	3,000
		*Water supply (campground distribution only - see below for North Shore water system)			
		3/4" galvanized pipe	960 ft.	1.50	1,440
		1-1/2" galvanized pipe	720 ft.	1.75	1,260
		Fire hydrants	1	200.00	200
		Hose bibb	8	60.00	480
			Total rounded to nearest $10		$ 38,880

French Meadows Complex (con't.)

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
McGuire (2.1T)	Picnic Sites	Site cleanup	3 ac.	$ 200.00	$ 600
		Picnic facilities (stoves, tables)	10	200.00	2,000
		Picnic ground access road (20' wide)	800 ft.	2.00	1,600
		Parking area (32 cars and trailers)	19,200 sq. ft.	0.10	1,920
		Service road (10' wide, graded)	470 ft.	0.50	240
		*Toilets (four unit, flush type)			
		Building w/leach lines	1	6,500.00	6,500
		Septic tank (1800 gal. w/leach lines 300'-400')	1	1,500.00	1,500
		*Water supply (picnic ground distribution only - see below for North Shore water system)			
		3/4" galvanized pipe	280 ft.	1.50	420
		1-1/2" galvanized pipe	640 ft.	1.75	1,120
		Fire hydrant	1	200.00	200
		Hose bibb	2	60.00	120
			Total rounded to nearest $10		$ 16,220
French Meadows Vista (2.9T)	Observation Point	Site cleanup	2 ac.	200.00	400
		Access road (20'wide)	200 ft.	2.00	400
		Circulation road (10' wide)	1060 ft.	1.00	1,060
		Parking area (25 cars)	12,500 sq.ft.	0.10	1,250
		*Toilets (four unit, vault type)	1	4,000.00	4,000
		*Water supply (distribution only - see below for North Shore water supply)			
		3/4" galvanized pipe	140 ft.	1.50	210
		Fire hydrant	1	200.00	200
		Hose bibb	1	60.00	60
		Drinking fountain	1	100.00	100
			Total rounded to nearest $10		$ 7,680

French Meadows Complex (con't.)

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
McGuire (2.2T)	Boat Ramp	Site cleanup	5 ac.	$ 200.00	$ 1,000
		Access road (20' wide)	200 ft.	2.00	400
		Circulation road (10' wide)	180 ft.	1.00	180
		Parking area (75 cars and trailers)	52,500 sq.ft.	0.10	5,250
		Ramp (6" reinforced conc.)	21,000 sq.ft.	1.00	21,000
		*Toilets (four unit, flush type)			
		Building	1	6,500.00	6,500
		Septic tank (18 gal. w/leach lines 300' - 400')	1	1,500.00	1,500
			Total rounded to nearest $10		$ 35,830
McGuire (2.1T)	Swimming Beach	Site cleanup	1 ac.	200.00	200
		Depth markers, life rings, marker buoys, etc.		L.S.	1,000
		Beach house	2	2,000.00	4,000
		*Toilet (four unit, flush type)			
		Building	1	6,500.00	6,500
		Septic tank (1800 gal.w/leach lines 300' - 400')	1	1,500.00	1,500
		*Water supply (lateral included in picnic ground)			
		Drinking fountain	1	100.00	100
			Total rounded to Nearest $10		$ 13,300
Poppy (44T)	Trail Camp	Site cleanup	4 ac.	200.00	800
		Camp facilities (stoves, tables, grading)	12	300.00	3,600
		*Toilets (two unit pit type)	2	1,000.00	2,000
			Total rounded to nearest $10		$ 6,400

French Meadows Complex (con't.)

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
North Shore	Access Road	Improve existing road from Lewis commercial site to McGuire boat ramp			3,600
		Culverts	10	360.00	3,600
		Grading & surface treatment (20 ft. wide)	7500 ft.	2.00	15,000
			Total rounded to nearest $10		$ 18,600
	Water System	*Water supply system to serve McGuire Lewis and Coyote developments			
		Collection dam and gallery	1	3,500.00	3,500
		Chlorinator	1	1,500.00	1,500
		Storage tank (10,000 gal.)	2	4,200.00	8,400
		4" asbestos cement pipe	6850 ft.	3.25	22,260
		6" asbestos cement pipe	8150 ft.	4.50	36,680
			Total rounded to nearest $10		$ 72,340

French Meadows Complex (con't.)

		QUANTITY	UNIT COST	AMOUNT
Miscellaneous	Signs, safety booms, zoning buoys, etc.		L.S.	$ 1,000
	Total cost French Meadows Complex			$434,220
	Engineering and contingencies @ 15%			65,130
	Grand total 1965 construction at French Meadows Complex			$499,350
*	Total water supply and sanitary facilities			$231,790
	Less amount allocated to future use			11,710
	Net first-stage total			$220,080
	Engineering and contingency @ 15%			33,010
	Net initial facilities cost at French Meadows Complex			$253,090

Hell Hole Complex

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
Middle Meadow (144.5E)	Group Camp	Site cleanup	5 ac.	$ 200.00	$ 1000
		Camp facilities (tables, stoves, tent spaces)	3	1500.00	4500
		Campground access road (20' wide)	950 ft	2.00	1900
		Parking area (15 cars)	7500 sq.ft.	0.10	750
		Creek crossing (culvert, reinf., conc. etc.)		L.S.	2000
		*Toilets (four unit, flush type)			
		Building	1	6500.00	6500
		Septic tank (1800 gal. w/leach lines 300' - 400')	1	1500.00	1500
		*Water supply			
		Collection dam and gallery	1	3500.00	3500
		Chlorinator	1	1500.00	1500
		Storage tank (10,000 gal.)	1	4200.00	4200
		4" asbestos cement pipe	4200 ft.	3.25	13650
		1-1/2" galvanized pipe	490 ft.	1.75	860
		3/4"galvanized pipe	300 ft.	1.50	450
		Fire hydrant	1	200.00	200
		Hose bibb	6	60.00	360
		Total rounded to nearest $10			$ 42870
Big Meadow (136.5E) (136 aE)	Family Camp	Site cleanup	12 ac.	200.00	2400
		Camp facilities (stoves, tables, tent spaces)	55	300.00	16500
		Campground access road (20' wide)	300 ft.	2.00	600
		Campground circulation roads (10' wide) (including trailer and auto spurs)	5400 ft.	1.00	5400
		*Toilets (four unit, flush type)			
		Building	2	6500.00	13000
		Septic tank (1800 gal. w/leach lines 300' - 400')	2	1500.00	3000
		*Toilets (four unit, vault type)	1	4000.00	4000
		*Water Supply			
		Rehabilitate and extend existing diversion from Long Canyon Creek		L.S.	3000
		Chlorinator	1	1500.00	1500
		Storage tank (10,000 gal.)	1	4200.00	4200
		4" asbestos cement pipe	2000 ft.	3.25	6500
		1-1/2" galvanized pipe	1160 ft.	1.75	2030
		3/4"galvanized pipe	700 ft.	1.50	1050
		Fire hydrant	1	200.00	200
		Hose bibb	14	60.00	840
		Total rounded to nearest $10			$ 64220

Hell Hole Complex (Cont'd)

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
Big Meadows (136.7E)	Administrative Center	Site cleanup	2 ac.	$ 200.00	$ 400
		Buildings: Residence (two bedroom)	600 sq. ft.	12.00	7,200
		Office & garage (4 bays)	800 sq.ft.	8.00	6,400
		Total rounded to nearest $10			$14,000
Hell Hole (118E)	Picnic Sites	Site cleanup	3 ac.	200.00	600
		Picnic facilities (tables, stoves)	10	200.00	2,000
		Picnic ground access roads (20 ft.wide)	900 ft.	2.00	1,800
		Parking area (10 cars)	5000 sq.ft.	0.10	500
		*Toilets (two unit, vault type)	1	2,000.00	2,000
		*Water supply			
		Rehabilitate and extend existing diversion from Long Canyon Creek		L.S.	2,000
		1-1/2" galvanized pipe	600 ft.	1.75	1,050
		Fire hydrant	1	200.00	200
		Hose bibb	2	60.00	120
		Total rounded to nearest $10			$10,270
Hell Hole (109.4E)	Boat Ramp	Ramp, access road, parking area	(included in Project construction)		
		*Toilets, (single unit, chemical type)	2	1,000.00	2,000
Upper Hell Hole (155E)	Trail Camp	Site cleanup	8 ac.	200.00	1,600
		Camp facilities (stoves, tables, tent space)	15	300.00	4,500
		*Toilets (two unit, pit type)	1	2,000.00	2,000
		Spring development (collection and storage box)		L.S.	4,000
		Total rounded to nearest $10			$ 12,100
	Miscellaneous	Signs, safety booms and markers, etc.		L.S.	1,000

Total cost Hell Hole Complex	$ 146,460
Engineering and contingencies at 15%	21,970
Grand total 1965 construction at Hell Hole Complex	$ 168,430

Hell Hole Complex (Cont'd)

	QUANTITY	UNIT COST	AMOUNT
*Total water supply and sanitary facilities			$ 85,410
Less amount allocated to future use			-
Net first stage total			$ 85,410
Engineering and contingencies at 15%			12,810
Net initial facilities cost at Hell Hole Complex			$ 98,220

Ralston Afterbay

LOCATION	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT
Ralston Afterbay Dam(RA)	Picnic Sites	Site cleanup	1 ac.	$200.00	$ 200
		Picnic facilities (tables only)	6	70.00	420
		*Toilets (single units chemical)	2	1,000.00	2,000
		*Water supply			
		1-1/2" galvanized pipe	300 ft.	1.50	450
		Hose bibb	1	60.00	60
		Total cost first stage facilities at Ralston Afterbay			$ 3,130
		Engineering and contingencies at 15%			470
		Grand total 1965 construction at Ralston Afterbay			$ 3,600

*Total water supply and sanitary facilities	$ 2,510
Less amount allocated to future use	-
Net first stage total	$ 2,510
Engineering and contingencies at 15%	380
Net initial facilities at Ralston Afterbay	$ 2,890

ESTIMATED COSTS TO PCWA FOR CONSTRUCTING SECOND-STAGE
ON-SHORE RECREATIONAL FACILITIES
(1980)

French Meadows Complex

SITE	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT*
Duncan (53.1T)	Family Camp	Camp units	12	$ 1,000.00	$ 12,000
		Swimming beach		L.S.	5,000
		Water supply			
		Collection		L.S.	25,000
		Distribution	12	90.00	1,000
Mildred (3.6T)	Family Camp	Camp units	26	1,000.00	26,000
		Swimming beach		L.S.	5,000
		Water supply			
		Distribution only	26	90.00	2,500
Mt. Mildred (3.5T)	Picnic Ground	Picnic units	7	700.00	4,900
		Water supply			
		Distribution only	7	160.00	1,000
Mt. Mildred (3.7T)	Administrative Center	Residence	1	8,000.00	8,000
Gates (42.5T)	Group Camp	Camp units	4	6,000.00	24,000
		Water supply			
		Distribution only	4	750.00	3,000
McGuire (2.5T)	Family Camp	Camp units	41	1,000.00	41,000
		Water supply			
		Distribution only	41	90.00	3,500
(2.1T)	Picnic Ground	Picnic units	5	700.00	3,500
		Water supply			
		Distribution only	5	160.00	1,000

Hell Hole Complex

SITE	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT *
Middle Meadow (144.5E)	Group Camp	Camp units	2	$ 6,000.00	$ 12,000
		Water supply			
		Distribution only	2	750.00	1,500
(144.1E)	Picnic Ground	Picnic units	10	700.00	7,000
		Water supply			
		Distribution only	10	160.00	1,500
Lagoon Lake (122.E)	Family Camp	Camp units	21	1,000.00	21,000
		Water supply			
		Collection		L.S.	25,000
		Distribution	21	90.00	2,000
		Total			$236,400
		Engineering and contingencies at 15%			35,500
		Total 1980 costs			$271,900
		Present worth in 1966			$167,980

*Distribution costs rounded to nearest $500

ESTIMATED COSTS TO PCWA FOR CONSTRUCTING THIRD-STAGE
ON-SHORE RECREATIONAL FACILITIES
(1990)

French Meadows Complex

SITE	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT *
Mt. Mildred (3.5T)	Picnic Ground	Picnic units	14	$ 700.00	$ 9,800
		Water supply			
		Distribution only	14	160.00	2,000
Mt. Mildred (3.7T)	Administrative Center	F. S. trailer and pads	5	5,000.00	25,000
Gates (42.5T)	Group Camp	Camp units	7	6,000.00	42,000
		Water supply			
		Distribution only	7	750.00	5,500
Ahart (42.6T)	Family Camp	Camp units	85	1,000.00	85,000
		Water supply			
		Collection		L.S.	25,000
		Distribution	85	90.00	7,500
Lewis (2.6T)	Family Camp	Camp units	41	1,000.00	41,000
		Water supply			
		Distribution only	41	90.00	4,000

Hell Hole Complex

Lower Meadow (153.5E)	Family Camp	Camp units	36	1,000.00	36,000
		Water supply			
		Collection		L.S.	25,000
		Distribution	36	90.00	3,500
Middle Meadow (144.5E)	Group Camp	Camp units	2	6,000.00	12,000
		Water supply			
		Distribution only	2	750.00	1,500
Hell Hole Dam (113E)	Picnic Ground	Picnic units	6	700.00	4,200
		Water supply			
		Distribution only	6	160.00	1,000
		Miscellaneous valves, signs, etc.		L.S.	3,500
		Total			$333,500
		Engineering and contingencies at 15%			50,030
		Total 1990 costs			$383,530
		Present worth in 1966			$149,620

* Distribution costs rounded to nearest $500

ESTIMATED COSTS TO PCWA FOR CONSTRUCTING FOURTH-STAGE
ON-SHORE RECREATIONAL FACILITIES
(2000)

French Meadows Complex

SITE	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT*
French Meadows (3.2T)	Boat Ramp	Ramp and parking		L.S.	$ 28,000
Mt. Mildred (3.5T)	Picnic Ground	Picnic units	3	$ 700.00	2,100
Gates (42.5T)	Group Camp	Camp units	10	6,000.00	60,000
		Water supply Distribution only	10	750.00	7,500
Dolly (42.7T)	Family Camp	Camp units	136	1,000.00	136,000
		Water supply Distribution only	136	90.00	12,000
Ahart (42.6T)	Family Camp	Camp units	34	1,000.00	34,000
		Water supply Distribution only	34	90.00	3,000
McGuire (2.1T)	Picnic Ground	Group picnic units	2	4,000.00	8,000
		Individual picnic units	5	700.00	3,500
		Water supply Distribution only	5	160.00	1,000

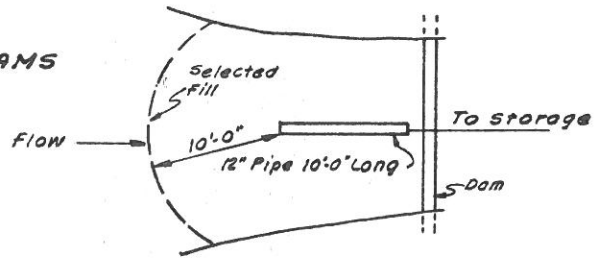
Hell Hole Complex

SITE	FEATURE	ITEM	QUANTITY	UNIT COST	AMOUNT *
Middle Meadow (144aE)	Family Camp	Camp units	12	$ 1,000.00	$ 12,000
		Water supply			
		Distribution only	12	90.00	1,000
(144.5E)	Group Camp	Camp units	2	6,000.00	12,000
		Water supply			
		Distribution only	2	750.00	1,500
So. Fork Long Canyon (136.8E)	Family Camp	Camp units	12	1,000.00	12,000
		Water supply			
		Distribution only	12	90.00	1,000
Big Meadow (136 aE)	Family Camp	Camp units	11	1,000.00	11,000
		Water supply			
		Distribution only	11	90.00	1,000
Hell Hole (118E)	Picnic Ground	Picnic units	17	700.00	11,900
		Water supply			
		Distribution only	17	160.00	2,500
		Miscellaneous valves, signs, etc.		L.S.	1,500
		Total			$ 362,500
		Engineering and contingencies at 15%			54,380
		Total 2000 costs			$ 416,880
		Present worth in 1966			$ 109,890

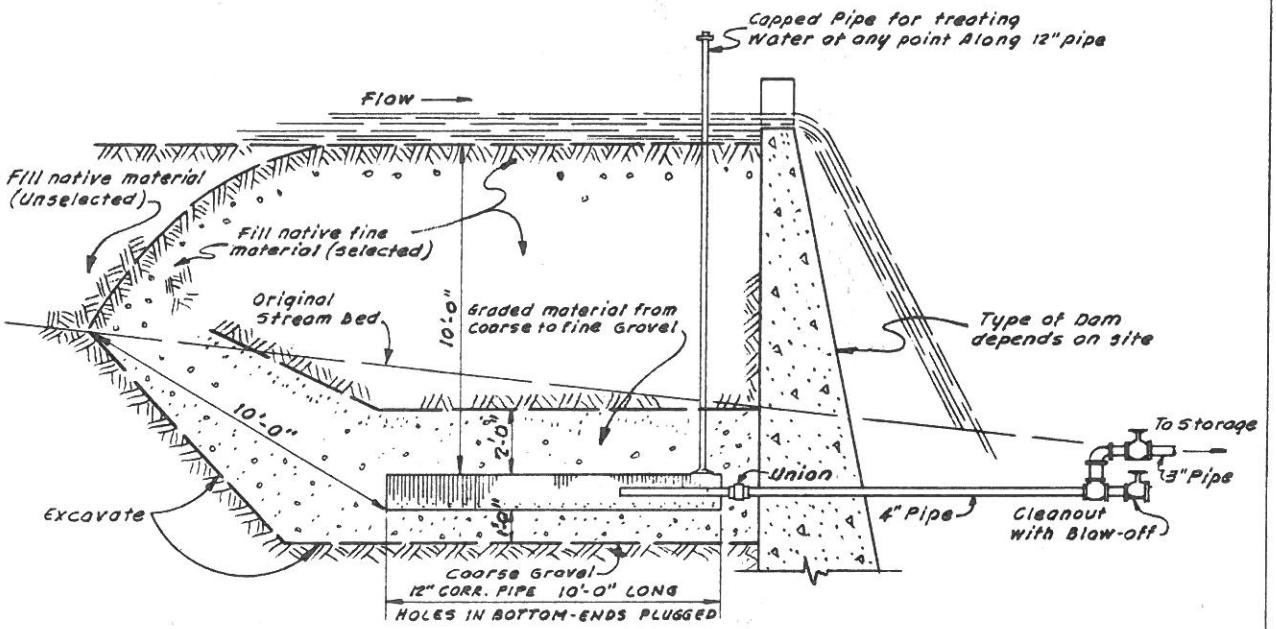
*Distribution costs rounded to nearest $500

FILTER GALLERIES FOR STREAMS

IN STREAMS WITH NATIVE FILL
TOP SURFACE FILTER AREA =
50 GALS. PER SQ. FT. PER DAM



PLAN WITH PIPE
PARALLEL TO STREAM

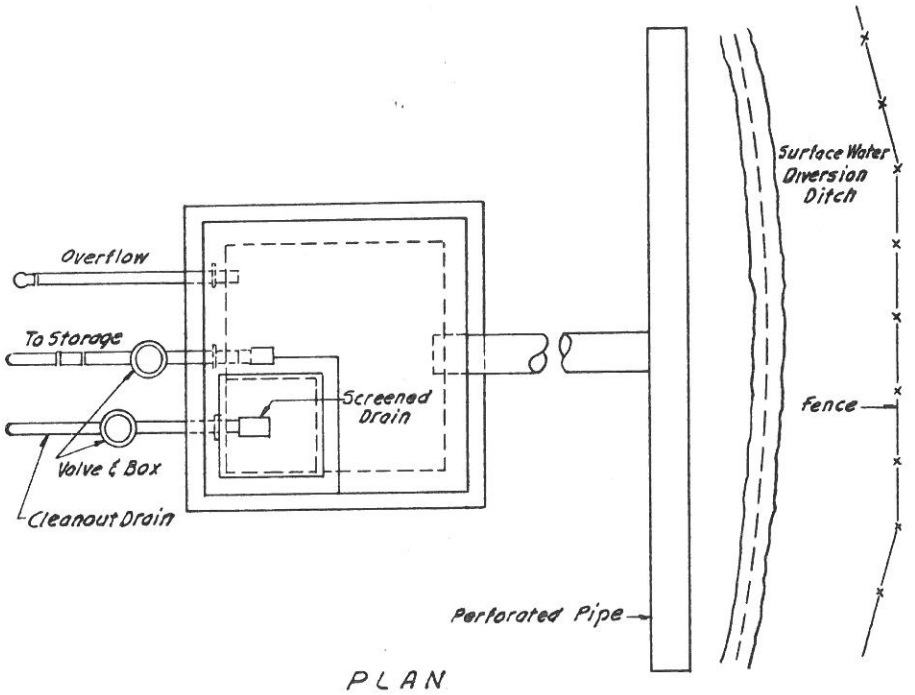


SECTION WITH PIPE PARALLEL TO STREAM

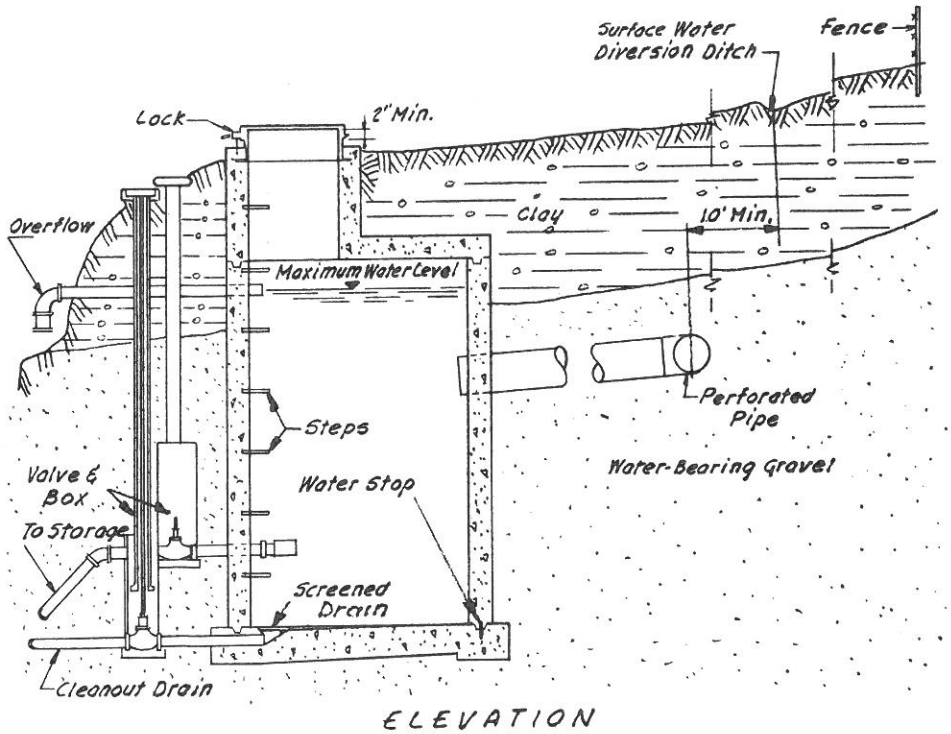
TYPICAL INFILTRATION GALLERY FOR STREAMS

(ABSTRACTED FROM U.S. FOREST SERVICE
WATER DEVELOPMENTS AND SANITATION HANDBOOK)

LEEDS, HILL AND JEWETT, INC.



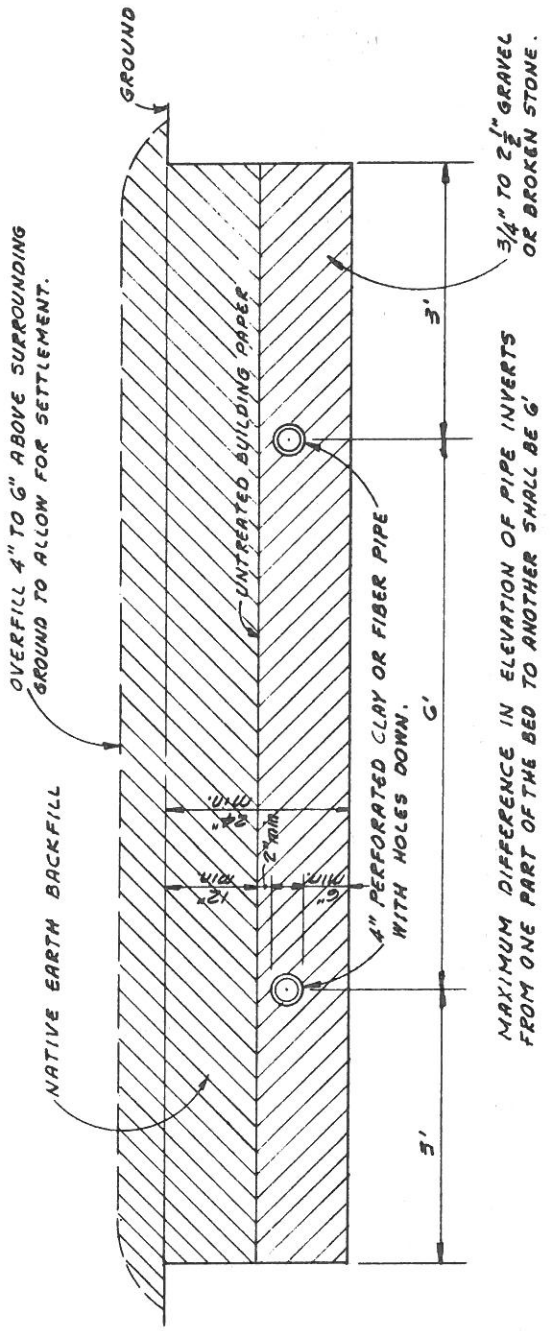
PLAN



ELEVATION

TYPICAL INFILTRATION GALLERY FOR SPRINGS
(ABSTRACTED FROM U.S. FOREST SERVICE WATER DEVELOPMENTS AND SANITATION HANDBOOK)

LEEDS, HILL AND JEWETT, INC.



LEACHING FIELD
(TYPICAL CROSS SECTION)

LEEDS, HILL AND JEWETT, INC.

APPENDIX B

Letters between the United States Forest Service and the Placer County Water Agency, indicating intention to enter into an agreement for the operation of Project-associated recreational facilities.

PLACER COUNTY
WATER AGENCY

BOARD OF DIRECTORS
Frank J. Paoli, Chairman
Robert Radovich, Secy. J. O. Anderson
George A. Lambert Wm. S. Briner

1115 HIGH STREET, ROOM 9 AUBURN, CALIFORNIA 885-2411

John M. Bernard
General Manager

December 11, 1963

Mr. H. E. Branagh
Forest Supervisor
Tahoe National Forest
Nevada City, California

Dear Mr. Branagh: Attention: Mr. Ralph Lessel

This is to advise you that it is the intention of the Placer County Water Agency to enter into an agreement with the United States Forest Service for the operation of the recreational facilities on our American River Middle Fork Project.

As soon as the drafts of the Memorandum of Understanding have been worked out to our mutual satisfaction, we hope to meet with you to prepare the final operating agreement for these services.

Very truly yours

PLACER COUNTY WATER AGENCY

John M. Bernard
General Manager

JMB/eb
cc: Leeds, Hill and Jewett
Kronick, Moskovitz and Vanderlaan
McCreary-Koretsky-Engineers

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
TAHOE NATIONAL FOREST
NEVADA CITY, CALIFORNIA

ADDRESS REPLY TO
FOREST SUPERVISOR
AND REFER TO
2750(2300)

December 10, 1963

Mr. John M. Bernard, General Manager
Placer County Water Agency
1115 High Street
Auburn, California, 95603

Dear John:

During many of our discussions in the past concerning on-shore recreation facilities to be provided by the Agency at French Meadows, Hell Hole, and other locations, we have indicated that the Service would take over these facilities. This letter is to clarify this point.

It is the intent of the Service to assume the responsibilities for administration, operation, maintenance and repair of all the on-shore facilities to be provided by the Agency. The details of this assumption will be spelled out in the cooperative agreement now under consideration by the Service and the Agency. Conformation of this agreement will seal this intent.

Sincerely yours,

HENRY E. BRANAGH
Forest Supervisor

By H J Sennickol

APPENDIX C

Letter from Stone and Youngberg, financial consultants to the Placer County Water Agency, indicating opinion as to financial feasibility of the Project.

DANIEL STONE
BENJAMIN J. BAUM
DON M. DAVIS
RICHARD P. GROSS

STONE & YOUNGBERG
MUNICIPAL FINANCING CONSULTANTS
1314 RUSS BUILDING
SAN FRANCISCO 4
YUKON 1-1314

RICHARD M. BARTLE
EDWARD W. BURNETT
DAVID E. HARTLEY
PATRICK J. KAVANAUGH
BARRY M. NEWMAN
EDWIN A. WELLS, JR.
EVERETT D. WILLIAMS

October 30, 1963

Leeds, Hill and Jewett, Inc.
Consulting Engineers
120 Montgomery Street
San Francisco 4, California

Gentlemen:

You have advised us that an application is being made on behalf of the Placer County Water Agency for a grant of funds for recreational purposes pursuant to the Davis-Grunsky Act. This grant is being requested in connection with the Middle Fork American River Project of the Agency.

As a part of the application it is necessary to demonstrate financial feasibility of the project. As financing consultants to the Agency, we feel that financial feasibility has been amply demonstrated by actions and occurrences to date, as follows:

The Agency has successfully sold $115,000,000 of revenue bonds which have provided sufficient funds to complete construction of the project. Firm construction bids have been received well within the amount of funds provided and construction is now under way. Adequate revenues are provided for operation and maintenance of the project when completed pursuant to the terms of the contract between the Agency and the Pacific Gas and Electric Company.

In light of the foregoing, financial feasibility of the Middle Fork American River Project is assured.

Yours very truly,

STONE & YOUNGBERG

Don M. Davis

Don M. Davis

DMD:er

APPENDIX D

Bid by American River Constructors for construction of the Middle Fork American River Project, under Specification No. 63-101.

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-EARTH & ROCKFILL DAMS,DIVERSION DAMS,HORSESHOE TUNNELS, POWER-HOUSES,ETC.)

AUBURN,CALIF.(BID RECEIVED,TAKEN UNDER ADVISEMENT)

AMERICAN RIVER CONSTRUCTORS,300 LAKESIDE DRIVE,OAKLAND,CALIF.,$91,750,000.,COMPOSED OF: HENRY J.KAISER CO.,OAKLAND;PERINI CORP.,S.F.;MORRISON-KNUDSEN CO.,INC.,BOISE,IDAHO; MACCO CORP.,PARAMOUNT,CALIF.;RICHARD CONSTAIN,LONDON;AND LIMITED & ENTERPRISES CAMPENON BERNARD,PARIS,ONLY BID TO CLERK,PLACER COUNTY WATER AGENCY,COURT HOUSE,AUBURN,CALIF.,FOR CONSTRUCTION OF THE MIDDLE FORK AMERICAN RIVER PROJECT,UNDER SPEC.#63-101. UNIT BIDS:

SCH.1-DUNCAN CREEK DAM & DUNCAN CREEK-FRENCH MEADOWS TUNNEL

L.S.,	DIVERT STREAM & UNWATER FOUNDATION	$27,732
4	A RESERVOIR CLEARING	$1,500
1,620	CY.STRUCTURAL EXCAVATION	6.10
650	CY.EXCAVATION,TUNNEL INLET WORKS	11.40
1,800	CY.EXCAVATION,TUNNEL OUTLET WORKS	6.80
22,000	CY.TUNNEL EXCAVATION	62.70
300	LFT.DRILL GROUT HOLES,TUNNEL	5.60
250	LB.GROUT PIPE & FITTINGS	.90
30	EA.CONNECTIONS FOR GROUTING,TUNNEL	32.65
30	CU.FT.CONTACT GROUTING,TUNNEL	36.10
130	CU.FT.CONSOLIDATION GROUTING,TUNNEL	8.10
75	EA.STEEL TUNNEL SUPPORTS	358.40
2,660	LFT.TUNNEL ROOF BOLTS	2.60
275	LB.BEARING PLATES,ROOF BOLTS	.46
2,150	LB.CH.LK.WOV.WIRE FAB.,ROOF BOLTS	.62
80	LFT."B"CONCRETE TUNNEL LINING	144.80
200	LFT."C"CONCRETE TUNNEL LINING	289.60
1,730	CY."B"CONCRETE	95.74
20	CY.FISSURE CONCRETE	40.20
2,300	BBL.PORTLAND CEMENT	12.78
77	T POZZOLAN	48.00
10,600	LB.REINFORCING STEEL	.34
L.S.,	INTAKE STRUCTURE	$26,800
L.S.,	STREAM FLOW MAINT.FACILS.&OUTLET PIPE	$10,000

SCH.11-FRENCH MEADOWS DAM,FRENCH MEADOWS-HELL HOLE TUNNEL & FRENCH MEADOWS POWERHOUSE

L.S.,	DIVERT STREAM & UNWATER FOUNDATIONS	$19,450
1,450	A RESERVOIR CLEARING	$1,200
45	A RESERVOIR CLEARING & GRUBBING	$1,500
129,000	CY.EXCAV.,DAM EMBKMT&CUTOFF TRENCHES	3.15
345,500	CY.EXCAVATION,SPILLWAY	1.86
160,000	CY.EXCAVATION,INLET WORKS	.88
5,220	CY.EXCAVATION,OUTLET WORKS	9.82
68,500	CY.TUNNEL EXCAVATION	40.94
1,050	CY.SHAFT EXCAVATION	142.66
530,000	CY.IMPERVIOUS CORE MATERIAL	1.12
163,000	CY.TRANSITION ZONE MATERIAL	1.83
2,570,000	CY.GRAVEL SHELL MATERIAL	.53
175,000	CY.COMPACTED ROCK ZONE MATERIAL	.43
72,000	CY.RIPRAP	.52
25,960	LFT.DRILL GROUT HOLES,DAM&MISC.	6.00
880	EA.CONNECTIONS,GROUTING,DAM&MISC.	10.00
19,440	CU.FT.PLACE GROUT,DAM & MISC.	4.00
1,000	LFT.SPILLWAY ANCHOR BARS	4.70
1,700	LFT.DRILL GROUT HOLES,TUNNEL	5.08
330	EA.CONNECTIONS FOR GROUTING,TUNNEL	13.78
1,100	CU.FT.CONTACT GROUTING TUNNEL	3.10
2,100	CU.FT.CONSOLID.GROUTING,TUNNEL	5.00
1,800	LFT.DRILL GROUT HOLES,SHAFT	2.40

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

350	EA.CONNECTIONS FOR GROUTING,SHAFT	6.50
80	CU.FT.CONTACT GROUTING,SHAFT	15.50
950	CU.FT.CONSOLID.GROUTING,SHAFT	3.13
13,900	LB.GROUT PIPE & FITTINGS	.90
300	EA.STEEL TUNNEL SUPPORTS	$350
25	EA.STEEL SHAFT SUPPORTS	$646
111,000	LB.STEEL LINING	.60
3,000	LFT.TUNNEL ROOF BOLTS	5.20
1,600	LB.BEARING PLATES,ROOF BOLTS	.84
1,400	LB.CH.LK.WOV.WIRE FAB.,ROOF BOLTS	1.24
1,150	LFT."B"CONCRETE TUNNEL LINING	$121
900	LFT."C"CONCRETE TUNNEL LINING	$106
8	LFT.CONC.SHAFT LINING,"B"	$282
225	LFT."C"CONC.SHAFT LINING	$206
100	CY.FISSURE CONCRETE	20.40
1,475	CY."A"CONCRETE	55.75
7,000	BBL.PORTLAND CEMENT	11.90
168	T POZZOLAN	41.60
184,400	LB.REINFORCING STEEL	.27
L.S.,	SPILLWAY GATES & HOISTS	$66,200
L.S.,	SPILLWAY DRAINS	$4,500
L.S.,	TUNNEL INLET STRUCTURE	$73,450
L.S.,	FIX.WHEEL GATE,GATE HOUSE&APPURTS.	$44,800
L.S.,	DIV.& STREAM FL.INLT.,CONDTS.&OTLT.WKS.	$601,750
L.S.,	PENSTOCKS,VALVES & APPURTS.	$471,650
L.S.,	FRENCH MEADOWS POWERHOUSE	$727,550
L.S.,	GANTRY CRANE	$51,550
L.S.,	FURNISH TURBINES	$521,900
L.S.,	INSTALL TURBINES	$51,550
L.S.,	FURN.TURBINE INLET VALVES	$38,650
L.S.,	INST.TURBINE INLET VALVES	$3,850
L.S.,	FURN.PRESSURE REGULATOR,TURBINE	$38,650
L.S.,	INST.PRESSURE REGULATOR,TURBINE	$3,850
L.S.,	FURN.TURBINE GOVERNOR	$32,200
L.S.,	INST.TURBINE GOVERNOR	$3,200
L.S.,	FURN.GENERATOR & APPURTS.	$451,000
L.S.,	INST.GENERATOR & APPURTS.	$32,200
L.S.,	FURN.MAIN TRANSFORMER	$64,450
L.S.,	INST.MAIN TRANSFORMER	$6,450
L.S.,	FURN.OIL CIRCUIT BREAKERS	$18,050
L.S.,	INST.OIL CIRCUIT BREAKERS	$1,950
L.S.,	FURN.STATION SERVICE TRANSFORMERS	$5,150
L.S.,	INST.STATION SERVICE TRANSFORMERS	$500
L.S.,	FURN.GENERATOR BUS	$12,900
L.S.,	INST.GENERATOR BUS	$1,300
L.S.,	FURN.SURGE PROT.&POT.TRNSFMR.EQ.&CUB.	$6,450
L.S.,	INST.SURGE.PORT.&POT.TRNSFMR.EQ.&CUB.	$650
L.S.,	FURN.NEUT.GRNDG.TRNSFMR.&CUBICLES	$2,600
L.S.,	INST.NEUT.GRNDG.TRNSFMR.&CUBICLES	$250
L.S.,	DIESEL ENGINE GENERATOR & APPURTS.	$45,100

SCH.III-HELL HOLE DAM,HELL HOLE-MIDDLE FORK TUNNEL & MIDDLE FORK POWER-HOUSE

L.S.,	DIVERT STREAM & UNWATER FOUNDATION	$12,900
1,150	A RESERVOIR CLEARING	$1,200
103	A RESERVOIR CLEARING & GRUBBING	$1,500
139,000	CY.EXCAV.,DAM EMBKMT.&CUTOFF TRNCHS.	2.37
6,000,000	CY.EXCAVATION,SPILLWAY	1.68

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

2,700	CY.EXCAV.,INLET WKS.,MID.FORK TUN.	12.95
19,600	CY.EXCAV.,INLET WORKS,DIVERS.TUNNEL	6.45
5,000	CY.EXCAV.,OUTLET WKS.,MID.FORK TUN.	5.95
4,400	CY.EXCAV.,OUTLET WKS.,DIVERS.TUNNEL	10.75
319,000	CY.TUNNEL EXCAV.,MIDDLE FORK TUNNEL	33.10
9,450	CY.TUNNEL EXCAV.,DIVERSION TUNNEL	51.45
5,400	CY.SHAFT EXCAVATION	110.20
781,400	CY.IMPERVIOUS CORE MATERIAL	1.86
302,500	CY.FINE FILTER MATERIAL	.75
327,000	CY.COARSE FILTER MATERIAL	.74
243,000	CY.SMALL ROCK TRANSITION MATERIAL	.83
181,000	CY.COMPACTED ROCK ZONE MATERIAL	.09
6,879,000	CY.DUMPED ROCK SHELL MATERIAL	.15
178,600	CY.RIPRAP	.09
26,400	LFT.DRILL GROUT HOLES,DAM & MISC.	6.00
757	EA.CONNECTIONS FOR GROUTING,DAM&MISC.	10.00
13,240	CU.FT.PLACE GROUT,DAM & MISC.	4.00
7,250	LFT.DRILL GROUT HOLES,MID.FORK TUN.	3.30
600	LFT.DRILL GROUT HOLES,DIVERS.TUNNEL	2.40
1,265	EA.CONNECTIONS FOR GROUTING,MID.FORK	12.85
180	EA.CONNECS.FOR GROUTING,DIV.TUNNEL	6.50
1,100	CU.FT.CONTACT GROUTING,MID.FORK TUN.	11.35
46	CU.FT.CONTACT GROUTING,DIVERS.TUN.	9.80
2,100	CU.FT.CONSOLID.GROUT.,MID.FORK TUN.	4.15
170	CU.FT.CONSOLID.GROUT.,DIVERS.TUNNEL	4.10
3,500	LFT.DRILL GROUT HOLES,SHAFT	1.25
700	EA.CONNECTIONS FOR GROUTING,SHAFT	6.50
90	CU.FT.CONTACT GROUTING,SHAFT	6.65
225	CU.FT.CONSOLID.GROUTING,SHAFT	24.90
15,200	LB.GROUT PIPE & FITTINGS	.90
1,510	EA.STEEL TUNNEL SUPPORTS	$284
56	EA.STEEL SHAFT SUPPORTS	$1,283
4,071,000	LB.STEEL LINING,MID.FORK TUNNEL	.70
20,000	LFT.TUNNEL ROOF BOLTS,MID.FK.TUN.	2.60
1,000	LFT.TUNNEL ROOF BOLTS,DIVERS.TUN.	2.60
10,000	LB.BEARING PLATES,ROOF BOLTS,M.F.T.	.42
1,000	LB.BEARING PLATES,ROOF BOLTS,DIV.T.	.42
8,400	LB.CH.LK.WOV.WIRE FAB,RF.BOLTS,M.F.T.	.62
250	LB.CH.LK.WOV.WIRE FAB,RF.BOLTS,DIV.T.	.62
590	LFT."B"CONC.,TUNNEL LINING,M.F.TUN.	$147
60	LFT."B"CONC.TUNNEL LINING,DIV.TUN.	$240
5,550	LFT."C"CONC.TUNNEL LINING,M.F.TUN.	$205
40	LFT."C"CONC.TUNNEL LINING,DIV.TUN.	$320
60	LFT."B"CONC.SHAFT LINING	$200
660	LFT."C"CONC.SHAFT LINING	$211
100	CY.FISSURE CONCRETE	20.40
730	CY."A"CONCRETE	$140
20,750	BBL.PORTLAND CEMENT	11.00
630	T POZZOLAN	44.60
116,000	LB.REINFORCING STEEL	.14
L.S.,	POWER TUNNEL INLET STRUCTURE	$26,650
L.S.,	DIVERSION TUNNEL INLET STRUCTURE	$19,400
L.S.,	FIX.WHEEL GATE,GATE HOUSE & APPURTS.	$43,450
L.S.,	DIV.&STREAM FLOW CONDUIT,OUTLET WORKS&APP.	$80,750
L.S.,	SURGE TANK	$59,550
L.S.,	MIDDLE FORK TUNNEL-NORTH FORK CROSSING	$206,700
L.S.,	PENSTOCKS,VALVES & APPURTS.	$4,467,070

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

L.S.,MIDDLE FORK POWERHOUSE	$1,360,650
L.S.,FURN.TURBINES	$2,683,307
L.S.,INST.TURBINES	$87,600
L.S.,FURN.TURBINE INLET VALVES	$180,400
L.S.,INST.TURBINE INLET VALVES	$18,050
L.S.,FURN.TURBINE GOVERNOR	$103,100
L.S.,INST.TURBINE GOVERNOR	$10,300
L.S.,FURN.GENERATOR & APPURTS.	$1,675,150
L.S.,INST.GENERATOR & APPURTS.	$103,100
L.S.,FURN.MAIN TRANSFORMER	$244,850
L.S.,INST.MAIN TRANSFORMER	$24,500
L.S.,FURN.OIL CIRCUIT BREAKERS	$96,650
L.S.,INST.OIL CIRCUIT BREAKERS	$9,650
L.S.,FURN.STATION SERVICE TRANSFORMERS	$38,650
L.S.,INST.STATION SERVICE TRANSFORMERS	$3,850
L.S.,FURN.GENERATOR BUS	$51,550
L.S.,INST.GENERATOR BUS	$5,150
L.S.,FURN.AIR BLAST CIRCUIT BREAKERS	$64,450
L.S.,INST.AIR BLAST CIRCUIT BREAKERS	$6,450
L.S.,FURN.SURGE PROT.&POT.TRNSFMR.EQ&CUB.	$10,300
L.S.,INST.SURGE PROT.&POT.TRNSFMR.EQ&CUB.	$1,050
L.S.,FURN.NEUT.GRNDG.TRNSFMRS.&CUBICLES	$5,800
L.S.,INST.NEUT.GRNDG.TRNSFMRS.&CUBICLES	$600
L.S.,FURN.BUS POTENTIAL TRANSFORMERS	$9,000
L.S.,INST.BUS POTENTIAL TRANSFORMERS	$900
SCH.IV-NORTH FORK-LONG CANYON DAM & SHAFT	
L.S.,DIVERT STREAM & UNWATER FOUNDATION	$9,000
1 A RESERVOIR CLEARING	$1,290
6,600 CY.STRUCTURAL EXCAVATION	6.20
500 CY.SHAFT EXCAVATION	$205
200 LFT.DRILL GROUT HOLES,SHAFT	7.75
150 LB.GROUT PIPE & FITTINGS	5.80
50 EA.CONNECTIONS FOR GROUTING,SHAFT	12.75
50 CU.FT.CONTACT GROUTING,SHAFT	7.75
50 CU.FT.CONSOLIDATION GROUTING,SHAFT	22.55
12 EA.STEEL SHAFT SUPPORTS	$512
3,000 LB.STEEL SHAFT LINING	.26
85 LFT."B"CONC.SHAFT LINING	84.00
15 LFT."C"CONC.SHAFT LINING	84.00
10 CY.FISSURE CONCRETE	20.50
10 CY."C"CONCRETE	97.00
100 BBL.PORTLAND CEMENT	20.20
2.3 T POZZOLAN	67.00
3,600 LB.REINFORCING STEEL	.35
L.S.,DAM,DIVERSION STRUC,RECORD.HSE&APPURTS.	$225,500
L.S.,STANDPIPE & GRATES FOR SHAFT	$1,200
SCH.V-SOUTH FORK-LONG CANYON DAM & SHAFT	
L.S.,DIVERT STREAM & UNWATER FOUNDATION	$10,950
1 A RESERVOIR CLEARING	$775
1 A RESERVOIR CLEARING & GRUBBING	$1,290
1,350 CY.STRUCTURAL EXCAVATION	5.35
420 CY.SHAFT EXCAVATION	$233
200 LFT.DRILL GROUT HOLES,SHAFT	7.75
150 LB.GROUT PIPE & FITTINGS	5.80
50 EA.CONNECTIONS FOR GROUTING,SHAFT	12.75
50 CU.FT.CONTACT GROUTING,SHAFT	1.95
50 CU.FT.CONSOLIDATION GROUTING,SHAFT	22.55

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

3,000	LB.STEEL SHAFT LINING	.26
15	LFT."C"CONC.SHAFT LINING	84.00
10	CY.FISSURE CONCRETE	20.50
10	CY."C"CONCRETE	97.00
25	BBL.PORTLAND CEMENT	15.25
2	T POZZOLAN	21.90
L.S.,	DAM,DIVERS.STRUC.,RECORD.HSE&APPURTS.	$103,750
L.S.,	STANDPIPE & GRATES FOR SHAFT	$1,200

SCH.VI-INTERBAY DAM, INTERBAY-RALSTON TUNNEL & RALSTON POWERHOUSE

L.S.,	DIVERT STREAM & UNWATER FOUNDATION	$24,000
30	A RESERVOIR CLEARING	$1,200
12,600	CY.STRUCTURAL EXCAVATION	2.30
3,800	CY.EXCAVATION,INLET WORKS	3.40
6,000	CY.EXCAVATION,OUTLET WORKS	4.00
211,200	CY.TUNNEL EXCAVATION	32.96
1,550	CY.SHAFT EXCAVATION	136.78
750	LFT.DRILL GROUT HOLES,DAM & MISC.	3.85
26	EA.CONNECS.FOR GROUTING,DAM&MISC.	6.45
175	CU.FT.PLACE GROUT,DAM & MISC.	2.60
5,750	LFT.DRILL GROUT HOLES,TUNNEL	1.55
1,050	EA.CONNECTIONS FOR GROUTING,TUNNEL	10.00
375	CU.FT.CONTACT GROUTING,TUNNEL	21.45
2,100	CU.FT.CONSOLIDATION GROUTING,TUNNEL	2.70
600	LFT.DRILL GROUT HOLES,SHAFT	2.30
100	EA.CONNECTIONS FOR GROUTING,SHAFT	6.35
50	CU.FT.CONTACT GROUTING,SHAFT	4.65
150	CU.FT.CONSOLID.GROUTING,SHAFT	3.85
6,700	LB.GROUT PIPE & FITTINGS	.60
1,220	EA.STEEL TUNNEL SUPPORTS	$349
26	EA.STEEL SHAFT SUPPORTS	$580
150,000	LB.STEEL LINING	.70
10,000	LFT.TUNNEL ROOF BOLTING	3.64
5,300	LB.BEARING PLATES,ROOF BOLTS	.56
5,600	LB.CH.LK.WOV.WIRE FAB.,ROOF BOLTS	.66
130	LFT."B"CONC.TUNNEL LINING	$588
5,110	LFT."C"CONC.TUNNEL LINING	$218
45	LFT."B"CONC.SHAFT LINING	$214
280	LFT."C"CONC.SHAFT LINING	$216
100	CY.FISSURE CONCRETE	20.40
14,360	CY."B"CONCRETE	53.70
26,350	BBL.PORTLAND CEMENT	10.80
860	T POZZOLAN	40.90
75,200	LB.REINFORCING STEEL	.40
L.S.,	SPILLWAY GATES & HOISTS	$130,300
L.S.,	SPILLWAY DRAINS	$2,150
L.S.,	INTAKE STRUCTURE	$132,700
L.S.,	STREAM MAINTENANCE FACILITIES	$17,100
L.S.,	SURGE TANK	$102,600
L.S.,	PENSTOCKS, VALVES & APPURTS.	$1,809,200
L.S.,	RALSTON POWERHOUSE	$1,322,900
L.S.,	FURN.TURBINES	$1,224,150
L.S.,	INST.TURBINES	$64,450
L.S.,	FURN.TURBINE INLET VALVES	$77,300
L.S.,	INST.TURBINE INLET VALVES	$7,750
L.S.,	FURN.TURBINE GOVERNOR	$51,550
L.S.,	INST.TURBINE GOVERNOR	$5,150
L.S.,	FURN.GENERATOR & APPURTS.	$1,288,600

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

L.S.,	INST.GENERATOR & APPURTS.	$64,450
L.S.,	FURN.MAIN TRANSFORMER	$244,850
L.S.,	INST.MAIN TRANSFORMER	$24,500
L.S.,	FURN.OIL CIRCUIT BREAKERS	$64,450
L.S.,	INST.OIL CIRCUIT BREAKERS	$6,450
L.S.,	FURN.STATION SERVICE TRANSFORMERS	$6,450
L.S.,	INST.STATION SERVICE TRANSFORMERS	$650
L.S.,	FURNISH GENERATOR BUS	$38,650
L.S.,	INSTALL GENERATOR BUS	$3,850
L.S.,	FURN.SURGE PROT.&POT.TRNSFMR.EQ&CUB.	$10,300
L.S.,	INST.SURGE PROT.&POT.TRNSFMR.EQ&CUB.	$1,050
L.S.,	FURN.NEUT.GRNDG.TRNSFMRS.&CUBICLES	$5,150
L.S.,	INST.NEUT.GRNDG.TRNSFMRS.&CUBICLES	$500
SCH.VII-AUBURN PUMP STATION & TUNNEL		
1,300	CY.EXCAVATION,INLET WORKS	5.60
28,740	CY.EXCAVATION,OUTLET WORKS	3.35
74,200	CY.TUNNEL EXCAVATION	26.55
1,300	CY.SHAFT EXCAVATION	85.00
4,800	LFT.DRILL GROUT HOLES,TUNNEL	1.40
1,050	EA.CONNECTIONS FOR GROUTING,TUNNEL	4.20
80	CU.FT.CONTACT GROUTING,TUNNEL	20.15
2,000	CU.FT.CONSOLIDATION GROUTING,TUNNEL	2.25
100	LFT.DRILL GROUT HOLES,SHAFT	12.35
240	EA.CONNECTIONS FOR GROUTING,TUNNEL	5.30
80	CU.FT.CONTACT GROUTING,SHAFT	4.85
15	CU.FT.CONSOLIDATION GROUTING,SHAFT	54.00
5,700	LB.GROUT PIPE & FITTINGS	.60
25	EA.STEEL TUNNEL SUPPORTS	$1,765
10	EA.STEEL SHAFT SUPPORTS	$731
10,000	LFT.TUNNEL ROOF BOLTS	1.65
5,320	LB.BEARING PLATES FOR ROOF BOLTS	.22
4,200	LB.CH.LK.WOV.WIRE FAB.,ROOF BOLTS	.40
1,000	LFT."B"CONC.TUNNEL LINING	$124
270	LFT."C"CONC.TUNNEL LINING	$220
50	LFT."B"CONC.SHAFT LINING	$128
370	LFT."C"CONC.SHAFT LINING	$128
20	CY.FISSURE CONCRETE	25.85
2,750	BBL.PORTLAND CEMENT	1.65
83	T POZZOLAN	21.90
107,600	LB.REINFORCING STEEL	.17
L.S.,	PUMP STATION & PIPE LINE	$400,350
L.S.,	TUNNEL INLET STRUCTURE	$29,100
L.S.,	VALVE CHMBR.,VALVES,CONDUITS&APPURTS.	$86,200
L.S.,	TUNNEL OUTLET STRUCTURE	$2,950
SCH.VIII-ROADS		
8,160	CY.EXCAVATION,ROADWAY CULVERTS	5.88
816,860	CY.UNCLASS.ROADWAY EXCAVATION	2.74
4,200	CY.UNCL.BORROW EXCAV.,FOR ROADWAY	.40
33,680	CY."A"BASE COURSE	3.74
2,000	SQ.YD.2"ASPH.CONC.PAVING	2.00
107,180	SQ.YD.BITUM.PENETRATION PAVING	.16
148,900	SQ.YD.2"ROAD MIX ASPH.PAVING	2.25
286,500	GAL.LIQ.ASPHALT,MC-250	.80
32,450	GAL.LIQ.ASPHALT,MC-70	.70
29,660	GAL.LIQ.ASPHALT,SC-800	.62
24,720	GAL.LIQ.ASPHALT,SC-250	.72
6,953	LFT.18"C.M.P.,16-GA.	9.60
742	LFT.21"C.M.P.,16-GA.	10.70
925	LFT.24"C.M.P.,14-GA.	12.00

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63(CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT)

377 LFT.30"C.M.P.,14-GA.	16.70
413 LFT.36"C.M.P.,14-GA.	20.20
526 LFT.42"C.M.P.,14-GA.	23.80
223 LFT.48"C.M.P.,12-GA.	32.00
330 LFT.54"C.M.P.,12-GA.	36.80
302 LFT.60"C.M.P.,12-GA.	40.60
142 LFT.66"C.M.P.,12-GA.	45.20
332 LFT.72"C.M.P.,10-GA.	57.00
120 LFT.120"MULT.PIPE ARCH,10-GA.	50.00
120 LFT.132"MULT.PIPE ARCH,10-GA.	56.00
70 LFT.13'2"x20'7"MULT.PIPE ARCH,8-GA.	$120
690 CY.RIPRAP	14.00
160 LFT.4' BIN RETAINING WALL	51.40
145 LFT.3-1/3' BIN RETAINING WALL	47.35
70 LFT.6-2/3' BIN RETAINING WALL	87.00
90 LFT.8' BIN RETAINING WALL	$107
10 LFT.9-1/3' BIN RETAINING WALL	$127
30 LFT.10-2/3'BIN RETAINING WALL	$148
60 LFT.12' BIN RETAINING WALL	$170
30 LFT.13-1/3' BIN RETAINING WALL	$202
30 LFT.14-2/3' BIN RETAINING WALL	$226
L.S.,BRIDGE ACR.MIDDLE FORK AT FRENCH MEADOW	$162,600
L.S.,BRIDGE ACR.FRENCH MEADOWS SPILLWAY	$70,304
L.S.,BRIDGE ACR.HELL HOLE SPILLWAY	$298,418
L.S.,BRIDGE ACR.RALSTON INTERBAY SPILLWAY	$76,056
L.S.,BRIDGE ACR.MIDDLE FORK AT RALSTON PWRHSE.	$108,494
590 STA.OPERATION ROADS	$1,914
5 EA.CATTLE GUARDS	$4,780
6,825 LFT.GUARD RAIL	6.00
SCH.IX-RESIDENCES & SERVICE BUILDINGS	
L.S.,RESIDENT COTTAGE,FRENCH MEADOWS	$50,000
L.S.,HELIPORT,FRENCH MEADOWS	$3,000
L.S.,2 RESIDENT COTTAGES,HELL HOLE	$100,000
L.S.,DORMITORY,HELL HOLE	$210,000
L.S.,5-VEHICLE GARAGE,HELL HOLE	$16,000
L.S.,HELIPORT,HELL HOLE	$6,000
L.S.,HEADQUARTERS BUILDING,FORESTHILL	$34,000
L.S.,HEADQUARTERS SHOPS,FORESTHILL	$32,000
SCH.X-MISCELLANEOUS	
L.S.,OVERHEAD DISTRIBUTION SYSTEM	$100,000
L.S.,AUTOMATIC DIAL SYSTEM	$100,000
L.S.,MICROWAVE/MULTIPLEX SYSTEM	$100,000
L.S.,POWERLINE CARRIER SYSTEM	$200,000
L.S.,VHF MOBILE RADIO SYSTEM	$100,000
L.S.,HYDROLOGIC INSTRUMENTS & ACCESS.	$100,000
L.S.,INDICATING RECORDERS & CONTROLLERS	$100,000
L.S.,SUPERVISORY CONTROL SYSTEMS	$200,000
L.S.,CABLES,TELEPHONE & CONTROL	$200,000
L.S.,TOOLS & EQUIPMENT	$100,000
L.S.,PROJECT SIGNS	$4,000
560 STA.TRAILS	$411
L.S.,PORT.SHAFT INSPEC.CAGES & HOISTS	$20,000
L.S.,BARGE & TRAILER	$10,000
L.S.,BOAT & TRAILER	$8,000
L.S.,FARM FENCE	$46,000
SCH.XI-RALSTON AFTERBAY DAM,OXBOW TUNNEL AND OXBOW POWERHOUSE	
L.S.,DIVERT STREAM & UNWATER FOUNDATION	$34,150
16 A RESERVOIR CLEARING	$965

DAILY CONSTRUCTION SERVICE

DAM, TUNNEL & POWER CONSTRUCTION

3-5-63 (CO.DIST-MIDDLE FORK AMERICAN RIVER PROJECT) PAGE 8

32,600	CY.STRUCTURAL EXCAVATION	3.60
1,340	CY.EXCAVATION FOR INLET WORKS	4.05
2,270	CY.TUNNEL EXCAVATION	34.20
2,570	LFT.DRILL GROUT HOLES,DAM & MISC.	3.85
62	EA.CONNECS.FOR GROUTING,DAM & MISC.	6.45
1,290	CU.FT.PLACE GROUT,DAM & MISC.	2.60
278	LFT.DRILL GROUT HOLES,TUNNELS	4.15
47	EA.CONNECS.FOR GROUTING TUNNEL	4.50
280	CU.FT.CONTACT GROUTING,TUNNEL	2.60
105	CU.FT.CONSOLIDATION GROUTING,TUN.	2.85
610	LB.GROUT PIPE & FITTINGS	.60
25	EA.STEEL TUNNEL SUPPORTS	$182
29,450	LB.STEEL LINING	.45
700	LFT.TUNNEL ROOF BOLTING	1.70
290	LB.BEARING PLATES FOR ROOF BOLTS	.30
560	LB.CH.LK.WOV.WIRE FAB.,ROOF BOLTS	.40
12	LFT."B"CONCRETE TUNNEL LINING	$110
391	LFT."C"CONCRETE TUNNEL LINING	$110
20	CY.FISSURE CONCRETE	20.40
76,300	CY."B"CONCRETE	31.55
82,340	BBL.PORTLAND CEMENT	6.60
2,720	T POZZOLAN	25.55
294,990	LB.REINFORCING STEEL	.12
L.S.,	SPILLWAY GATES & HOISTS	$357,650
L.S.,	SPILLWAY DRAINS	$3,250
L.S.,	INTAKE STRUCTURE	$123,950
L.S.,	STREAM MAINT.FACILS&OUTLET PIPE	$36,450
L.S.,	RECORDER HOUSE & APPURTS.	$51,050
L.S.,	RALSTON AFTERBAY BRIDGE	$39,850
L.S.,	OXBOW POWERHOUSE	$546,750
L.S.,	FURN.TURBINE	$257,700
L.S.,	INST.TURBINE	$25,350
L.S.,	FURN.TURBINE GOVERNOR	$19,350
L.S.,	INST.TURBINE GOVERNOR	$1,950
L.S.,	FURN.SYNCHRONOUS BYPASS VALVE	$19,350
L.S.,	INST.SYNCHRONOUS BYPASS VALVE	$1,950
L.S.,	FURN.GENERATOR & APPURTS.	$225,500
L.S.,	INST.GENERATOR & APPURTS.	$19,350
L.S.,	FURN.MAIN TRANSFORMER	$32,200
L.S.,	INST.MAIN TRANSFORMER	$3,200
L.S.,	FURN.OIL CIRCUIT BREAKER	$9,000
L.S.,	INST.OIL CIRCUIT BREAKER	$900
L.S.,	FURN.STATION SERVICE TRANSFORMER	$2,600
L.S.,	INST.STATION SERVICE TRANSFORMER	$250
L.S.,	FURN.GENERATOR BUS	$6,400
L.S.,	INST.GENERATOR BUS	$650
L.S.,	FURN.SURGE PROT&POT.TRNSFMR.EQ&CUB.	$3,850
L.S.,	INST.SURGE PROT&POT.TRNSFMR.EQ&CUB.	$400
L.S.,	FURN.NEUT.GRNDG.TRANSFMR&CUBICLES	$1,900
L.S.,	INST.NEUT.GRNDG.TRANSFMR&CUBICLES	$250

SUB CONTRACTORS:

POWERHOUSE, ELECTRICAL, MECHANICAL & COMMUNICATIONS SYS.: ETS-HOKIN & GALVAN, SAN FRANCISCO
ROADS: MAC GREGOR TRIANGLE, BOISE, IDAHO
CLEARING: THE CATTERMOLE-TRETHEWEY CONTRACTORS (PACIFIC) INC., PORTLAND, OREGON
REINFORCING STEEL: COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO, CALIFOR
TUNNEL LINER: KAISER STEEL, OAKLAND, CALIFORNIA
TURBINES & GENERATORS: TOSHIBA
TRANSFORMERS: WESTINGHOUSE