

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
DIVISION OF RESOURCES PLANNING

Bulletin No. 3

The CALIFORNIA WATER PLAN



GOODWIN J. KNIGHT
Governor

May, 1957

HARVEY O. BANKS
Director of Water Resources

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LETTER OF TRANSMITTAL

HARVEY O. BANKS
DIRECTORGOODWIN J. KNIGHT
GOVERNORADDRESS REPLY TO
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Department of Water Resources
SACRAMENTO

May 6, 1957

HONORABLE GOODWIN J. KNIGHT, *Governor, and*
Members of the Legislature of the
State of California

GENTLEMEN:

I have the honor to transmit herewith Bulletin No. 3 of the Department of Water Resources, entitled "The California Water Plan," as authorized by Chapter 1541, Statutes of 1947.

Bulletin No. 3 presents a master plan to guide and coordinate the activities of all agencies in the planning, construction, and operation of works required for the control, development, protection, conservation, distribution, and utilization of California's water resources for the benefit of all areas of the State and for all beneficial purposes.

It is believed that The California Water Plan provides the basis for achieving the most effective and comprehensive development of California's water resources. It is concluded that California does have enough water, including the State's present rights in and to the waters of the Colorado River, to satisfy the ultimate water needs if the available resources are wisely controlled, conserved, and distributed. The full solution of California's water problems thus becomes essentially a financial and engineering problem.

Bulletin No. 3 contains recommendations that The California Water Plan be accepted by the Legislature as the general and coordinated master plan for the progressive and comprehensive future development of the water resources of California by all agencies; that adequate funds be provided by the Legislature for a continuing, more detailed study under the California Water Development Program; that positive assurances be provided, to the maximum practicable extent, by constitutional amendment and legislative enactments, that water required to meet all future beneficial uses in all areas of the State will be available in adequate quantity and quality when and where needed; that a long-range water development fund and enabling policies to assure the financing and construction of needed water development works in California be established; that the financing and construction of the authorized Feather River Project be expedited; and that other presently needed water development works be undertaken immediately.

Very truly yours,

A handwritten signature in cursive script, reading "Harvey O. Banks".

Harvey O. Banks
Director

SYNOPSIS

This is the final of a series of three bulletins setting forth the results of the State-wide Water Resources Investigation, which has been in progress for the past 10 years under provisions of Chapter 1541, Statutes of 1947. This investigation entailed a three-fold program of study to evaluate the water resources of California, to determine present and probable ultimate water requirements, and to formulate plans for the orderly development of the State's water resources to meet its ultimate water requirements. Funds to meet the cost of the investigation were provided by the cited statute and subsequent budgetary acts of the Legislature.

The first phase of the State-wide Water Resources Investigation comprised an inventory of data on sources, quantities, and characteristics of water in California. The results are available in State Water Resources Board Bulletin No. 1, "Water Resources of California," published in 1951. This bulletin comprises a concise compilation of data on precipitation, runoff of streams, flood flows and frequencies, and quality of water throughout the State.

The second phase dealt with present and ultimate requirements for water. The associated report, State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," was published in 1955. This study comprised determinations of the present use of water throughout the State for all consumptive purposes, and forecasts of ultimate water requirements based in general on the capabilities of the land to support further balanced development.

The final phase of the State-wide Water Resources Investigation is presented herein as "The California Water Plan." Bulletin No. 3 describes a comprehensive master plan for the control, protection, conservation, distribution, and utilization of the waters of California, to meet present and future needs for all beneficial uses and purposes in all areas of the State to the maximum feasible extent. The Plan is designed to include or supplement rather than to supersede existing water resource development works, and does not interfere with existing rights to the use of water.

The objective in the formulation of The California Water Plan has been to provide a logical, engineering basis for future administration of the water resources of the State and for coordination of the efforts of all entities engaged in the construction and operation of water development projects, to the end that maximum benefit to all areas and peoples of the State may ultimately be achieved.

The California Water Plan includes local works to meet local needs in all portions of the State. It also includes the California Aqueduct System, an unprecedented system of major works to redistribute excess waters from northern areas of surplus to areas of deficiency throughout the State. The Plan gives consideration to water conservation and reclamation; to flood control and flood protection; to the use of water for agricultural, domestic, municipal, and industrial purposes; to hydroelectric power development; to salinity control and protection of the quality of fresh waters; to navigation; to drainage; and to the interests of fish, wildlife, and recreation. It contemplates the conjunctive operation of surface and ground water reservoirs, which operation will be essential to regulation of the large amounts of water ultimately to be involved.

The very magnitude of the task involved in formulation of The California Water Plan was such that detailed surveys and studies, and economic and financial analyses, could not be undertaken in this initial phase of investigation. At this stage of its development, therefore, the Plan must be regarded as no more than a broad and flexible pattern into which future definite projects may be integrated in an orderly fashion. As additional data and experience are gained, as technology advances, and as future conditions change in manners that cannot be foreseen today, The California Water Plan will be substantially altered and improved. However, the basic concept of the Plan as a master plan to meet the ultimate requirements for water at some unspecified but distant time in the future, when the land and other resources of California have essentially reached a state of complete development, will remain unchanged.

Voluminous data and information have been compiled and assembled in connection with preparation of The California Water Plan. It is realized that the need of the general public, on the one hand, is for a summary report with a minimum of technical detail but containing all of the information essential to an adequate understanding of the Plan. The need of engineering and other professional people, on the other hand, is for more detailed technical information which would be of minor interest to the general public. Therefore, publication has been set up to meet these separate needs—Bulletin No. 3 itself to meet the general need and the several appendixes to Bulletin No. 3 to meet the engineering and other technical needs.

THE CALIFORNIA WATER PLAN

CONCURRENT RELATED INVESTIGATIONS

A number of specific regional water resources investigations, complementing the state-wide studies, have been carried on concurrently by the Department of Water Resources and its predecessors. Some of these investigations utilized state funds entirely, while others were financed cooperatively by state and local interests. The planning for water development in those regions has been coordinated with and integrated into The California Water Plan. The features of the Plan in those regions of special investigation have been formulated and reported upon in more detail than are presented herein. The following bulletins present results of these regional studies.

California State Department of Public Works, Division of Water Resources. "Survey of Mountainous Areas." Bulletin No. 56. December, 1955.

—— "Santa Margarita River Investigation." Bulletin No. 57. June, 1956.

—— "Northeastern Counties Investigation, Report on Upper Feather River Service Area." (interim report) April, 1955.

—— "Program for Financing and Constructing the Feather River Project as the Initial Unit of The California Water Plan." February, 1955.

—— "Report to the California State Legislature on Putah Creek Cone Investigation." December, 1955.

California State Department of Water Resources. "Investigation of Upper Feather River Basin Development, Interim Report on Engineering, Economic, and Financial Feasibility of Initial Units." Bulletin No. 59. February, 1957.

—— "Interim Report to the California State Legislature on the Salinity Control Barrier Investigation." Bulletin No. 60. March 1957.

California State Water Project Authority. "Report to the California State Legislature on Feasibility of Construction by the State of Barriers in the San Francisco Bay System." March 1955.

California State Water Resources Board. "Santa Cruz-Monterey Counties Investigation." Bulletin No. 5. September, 1953.

—— "Sutter-Yuba Counties Investigation." Bulletin No. 6. September, 1952.

—— "Santa Clara Valley Investigation." Bulletin No. 7. June, 1955.

—— "Elsinore Basin Investigation." Bulletin No. 9. February, 1953.

—— "Placer County Investigation." Bulletin No. 10. June, 1955.

—— "San Joaquin County Investigation." Bulletin No. 11. June, 1955.

—— "Ventura County Investigation." Bulletin No. 12. October, 1953, Revised April, 1956.

—— "Alameda County Investigation." Bulletin No. 13. (preliminary report) July, 1955.

—— "Lake County Investigation." Bulletin No. 14. (preliminary report) October, 1955.

—— "Santa Ana River Investigation." Bulletin No. 15. (preliminary report) April, 1956.

—— "American River Basin Investigation, Report on Development Proposed for The California Water Plan." Bulletin No. 21. (preliminary report) June, 1955.

—— "Interim Report on Klamath River Basin Investigation, Water Utilization and Requirements." March, 1954.

—— "Interim Summary Report on San Luis Obispo County Investigation." October, 1955.

Other studies conducted by the Department and its predecessor agencies, the results of which are not yet available in final report form, include the following:

Cache Creek Watershed Investigation—Yolo County

Klamath River Basin Investigation

Northeastern Counties Investigation

Salinas River Basin Investigation

San Luis Obispo County Investigation

Shasta County Investigation

Data and information from the many other investigations conducted by the Department have been utilized. Pertinent investigations and plans of the U. S. Department of the Interior; the Corps of Engineers, U. S. Army; and the Department of Agriculture have been utilized and integrated into The California Water Plan.

THE CALIFORNIA WATER DEVELOPMENT PROGRAM

In order to plan intelligently for future development of California's water resources to meet increasing water needs, the investigation and study of water requirements, available resources, and potential water development projects must be a continuing process. This continuing need has been recognized, as is evidenced by legislative acts authorizing the Feather River Project provides for a multipurpose development, and, most recently, the Inventory of Water Resources, all of which are designated functions of the Department of Water Resources. These three investigations are discussed in the following sections. Complementing these investigations, and in close coordination therewith, the Department is engaged in an intensive and continuing program of study of the needs for specific projects, economic and financial analyses, and determination of recommended staging of construction. All of these investigations and studies collectively comprise the California Water Development Program, which incorporates subsequently authorized data gathering and planning activities.

Feather River Project

Many of the principles of The California Water Plan are embodied in the authorized Feather River Project, the initial unit of the Plan. The Feather River Project provides for a multipurpose development for firming water supplies, providing flood protection in the Feather River area, generating hydroelectric energy, and exporting surplus waters available in the Sacramento-San Joaquin Delta to areas of deficiency in the San Joaquin Valley, San

Francisco Bay Area, and southern California, with incidental fish, wildlife, and recreational benefits. This project was conceived by former State Engineer A. D. Edmonston and formulated by the former Division of Water Resources. It was first presented in 1951 in a publication of the State Water Resources Board entitled "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of The California Water Plan." The Legislature authorized the project in 1951 and provided funds for additional studies, including preparation of plans and specifications. These further studies are published in a report on "Program for Financing and Constructing the Feather River Project as the Initial Unit of The California Water Plan," submitted in February, 1955.

The Legislature, by the Budget Act of 1956, appropriated \$9,350,000 for continued engineering design and exploration, including the preparation of construction plans and specifications and providing for acquisition of right of way for some of the project features. The 1957 Legislature passed an urgency appropriation for \$25,190,000 to commence relocation of the Western Pacific Railroad and U. S. Highway 40 Alternate out of the Oroville Reservoir area.

Salinity Control Barrier Investigation

The need and feasibility of physical barriers to salt-water inflow in the San Francisco Bay system has been evaluated by the Division of Water Resources, pursuant to the Abshire-Kelly Salinity Control Barrier Act of 1953, Chapter 1104, Statutes of 1953. Incorporated in the report entitled "Feasibility of Construction by the State of Barriers in the San Francisco Bay System," March 1955, are provisions for conserving and developing waters presently being utilized for repulsion of sea water in the Sacramento-San Joaquin Delta. A conduit for conveying Sacramento River flow across the Delta is also proposed. These features, which are vital elements of The California Water Plan, are receiving further consideration through an extension of this study authorized by the Abshire-Kelly Salinity Control Barrier Act of 1955, Chapter 1434, Statutes of 1955. An interim report entitled "Salinity Control Barrier Investigation," March 1957, describes the recommended plan for accomplishing the foregoing objectives.

Inventory of Water Resources

Pursuant to Chapter 61, Statutes of 1956, the Department of Water Resources is conducting an investigation to determine in detail: the amount of water resources available in the separate watersheds in the State; the amounts of present and ultimate water required for beneficial uses in those watersheds; and, from the foregoing, the quantities of water, if

any, available for export from the watersheds of origin. This investigation, which will continue over a period of years, will be accomplished in greater detail than has heretofore been undertaken and will serve as a basis for assuring reservation of adequate water resources for the areas of origin.

OTHER PROPOSALS FOR DEVELOPMENT OF THE STATE'S WATER RESOURCES

The increasing awareness of the present prevailing water problems, and of the need for state-wide development of California's water resources, has been manifested in a number of ideas or proposals paralleling The California Water Plan. In general, these proposals purport a common objective, that is, the transfer of surplus northern waters to southern areas of deficiency. However, they have been advanced without adequate engineering and geologic study. Furthermore, their objectives and scope, as compared with those of The California Water Plan, are inadequate.

One such proposal, which has been termed the "Gravity Plan," has received considerable publicity during recent years. This plan would convey water by gravity conduit extending from Shasta Dam southerly to the Merced River. There it would cross the San Joaquin Valley and would be pumped over the Coast Range, where it would continue by gravity conduit into southern California. It is a fact, however, that the water supplies involved in the Gravity Plan are not available in adequate quantity, nor in proper monthly distribution to enable operation of the plan.

Another serious shortcoming in the Gravity Plan and other similar proposals involves their conflict with presently vested water rights, and interference with existing projects of various agencies. These plans would involve exchanges of water which would be impossible of accomplishment.

All of these alternatives have been analyzed by the Department of Water Resources in the formulation of The California Water Plan, and those elements found feasible have been incorporated into the Plan.

SCOPE OF PLANNING PHASE OF STATE-WIDE WATER RESOURCES INVESTIGATION

The planning phase of the current State-wide Water Resources Investigation, broader in scope than that for earlier investigations, has as its objective the formulation of a long-range plan for the comprehensive development of the water resources of the entire State. It contemplates the full control, conservation, protection, distribution, and utilization of the water resources of California, both surface and underground, to meet present and future water needs for all beneficial purposes and uses in all areas of the State, insofar as practicable.

THE CALIFORNIA WATER PLAN

103

Black Butte Reservoir, would be used for ground water recharge and export.

The runoff from some of the minor foothill streams between the drainage divides of Stony and Cache Creeks could be partially conserved for recreation by constructing small reservoirs at Clark Valley on the North Fork of Willow Creek, Squaw Flat on Logan Creek, High Peak on Hunters Creek, and Golden Gate Funks and Stone Corral Creeks. These small reservoirs could possibly also be used for flood control and terminal storage of pumped diversions from the Shama-Colusa Canal to serve contiguous lands.

Irrigation developments in the Clear Lake area of Cache Creek would consist of Excelsior Reservoir on Popsey Creek with feeder canal from Seigler Canyon Creek, both tributary to the outlet channel of Clear Lake, to serve lands near the lake outlet; Boggs and Kelseyville Reservoirs on Kelsey Creek, with feeder canal from Cold Creek into the latter reservoir, to serve Big Valley and other lands south of the lake; and Pitney Ridge Reservoir on Middle Creek and Lakeport Reservoir on Scott Creek, a tributary of Middle Creek, to serve lands on the north and west sides of the lake.

Flood control in the Clear Lake area could be provided by conducting spills from Kelseyville and Lakeport Reservoirs into Clear Lake through separate floodway channels; by improving and leveeing the channel of Middle Creek; and by enlarging the outlet channel of Clear Lake with downstream flood control storage space provided in Guinda Reservoir at the head of Capay Valley, or in alternative reservoirs at Blue Ridge or Wilson Valley. These alternative sites are presently (1957) under detailed investigation. Present court decrees governing the operation of Clear Lake for flood control would have to be rescinded and/or modified before the outlet channel could be enlarged.

Firm water supplies developed in Guinda or suitable alternative reservoir would be used in Capay Valley and other downstream areas. Secondary supplies, comprising regulated flood releases, would be used for ground water recharge and export. Because of the latter function, Guinda Reservoir, or suitable alternative, would be classified as a feature of the Sacramento Division of the California Aqueduct System.

Other local developments in the Cache Creek Basin would consist of Indian Valley Reservoir on the North Fork of Cache Creek for conservation and flood control, and pumped diversions from East Park Reservoir on Stony Creek to serve irrigable lands in Bear Valley. A small reservoir could be constructed on Bear Creek at the lower end of Bear Valley to impound water for recreational purposes.

Local works in the drainage basin of Putah Creek would consist of Middletown Reservoir on Putah Creek to serve lands in the vicinity of Middletown,

and Goodings Reservoir on Maxwell Creek, a tributary of Pope Creek which flows into Putah Creek, to serve lands in Pope Valley by pumped diversions. Local inflow to Goodings Reservoir would be augmented by importations of surplus water from Middletown Reservoir and Pope Creek.

The principal feature of the California Aqueduct System on Putah Creek would be Monticello Reservoir of the Eel River Division. No increase in capacity of Monticello Reservoir is contemplated under The California Water Plan, but considerable revision in its planned operation may be desirable. In its local function this reservoir would serve downstream areas and provide flood protection thereto. It would also afford opportunities for recreational development. With respect to future local development it is pertinent to note that recent permits issued by the State Water Rights Board to the United States Bureau of Reclamation in furtherance of the Solano Project, contain a condition subjecting the permits to depletion of stream flow above Monticello Reservoir in an amount not to exceed 33,000 acre-feet annually by future appropriations of water for reasonable beneficial use within the watershed of Putah Creek above said reservoir; provided such future appropriations shall be initiated and consummated prior to full beneficial use of water within the Solano Project service area. This permit term may make it necessary that any developments constructed in the area upstream from Monticello Reservoir for conservation of local water resources subsequent to the time that full beneficial use has been made under the Solano Project be based on an exchange of water imported from the Eel River or other sources under The California Water Plan.

In summary, the local works of the West Side Stream Group would consist of 17 reservoirs together with associated diversion dams and a power plant; feeder and service conduits, including pump lifts where required; and leveed stream channel improvements and floodway channels. The reservoirs would have a combined gross storage capacity of 1,920,000 acre-feet, of which only 154,000 acre-feet would be inactive. Operated in conjunction with ground water storage in local areas, these reservoirs would insure virtually full irrigation development of the land resources of the stream group and would provide opportunities for recreational development. In conjunction with features of the California Aqueduct System, these reservoirs would regulate water for downstream use, including ground water recharge and export. Together with Monticello Reservoir and Clear Lake, the reservoirs would contain about 400,000 acre-feet of storage space specifically reserved for flood control and strategically disposed throughout the stream group to protect downstream areas. Flood protection for the Clear Lake area would be accomplished by

conduits for conveyance southward and westward. It would also provide urgently needed flood protection and salinity control for the Delta lands.

The major works of the Delta Division would consist of two features: first, the Cross-Delta Canal of the Biemond Plan, utilizing natural and modified channels hydraulically isolated from the remainder of the Delta, and a siphon under the San Joaquin River to transfer the greater portion of the water developed in the Sacramento River Basin; and second, a conduit leading from Montezuma Reservoir to the southerly edge of the Delta, and including a siphon beneath the Sacramento and San Joaquin Rivers near Antioch to transfer the water developed in the North Coastal Area and the upper Sacramento River Basin and delivered to the Delta by the Sacramento West Side Canal. Hydraulic separation is necessary to prevent undue loss in transit and impairment in quality. Associated facilities of the Biemond Plan would include control structures on the Sacramento River and Steamboat Slough, a system of master levees along flood channels, floodways and control structures at several locations, barge locks, and fishways to pass anadromous fish. These facilities are described herein under the heading "Trans-Delta System."

Other features of the Delta Division are the South Bay Aqueduct and the Kirker Pass Aqueduct, which would serve the southern portions of the San Francisco Bay Area and the northern portions of the Central Coastal Area. Both of these aqueducts are distribution features of the Delta Division, as contrasted with other features designed as primary transmission facilities. They are subsequently discussed in this section under their respective headings.

The general location of the Delta Division is shown on Plate 6, and its component facilities are delineated on Sheets 8, 10, and 13 of Plate 5.

Trans-Delta System. Facilities of the Trans-Delta System would ultimately transfer some 18,330,000 acre-feet of water per season, on the average, across the Delta for conveyance to areas of deficiency in central and southern California and in the San Francisco Bay Area. The ultimate transfer across the Delta of water developed in the Sacramento River Basin would be accomplished by construction of an isolated canal and control structures, as hereinafter explained. As unregulated flows of the Sacramento and San Joaquin Rivers are reduced in the future by increased upstream storage developments for local use and for export of water, it will become necessary to segregate and prevent commingling, during transit, of the imported and locally developed waters of high quality with the drainage and flushing waters of poor quality which occur in and drain to the Delta. Segregation of these waters would be accomplished by facilities of the Biemond Plan. Controlled releases of

water to Suisun Bay for salinity repulsion would likewise be reduced.

1. *Biemond Plan.* Alternative barrier plans for salinity control in the Delta and for transfer of water across the Delta were studied under authorization of the Abshire-Kelly Salinity Control Barrier Act of 1953. Ir. Cornelius Biemond, Consulting Engineer from The Netherlands, who was retained during that investigation, recommended a plan with facilities for fresh-water transfer in an isolated system of channels and a master levee system along principal flood channels for flood protection to the Delta islands. Details of that investigation are presented in a report of the Water Project Authority of California entitled "Feasibility of Construction by the State of Barriers in the San Francisco Bay System," dated March 1955. In 1955, the Legislature enacted the Abshire-Kelly Salinity Control Barrier Act of 1955, which directed further study of barrier plans, and the Biemond Plan, as presently proposed, was developed during this investigation, currently (1957) in progress. Details of this investigation are presented in a report of the Department of Water Resources Bulletin No. 60, entitled "Salinity Control Barrier Investigation."

The Biemond Plan was designed to transfer water across the Delta, to provide flood protection to the Delta, and to conserve salinity control flows. Some flood flows would be conveyed through the Cross-Delta Canal, thereby reducing the lengths of master levees and the costs of construction and maintenance.

The Biemond Plan would have control structures on the Sacramento River and Steamboat Slough to divert water through the existing Delta Cross Channel into the proposed Cross-Delta Canal, and to provide sufficient hydraulic gradient in the canal to convey water to the major pumping plants on the southern fringe of the Delta. A barge lock and fishway would be located at the Sacramento River control structure. The Cross-Delta Canal would follow improved existing channels, and water would pass under the Stockton Deep Water Channel in large, inverted siphons located near Little Venice Island in the center of the Delta. Flood flows of the Mokelumne and Cosumnes Rivers would be conveyed in the Cross-Delta Canal to Little Venice Island where the flood waters would be discharged through a floodway structure into the San Joaquin River. All or a portion of these flows could be conveyed to the major pumping plants. A fishway would also be provided at Little Venice Island. A portion of the flood flows of the San Joaquin River would be diverted via Paradise Cut and Grant Line Canal to the major pumping plants. The portion of the flows not required for diversion by the major pumping plants would be discharged from the Cross-Delta Canal through a floodway structure into Franks Tract and then into the San Joaquin River. A barge lock